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To,

Date: 10.12.2020

The Secretary,

Gujarat Electricity Regulatory Commission

6th Floor, GIFT ONE, Road 5C, Zone 5, GIFT City, Gandhinagar

Re: Petition under section under section 86 (1)(e) (4) and 181 of the Electricity Act, 2003 seeking implementation of Notification dated 1/2/2019 and 1/10/2019 issued by Ministry of Power

Dear Sir,

We act on behalf of M/s Hindalco Industries Limited, the Petitioner herein. The captioned Petition is being filed under section 86 (1)(e), (4) and 181 of the Electricity Act, 2003 read with Clause 12.1 of the GERC (Procurement of Energy from Renewable Sources) Regulations, 2010 and Article 6.4 of the National Tariff Policy 2016, seeking implementation of Notification dated 1/2/2019 and 1/10/2019 issued by Ministry of Power.

Through the present Petition, the Petitioner is seeking amendment of the aforesaid RPO obligations in terms of the mandate/ intent of the aforesaid notification

We humbly request the Registry of this Hon'ble Commission to kindly acknowledge the filing of the said Petition, number the same and proceed accordingly.

The above is for your information and record.

Thanking You

With regards

Krishal

KRISHAL H. PATEL

(Advocate for Petitioner)

BEFORE THE GUJARAT ELECTRICITY REGULATORY COMMISSION
AHMEDABAD

FILING NO.________________

CASE NO.________________

IN THE MATTER OF:

M/s Hindalco Industries Limited .... **PETITIONER**

vs

GUJARAT ENERGY DEVELOPMENT AGENCY ......**RESPONDENT**

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Hindalco Industries Ltd. (Unit : Birla Copper) Dahej.

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BEFORE THE GUJARAT ELECTRICITY REGULATORY COMMISSION
AHMEDABAD

FILING NO.________________

CASE NO.________________

IN THE MATTER OF:

M/s HINDALCO INDUSTRIES LIMITED **...PETITIONER**

VERSUS

GUJARAT ENERGY DEVELOPMENT AGENCY **...RESPONDENT**

SYNOPSIS

1. That, the Petitioner i.e., Hindalco Industries Limited, is a Company incorporated under the provisions of the Companies Act, 1956 having its registered office at Ahura Centre, 15 Floor, B Wing, Mahakali Caves Road, Andheri (East) Mumbai- 400093. The Petitioner is the metals flagship company of the Aditya Birla Group and an industry leader in aluminum and copper. Birla Copper, Hindalco's copper unit, is located at Dahej in the Bharuch district of Gujarat. Birla Copper is one of the largest single-location copper smelters in the world with integrated port facilities.

2. The present petition is necessitated on account of the issuance of notifications by the Ministry of Power, Govt. of India, dated 01.02.2019 and 1.10.2019 with respect to fulfilment of renewable purchase obligations (RPOs) by industries/ consumers, who avail power from captive generating plants under captive mode. It is stated that vide the above notifications, the Ministry of Power has admitted that RPO norms have to be modified in the event the same cannot be fulfilled on account of technical and / or commercial impossibility.

3. That on 26.05.2010, this Hon'ble Commission notified the RPO

Regulations, viz. GERC (Procurement of Energy from Renewable Sources) Regulations, 2010 (hereinafter "RPO Regulations") for procurement of renewable energy by the DISCOMs and other obligated entities. That, vide a gazette notification dated 21.04.2018, this Hon'ble Commission amended Regulation 4.1 of the said RPO Regulations wherein the RPO norms were prescribed for the Financial Years 2016-20. It is pertinent to mention herein that the RPO for the FY 2010-11 was totaling to 5% and it was 7.00% for the FY 2012-13. However, under the aforesaid amendment to the RPO Regulations, the RPO for the FY 2019-20 was made 14.30%, which further increased to 17% for FY 2021-22.

4. That, in view of the manner in which the RPO on the captive users were escalating as stated above, commercial sustainability of such captive users such as the Petitioner, became increasingly difficult. It is to be kept in mind that the existing industry and their captive generating plants are not designed in a way to sustain an ever-increasing proportion of renewable power or by REC certificates, which entail a huge cost. Thus, by way of the aforementioned burden of RPO, the entire objective of the Electricity Act, 2003 i.e., encouraging and allowing captive generating plants to foray into the power markets stands watered down and diluted.

5. It is stated that industries, especially those engaged in manufacturing, including the Petitioner, which is a Copper producer/ manufacturer, are power intensive. This means that cost of Power/ electricity is one of the major input costs, and the same directly affects the competitiveness of the end products produced by such industries. A high cost of power makes the goods unviable in the open market.

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6. Hence, in order to address the above problems, and to usher in the era

of globalization, the legislature enacted the Electricity Act, 2003, for liberalizing and freeing the industry from the shackles of distribution licensees. Open access and captive generation were promoted, as is evident from the fact that, as per section 42(2), captive users were exempted from levy of cross subsidy surcharge and additional surcharge. Further, the generation of electricity, was also de-licensed, so as to attract more and more private investment in the generating business. However, at the same time, the above legislation also sought to promote renewable energy generation, as provided under section 86(1)(e).

7. In order to enforce Section 86(1)(e), this Hon'ble Commission promulgated regulations for mandatory purchase of renewable energy by the consumers of electricity, including industries. The said regulations are termed as GERC (Procurement of Energy from Renewable Sources) Regulation, 2010. The said regulations provided for a spiked increase in the share of renewable power by the industries, over a period of time. As such, the aforementioned mandatory imposition and the yearly escalation in the quantum of renewable energy consumption, started taking a toll on the industries with respect to overall energy costs, as renewable energy was expensive, as compared to captive power. While it is necessary to promote renewable energy, however, at the same time, the Act also envisaged promotion of captive consumption by virtue of the abovementioned exemptions from levy of cross subsidy surcharge and additional surcharge.

8. Accordingly, in order to strike a balance, as goods in the international market became cheaper, especially goods coming from China, the Ministry of Power issued the aforementioned two notifications dated 01.02.2019 and 01.10.2019, whereby the renewable purchase

Hindalco Industries Ltd (Unit: Birla Copper) Dahej obligations have been sought to be substantially reduced upon captive users. As per a combined reading of the aforesaid notifications, the Petitioner seeks that the existing RPO norms should be modified in terms of the following:

(a) the Renewable Purchase Obligation (RPO) norms for captive user(s), wherein the captive generating plant(s) is commissioned after the enactment of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010, has to be pegged at the level of RPO norms, prevalent in the year in which the captive generating plant(s) was commissioned, with respect to the entire life of such captive generating plant(s);

(b) the Renewable Purchase Obligation (RPO) norms for captive user(s), wherein the captive generating plant(s) is commissioned *before* the enactment of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010, is zero for the captive power used from such power plant(s) for its entire life.

In view of the above, the Petitioner, through the present Petition, seeks implementation of the first notification of MoP (01.02.2019), which means that this Hon'ble Commission may deviate from the notification dated 01.10.2019 based on the reasons enumerated herein.

List of Dates and Events

Sl. No.	Date	Event
1.	1998	Unit - 1 of the Petitioner of capacity of 35 MW achieved commissioning
2.	2002	Unit – 2 of the Petitioner having capacity of 39.8 MW achieved commissioning.
3.	2005	Unit – 3 of the Petitioner with a capacity of 60 MW achieved commissioning.

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4.	12.02.2005	The Ministry of Power (MoP) notified the National Electricity Policy (NEP).
5.	06.01.2006	The MoP notified the Tariff Policy (NTP).
6.	30.06.2008	The National Action Plant on Climate Change (NPACC) was released which provided for certain measures to be adopted in the regulatory/ tariffs regime to help mainstream renewable based sources in the national power system. The Plan also envisaged for issuance of Renewable Energy Certificates for the first time.
7.	November, 2008	The Forum of Regulators in 2008, recommended for promotion of REC mechanism, due to issues arising on account of divergence in RPOs, tariffs and different technologies across the country.
8.	June, 2009	The REC mechanism was also considered effective by the Ministry of New and Renewable Energy (MNRE), which issued a Report on the Development of Conceptual Framework for Renewable Energy Certificate Mechanism for India in 2009.
9.	11.01.2010	The Government of India launched the Jawaharlal Nehru National Solar Mission (JNNSM) whereby, the Central Government acknowledged the creation of a friendly and enabling environment for the purpose of diffusion of electricity generation through renewable sources across the country on priority.
10.	26.05.2010	Promulgation of the Gujarat Electricity Regulatory Commission (Procurement of Energy from Renewable Sources) Regulations, 2010.
11.	28.01.2016	The MoP introduced the NTP which envisaged that the appropriate Commission shall be required to create an enabling environment which promotes Captive Generation and also helps in promoting renewable sources of energy.
12.	01.02.2019	The MoP after taking into account the concerns of various stakeholders, regarding the applicability of RPO Obligations upon CPPs, and after consultation with MNRE, issued a notification, being Letter No. 30/04/2018-R&R, wherein reduction of burden of RPO obligation upon captive users was contemplated and suggested.
13.	26.04.2019	The MNRE issued an Office Memorandum being 16/1/2018-EFM.
14.	01.10.2019	The MoP in pursuance to the Notification dated 01.02.2019, issued a clarification Notification depicting the RPO norms for CPPs commissioned prior to 2015-16 and after 2016.

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		Hence, the present Petition is being filed seeking amendment of the GERC RPO Regulations, 2010, in line with the mandate of the aforesaid Notifications.

Hindalco Industries Ltd.
(Unit : Birla Copper, Dahej.)

BEFORE THE GUJARAT ELECTRICITY REGULATORY COMMISSION AHMEDABAD

FILING NO.__________________

CASE NO.__________________

IN THE MATTER OF: An application under section 86 (1)(e) (4) and 181 of the Electricity Act, 2003 read with Clause 12.1 of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010 and Article 6.4 of the National Tariff Policy 2016, seeking implementation of Notification dated 1/2/2019 and 1/10/2019 issued by Ministry of Power

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And

IN THE MATTER OF: Regulations 25, 26, 27, 30 of the GERC (Conduct of Business) Regulation, 2004.

And

IN THE MATTER OF:

M/s HINDALCO INDUSTRIES LIMITED
Ahura Centre, 15 Floor, B Wing, Mahakali Caves Road,Andheri (East)Mumbai-400093 **...PETITIONER**

VERSUS

GUJARAT ENERGY DEVELOPMENT AGENCY
(Through its Principal Secretary),
4th floor, Block No. 11 & 12, Udyog Bhavan,
Sector -11, Gandhinagar,
Gujarat 382017 **...RESPONDENT**

PETITION SEEKING MODIFICATION OF THE RENEWABLE PURCHASE OBLIGATIONS (RPOs) BY CAPTIVE USERS OF THE CAPTIVE GENERATING PLANTS IN THE STATE OF GUJARAT

MOST RESPECTFULLY SHOWETH:

Facts of the Case/Scope of the present petition

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1. That, the Petitioner i.e., Hindalco Industries Limited, is a Company incorporated under the provisions of the Companies Act, 1956 having its registered office at Ahura Centre, 15 Floor, B Wing, Mahakali Caves Road, Andheri (East) Mumbai-400093. The Petitioner is the metals flagship company of the Aditya Birla Group and an industry leader in aluminum and copper. Birla Copper, Hindalco's copper unit, is located at Dahej in the Bharuch district of Gujarat. Birla Copper is one of the largest single-location copper smelters in the world with integrated port facilities.

2. The present petition is necessitated on account of the issuance of notifications by the Ministry of Power, Govt. of India, dated 01.02.2019 and 1.10.2019 with respect to fulfilment of renewable purchase obligations (RPOs) by industries/ consumers, who avail power from captive generating plants under captive mode. It is stated that vide the above notifications, the Ministry of Power has admitted that RPO norms have to be modified in the event the same cannot be fulfilled on account of technical and / or commercial impossibility.

3. That on 26.05.2010, this Hon'ble Commission notified the RPO Regulations, viz. GERC (Procurement of Energy from Renewable Sources) Regulations, 2010 (hereinafter "RPO Regulations") for procurement of renewable energy by the DISCOMs and other obligated entities. That, vide a gazette notification dated 21.04.2018, this Hon'ble Commission amended Regulation 4.1 of the said RPO Regulations wherein

the RPO norms were prescribed for the Financial Years 2016-20. It is pertinent to mention herein that the RPO for the FY 2010-11 was totaling to 5% and it was 7.00% for the FY 2012-13. However, under the aforesaid amendment to the RPO Regulations, the RPO for the FY 2019-20 was made 14.30%, which further increased to 17% for FY 2021-22.

4. That, in view of the manner in which the RPO on the captive users were escalating as stated above, commercial sustainability of such captive users such as the Petitioner, has become increasingly difficult. It is to be kept in mind that the existing industry and their captive generating plants are not designed in a way to sustain an ever-increasing proportion of renewable power or by REC certificates, which entail a huge cost. Thus, by way of the aforementioned burden of RPO, the entire objective of the Electricity Act, 2003 i.e. encouraging and allowing captive generating plants to foray into the power markets stands watered down and diluted.

5. It is stated that industries, especially those engaged in manufacturing, including the Petitioner, which is a Copper producer/ manufacturer, are power intensive. This means that cost of Power/ electricity is one of the major input costs, and the same directly affects the competitiveness of the end products produced by such industries. A high cost of power makes the goods unviable in the open market.

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6. It is stated that when the Electricity Act, 2003 was enacted, captive consumption and open access were two of the major reforms to have been introduced. Both the said reforms aimed

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at making industries power independent, in terms of the fact that said reforms liberated the industries from the obligation to compulsorily buy power from their area distribution licensees. The same exposed the industries to high cost of power, on account of the inbuilt cross subsidies in the power tariffs, and also on account of the frequent load shedding(s) and power cuts.

7. The above made the manufactured goods overpriced and the Indian industries were becoming incompetent to compete with onslaught of cheap global imports. Further, the said industries could not export their goods freely on account of being overpriced. This became one of the primary reasons for hampering economic growth, as well as employment generation.

8. Hence, in order to address the above problems, and to usher in the era of globalization, the legislature enacted the Electricity Act, 2003, for liberalizing and freeing the industry from the shackles of distribution licensees. Open access and captive generation were promoted, as is evident from the fact that, as per section 42(2), captive users were exempted from levy of cross subsidy surcharge and additional surcharge. Further, the generation of electricity, was also de-licensed, so as to attract more and more private investment in the generating business. However, at the same time, the above legislation also sought to promote renewable energy generation, as provided under section 86(1)(e).

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9. In order to enforce Section 86(1)(e), this Hon'ble Commission

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promulgated regulations for mandatory purchase of renewable energy by the consumers of electricity, including industries. The said regulations are termed as GERC (Procurement of Energy from Renewable Sources) Regulation, 2010. The said regulations provided for a spiked increase in the share of renewable power by the industries, over a period of time. As such, the aforementioned mandatory imposition and the yearly escalation in the quantum of renewable energy consumption, started taking a toll on the industries with respect to overall energy costs, as renewable energy was expensive, as compared to captive power. While it is necessary to promote renewable energy, however, at the same time, the Act also envisaged promotion of captive consumption by virtue of the abovementioned exemptions from levy of cross subsidy surcharge and additional surcharge.

10. Accordingly, in order to strike a balance, as goods in the international market became cheaper, especially goods coming from China, the Ministry of Power issued the aforementioned two notifications dated 01.02.2019 and 01.10.2019, whereby the renewable purchase obligations have been sought to be substantially reduced upon captive users. As per a combined reading of the aforesaid notifications, the Petitioner seeks that the existing RPO norms should be modified in terms of the following:

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(a) the Renewable Purchase Obligation (RPO) norms for captive user(s), wherein the captive generating plant(s) is commissioned after the enactment of the GERC (Procurement of Energy from Renewable Sources)

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Regulation, 2010, has to be pegged at the level of RPO norms, prevalent in the year in which the captive generating plant(s) was commissioned, with respect to the entire life of such captive generating plant(s);

(b) the Renewable Purchase Obligation (RPO) norms for captive user(s), wherein the captive generating plant(s) is commissioned *before* the enactment of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010, is zero for the captive power used from such power plant(s) for its entire life.

In view of the above, the Petitioner seeks implementation of the first notification of MoP (01.02.2019), which means that this Hon'ble Commission may deviate from the notification dated 01.10.2019 based on the reasons enumerated in the present petition.

11. It needs to be appreciated that, as a sector regulator, this Hon'ble Commission has absolute powers to decide independently as to how the intent behind the aforementioned notifications is to be implemented. In this context, reference be made to Sections 66 and 86(1)(e) of the Electricity Act, 2003. Hence, while this Hon'ble Commission ought to take into account the fact that the RPO regime needs to be relaxed in terms of the above notifications, however, this Hon'ble Commission, for the purpose of economic development of the State, and development of the captive power market, ought to deviate and provide for more relaxed RPO norms in terms of the notification dated 01.02.2019.

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12. Since, the entire RPO regime formulated by this Hon'ble Commission was entirely based upon the notifications/ policies issued by the Central Government, it is imperative that this Hon'ble Commission ought to implement the intent of the aforementioned notifications dated 01.02.2019 and 01.10.2019 issued by the Ministry of Power. In this context, reference be made to Clause 6.4(1) of the Tariff Policy, 2016 issued by the Central Government under Section 3 of the Electricity Act, 2003, which mandates that the long-term trajectory of RPO norms have to be specified by the State Commissions by taking guidance from the Ministry of Power. For the said purpose, this Hon'ble Commission ought to amend its 2010 RPO Regulations (amended from time to time) in order to give effect to the intent of the aforementioned notifications, which is to lessen/ reduce the burden of the existing RPO norms on industries, especially Copper Industries.

13. It is submitted that the notification dated 01.10.2019, is a deviation from the earlier notification dated 01.02.2019. However, what needs to be considered is the "intent" of MoP, which is recognition of the fact that RPO norms can be relaxed when there is physical, technical and/ or commercial impossibility. This intent has to be kept in mind, when this Hon'ble Commission adjudicates the present petition for the purpose of implementation of the notification dated 01.02.2019.

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14. That, this Hon'ble Commission has ample powers available

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under Section 66 of the Electricity Act, 2003, for development of power market. Further, in the event this Hon'ble Commission deviates from the aforementioned notification dated 01.10.2019, and instead implements 01.02.2019, then it would not only encourage a conducive market towards encouragement of captive generation of power, but would also lead to more robust industrial growth on account of such conducive electricity regulatory scenario.

15. It is further submitted that when an investor invests for setting up of an industrial unit, the said investor has to factor in all the possible costs which could be involved in the manufacture of the goods. One of the critical costs is related to the cost of electricity. The present RPO regime provides for a year on year increase in the RPO norms, and the investor is not aware as to how much cost is to be factored in, for the purpose of complying with the RPO norms for the future. Since, the cost associated with fulfilment of RPO norms, as per the present regime, is substantial, the same makes the industrial output as uncompetitive. Therefore, in order to provide a certainty as to the costs associated with fulfilment of RPO norms, the Central Government (through MoP and MNRE) issued the aforementioned notifications. The implementation of the intent of the aforesaid notifications, as sought in the present petition, will provide transparency and certainty to an investor, both, before a decision to invest is taken, and for those investors who have already invested and their output/ goods are becoming in-competitive on account of the huge costs associated with the present RPO regime.

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It is stated that robust industrial growth can only be achieved in the event there is regulatory certainty with respect to the material input costs, and with electricity being one of the major input costs (especially in Copper Industry), the RPO regime prevalent in the State ought to be modified/ reformed in terms of the intent of the aforesaid notifications.

16. That, this Hon'ble Commission is required to consider that captive generation needs to be promoted. For this, a perusal of the Preamble and Statement of Object and Reasons of the Electricity Act, 2003, are most vital, which clearly provides for such promotion of captive generation in the country. Further, under Sections 38 and 42, captive generation is promoted by providing exemptions from cross subsidy surcharge and additional surcharge. As such, mandate of the Act is to also promote captive generation, apart from renewable generation.

17. Thus, in the circumstances, this Hon'ble Commission needs to pass appropriate directions for amendment of the RPO Regulations, with the effect that the CPPs, which have commissioned after the enactment of aforesaid Regulations, will have to comply with the RPO norms at the levels as mandated by the Hon'ble Commission for the year in which the CPP was commissioned, which will be applicable for the entire life of such CPP, i.e. in line with the notification dated 01.02.2019.

18. That, the aforesaid can be achieved by "prospectively" providing in the amended regulations that any RPO already fulfilled by the CPPs, which is in excess when compared with

the year wise RPO norms to be provided in the amended regulations, shall be set-off/ adjusted against the future RPO fulfilment obligations. In this regard, it is submitted that there needs to be a specific provision for providing set-off/ adjustment, which would be for future.

19. Hence, the said petition.

Chronological Brief facts

20. The Petitioner, *viz.* Hindalco Industries Limited, Unit: Birla Copper, is a Copper manufacturing plant having a Captive Power Plant with 134.8 MW capacity. The three Units of the Petitioner were commissioned and synchronized with the Grid, at different points of time, from 1998 to 2005 as given below:

Sl. No.	Units	Name Plate Capacity in MW	Commissioning Date
1.	Unit- 1	35	1998
2.	Unit -2	39.8	2002
3.	Unit –3	60	2005

21. The Petitioner is a large industry having set up Captive Generating Plant (CGP) within the State, with an installed capacity of about 134.8 MW for generation of electricity. The said CGP has been set up with an objective of supplying continuous, consistent, quality of power to the Copper plant. Hence, the sustainability of the parent industry, as well as their captive power plants, are of material importance for the State.

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22. In the year 2003, the Electricity Act was passed with the objective to introduce competitive environment in the electricity sector and to take measures, conducive to development of electricity industry and also for promotion of environmentally benign policies. In addition, to the Electricity Act, the Central Government had undertaken various others exercises and initiatives towards promotion of renewable energy, which are discussed in detail herein below.

23. Thereafter, in compliance with section 3 of Electricity Act, 2003, the Ministry of Power notified the National Electricity Policy on 12.02.2005, for development of power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. The said policy provided that the purchase obligations with respect to renewable consumption (*as envisaged in section 86(1)(e) of the Electricity Act 2003*) should be made applicable to the tariff determined by the various State Electricity Regulatory Commissions (SERCs) at the earliest and progressively such purchase obligations would be increased with increasing obligation for share of electricity from non-conventional sources.

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24. It is stated that the Ministry of Power on 05.01.2006 notified the National Electricity Policy, in order to further the intent of the Act.

A copy of the National Electricity Policy notified on 12.02.2005 is annexed hereto and marked as **Annexure P-1**.

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25. The Ministry of Power on 05.01.2006 notified the National Tariff Policy, in order to further the intent of the Electricity Act, 2003.

A copy of the National Tariff Policy notified on 06.01.2006 is annexed hereto and marked as **Annexure P-2**.

26. It is submitted that for the purpose of promoting renewable energy in terms of Section 86(1)(e) of the Act, India's first National Action Plan on Climate Change (NAPCC) was released on June 30, 2008, which provided for certain measures to be adopted in the regulatory/ tariffs regime to help mainstream renewable based sources in the national power system. The Plan also envisaged for issuance of Renewable Energy Certificates for the first time, in order to address the concerns with respect to divergence in RPOs for the states and hence hindrances being created for the state commissions in providing for higher RPOs. Relevant extract from the aforesaid NAPCC, has been reproduced herein below for ready reference:

"4.2.2 GRID CONNECTED SYSTEMS

... ...

(i) A dynamic minimum renewable purchase standard (DMRPS) may be set, with escalation each year till a pre-defined level is reached, at which time the requirements may be revisited. It is suggested that starting 2009-10, the national renewables standard (excluding hydropower with storage capacity in excess of daily peaking capacity, or based on agriculture based renewable sources that are used for human food) may be set at 5% of total grids purchase, to increase by 1%

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each year for 10 years. SERCs may set higher percentages than this minimum at each point in time.

(ii) Central and State governments may set up a verification mechanism to ensure that the renewable based power is actually procured as per the applicable standard (DMRPS or SERC specified). Appropriate authorities may also issue certificates that procure renewable based power in excess of the national standard. Such certificates may be tradeable, to enable utilities falling short to meet their renewables standard obligations. In the event of some utilities still falling short, penalties as may be allowed under the Electricity Act 2003 and rules thereunder may be considered. … … … …"

A copy of NAPCC dated 30.06.2008 is annexed herewith as **Annexure P-3**.

27. It is submitted that the Forum of Regulators in 2008, had also recommended for promotion of REC mechanism, due to issues arising on account of divergence in RPOs, tariffs and different technologies across the country. The following recommendations were made after considering the report of the working group:

"11.8 Feasibility of introducing RE certificate mechanism

11.8.1 A suitable mechanism like REC is necessary to promote RE sources on the scale envisaged in the National Action Plan on Climate Change. The MNRE had commissioned a study to examine the feasibility of developing a model to operationalize

> RECs. The study should also examine the GBI as a basis for evaluation of RECs. The legal sanctity of REC vis-à-vis EA 2003 needs to be examined."

A copy of the recommendations of Forum of Regulators is annexed herewith and marked as **Annexure P-4**.

28. It is submitted that the REC mechanism was also considered effective by the Ministry of New and Renewable Energy, which issued a Report on the Development of Conceptual Framework for Renewable Energy Certificate Mechanism for India, in June 2009, discussing various aspects including the legal sanction for introducing Renewable Energy Certificates, the eligibility of renewable sources and technologies, the obligated entities, the shelf life of such certificates, compatibility with other schemes etc.

    A copy of the MNRE Report is annexed herewith and marked as **Annexure P-5.**

29. Hence, as has been stated above, due to uneven distribution of renewable energy sources across the country, which created hindrance for the Commissions to specify higher RPOs, the regime for RECs began with the aforesaid policy framework laid down by the Central Government. It is further stated that in lieu of the above policies and plan of the Central Government, the Hon'ble Central Commission came out with the mechanism of sale and purchase of RECs through the CERC REC Regulations, 2010. The said REC regime was adopted by the State Commissions by way of either amending their existing regulations or issuing fresh regulations to include

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the renewable energy certificate mechanism as a means for achieving/ meeting renewable purchase obligation by the distribution licensees and other obligated entities.

In lieu of the aforesaid intent and framework encapsulated by the Central Government, vide its policies and guidelines, from time to time, this Hon'ble Commission had also promulgated its RPO Regulations in 2010, which also provided for the aforesaid regime.

30. It is submitted that in order to further promote electricity generation through renewable sources, Jawaharlal Nehru National Solar Mission (JNNSM) was launched on the 11.01.2010 by the Government of India, wherein the Central Government itself acknowledged creation of a friendly and enabling environment for the purpose of diffusion of electricity generation through renewable sources across the country on priority. Article 6 in this regard is relevant, which talks about the policy and regulatory framework. The relevant provisions of the JNNSM are extracted herein below:

> "6. Policy and regulatory framework
>
> The objective of the Mission is to create a policy and regulatory environment which provides a predictable incentive structure that enables rapid and large-scale capital investment in solar energy applications and encourages technical innovation and lowering of costs.
>
> Although in the long run, the Mission would seek to establish a sector-specific legal and regulatory framework for the development of

solar power, in the shorter time frame, it would be necessary to embed the activities of the Mission within the existing framework of the Electricity Act 2003. The Electricity Act already provides a role for renewables but given the magnitude and importance of the activities under the Mission, it would be necessary to make specific amendments. The National Tariff Policy 2006 mandates the State Electricity Regulatory Commissions (SERC) to fix a minimum percentage of energy purchase from renewable sources of energy taking into account availability of such resources in the region and its impact on retail tariff. National Tariff Policy, 2006 would be modified to mandate that the State electricity regulators fix a percentage for purchase of solar power. The solar power purchase obligation for States may start with 0.25% in the phase I and to go up to 3% by 2022. This could be complemented with a solar specific Renewable Energy Certificate (REC) mechanism to allow utilities and solar power generation companies to buy and sell certificates to meet their solar power purchase obligations.

The Central Electricity Regulatory Commission has recently issued guidelines for fixing feed-in-tariff for purchase of Solar power taking into account current cost and technology trends. These will be revised on an annual basis. The CERC has also stipulated that Power Purchase Agreement that utilities will conclude with Solar power promoters, should be for a period of 25 years.

.........."

31. It is submitted that on the basis of the aforesaid study/ policy framework of the Central Government, which was issued from

time to time, RPO Regulations came to be promulgated by various State Commissions. That, the primary objective of such Regulations was to promote a friendly environment for RPO imposition. What is evident from the above is that the entire RPO and REC regime was conceptualized by the Central Government, which was thereafter adopted by the Hon'ble Central Commission, as well as this Hon'ble Commission.

32. That, it may not be out of place to specifically mention herein that such obligations were creating hindrances for various industries, including that of the Petitioner, which pertained to technical and commercial restraints on them, giving rise to various concerns from such stakeholders for such industries, including the Petitioner. It is pertinent to note that the Petitioner, amongst others, had already been adversely affected due to a lack of pro-industry policy(ies) to support Copper Industries, in the country, on a whole.

33. In addition to the above, the Renewable Purchase Obligations (RPOs), instead of creating an enabling environment, had fastened upon the captive users of the captive generating plants, compulsorily procurement of a specific percentage of physical renewable energy, or in the alternative procurement of renewable energy certificates (RECs), out of the total consumption of electricity by such captive users, through their captive generating plants, which acted as an additional cost burden on them. This led to a lot of turmoil for the Petitioner and its members, when the intent of the Electricity Act, 2003 and the policy and regulatory framework of the Central Government, was to also actively promote captive generation

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of power.

34. On 26.05.2010, this Hon'ble Commission notified the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010, for procurement of renewable energy by the DISCOMS and other obligated entities. That, vide a gazette notification dated 21.04.2018, this Hon'ble Commission amended Regulation 4.1 of the said RPO Regulations wherein the RPO norms were prescribed for the Financial Years 2010-11 to FY 2021-22. It is pertinent to mention herein that the RPO for the FY 2010-11 was totaling to 5% and it was 7.00% for the FY 2012-13. However, under the aforesaid amendment to the RPO Regulations, the RPO for the FY 2019-20 was made 14.30%, which further increased to 17% for FY 2021-22.

35. It is pertinent to note that the aforesaid RPO norms for the State of Gujarat are comparatively higher than the RPO norms for the other states, which has brought the industries such as that of the Petitioner and its members, operating in the State, in a comparatively disadvantageous position than the industries operating in elsewhere. This also vitiates the very objective of Section 66 of Electricity Act, 2003, which envisages promotion of development of power market, so that the market becomes more competitive and there is regulatory certainty.

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A comparative chart detailing the fact that RPO norms in the State of Gujarat are higher than most other States in India, is annexed herewith and marked as **Annexure P-6.**

36. Further, the manner in which the RPO obligations on the

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captive users are increasing, no such user shall be able to sustain itself financially and operationally, as the existing industries and their CGPs are not designed in such a way to use ever increasing proportion of renewable power and keep their own power plants ideal or buy REC certificates at huge cost, and therefore, the whole objective of the Electricity Act, 2003 behind encouraging and allowing captive generating plants (CGPs) to enter the Electricity Market shall stand defeated.

37. That, in terms of the prevailing RPO regime in the State of Gujarat and the above RPO Regulations, the Petitioner submits that the following issues are faced by it, as below:

That, assuming that 5% of the power is consumed from Renewable Sources, in the total power mix by the Petitioner, the capacity of Renewable Energy project required for a unit with consumption of 90 MW is 18 MW (considering an average CUF of 25% for different Renewable Sources);

i. Further, the capacity of existing CGPs have to be kept idle and the fixed cost has to be borne by the industry;

ii. That the industrial consumers having a CGP, usually maintain a miniscule/ limited contract demand with the Discom, primarily to meet the startup power (in case of black out) and emergency supply. Import of power under open access gets restricted to the contract demand. This implies that import of renewable power also gets restricted qua contract demand maintained with the Discom. The same results in the industrial

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consumer paying very high demand charges along with Parallel Operation charges, even if it does not require such contract demand in normal course;

iii. In case of high-power import, and in the event an islanding occurs due to grid disturbance, there is high probability that the power plant will not be able to sustain the sudden load change, which may lead to black outs;

iv. Discoms have a large generation & consumption base and it is easier to handle variation on both generation and consumption fronts. Unlike in case of an individual consumer, deviations from a Discom gets settled at State/Regional level under UI mechanism and in turn, the deviation charges are recovered either from the RE power generator or the consumer;

v. For the solar project, a large parcel of land (@5 Acre per MW) is also required in the vicinity of the existing plant else the need for power transfer over long distance arises and conditions are completely unfavorable;

vi. Any production process, more so for continuous process industry(ies), requires continuous and steady supply of power. Renewable Energy is infirm in nature and its usage in high ratio, makes the power system unstable and unreliable. Neither the grid nor the CGP can sustain/ support excursions (due to natural phenomenon) beyond certain limit.

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38. In addition to the above, there are other constraints in the ISTS network and that Inter State transmission of high quantum of renewable power is not yet favourable. It is stated that unlike in case of Discoms, when open access charges and losses are waived for inter-state transmission of renewable power, no such waiver is available in case of CGPs. The landed rate at the consumption point, after addition of inter-state & intra-state transmission charges/ losses and other charges, is unfavourable and financially unviable.

39. That, in terms of the above, the MoP taking into account the concerns of various stakeholders, regarding the applicability of RPO Obligations upon CPPs, the consequent impact of such imposition on industries, including various constraints with compliance on account of technical and/ or commercial impossibility, etc., after consultation with Ministry of New and Renewable Energy (hereinafter referred to as "MNRE"), issued a notification, being Letter No. 30/04/2018-R&R, on 01.02.2019, wherein reduction of burden of RPO obligation upon captive users was contemplated and suggested. Relevant extract of the aforesaid notification is reproduced herein below for ready reference of this Hon'ble Commission:

> "The request of various stakeholders regarding capping of RPO for Captive Power Plants (CPP) has been examined in consultation with Ministry of Renewable Energy and it is clarified that RPO of the CPP may be pegged at the RPO level applicable in the year in which the CPP was commissioned. As and when the company adds to

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> the capacity of the CPP, it will have to provide the additional RPO as obligated in the year in which new capacity is commissioned. There should not be an increase in RPO without any additional fossil fuel capacity being added."

Copy of the MoP notification dated 01.02.2019, has been annexed herewith and marked as **Annexure P-7.**

40. In this regard, it is specifically submitted that RPO obligations of the Petitioner, if calculated in terms of the above notification dated 01.02.2019 and followed, the level of outstanding RPO's shall gradually decrease, which is much more viable and achievable.

A chart depicting the percentage of RPO norms based on commissioning year of the different generating units of the CGP of the Petitioner is as follows:

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	Obligation		REC Purchased	
Year	Solar	Non-Solar	Solar	Non-Solar
FY 16	7893	39463	7,800	39,000
FY 17	11143	52530	11,136	52,500
FY 18	12200	57515	32,850	57,515
FY 19	26306	52303	26,608	52,903
FY 20	29052	46479	302	17,603
Total	**86,594**	**2,48,290**	**78,696**	**2,19,521**

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41. Pursuant to the foregoing notification of 01.02.2019, the MoP has issued a subsequent notification dated 01.10.2019, in the nature of a clarification to the said earlier notification. The relevant extract of the aforesaid letter is reproduced herein

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below for ready reference of this Hon'ble Commission:

> "............
>
> (i) For CPPs that have commissioned before 01.04.2016, RPO should be at the level as mandated by the appropriate Commission for the year 2015-16. For CPPs commissioned from 1.04.2016 onwards, the RPO level as mandated by the Appropriate Commission or Ministry of Power, whichever is higher, for the year of commissioning of the CPP shall be applicable."

It is the humble submission of the Petitioner that, at present, an atmosphere of ambiguity and uncertainty has arisen, in view of the aforementioned notifications dated 01.02.2019 and 01.10.2019 issued by MoP, even though the endeavor of the said notifications was to address the concerns with respect to fulfillment of RPO norms by industries/ consumers who avail power from captive generating plants under captive mode including non fulfilment of the said norms on account of technical and/ or commercial impossibility, and this has led to an extraordinary circumstance before this Hon'ble Commission, wherein it is required to independently adjudicate this issue, and invoke its regulatory as well as, legislative powers, to actually give effect to the intent of MoP in issuing the notification dated 01.02.2019.

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Copy of the subsequent MoP notification dated 01.10.2019, has been annexed herewith and marked as **Annexure P-8.**

42. In this context, it is submitted that the Statement of Objects and Reasons of the Electricity Act, 2003 provides for *'taking measures conducive to development of electricity industry,*

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promoting competition therein/ protecting interest of consumers...' as well as 'promotion of efficient and environmentally benign policies'.

43. Furthermore, the National Tariff Policy, 2016 also primarily envisages that the appropriate Commission shall be required to create an enabling environment which promotes Captive Generation as provided under Article 6.3, all the while, balancing the aspects to promote renewable sources of energy under Article 6.4. In the present circumstances, taking aide of the above Articles of the National Tariff Policy, this Hon'ble Commission is mandated to create a harmony between promotion of renewable sources of energy and creating an enabling environment which promotes harnessing of Captive Generation of power. This has also been the vision of the legislature while enacting the Electricity Act, 2003.

A copy of the Tariff Policy 2016, is annexed hereto and marked as **Annexure P-9**.

44. It is also submitted that Article 5.2.24 and 5.2.25 of the National Electricity Policy, 2005 explains the establishment of CGP's as a means of securing reliable, quality and cost-effective power.

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It is respectfully stated that after considering the economic situation of the country, and with the aim to focus on sustained economic growth, the Ministry of Power, in consultation with Ministry of New and Renewable Energy, had come out with the aforementioned notifications. Thus, with the aim of providing clarity on the issue of renewable purchase

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obligations required to be fulfilled before the industrial consumers make huge investments for constructing CGPs, the MoP issued its earlier notification dated 01.02.2019 whereunder it was contemplated and suggested that captive user's RPO obligation has to be pegged at the RPO level applicable in the year when the said CGP was commissioned, commensurate with the entire life of the said captive generating asset and the captive power consumed. However, vide the subsequent notification of MoP dated 01.10.2019, inevitably, the atmosphere of ambiguity is back wherein RPO obligations on account of technical and commercial impossibility cannot be fulfilled thus, creating a detrimental atmosphere for the Petitioner in the state of Gujarat.

45. It is pertinent to mention that after the said notification dated 01.02.2019, the Ministry of New and Renewable Energy has come up with an Office Memorandum dated 26.04.2019 being 16/1/2018-EFM, wherein it has proposed the following:

> "3. It may further be mentioned that CPPs have been importing/ exporting electricity from/ to the grid, as per the requirement and cost-comparative considerations. Under the RPO, the CPPs will have to either buy or generate renewable power according to the RPO for particular year. Increasing RPO trajectory will necessitate either increasing power export to the grid, cutting down import from grid. As such, under the prevailing renewables costs and trends thereof, increasing RPO trajectory may not put CPPs in financially disadvantageous position across the CPP landscape. However, increasing RPO may be

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> disadvantageous to certain categories of CPPs (say CPPs in Aluminium industry) on technical grounds.
>
> 4. In view of the above, it is suggested that the Ministry of Power may consider issuing clarification order in supersession to the order referred to in Paragraph 1.0 above of the 1 February 2019. The clarification order may propose that while considering RPOs for CPPs, the SERCs may permit deviation from the RFC trajectory as notified by the Ministry Power only in the cases where: i) Achieving RPO trajectory will put the industry deploying CPP in a financially disadvantageous position; or ii) increasing renewable power consumption is not technically feasible for operations of the industry deploying CPPs. The above may act as guiding principle for SERCs in determining applicability of RPOs for CPPs."

Hence, as per the aforesaid office memorandum of the MNRE, SERCs in determining applicability of RPOs for CPPs, has to examine whether achieving RPO trajectory will put the industry deploying CPP in a financially disadvantageous position and increasing renewable power consumption is not technically feasible for operations of the industry deploying CPPs.

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A copy of Office Memorandum dated 26.04.2019, being 16/1/2018-EFM is annexed hereto and marked as **Annexure P-10.**

46. It is a fact that Renewable power is intermittent in nature as it depends mostly on climatic conditions and hence, huge generation fluctuation and voltage spikes are pretty common. Highly fluctuating renewable energy generation would not only

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play havoc on the life of conventional CPPs but also would result into curtailment of renewable energy generation itself, in order to operate the CPPs at technical minimum. At the same time, qua industries like the Copper Industry, cannot survive without uninterrupted power, which is impossible using a Renewable source of power.

47. Therefore, it is submitted that while deciding the RPO obligations pursuant to the notifications dated 01.02.2019 and 01.10.2019 issued by MoP, it is to be taken into consideration that purchasing Renewable Energy Certificate for fulfilment of RPO by Gujarat based captive users and CGPs does not help the State of Gujarat, in revenue generation/ industrial growth, as not many Renewable Energy generators are situated in the State. Whereas, on the other hand imposition of higher RPO norms creates a non-favourable atmosphere for industry in the State. Therefore, the existing RPO obligations needs an independent review, particularly in view of the MoP notification dated 01.02.2019.

48. Further, it is submitted that the pool of Renewable Energy Certificates has almost depleted on the Energy Exchange, and therefore after sometime, the captive users will not be in a position to procure any more REC and hence will fail in fulfilling its RPO obligations.

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49. In this regard, it is submitted that the past inventory of Renewable Energy Certificates (REC) has already depleted with demand far exceeding supply on the Energy Exchanges, and therefore, the captive users will not be in a position to

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procure any more RECs and hence, will fail in fulfilling their RPO obligations. In this context, reference may be made to the below table:

Month, Year	Opening Balance (A)	REC Issued (B)	No. of REC Redeemed: RECs Redeemed through Power Exchanges (C)	No. of REC Redeemed: RECs retained by RE Generators (D)	Total E=(C+D)	Closing Balance (F=A+B-E)
Feb, 2019	2243123	2092011	1240849	15599	1256448	3078686
Mar, 2019	3078686	344468	1177761	37410	1215171	2207983
Apr, 2019	2207983	365455	368902	299	369201	2204237
May, 2019	2204237	535170	750792	9782	760574	1978833
Jun, 2019	1978833	696765	698298	4313	702611	1972987
Jul, 2019	1972987	552581	629628	40832	670460	1855108
Aug, 2019	1855108	409308	430513	9004	439517	1824899
Sep, 2019	1824899	617082	800435	6173	806608	1635373
Oct, 2019	1635373	697050	687439	24181	711620	1620803
Nov, 2019	1620803	371910	505673	19587	525260	1467453
Dec, 2019	1467453	541671	504608	126244	630852	1378272
Jan, 2020	1378272	247719	0	0	0	1625991
Total:		**58910054**	**55028254**	**2255809**	**57284063**	

50. Further, with demand exceeding supply, the REC's trading prices at both the exchanges have increased substantially, causing additional burden for the industries. In this context, the below table be referred:

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Solar REC						Non Solar REC					
Lakh REC			Rs/REC			Lakh REC			Rs/REC		
Total Sell Bid	Total Buy Bid	Market Clearing Volume	Market Clearing Price: Floor	Market Clearing Price: IEX	Market Clearing Price: PXIL	Total Sell Bid	Total Buy Bid	Market Clearing Volume	Market Clearing Price: Floor	Market Clearing Price: IEX	Market Clearing Price: PXIL
49.2	8.8	8.8	1000	1000	1000	2.5	11.0	1.9	1000	1001	1000
50.0	9.1	9.1	1000	1000	1000	4.6	6.3	4.0	1001	1010	1000
41.8	5.9	5.9	1000	1000	1000	3.8	11.1	3.0	1002	1150	1050
36.9	13.8	13.8	1000	1000	1000	3.1	9.3	2.4	1003	1200	1050
24.0	4.9	4.9	1000	1000	1000	4.9	9.7	3.3	1004	1200	1101
20.0	23.6	15.6	1000	1000	1000	5.9	7.9	3.5	1005	1100	1300
5.7	10.3	2.8	1000	1001	1000	6.4	9.0	4.3	1006	1251	1201
4.0	15.6	0.6	1000	1101	1051	7.1	10.0	4.5	1007	1252	1260
4.1	14.7	1.8	1000	1450	1500	5.4	17.2	3.8	1008	1320	1255
3.6	6.9	1.2	1000	1750	1500	5.7	10.5	4.9	1009	1500	1501
8.1	8.1	4.1	1000	1500	1908	16.3	12.1	8.1	1010	1395	1555
5.1	9.2	3.5	1000	2000	1700	11.1	11.8	8.3	1011	1500	1395
2.2	5.6	0.8	1000	2000	1800	4.8	10.4	2.9	1012	1300	1500
2.5	7.8	1.9	1000	2000	2000	6.2	13.7	5.6	1013	1500	1450
1.7	7.1	1.2	1000	2000	2000	4.7	14.9	4.5	1014	1600	1555
1.8	5.6	1.3	1000	2000	2000	5.1	9.9	4.9	1015	1650	1705
1.1	5.7	0.7	1000	2100	2000	4.0	9.4	3.6	1016	1750	1500
1.1	8.5	0.8	1000	2250	2200	6.1	6.3	4.4	1017	1500	1780
1.0	9.1	1.0	1000	2400	2400	7.1	9.6	5.7	1018	1650	1650

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51. Therefore, considering the nature of the aforesaid notifications, it is submitted that this Hon'ble Commission may be pleased to invoke its regulatory and legislative powers in order to effectively give mandate to the aforesaid notification of MoP dated 01.02.2019, instead of the subsequent notification dated 01.10.2019, to the effect, whereunder, the existing RPO norms should be modified for the State of Gujarat to the extent, where the captive generating plant(s) is commissioned *after* the enactment of the GERC (Procurement of Energy from Renewable Sources) Regulations, 2010, has to be pegged at the level of RPO norms prevalent in the year in which the captive generating plant(s) was commissioned, with respect to the entire life of such captive generating plant(s).

52. Hence, in view of the aforementioned factual background, the Petitioner is constrained to file the present petition.

Submissions/Grounds

53. The present petition is preferred on the following, amongst other grounds, for proper adjudication of the lis at hand, and the same are divided under sub-headings for the convenience of this Hon'ble Commission

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Re: Grounds necessitating amendments in the RPO norms for the State of Gujarat, as envisaged in the present petition

A. Because, the present petition is necessitated on account of issuance of notifications by the Ministry of Power, Govt. of

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India dated 01.02.2019 and 01.10.2019 with respect to fulfillment of RPO norms by industries/ consumers who avail power from captive generating plants under captive mode. It is stated that vide the above notifications, the Ministry of Power has admitted that RPO norms have to be modified in the event the same cannot be fulfilled on account of technical and/ or commercial impossibility.

B. Because, the industries, especially those engaged in manufacturing are bare power intensive, meaning thereby that the cost of power/ electricity is one of the major input costs, and the same directly affects the competitiveness of the end product(s) produced by such industries. A high cost of power makes the goods unviable in the open market.

C. Because, the Electricity Act, 2003 as enacted, vigorously envisioned two major reforms with regard to captive consumption and open access. Both the said reforms aimed at making industries power independent, in terms of the fact that the said reforms liberated the industries from the obligation to compulsorily buy power from their area distribution licensees. Compulsory procurement of power from distribution licensees exposed the industries to high cost of power, on account of the in-built cross subsidies in the power tariffs, and also on account of the frequent load shedding and power cuts.

D. Because, as mentioned in the foregoing ground, the manufactured goods were over-priced and the Indian Industries were becoming incompetent to compete with onslaught of cheap global imports. Further, the said industries could not export their goods freely on account of being over-priced. This became one of the primary reasons for hampering economic growth, as well as employment generation.

E. Because, in order to address the above problems, and to usher in the era of globalisation, the legislature enacted the Electricity Act, 2003 for liberalising and freeing the industries from the shackles of distribution licensees. Open access and captive generation were promoted, as is evident from the fact that, as per Section 42(2), captive users were exempted from levy of cross subsidy surcharge and additional surcharge. Further, the generation of electricity was also de-licensed, so as to attract more and more private investment in generation business. However, at the same time, the above legislation also sought to promote renewable energy generation, as provided under Section 86(1)(e).

F. Because, in order to enforce Section 86(1)(e), this Hon'ble Commission enacted the GERC (Procurement of Energy from Renewable Sources) Regulations, 2010. The said Regulations provided the norms for fulfilment of renewable purchase obligations (RPOs) by various obligated entities, including those entities which are procuring power through their captive generating plants.

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G. Because, in the present context, it is stated that the entire regime for fulfilment of RPO norms in the country, under Section 86(1)(e), was pursuant to the various policy initiatives of the Central Government (Ministry of Power; and Ministry of New & Renewable Energy), as already detailed hereinbefore.

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Based upon the said notifications/ policy initiatives, the Central, as well as all the State Commissions, including this Hon'ble Commission, proceeded to enact their own Regulations for fulfilment of RPO norms.

H. Because, the above said regulations provided for a gradual increase in the share of renewable power by the industries, over a period of time. As such, the said mandatory imposition, and the yearly increase in the quantum of renewable energy consumption, started to take a toll on the industries with respect to overall energy costs, as renewable energy was expensive as compared to captive power.

While it is necessary to promote renewable energy, however, at the same time, the Act also envisaged promotion of captive consumption by virtue of the aforementioned exemptions from levy of cross subsidy surcharge and additional surcharge.

I. Because, in order to strike a balance, as goods in the international market became cheaper, especially goods coming from China, the Ministry of Power, issued the aforementioned notifications dated 01.02.2019 and 01.10.2019, whereby the renewable purchase obligations have been sought to be substantially reduced upon captive users. That, this Hon'ble Commission, needs to deviate and implement the intent of notification dated 01.02.2019 instead of notification dated 01.10.2019, consequently, the existing RPO norms for the State of Gujarat ought to be modified, in terms of the following:

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(a) the Renewable Purchase Obligation (RPO) norms for captive user(s), where the captive generating plant(s) is commissioned *after* the enactment of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010 , has to be pegged at the level of RPO norms prevalent in the year in which the captive generating plant(s) was commissioned, with respect to the entire life of such captive generating plant(s);

(b) the Renewable Purchase Obligation (RPO) norms for captive user(s), wherein the captive generating plant(s) is commissioned *before* the enactment of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010, is zero for the captive power used from such power plant(s) for its entire life.

J. Because, it needs to be appreciated that, as a sector regulator, this Hon'ble Commission has absolute powers to decide independently as to how the intent behind the aforementioned notifications is to be implemented. Hence, while this Hon'ble Commission ought to take into account the fact that the RPO regime needs to be relaxed in terms of the above notifications, however, this Hon'ble Commission, for the purpose of economic development of the State, ought to deviate and provide for more relaxed RPO norms in terms of the notification dated 01.02.2019.

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K. Because, robust industrial growth can only be achieved in the event there is regulatory certainty with respect to the material input costs, and with electricity being one of the major input

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costs (especially in the Copper Industry), the RPO regime prevalent in the State ought to be modified/ reformed in terms of the intent of the aforesaid notifications. When an investor invests for setting up of an industrial unit, the said investor has to factor in all the possible costs which could be involved in the manufacture of the goods. One of the critical costs is related to the cost of electricity. The present RPO regime provides for a year on year increase in the RPO norms, and the investor is not aware as to how much cost is to be factored in for the purpose of complying RPO norms for future. Since, the cost associated with fulfilment of RPO norms, as per the present regime, is substantial, the same makes the industrial output as in-competitive. Therefore, in order to provide a certainty as to the costs associated with fulfilment of RPO norms, the Central Government (through MoP and MNRE) issued the aforementioned notifications. The implementation of the intent of the aforesaid notifications, as sought in the present petition, will provide transparency and certainty to an investor, both, before a decision to invest is taken, and for those investors who have already invested and their output/ goods are becoming in-competitive on account of the huge costs associated with the present RPO regime.

L. Because, since the entire RPO regime formulated by this Hon'ble Commission was entirely based upon the notifications/ policies issued by the Central Government, it is imperative that this Hon'ble Commission ought to implement the *intent* of the aforementioned notification dated 01.02.2019 issued by the Ministry of Power. In this context, reference be made to Clause

6.4(1) of the Tariff Policy, 2016 issued by the Central Government under Section 3 of the Electricity Act, 2003, which mandates that the long-term trajectory of RPO norms have to be specified by the State Commissions by taking guidance from the Ministry of Power. For the said purpose, this Hon'ble Commission ought to amend the 2010 RPO Regulations (amended from time to time) in order to give effect to the intent of the aforementioned notifications.

Re: Policy and Regulatory framework of the Central Government under which RPO norms came to be enacted by the various State as well as Central Commission including this Hon'ble Commission

M. Because, it needs to be appreciated that the RPO regime and the consequent norms including that in the State of Gujarat were all based upon various studies/ policy framework/ initiatives of the Central Government.

N. Because, the Electricity Act, 2003 envisaged development of electricity industry by way of promotion of environmentally benign policies. Further, a perusal of the Preamble of Electricity Act, 2003 is important, which provides as under:

> "An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies, constitution of Central Electricity Authority, Regulatory

Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto."

(underline supplied)

O. Because, Articles 5.2.24 and 5.2.25 of National Electricity Policy (NEP) [*which has been formulated under Section 3(1) of the Electricity Act, 2003*] provide for the establishment of CGP's as a means of securing reliable, quality and cost-effective power. Relevant portion of the National Electricity Policy, 2005 is being reproduced herein for ready reference of this Hon'ble Commission:

"Captive Generation

5.2.24 The liberal provision in the Electricity Act, 2003 with respect to setting up of captive power plant has been made with a view to not only securing reliable, quality and cost-effective power but also to facilitate creation of employment opportunities through speedy and efficient growth of industry.

5.2.25 The provision relating to captive power plants to be set up by group of consumers is primarily aimed at enabling small and medium industries or other consumers that may not individually be in a position to set up plant of optimal size in a cost-effective manner. It needs to be noted that efficient expansion of small and medium industries across the country would lead to creation of enormous employment opportunities."

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P. Because Article 6.3 readwith Article 6.4 of the National Tariff Policy 2006, envisages promotion of enabling environment for harnessing of captive generation of power.

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Q. Because with the underlying objective of ensuring a harmonious interplay between promotion of renewable consumption of power and a favourable environment for captive generation of power, India's first National Action Plan on Climate Change (NAPCC) was released on June 30, 2008, which outlined the existing and future policies and programs addressing climate mitigation and adaptation, and identified eight core "national missions" running through 2017. This plan provided for certain measures to be adopted in the regulatory/ tariffs regime to help mainstream renewable based sources in the national power system. Such NAPCC also, for the first time envisaged the concept of Renewable Energy Certificates, which would be a tradeable commodity.

R. Because, based upon the above policy initiative of the Central Government, the REC mechanism was also recommended by the Forum of Regulators in 2008, amidst issues arising on account of uneven distribution of renewable energy sources across the country and divergence in RPOs, tariffs and different technologies across the country, which created hindrance for the Commissions to specify higher RPOs.

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S. Because the REC mechanism was also considered effective by the Ministry of New and Renewable Energy, which issued a Report on the Development of Conceptual Framework for Renewable Energy Certificate Mechanism for India, in June 2009, thereby discussing various aspects, including the legal sanction for introducing Renewable Energy Certificates, the eligibility of renewable sources and technologies, the obligated

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entities, the shelf life of such certificates, compatibility with other schemes, etc.

T. Because, for the purpose of furthering the aforesaid policy framework in the Regulatory regime across the country, Central Government had begun with its initiatives for the purpose of diffusing such renewable sources of energy for electricity generation, vide its policy framework and guidelines, from time to time, which were required to be complied with by the respective states by promulgating/ amending their concerned Regulations to that effect.

U. Because, on the basis of the above-mentioned policies and plan, the Hon'ble Central Commission came out with the mechanism of sale and purchase of RECs through the REC Regulations 2010, which was also incorporated by the various State Commissions, by way of amendment of their existing regulations and/ or issuance of fresh regulations to include the renewable energy certificate mechanism, as a means for achieving/ meeting renewable purchase obligation by the distribution licensees and other obligated entities. Thus, it firmly canvasses that under the aforesaid intent and framework encapsulated by the Central Government, vide its policies and guidelines, from time to time, this Hon'ble Commission had also promulgated its RPO Regulations, which also provided for the aforesaid regime.

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V. Because, in order to further promote electricity generation through renewable sources, and at the same time not deviating from the objectives enshrined in the Electricity Act,

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2003 regarding captive generation, as well as taking into account the commercial and technical perspectives, Jawaharlal Nehru National Solar Mission (JNNSM) was launched on the 11.01.2010 by the Government of India, wherein the Central Government itself acknowledged creation of a friendly and enabling environment for the purpose of diffusion of electricity generation through renewable sources across the country as quickly as possible.

Re: The RPO Norms prevailing in various states including the state of Gujarat needs to be in consonance with the foregoing discussion on the Policy & Regulatory framework provided by the Central Government from time to time

W. Because, while the RPO Regulations promulgated by various States was based on the RPO regime of the Central Government, as elaborated hereinabove, yet it failed to effectively address the primary objective of promoting a friendly environment for RPO imposition *viz a viz* technical and commercial restraints for certain industries, since it led to additional cost burden on certain industries as that of the Petitioner, by way of imposition of compulsory procurement of a specific percentage of physical renewable energy, or in the alternative, procurement of renewable energy certificates (RECs), out of the total consumption of electricity by them. Hence, it led to serious concerns being raised by various stakeholders including the Petitioner herein, which had already been suffering due to inadequate friendly policy(ies) to support manufacturers in the country, and to enable them to survive stiff global competition, the cost of manufacturing has

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to gradually decrease, whereas, in the Indian context, such cost was escalating.

X. Because, for the State of Gujarat, the percentage of RPO imposed upon all obligated entities, which includes captive users, is provided under Regulation 4.1, which prescribes for escalating RPO norms for each year. That, such a provision under the existing RPO Regulations 2016, is not in line with the policy and regulatory framework of the Central Government and it has also failed to address various concerns raised by the industries, including like that of the Petitioner, pertinently with regard to technical and commercial impossibility being faced by them, while complying with the RPO norms in the State.

Re: MoP notifications dated 01.02.2019 and 01.10.2019 and MNRE Office Memorandum dated 26.04.2019

Y. Because, the Ministry of Power, Govt. of India, after taking into account the concerns of various stakeholders, regarding the applicability of RPO Obligations upon CPPs, the consequent impact of such imposition on industries, including various constraints with compliance, on account of technical and/ or commercial impossibility, etc., after consultation with Ministry of New and Renewable Energy, and with this *intent*, issued notification dated 01.02.2019, whereunder, reduction of burden of RPO obligation upon captive users was contemplated and suggested. Further, in the interest of the industries including CPPs, the MoP envisaged that the liability towards RPO was to be determined, as per the RPO level applicable for the year in which the CPP was commissioned.

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Z. Because, subsequently, the MoP vide its letter No.30/04/2018-R&R, dated 01.10.2019, issued a clarification to the above notification dated 01.02.2019. It is most humbly stated that, at present, an atmosphere of ambiguity and uncertainty has arisen, qua RPO obligations in the State of Gujarat, in view of the aforementioned notifications dated 01.02.2019 and 01.10.2019 issued by MoP, even though the endeavor of the said notifications was to address the concerns with respect to fulfillment of RPO norms by industries/ consumers, which avail power from captive generating plants under captive mode, including non-fulfilment of the said norms, on account of technical and/or commercial impossibility. This has led to an extraordinary circumstance before this Hon'ble Commission, wherein it is required to independently adjudicate this issue, and invoke its regulatory as well as, legislative powers, to actually give effect to the intent of MoP in issuing the said notifications, which is to relax RPO norms for captive users when they procure power from their captive plants, by way of deviating and providing for more relaxed RPO norms in terms of the notification dated 01.02.2019. This Hon'ble Commission, keeping in mind the fact that the industries are vital for the economy of the State, is required to also deviate from the aforementioned notifications in order to further relax the RPO norms mandated in the said notifications.

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AA. Because, the Ministry of New and Renewable Energy had also come up with an Office Memorandum dated 26.04.2019 being 16/1/2018-EFM, wherein it recognized that SERCs in

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determining applicability of RPO norms for CPPs, has to examine whether achieving RPO trajectory will put the industry deploying CPPs, in a financially disadvantageous position and increasing renewable power consumption is not technically feasible for operations of the industry deploying CPPs.

Re: National Tariff Policy, 2016 is a guiding force for the Central and State Commissions

BB. Because, as per Article 6.4 of the National Tariff Policy, 2016, the Ministry of Power, in consultation with Ministry of New and Renewable Energy is empowered to *prescribe* the long-term growth trajectory of Renewable Purchase Obligations (RPOs).

CC. Because, the National Tariff Policy, 2016 primarily envisages that the appropriate State Commission shall be required to create an enabling environment which promotes Captive Generation as provided under Article 6.3, all the while, balancing the aspects to promote renewable sources of energy under Article 6.4. In the present circumstances, taking aide of the above Articles of the National Tariff Policy, this Hon'ble Commission is mandated to create a harmony between promotion of renewable sources of energy and creating an enabling environment which promotes harnessing of Captive Generation of power. This has also been the vision of the legislature while enacting the Electricity Act, 2003.

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DD. Because, the Petitioner refers to Section 86(4) of the Electricity Act, 2003, which provides that this Hon'ble Commission has to be guided by the Tariff Policy and the

Electricity Policy issued by the Central Government under Section 3 of the said Act. As such, the aforementioned notifications, particularly notification dated 01.02.2019 carry a strong guiding force upon this Hon'ble Commission, especially keeping in mind the fact that the entire RPO and REC regime of this Hon'ble Commission is based upon the notifications and policies issued by the Central Government. This Hon'ble Commission has to take guidance from the above notifications to further relax RPO norms, as prayed in the present petition, in terms of notification dated 1.02.2019 of MoP.

Re: Technical and/ or commercial impossibility qua aluminium industry with regard to renewable purchase obligations

EE. Because this Hon'ble Commission needs to appreciate that renewable power consumption is not at all feasible for energy intensive industries such as copper industry. It is submitted that renewable power is intermittent in nature as it depends mostly upon climatic conditions and hence generation fluctuation and voltage spikes are pretty common. It is pertinent to mention that worldwide there is no precedence where copper industry can run on renewable power, as the same is intermittent in nature.

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FF. Because it is impossible for a Captive Power Plant to import Renewable power for the following reasons:

(a) Captive Power plant which is either exporting power for sale or supplying the same to the captive unit, is not allowed to import power from Renewable sources or for

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any other source for that matter as RLDC does not permit CPP's to do so;

(b) The interregional transmission grid frequently faces the problem of transmission congestion coupled with intermittent nature of generation of renewable power, which makes such power highly unreliable for running energy intensive industrial units.

GG. Because the manufactures in question cannot even establish power plants producing Renewable energy as the same will require them to make another huge investment over and above the investment already made by them. It is pertinent to mention that in India, copper industry has invested thousands of crores and have set up CPPs and that too at a time when RPO obligations-were not at all in picture, and if over and above the said huge investment made by the CPPs, they are asked to keep giving more and more towards RPO compliance, they would go bankrupt and copper production in the country would have to face the fall.

HH. Because this Hon'ble Commission has to ensure the survival of the industry, as this ever-growing liability of RPO/ REC compliance is eating away all profits and if the same are not done away with, particularly in view of the above notification(s) dated 01.02.2019, and Office Memorandum dated 26.04.2019, then the energy intensive industry would not be in a position to survive, which will not only affect the overall revenue of the State, but also would result in a huge number of people becoming unemployed.

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II. Because the pool of Renewable Energy Certificates is fast depleting on the Energy Exchange, and therefore after sometime the captive users will not be in a position to procure any more RECs and hence will fail in fulfilling their RPO obligations. Estimated availability of REC is as follows:

	Solar REC				Non Solar REC			
Month, Year	Opening Balance	Issued	Redeemed - PX & Self	Closing Balance	Opening Balance	Issued	Redeemed - PX & Self	Closing Balance
Apr-18	60.0	0.6	8.8	51.8	14.9	2.7	2.2	15.5
May-18	51.8	0.6	9.2	43.4	15.5	4.3	4.3	15.5
Jun-18	43.4	0.8	6.0	38.3	15.5	4.8	3.7	16.7
Jul-18	38.3	1.4	13.8	25.9	16.7	2.7	2.9	1.5
Aug-18	25.9	1.8	4.9	22.8	16.5	4.3	3.4	17.5
Sep-18	22.8	0.6	15.6	7.8	17.5	4.9	3.5	18.8
Oct-18	7.8	0.7	2.8	5.8	18.8	6.0	4.4	20.4
Nov-18	5.8	0.6	0.6	5.8	20.4	5.8	4.8	21.5
Dec-18	5.8	0.8	1.8	4.8	21.5	3.0	4.6	19.9
Jan-19	4.8	1.4	1.2	5.0	19.9	5.4	7.8	17.4
Feb-19	5.0	5.4	4.1	6.3	17.4	15.5	8.5	24.5
Mar-19	6.3	0.7	3.6	3.4	24.5	2.7	8.5	18.7
Apr-19	3.4	0.5	0.8	3.0	18.7	3.1	2.9	19.0
May-19	3.0	1.1	1.9	2.2	19.0	4.3	5.7	17.5
Jun-19	2.2	1.0	1.3	1.9	17.5	6.0	5.7	17.8
Jul-19	1.9	1.1	1.3	1.7	17.8	4.5	5.4	16.8
Aug-19	1.7	0.6	0.7	1.7	16.8	3.5	3.7	16.6
Sep-19	1.7	0.6	0.8	1.4	16.6	5.6	7.2	14.9
Oct-19	1.4	0.8	1.0	1.2	14.9	6.2	6.1	15.0

JJ. Because power is a critical input for energy intensive industry accounting for almost 30-40% of their cost of production. Coal subsidies in China, natural gas subsidies in Russia and subsidized power in Middle East gives an edge to them over Indian players. This cost of power is over and above the taxes and duties paid on generation of power and royalties, Coal Cess, etc. paid on the procurement of the coal, etc.

KK. Because, for production of copper, the manufacturers cannot increase the cost of their end product as prices of copper are also regulated internationally. Hence, even the slightest increase in the price of copper will affect the buyer base of the manufacturers. In addition to these already existing costs, if the remanufacturer is made to pay for ever increasing cost, and percentage of RECs, the manufacturers have no chance of surviving the prevailing competition. For that the rising RPO trajectory as stipulated in RPO Regulations, would increase the cost of power in copper industry making it non-competitive. It is for this reason that the Central Government has decided to intervene by way of issuance of the aforementioned notifications dated 01.02.2019, 26.04.2019 and 01.10.2019.

Hence, there is an urgent need to implement the intent of the notifications of the Central Government, and that this Hon'ble Commission ought to further relax the RPO norms by way of deviating and providing for more relaxed RPO norms in terms of the notification dated 01.02.2019.

LL. Because, while deciding the RPO obligations pursuant to the two notifications, particularly notification dated 01.02.2019, issued by MoP, it is to be taken into consideration that purchasing Renewable Energy Certificate for fulfilment of RPO by the captive users does not help the State of Gujarat in revenue generation/ industrial growth as most of the Renewable Energy generators are situated outside the State. Whereas, on the other hand, imposition of strict and high RPO obligations creates a non-favourable atmosphere for industry in the State.

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MM. Because, the Industries having Captive Generating Plants (CGPs) are suffering badly due to lack of industry friendly policies to support manufacturers in the country. That, in order

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to survive stiff global competition, the cost of manufacturing has to gradually decrease, whereas, in the Indian framework, the cost is actually on an upward trajectory. The cost of manufacturing is gradually going up for Indian Manufacturers due to lack of policy support and gradual burdening of various cess, levies and compliances. In addition to this, increase in trajectory of the Renewable Purchase Obligations (RPOs) have been fastened upon the captive users of the captive power generating plants, which includes the Petitioner herein. The said obligations require industries using power from their captive power plants to either compulsorily consume a specific percentage of renewable power, or in the alternative to procure renewable energy certificates (RECs), out of the total consumption of electricity by captive generating plants despite having their own captive generating plants to meet the entire consumption requirement which would result in keeping own CGP idle and using bought out renewable power. This is an additional cost burden on industries having CGPs, which is rendering the industrial output expensive, thereby taking way the ability to market the said product at competitive rates. This is so when the purpose of setting up of captive generating plants was to make cheaper and more efficient power available to industries.

NN. Because, the RPO norms are specified by the regulations of this Hon'ble Commission. The relevant regulations in this regard are the GERC (Procurement of Energy from Renewable Sources) Regulations, 2010. As per the said regulations, the percentage of RPO imposed upon all obligated entities, which includes captive users, is provided under Regulation 4.1 of the aforesaid Regulations. Vide the present petition, the Petitioner herein is seeking review of the said RPO norms in terms of the fact that the Ministry of Power, vide its notification, being Notification No. 30/04/2018-R&R dated 01.02.2019, has sought to reduce the burden of said RPO norms upon captive users, wherein the Ministry of Power has held as follows:

> "The request of various stakeholders regarding capping of RPO for Captive Power Plants (CPP) has been examined In consultation with Ministry of Renewable Energy and it is clarified that RPO of the CPP may be pegged at the RPO level applicable in the year in which the CPP was commissioned. As and when the company adds to the capacity of the CPP, it will have to provide the additional RPO as obligated in the year in which new capacity Is commissioned, there should not be an increase in RPO without any additional fossil fuel capacity being added."

OO. Because, under Article 6.4(1) of the Tariff Policy, 2016, in consultation with MNRE is empowered to decide on the Long-Term Growth Trajectory of RPO, and therefore, has issued the aforementioned notification dated 01.02.2019. It is further pertinent to mention that National Tariff Policy is statutory in nature as it derives its authority from Section 3 of the Electricity Act, 2003. It is submitted that the Hon'ble Supreme Court of India has relied upon the National Tariff Policy while interpreting the 'Composite Scheme' used under Section 79 (1) (b) of the Electricity Act, 2003. Further, SERCs are to be guided by the National Tariff Policy in discharge of its

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functions, as per Section 86 (4) of the Electricity Act, 2003. Therefore, the clarificatory notification issued by MoP on consultation with MNRE under the said tariff policy is binding on this Hon'ble Commission and ought to be followed in letter and spirit. Therefore, the present petition is being filed under Regulations 12.1 of the GERC RPO Regulations, 2010 read wi.th Article 6.4 of the Tariff Policy, 2016, for review of the renewable purchase obligations for captive users in view of the above notification issued by Ministry of Power, Government of India.

PP. Because, as per the clarificatory notification dated 01.02.2019, it has been directed that RPO of the CGPs may be pegged at the RPO levels applicable in the year in which the said CGP was commissioned. As and when the company adds to the capacity of the CGP, it will have to provide the additional RPO as obligated in the year in which new capacity is commissioned. There should not be an increase in RPO without any additional fossil fuel capacity being added.

QQ. Because, this Hon'ble Commission, through its regulations, mandates a certain percentage of electricity consumption by the obligated entities (including captive users owing Captive Power Plants) to be from renewable sources. The power to regulate RPO is granted to this Hon'ble Commission by virtue of Section 86(1)(e) of the Electricity Act, 2003 read with Clause 6.4 of the Tariff Policy, 2016. Article 6.4 (1) of the National Tariff Policy, 2016 reads as under:

"Pursuant to provisions of Section 86(1)(e) of the

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Act, the Appropriate Commission shall fix a minimum percentage of the total consumption of electricity in the area of a distribution licensee for purchase of energy from renewable energy sources, taking into account availability of such resources and its impact on retail tariffs. Cost of purchase of renewable energy shall be taken into account while determining tariff by SERCs. Long term growth trajectory of Renewable Purchase Obligations (RPOs) will be prescribed by the Ministry of Power in consultation with MNRE."

RR. Because, as is evident from a bare perusal of the Article reproduced above, long term growth trajectory of Renewable Purchase Obligations (RPOs) has to be prescribed by the Ministry of Power in consultation with MNRE. Therefore, the direction of the MoP dated 01.02.2019 is in line with the Tariff Policy, which Policy is statutory by virtue of being promulgated under Section 3 of the Act and as has been held by the Hon'ble Supreme Court, in the Energy Watchdog judgment (supra). As such, this Hon'ble Commission has to consider the above notification thereby modifying the RPO Regulations.

SS. Because, the Preamble of the Electricity Act, 2003 provides as follows:

"An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for <u>taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers</u> and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, <u>promotion of efficient and environmentally benign policies,</u> constitution of Central Electricity

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Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto."

(underline supplied)

Hence, as per the preamble, there has to be a balance between the promotion of renewable energy and captive generation.

TT. Because, in view of Clauses 6.3 and 6.4 of the Tariff Policy, 2016 this Hon'ble Commission is under an obligation to harmonize promotion of renewable source of energy and harness captive generation of power. Therefore, it is submitted that this Hon'ble Commission may not prioritize one, at the cost of the other, and the State Commissions are instead required to harmoniously and progressively promote both.

UU. Because, Clauses 5.2.24 and 5.2.25 of the Electricity Policy, 2005 explains the establishment of CGP's as a means of securing reliable, quality and cost-effective power. Relevant portion of the National Electricity Policy, 2005 is being reproduced herein for ready reference of this Hon'ble Commission:

"Captive Generation

5.2.24 The liberal provision in the Electricity Act, 2003 with respect to setting up of captive power plant has been made with a view to not only securing reliable, quality and cost effective power but also to facilitate creation of employment opportunities through speedy and efficient growth of industry.

5.2.25 The provision relating to captive power

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plants to be set up by group of consumers is primarily aimed at enabling small and medium industries or other consumers that may not individually be in a position to set up plant of optimal size in a cost-effective manner. It needs to be noted that efficient expansion of small and medium industries across the country would lead to creation of enormous employment opportunities."

VV. Because, under Regulation 12 of 2010 RPO Regulations, this Hon'ble Commission has the power to amend any provisions of such regulations. Therefore, keeping in mind the aforementioned provisions readwith the notification dated 01.02.2019 issued by the MoP, this Hon'ble Commission ought to invoke the above regulations thereby relaxing the RPO norms in line with the said notification. This will peg the RPO applicable to the Petitioner and its members to the level of the year when the said Petitioner commissioned its Captive Generating Plant.

WW. Because, under Regulation 12 of the RPO Regulations, 2010 this Hon'ble Commission is empowered to amend or modify the regulations. It is pertinent to mention that as already demonstrated above, this Hon'ble Commission ought to modify/ amend the 2010 regulations in line with the MoP clarification dated 01.02.2019, as the Long-Term Growth Trajectory of RPO is to be decided by the MoP in consultation with MNRE, which has been done while issuing the letter/ notification dated 01.02.2019.

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XX. Because, it is pertinent to mention that while deciding the RPO

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obligations pursuant to the notification dated 01.02.2019 issued by MoP, it is to be taken into consideration that purchasing Renewable Energy Certificate for fulfilment of RPO by the captive users does not help in revenue generation/ industrial growth. Whereas, on the other hand, imposition of strict and high RPO obligations creates a non-conducive atmosphere for industry.

YY. Because, the pool of Renewable Energy Certificates is fast depleting on the Energy Exchange, and therefore after sometime the captive users will not be in a position to procure any more RECs and hence will fail in fulfilling its RPO obligations. Further, with demand surpassing supply, the traded price of RECs almost reached its forbearance price. This has been demonstrated by the Petitioner herein before in the present petition.

ZZ. Because, the rising RPO trajectory as stipulated in RPO Regulations of this Hon'ble Commission, would significantly increase the cost of power in manufacturing. For the FY 2019-20, with RPO @ 14.30% as specified by this Hon'ble Commission and the prevailing the REC prices, the increase in power cost is approximately 27 paise per kWh. The same will rise to approximately 32 paise per kWh which may vary according to the power cost factor by the FY 2021-22. Hence, there is an extreme urgency for implementation of the notification dated 01.02.2019 of MoP.

AAA. Because, apart from higher power cost, additional burden in the form of Renewable Purchase Obligation (RPO), Goods and

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Service Tax Compensation Cess previously known as Clean Energy Cess on coal (Rs 400/MT) and PAT (Purchase, Achieve and Trade), have increased overall cost of production of the Petitioner, thereby decreasing the viability of the plant on a whole.

BBB. That, this Hon'ble Commission has ample powers available under Section 66 of the Electricity Act, 2003, for development of power market. Further, in the event this Hon'ble Commission deviates from the aforementioned notification dated 01.10.2019, and instead implements 01.02.2019, then it would not only encourage a conducive market towards encouragement of captive generation of power, but would also lead to more robust industrial growth on account of conducive electricity regulatory scenario.

CCC. That, this Hon'ble Commission is required to consider that captive generation needs to be promoted. For this, a perusal of the Preamble and Statement of Object and Reasons of the Electricity Act, 2003, are most vital, which clearly provide that captive generation needs to be promoted. Further, under Sections 38 and 42, captive generation is promoted by providing exemptions from cross subsidy surcharge and additional surcharge. As such, mandate of the Act is to also promote captive generation, apart from renewable generation.

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52. It is stated that the Present Petition is bonafide and made in the interest of justice.

53. The Petitioner craves leave of this Hon'ble Commission to raise any other further points/ grounds at the time of the hearing of

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the petition.

PRAYER/RELIEF

In view of the facts and circumstances mentioned herein above, the Hon'ble Commission may be pleased to:

(a) Initiate steps/ proceedings for amendment of the GERC (Procurement of Energy from Renewable Sources) Regulations, 2010, in terms of the following:

(i) introduce provisions for fixing the Renewable Purchase Obligation (RPO) norms for power procured by the captive user(s), wherein the captive generating plant(s) is commissioned before the enactment of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010, as zero/ nil for the captive power used from such power plant(s) for its entire life;

(ii) introduce provisions for fixing of Renewable Purchase Obligation (RPO) norms for power procured by captive user(s), wherein the captive generating plant is commissioned after the enactment of the GERC (Procurement of Energy from Renewable Sources) Regulations, 2010, pegged at the level of RPO norms prevalent in the year of commissioning, with respect to the entire life of such captive generating plant(s);

(iii) as a consequence, to prayer (a)(ii), introduce provisions providing for adjustment/ set-off qua any RPO already fulfilled by the captive users of the Captive Generating Plants, which is in excess when compared with the year wise RPO norms, to be provided in the amended regulations, against any future RPO fulfilment obligations as per the said amended/ modified regulations/ norms;

(iv) introduce provisions permitting captive user(s) to file revised compliance of the RPO norms to be fixed by the Hon'ble Commission, within one year from the date of the order or such extended time as may be granted by the Commission from time to time;

(v) introduce a stipulation that there cannot be any increase in RPO norms for captive users, till any additional fossil fuel power generating capacity is being added; and

(b) Pass any other order/orders or future order, as this Hon'ble Commission may deem fit and proper in the light of the facts and circumstances of the instant case.

Declaration that the subject matter of the petition has not been raised by the petitioner before any other competent forum, and that no other competent forum is currently seized of the matter or has passed any orders in relation thereto.

Place : Ahmedabad
Date : 09.12.2020

Signature of the Petitioner

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BEFORE THE GUJARAT ELECTRICITY REGULATORY COMMISSION AHMEDABAD

FILING NO._______________

CASE NO._________________

IN THE MATTER OF:

An application under section 86 (1)(e) (4) and 181 of the Electricity Act, 2003 read with Clause 12.1 of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010 and Article 6.4 of the National Tariff Policy 2016, seeking implementation of Notification dated 1/2/2019 and 1/10/2019 issued by Ministry of Power.

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And

IN THE MATTER OF:

M/s HINDALCO INDUSTRIES LIMITED
Ahura Centre, 15 Floor, B Wing, Mahakali
Caves Road, Andheri (East)Mumbai-400093 **...PETITIONER**

VERSUS

GUJARAT ENERGY DEVELOPMENT AGENCY
Through its Principal Secretary,
4th floor, Block No. 11 & 12, Udyog Bhavan,
Sector -11, Gandhinagar,
Gujarat 382017 **...RESPONDENT**

AFFIDAVIT VERIFYING THE PETITION

I, Major Tejus Patel (Retd), S/O Major Mahesh Patel (Retd), aged 39 years, having office at Aditya Birla Management Corporation Private Limited, B/2, 2nd Floor. Safal Profitaire, Corporate Road. Near Prahladnagar Garden, Ahmedabad-380015 working as Deputy General Manager do hereby solemnly affirm and state as follows:

1. That I am an authorised representative of M/s. HINDALCO INDUSTRIES LIMITED, a Company incorporated in India under Indian Companies Act, 1956 and having its Works at Unit: BIRLA COPPER, Lakhigam, P.O – Dahej, District – Bharuch, Gujarat, India and registered office at Ahura Centre, 1st Floor B Wing, Mahakali Caves Road, Andheri (East), Mumbai – 400093, Maharashtra, India.

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2. The statements made in the present Petition, now shown to me are true to my knowledge and the statements made in paragraphs 20-51 are based on information and I believe them to be true.

Solemnly affirm at Ahmedabad on this 9th day of December, 2020 that the contents of the above affidavit are true to my knowledge, no part of it is false and nothing material has been concealed therefrom.

Hindalco Industries Ltd. (Unit : Birla Copper)

Deponent

IDENTIFIED BY ME

ADVOCATE/PERSON

Name...Krishal. H. Patel

Enroll No......G/2121/2017

SR. NO. 433 DT. 09/12/2020

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9 DEC 2020

SOLEMNLY AFFIRMED
BEFORE ME

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National Electricity Policy

The Gazette of India

EXTRAORDINARY

PART I - Section 1

PUBLISHED BY AUTHORITY

No...., New Delhi, Dated ....

Ministry of Power

New Delhi,

Dated the 12th, February, 2005

RESOLUTION

No. 23/40/2004-R&R (Vol.II)

1.0 INTRODUCTION

1.1 In compliance with section 3 of the Electricity Act 2003 the Central Government hereby notifies the National Electricity Policy.

1.2 Electricity is an essential requirement for all facets of our life. It has been recognized as a basic human need. It is a critical infrastructure on which the socio-economic development of the country depends. Supply of electricity at reasonable rate to rural India is essential for its overall development. Equally important is availability of reliable and quality power at competitive rates to Indian industry to make it globally competitive and to enable it to exploit the tremendous potential of employment generation. Services sector has made significant contribution to the growth of our economy. Availability of quality supply of electricity is very crucial to sustained growth of this segment.

1.3 Recognizing that electricity is one of the key drivers for rapid economic growth and poverty alleviation, the nation has set itself the target of providing access to all households in next five years. As per Census 2001, about 44% of the households do not have access to electricity. Hence meeting the target of providing universal access is a daunting task requiring significant addition to generation capacity and expansion of the transmission and distribution network.

1.4 Indian Power sector is witnessing major changes. Growth of Power Sector in India since its Independence has been noteworthy. However, the demand for power has been outstripping the growth of availability. Substantial peak and energy shortages prevail in the country. This is due to inadequacies in generation, transmission & distribution as well as inefficient use of electricity. Very high level of technical and commercial losses and lack of commercial approach in management of utilities has led to unsustainable financial operations. Cross-subsidies have risen to unsustainable levels. Inadequacies in distribution networks has been one of the major reasons for poor quality of supply.

1.5 Electricity industry is capital-intensive having long gestation period. Resources of power generation are unevenly dispersed across the country. Electricity is a commodity that can not be stored in the grid where demand and supply have to be continuously balanced. The widely distributed and rapidly increasing demand requirements of the country need to be met in an optimum manner.

1.6 Electricity Act, 2003 provides an enabling framework for accelerated and more efficient development of the power sector. The Act seeks to encourage competition with appropriate regulatory intervention. Competition is expected to yield efficiency gains and in turn result in availability of quality supply of electricity to consumers at competitive rates.

1.7 Section 3 (1) of the Electricity Act 2003 requires the Central Government to formulate, inter alia, the National Electricity Policy in consultation with Central Electricity Authority (CEA) and State Governments. The provision is quoted below:

> *"The Central Government shall, from time to time, prepare the National Electricity Policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy".*

Section 3 (3) of the Act enables the Central Government to review or revise the National Electricity Policy from time to time.

1.8 The National Electricity Policy aims at laying guidelines for accelerated development of the power sector, providing supply of electricity to all areas and protecting interests of consumers and other stakeholders keeping in view availability of energy resources, technology available to exploit these resources, economics of generation using different resources, and energy security issues.

1.9 The National Electricity Policy has been evolved in consultation with and taking into account views of the State Governments, Central Electricity Authority (CEA), Central Electricity Regulatory Commission (CERC) and other stakeholders.

2.0 AIMS & OBJECTIVES

The National Electricity Policy aims at achieving the following objectives:

- Access to Electricity - Available for all households in next five years
- Availability of Power - Demand to be fully met by 2012. Energy and peaking shortages to be overcome and adequate spinning reserve to be available.
- Supply of Reliable and Quality Power of specified standards in an efficient manner and at reasonable rates.
- Per capita availability of electricity to be increased to over 1000 units by 2012.
- Minimum lifeline consumption of 1 unit/household/day as a merit good by year 2012.
- Financial Turnaround and Commercial Viability of Electricity Sector.
- Protection of consumers' interests.

3. NATIONAL ELECTRICITY PLAN

3.1 Assessment of demand is an important pre-requisite for planning capacity addition. Section 3 (4) of the Act requires the Central Electricity Authority (CEA) to frame a National Electricity Plan once in five years and revise the same from time to time in accordance with the National Electricity Policy. Also, section 73 (a) provides that formulation of short-term and perspective plans for development of the electricity system and coordinating the activities of various planning agencies for the optimal utilization of resources to subserve the interests of the national economy shall be one of the functions of the CEA. The Plan prepared by CEA and approved by the Central Government can be used by prospective generating companies, transmission utilities and transmission/distribution licensees as reference document.

3.2 Accordingly, the CEA shall prepare short-term and perspective plan. The National Electricity Plan would be for a short-term framework of five years while giving a 15 year perspective and would include:

- Short-term and long term demand forecast for different regions;
- Suggested areas/locations for capacity additions in generation and transmission keeping in view the economics of generation and transmission, losses in the system, load centre requirements, grid stability, security of supply, quality of power including voltage profile etc. and environmental considerations including rehabilitation and resettlement;
- Integration of such possible locations with transmission system and development of national grid including type of transmission systems and requirement of redundancies; and
- Different technologies available for efficient generation, transmission and distribution.
- Fuel choices based on economy, energy security and environmental considerations.

3.3 While evolving the National Electricity Plan, CEA will consult all the stakeholders including state governments and the state governments would, at state level, undertake this exercise in coordination with stakeholders including distribution licensees and STUs. While conducting studies periodically to assess short-term and long-term demand, projections made by distribution utilities would be given due weightage. CEA will also interact with institutions and agencies having economic expertise, particularly in the field of demand forecasting. Projected growth rates for different sectors of the economy will also be taken into account in the exercise of demand forecasting.

3.4 The National Electricity Plan for the ongoing 10th Plan period and 11th Plan and perspective Plan for the 10th, 11th & 12th Plan periods would be prepared and notified after reviewing and revising the existing Power Plan prepared by CEA. This will be done within six months.

4.0 ISSUES ADDRESSED

The policy seeks to address the following issues:

- Rural Electrification
- Generation
- Transmission
- Distribution
- Recovery of Cost of services & Targetted Subsidies.
- Technology Development and Research and Development (R&D)
- Competition aimed at Consumer Benefits
- Financing Power Sector Programmes Including Private Sector Participation.
- Energy Conservation
- Environmental Issues

- Training and Human Resource Development
- Cogeneration and Non-Conventional Energy Sources
- Protection of Consumer interests and Quality Standards

5.1 RURAL ELECTRIFICATION

5.1.1 The key development objective of the power sector is supply of electricity to all areas including rural areas as mandated in section 6 of the Electricity Act. Both the central government and state governments would jointly endeavour to achieve this objective at the earliest. Consumers, particularly those who are ready to pay a tariff which reflects efficient costs have the right to get uninterrupted twenty four hours supply of quality power. About 56% of rural households have not yet been electrified even though many of these households are willing to pay for electricity. Determined efforts should be made to ensure that the task of rural electrification for securing electricity access to all households and also ensuring that electricity reaches poor and marginal sections of the society at reasonable rates is completed within the next five years.

5.1.2 Reliable rural electrification system will aim at creating the following:

(a) Rural Electrification Distribution Backbone (REDB) with at least one 33/11 kv (or 66/11 kv) substation in every Block and more if required as per load, networked and connected appropriately to the state transmission system

(b) Emanating from REDB would be supply feeders and one distribution transformer at least in every village settlement.

(c) Household Electrification from distribution transformer to connect every household on demand.

(d) Wherever above is not feasible (it is neither cost effective nor the optimal solution to provide grid connectivity) decentralized distributed generation facilities together with local distribution network would be provided so that every household gets access to electricity. This would be done either through conventional or non-conventional methods of electricity generation whichever is more suitable and economical. Non-conventional sources of energy could be utilized even where grid connectivity exists provided it is found to be cost effective.

(e) Development of infrastructure would also cater for requirement of agriculture & other economic activities including irrigation pump sets, small and medium industries, khadi and village industries, cold chain and social services like health and education.

5.1.3 Particular attention would be given in household electrification to dalit bastis, tribal areas and other weaker sections.

5.1.4 Rural Electrification Corporation of India, a Government of India enterprise will be the nodal agency at Central Government level to implement the programme for achieving the goal set by National Common Minimum Programme of giving access to electricity to all the households in next five years. Its role is being suitably enlarged to ensure timely implementation of rural electrification projects.

5.1.5 Targetted expansion in access to electricity for rural households in the desired timeframe can be achieved if the distribution licensees recover at least the cost of electricity and related O&M expenses from consumers, except for lifeline support to households below the poverty line who would need to be adequately subsidized. Subsidies should be properly targeted at the intended beneficiaries in the most efficient manner. Government recognizes the need for providing necessary capital subsidy and soft long-term debt finances for investment in rural electrification as this would reduce the cost of supply in rural areas. Adequate funds would need to be made available for the same through the Plan process. Also commensurate organizational support would need to be created for timely implementation. The Central Government would assist the State Governments in achieving this.

5.1.6 Necessary institutional framework would need to be put in place not only to ensure creation of rural electrification infrastructure but also to operate and maintain supply system for securing reliable power supply to consumers. Responsibility of operation & maintenance and cost recovery could be discharged by utilities through appropriate arrangements with Panchayats, local authorities, NGOs and other franchisees etc.

5.1.7 The gigantic task of rural electrification requires appropriate cooperation among various agencies of the State Governments, Central Government and participation of the community. Education and awareness programmes would be essential for creating demand for electricity and for achieving the objective of effective community participation.

5.2 GENERATION

5.2.1 Inadequacy of generation has characterized power sector operation in India. To provide availability of over 1000 units of per capita electricity by year 2012 it had been estimated that need based capacity addition of more than 1,00,000 MW would be required during the period 2002-12.

5.2.2 The Government of India has initiated several reform measures to create a favourable environment for addition of new generating capacity in the country. The Electricity Act 2003 has put in place a highly liberal framework for generation. There is no requirement of licensing for generation. The requirement of techno-economic clearance of CEA for thermal generation project is no longer there. For hydroelectric generation also, the limit of capital expenditure, above which concurrence of CEA is required, would be raised suitably from the present level. Captive generation has been freed from all controls.

5.2.3 In order to fully meet both energy and peak demand by 2012, there is a need to create adequate reserve capacity margin. In addition to enhancing the overall availability of installed capacity to 85%, a spinning reserve of at least 5%, at national level, would need to be created to ensure grid security and quality and reliability of power supply.

5.2.4 The progress of implementation of capacity addition plans and growth of demand would need to be constantly monitored and necessary adjustments made from time to time. In creating new generation capacities, appropriate technology may be considered keeping in view the likely widening of the difference between peak demand and the base load.

Hydro Generation

5.2.5 Hydroelectricity is a clean and renewable source of energy. Maximum emphasis would be laid on the full development of the feasible hydro potential in the country. The 50,000 MW hydro initiative has been already launched and is being vigorously pursued with DPRs for projects of 33,000 MW capacity already under preparation.

5.2.6 Harnessing hydro potential speedily will also facilitate economic development of States, particularly North-Eastern States, Sikkim, Uttaranchal, Himachal Pradesh and J&K, since a large proportion of our hydro power potential is located in these States. The States with hydro potential need to focus on the full development of these potentials at the earliest.

5.2.7 Hydel projects call for comparatively larger capital investment. Therefore, debt financing of longer tenure would need to be made available for hydro projects. Central Government is committed to policies that ensure financing of viable hydro projects.

5.2.8 State Governments need to review procedures for land acquisition, and other approvals/clearances for speedy implementation of hydroelectric projects.

5.2.9 The Central Government will support the State Governments for expeditious development of their hydroelectric projects by offering services of Central Public Sector Undertakings like National Hydroelectric Power Corporation (NHPC).

5.2.10 Proper implementation of National Policy on Rehabilitation and Resettlement (R&R) would be essential in this regard so as to ensure that the concerns of project-affected families are addressed adequately.

5.2.11 Adequate safeguards for environmental protection with suitable mechanism for monitoring of implementation of Environmental Action Plan and R&R Schemes will be put in place.

Thermal Generation

5.2.12 Even with full development of the feasible hydro potential in the country, coal would necessarily continue to remain the primary fuel for meeting future electricity demand.

5.2.13 Imported coal based thermal power stations, particularly at coastal locations, would be encouraged based on their economic viability. Use of low ash content coal would also help in reducing the problem of fly ash emissions.

5.2.14 Significant Lignite resources in the country are located in Tamil Nadu, Gujarat and Rajasthan and these should be increasingly utilized for power generation. Lignite mining technology needs to be improved to reduce costs.

5.2.15 Use of gas as a fuel for power generation would depend upon its availability at reasonable prices. Natural gas is being used in Gas Turbine /Combined Cycle Gas Turbine (GT/CCGT) stations, which currently accounts for about 10 % of total capacity. Power sector consumes about 40% of the total gas in the country. New power generation capacity could come up based on indigenous gas findings, which can emerge as a major source of power generation if prices are reasonable. A national gas grid covering various parts of the country could facilitate development of such capacities.

5.2.16 Imported LNG based power plants are also a potential source of electricity and the pace of their development would depend on their commercial viability. The existing power plants using liquid fuels should shift to use of Natural Gas/LNG at the earliest to reduce the cost of generation.

5.2.17 For thermal power, economics of generation and supply of electricity should be the basis for choice of fuel from among the options available. It would be economical for new generating stations to be located either near the fuel sources e.g. pithead locations or load centres.

5.2.18 Generating companies may enter into medium to long-term fuel supply agreements specially with respect to imported fuels for commercial viability and security of supply.

Nuclear Power

5.2.19 Nuclear power is an established source of energy to meet base load demand. Nuclear power plants are being set up at locations away from coalmines. Share of nuclear power in the overall capacity profile will need to be increased significantly. Economics of generation and resultant tariff will be, among others, important considerations. Public sector investments to create nuclear generation capacity will need to be stepped up. Private sector partnership would also be facilitated to see that not only targets are achieved but exceeded.

Non-conventional Energy Sources

5.2.20 Feasible potential of non-conventional energy resources, mainly small hydro, wind and bio-mass would also need to be exploited fully to create additional power generation capacity. With a view to increase the overall share of non-conventional energy sources in the electricity mix, efforts will be made to encourage private sector participation through suitable promotional measures.

Renovation and Modernization (R&M)

5.2.21 One of the major achievements of the power sector has been a significant increase in availability and plant load factor of thermal power stations specially over the last few years. Renovation and modernization for achieving higher efficiency levels needs to be pursued vigorously and all existing generation capacity should be brought to minimum acceptable standards. The Govt. of India is providing financial support for this purpose.

5.2.22 For projects performing below acceptable standards, R&M should be undertaken as per well-defined plans featuring necessary cost-benefit analysis. If economic operation does not appear feasible through R&M, then there may be no alternative to closure of such plants as the last resort.

5.2.23 In cases of plants with poor O&M record and persisting operational problems, alternative strategies including change of management may need to be considered so as to improve the efficiency to acceptable levels of these power stations.

Captive Generation

5.2.24 The liberal provision in the Electricity Act, 2003 with respect to setting up of captive power plant has been made with a view to not only securing reliable, quality and cost effective power but also to facilitate creation of employment opportunities through speedy and efficient growth of industry.

5.2.25 The provision relating to captive power plants to be set up by group of consumers is primarily aimed at enabling small and medium industries or other consumers that may not individually be in a position to set up plant of optimal size in a cost effective manner. It needs to be noted that efficient expansion of small and medium industries across the country would lead to creation of enormous employment opportunities.

5.2.26 A large number of captive and standby generating stations in India have surplus capacity that could be supplied to the grid continuously or during certain time periods. These plants offer a sizeable and potentially competitive capacity that could be harnessed for meeting demand for power. Under the Act, captive generators have access to licensees and would get access to consumers who are allowed open access. Grid inter-connections for captive generators shall be facilitated as per section 30 of the Act. This should be done on priority basis to enable captive generation to become available as distributed generation along the grid. Towards this end, non-conventional energy sources including co-generation could also play a role. Appropriate commercial arrangements would need to be instituted between licensees and the captive generators for harnessing of spare capacity energy from captive power plants. The appropriate Regulatory Commission shall exercise regulatory oversight on such commercial arrangements between captive generators and licensees and determine tariffs when a licensee is the off-taker of power from captive plant.

5.3 TRANSMISSION

5.3.1 The Transmission System requires adequate and timely investments and also efficient and coordinated action to develop a robust and integrated power system for the country.

5.3.2 Keeping in view the massive increase planned in generation and also for development of power market, there is need for adequately augmenting transmission capacity. While planning new generation capacities, requirement of associated transmission capacity would need to be worked out simultaneously in order to avoid mismatch between generation capacity and transmission facilities. The policy emphasizes the following to meet the above objective:

- The Central Government would facilitate the continued development of the National Grid for providing adequate infrastructure for inter-state transmission of power and to ensure that underutilized generation capacity is facilitated to generate electricity for its transmission from surplus regions to deficit regions.
- The Central Transmission Utility (CTU) and State Transmission Utility (STU) have the key responsibility of network planning and development based on the National Electricity Plan in coordination with all concerned agencies as provided in the Act. The CTU is responsible for the national and regional transmission system planning and development. The STU is responsible for planning and development of the intra-state transmission system. The CTU would need to coordinate with the STUs for achievement of the shared objective of eliminating transmission constraints in cost effective manner.
- Network expansion should be planned and implemented keeping in view the anticipated transmission needs that would be incident on the system in the open access regime. Prior agreement with the beneficiaries would not be a pre-condition for network expansion. CTU/STU should undertake network expansion after identifying the requirements in consultation with stakeholders and taking up the execution after due regulatory approvals.
- Structured information dissemination and disclosure procedures should be developed by the CTU and STUs to ensure that all stakeholders are aware of the status of generation and transmission projects and plans. These should form a part of the overall planning procedures.
- The State Regulatory Commissions who have not yet notified the grid code under the Electricity Act 2003 should notify the same not later than September 2005.

5.3.3 Open access in transmission has been introduced to promote competition amongst the generating companies who can now sell to different distribution licensees across the country. This should lead to availability of cheaper power. The Act mandates non-discriminatory open access in transmission from the very beginning. When open access to distribution networks is introduced by the respective State Commissions for enabling bulk consumers to buy directly from competing generators, competition in the market would increase the availability of cheaper and reliable power supply. The Regulatory Commissions need to provide facilitative framework for non-discriminatory open access. This requires load dispatch facilities with state-of-the art communication and data acquisition capability on a real time basis. While this is the case currently at the regional load dispatch centers, appropriate State Commissions must ensure that matching facilities with technology upgrades are provided at the State level, where necessary and realized not later than June 2006.

5.3.4 The Act prohibits the State transmission utilities/transmission licensees from engaging in trading in electricity. Power purchase agreements (PPAs) with the generating companies would need to be suitably assigned to the Distribution Companies, subject to mutual agreement. To the extent necessary, such assignments can be done in a manner to take care of different load profiles of the Distribution Companies. Non-discriminatory open access shall be provided to competing generators supplying power to licensees upon payment of transmission charge to be determined by the appropriate Commission. The appropriate Commissions shall establish such transmission charges no later than June 2005.

5.3.5 To facilitate orderly growth and development of the power sector and also for secure and reliable operation of the grid, adequate margins in transmission system should be created. The transmission capacity would be planned and built to cater to both the redundancy levels and margins keeping in view international standards and practices. A well planned and strong transmission system will ensure not only optimal utilization of transmission capacities but also of generation facilities and would facilitate achieving ultimate objective of cost effective delivery of power. To facilitate cost effective transmission of power across the region, a national transmission tariff framework needs to be implemented by CERC. The tariff mechanism would be sensitive to distance, direction and related to quantum of flow. As far as possible, consistency needs to be maintained in transmission pricing framework in inter-State and intra-State systems. Further it should be ensured that the present network deficiencies do not result in unreasonable transmission loss compensation requirements.

5.3.6 The necessary regulatory framework for providing non-discriminatory open access in transmission as mandated in the Electricity Act 2003 is essential for signalling efficient choice in locating generation capacity and for encouraging trading in electricity for optimum utilization of generation resources and consequently for reducing the cost of supply.

5.3.7 The spirit of the provisions of the Act is to ensure independent system operation through NLDC, RLDCs and SLDCs. These dispatch centers, as per the provisions of the Act, are to be operated by a Government company or authority as notified by the appropriate Government. However, till such time these agencies/authorities are established the Act mandates that the CTU or STU, as the case may be, shall operate the RLDCs or SLDC. The arrangement of CTU operating the RLDCs would be reviewed by the Central Government based on experience of working with the existing arrangement. A view on this aspect would be taken by the Central Government by December 2005.

5.3.8 The Regional Power Committees as envisaged in section section 2(55) would be constituted by the Government of India within two months with representation from various stakeholders.

5.3.9 The National Load Despatch Centre (NLDC) along with its constitution and functions as envisaged in Section 26 of the Electricity Act 2003 would be notified within three months. RLDCs and NLDC will have complete responsibility and commensurate authority for smooth operation of the grid irrespective of the ownership of the transmission system, be it under CPSUs, State Utility or private sector.

5.3.10 Special mechanisms would be created to encourage private investment in transmission sector so that sufficient investments are made for achieving the objective of demand to be fully met by 2012.

5.4 DISTRIBUTION

5.4.1 Distribution is the most critical segment of the electricity business chain. The real challenge of reforms in the power sector lies in efficient management of the distribution sector.

5.4.2 The Act provides for a robust regulatory framework for distribution licensees to safeguard consumer interests. It also creates a competitive framework for the distribution business, offering options to consumers, through the concepts of open access and multiple licensees in the same area of supply.

5.4.3 For achieving efficiency gains proper restructuring of distribution utilities is essential. Adequate transition financing support would also be necessary for these utilities. Such support should be arranged linked to attainment of predetermined efficiency improvements and reduction in cash losses and putting in place appropriate governance structure for insulating the service providers from extraneous interference while at the same time ensuring transparency and accountability. For ensuring financial viability and sustainability, State Governments would need to restructure the liabilities of the State Electricity Boards to ensure that the successor companies are not burdened with past liabilities. The Central Government would also assist the States, which develop a clear roadmap for turnaround, in arranging transition financing from various sources which shall be linked to predetermined improvements and efficiency gains aimed at attaining financial viability and also putting in place appropriate governance structures.

5.4.4 Conducive business environment in terms of adequate returns and suitable transitional model with predetermined improvements in efficiency parameters in distribution business would be necessary for facilitating funding and attracting investments in distribution. Multi-Year Tariff (MYT) framework is an important structural incentive to minimize risks for utilities and consumers, promote efficiency and rapid reduction of system losses. It would serve public interest through economic efficiency and improved service quality. It would also bring greater predictability to consumer tariffs by restricting tariff adjustments to known indicators such as power purchase prices and inflation indices. Private sector participation in distribution needs to be encouraged for achieving the requisite reduction in transmission and distribution losses and improving the quality of service to the consumers.

5.4.5 The Electricity Act 2003 enables competing generating companies and trading licensees, besides the area distribution licensees, to sell electricity to consumers when open access in distribution is introduced by the State Electricity Regulatory Commissions. As required by the Act, the SERCs shall notify regulations by June 2005 that would enable open access to distribution networks in terms of sub-section 2 of section 42 which stipulates that such open access would be allowed, not later than five years from 27th January 2004 to consumers who require a supply of electricity where the maximum power to be made available at any time exceeds one mega watt. Section 49 of the Act provides that such consumers who have been allowed open access under section 42 may enter into agreement with any person for supply of electricity on such terms and conditions, including tariff, as may be agreed upon by them. While making regulations for open access in distribution, the SERCs will also determine wheeling charges and cross-subsidy surcharge as required under section 42 of the Act.

5.4.6 A time-bound programme should be drawn up by the State Electricity Regulatory Commissions (SERC) for segregation of technical and commercial losses through energy audits. Energy accounting and declaration of its results in each defined unit, as determined by SERCs, should be mandatory not later than March 2007. An action plan for reduction of the losses with adequate investments and suitable improvements in governance should be drawn up. Standards for reliability and quality of supply as well as for loss levels shall also be specified ,from time to time, so as to bring these in line with international practices by year 2012.

5.4.7 One of the key provisions of the Act on competition in distribution is the concept of multiple licensees in the same area of supply through their independent distribution systems. State Governments have full flexibility in carving out distribution zones while restructuring the Government utilities. For grant of second and subsequent distribution licence within the area of an incumbent distribution licensee, a revenue district, a Municipal Council for a smaller urban area or a Municipal Corporation for a larger urban area as defined in the Article 243(Q) of Constitution of India (74th Amendment) may be considered as the minimum area. The Government of India would notify within three months, the requirements for compliance by applicant for second and subsequent distribution licence as envisaged in Section 14 of the Act. With a view to provide benefits of competition to all section of consumers, the second and subsequent licensee for distribution in the same area shall have obligation to supply to all consumers in accordance with provisions of section 43 of the Electricity Act 2003. The SERCs are required to regulate the tariff including connection charges to be recovered by a distribution licensee under the provisions of the Act. This will ensure that second distribution licensee does not resort to cherry picking by demanding unreasonable connection charges from consumers.

5.4.8 The Act mandates supply of electricity through a correct meter within a stipulated period.

The Authority should develop regulations as required under Section 55 of the Act within three months.

5.4.9 The Act requires all consumers to be metered within two years. The SERCs may obtain from the Distribution Licensees their metering plans, approve these, and monitor the same. The SERCs should encourage use of pre-paid meters. In the first instance, TOD meters for large consumers with a minimum load of one MVA are also to be encouraged. The SERCs should also put in place independent third-party meter testing arrangements.

5.4.10 Modern information technology systems may be implemented by the utilities on a priority basis, after considering cost and benefits, to facilitate creation of network information and customer data base which will help in management of load, improvement in quality, detection of theft and tampering, customer information and prompt and correct billing and collection . Special emphasis should be placed on consumer indexing and mapping in a time bound manner. Support is being provided for information technology based systems under the Accelerated Power Development and Reforms Programme (APDRP).

5.4.11 High Voltage Distribution System is an effective method for reduction of technical losses, prevention of theft, improved voltage profile and better consumer service. It should be promoted to reduce LT/HT ratio keeping in view the techno economic considerations.

5.4.12 SCADA and data management systems are useful for efficient working of Distribution Systems. A time bound programme for implementation of SCADA and data management system should be obtained from Distribution Licensees and approved by the SERCs keeping in view the techno economic considerations. Efforts should be made to install substation automation equipment in a phased manner.

5.4.13 The Act has provided for stringent measures against theft of electricity. The States and distribution utilities should ensure effective implementation of these provisions. The State Governments may set up Special Courts as envisaged in Section 153 of the Act.

5.5 RECOVERY OF COST OF SERVICES & TARGETTED SUBSIDIES

5.5.1 There is an urgent need for ensuring recovery of cost of service from consumers to make the power sector sustainable.

5.5.2 A minimum level of support may be required to make the electricity affordable for consumers of very poor category. Consumers below poverty line who consume below a specified level, say 30 units per month, may receive special support in terms of tariff which are cross-subsidized. Tariffs for such designated group of consumers will be at least 50 % of the average (overall) cost of supply. This provision will be further re-examined after five years.

5.5.3 Over the last few decades cross-subsidies have increased to unsustainable levels. Cross-subsidies hide inefficiencies and losses in operations. There is urgent need to correct this imbalance without giving tariff shock to consumers. The existing cross-subsidies for other categories of consumers would need to be reduced progressively and gradually.

5.5.4 The State Governments may give advance subsidy to the extent they consider appropriate in terms of section 65 of the Act in which case necessary budget provision would be required to be made in advance so that the utility does not suffer financial problems that may affect its operations. Efforts would be made to ensure that the subsidies reach the targeted beneficiaries in the most transparent and efficient way.

5.6 TECHNOLOGY DEVELOPMENT AND R&D

5.6.1 Effective utilization of all available resources for generation, transmission and distribution of electricity using efficient and cost effective technologies is of paramount importance. Operations and management of vast and complex power systems require coordination among the multiple agencies involved. Effective control of power system at state, regional and national level can be achieved only through use of Information Technology. Application of IT has great potential in reducing technical & commercial losses in distribution and providing consumer friendly services. Integrated resource planning and demand side management would also require adopting state of the art technologies.

Special efforts would be made for research, development demonstration and commercialization of non-conventional energy systems. Such systems would need to meet international standards, specifications and performance parameters.

5.6.2 Efficient technologies, like super critical technology, IGCC etc and large size units would be gradually introduced for generation of electricity as their cost effectiveness is established. Simultaneously, development and deployment of technologies for productive use of fly ash would be given priority and encouragement.

5.6.3 Similarly, cost effective technologies would require to be developed for high voltage power flows over long distances with minimum possible losses. Specific information technology tools need to be developed for meeting the requirements of the electricity industry including highly sophisticated control systems for complex generation and transmission operations, efficient distribution business and user friendly consumer interface.

5.6.4 The country has a strong research and development base in the electricity sector which would be further augmented. R&D activities would be further intensified and Missions will be constituted for achieving desired results in identified priority areas. A suitable funding mechanism would be evolved for promoting R&D in the Power Sector. Large power companies should set aside a portion of their profits for support to R&D.

5.7 COMPETITION AIMED AT CONSUMER BENEFITS

5.7.1 To promote market development, a part of new generating capacities, say 15% may be sold outside long-term PPAs . As the power markets develop, it would be feasible to finance projects with competitive generation costs outside the long-term power purchase agreement framework. In the coming years, a significant portion of the installed capacity of new generating stations could participate in competitive power markets. This will increase the depth of the power markets and provide alternatives for both generators and licensees/consumers and in long run would lead to reduction in tariff. For achieving this, the policy underscores the following:-

a. It is the function of the Central Electricity Regulatory Commission to issue license for inter-state trading which would include authorization for trading throughout the country.

b. The ABT regime introduced by CERC at the national level has had a positive impact. It has also enabled a credible settlement mechanism for intra-day power transfers from licenses with surpluses to licenses experiencing deficits. SERCs are advised to introduce the ABT regime at the State level within one year.

c. Captive generating plants should be permitted to sell electricity to licensees and consumers when they are allowed open access by SERCs under section 42 of the Act .

d. Development of power market would need to be undertaken by the Appropriate Commission in consultation with all concerned.

e. The Central Commission and the State Commissions are empowered to make regulations under section 178 and section 181 of the Act respectively. These regulations will ensure implementation of various provisions of the Act regarding encouragement to competition and also consumer protection. The Regulatory Commissions are advised to notify various regulations expeditiously.

f. Enabling regulations for inter and intra State trading and also regulations on power exchange shall be notified by the appropriate Commissions within six months.

5.8 FINANCING POWER SECTOR PROGRAMMES INCLUDING PRIVATE SECTOR PARTICIPATION

5.8.1 To meet the objective of rapid economic growth and "power for all" including household electrification, it is estimated that an investment of the order of Rs.9,00,000 crores at 2002-03 price level would be required to finance generation, transmission, sub-transmission, distribution and rural electrification projects. Power being most crucial infrastructure, public sector investments, both at the Central Government and State Governments, will have to be stepped up. Considering the magnitude of the expansion of the sector required, a sizeable part of the investments will also need to be brought in from the private sector. The Act creates a conducive environment for investments in all segments of the industry, both for public sector and private sector, by removing barrier to entry in different segments. Section 63 of the Act provides for participation of suppliers on competitive basis in different segments which will further encourage private sector investment. Public service obligations like increasing access to electricity to rural households and small and marginal farmers have highest priority over public finances.

5.8.2 The public sector should be able to raise internal resources so as to at least meet the equity requirement of investments even after suitable gross budgetary support from the Government at the Centre and in the states in order to complete their on-going projects in a time-bound manner. Expansion of public sector investments would be dependent on the financial viability of the proposed projects. It would, therefore, be imperative that an appropriate surplus is generated through return on investments and, at the same time, depreciation reserve created so as to fully meet the debt service obligation. This will not only enable financial closure but also bankability of the project would be improved for expansion programmes, with the Central and State level public sector organizations, as also private sector projects, being in a position to fulfil their obligations toward equity funding and debt repayments.

5.8.3 Under sub-section (2) of Section 42 of the Act, a surcharge is to be levied by the respective State Commissions on consumers switching to alternate supplies under open access. This is to compensate the host distribution licensee serving such consumers who are permitted open access under section 42(2), for loss of the cross-subsidy element built into the tariff of such consumers. An additional surcharge may also be levied under sub-section (4) of Section 42 for meeting the fixed cost of the distribution licensee arising out of his obligation to supply in cases where consumers are allowed open access. The amount of surcharge and additional surcharge levied from consumers who are permitted open access should not become so onerous that it eliminates competition that is intended to be fostered in generation and supply of power directly to consumers through the provision of Open Access under Section 42(2) of the Act. Further it is essential that the Surcharge be reduced progressively in step with the reduction of cross-subsidies as foreseen in Section 42(2) of the Electricity Act 2003.

5.8.4 Capital is scarce. Private sector will have multiple options for investments. Return on investment will, therefore, need to be provided in a manner that the sector is able to attract adequate investments at par with, if not in preference to, investment opportunities in other sectors. This would obviously be based on a clear understanding and evaluation of opportunities and risks. An appropriate balance will have to be maintained between the interests of consumers and the need for investments.

5.8.5 All efforts will have to be made to improve the efficiency of operations in all the segments of the industry. Suitable performance norms of operations together with incentives and disincentives will need to be evolved along with appropriate arrangement for sharing the gains of efficient operations with the consumers . This will ensure protection of consumers' interests on the one hand and provide motivation for improving the efficiency of operations on the other.

5.8.6 Competition will bring significant benefits to consumers , in which case, it is competition which will determine the price rather than any cost plus exercise on the basis of operating norms and parameters. All efforts will need to be made to bring the power industry to this situation as early as possible, in the overall interest of consumers. Detailed guidelines for competitive bidding as stipulated in section 63 of the Act have been issued by the Central Government.

5.8.7 It will be necessary that all the generating companies, transmission licensees and distribution licensees receive due payments for effective discharge of their operational obligations as also for enabling them to make fresh investments needed for the expansion programmes. Financial viability of operations and businesses would, therefore, be essential for growth and development of the sector. Concerted efforts would be required for restoring the financial health of the sector. For this purpose, tariff rationalization would need to be ensured by the SERCs. This would also include differential pricing for base, intermediate and peak power.

5.8.8 Steps would also be taken to address the need for regulatory certainty based on independence of the regulatory commissions and transparency in their functioning to generate investor's confidence.

5.8.9 Role of private participation in generation, transmission and distribution would become increasingly critical in view of the rapidly growing investment needs of the sector. The Central Government and the State Governments need to develop workable and successful models for public private partnership. This would also enable leveraging private investment with the public sector finances. Mechanisms for continuous dialogue with industry for streamlining procedures for encouraging private participation in power sector need to be put in place.

Transmission & Distribution Losses

5.8.10 It would have to be clearly recognized that Power Sector will remain unviable until T&D losses are brought down significantly and rapidly. A large number of States have been reporting losses of over 40% in the recent years. By any standards, these are unsustainable and imply a steady decline of power sector operations. Continuation of the present level of losses would not only pose a threat to the power sector operations but also jeopardize the growth prospects of the economy as a whole. No reforms can succeed in the midst of such large pilferages on a continuing basis.

The State Governments would prepare a Five Year Plan with annual milestones to bring down these losses expeditiously. Community participation, effective enforcement, incentives for entities, staff and consumers, and technological upgradation should form part of campaign efforts for reducing these losses. The Central Government will provide incentive based assistance to States that are able to reduce losses as per agreed programmes.

5.9 ENERGY CONSERVATION

5.9.1 There is a significant potential of energy savings through energy efficiency and demand side management measures. In order to minimize the overall requirement, energy conservation and demand side management (DSM) is being accorded high priority. The Energy Conservation Act has been enacted and the Bureau of Energy Efficiency has been setup.

5.9.2 The potential number of installations where demand side management and energy conservation measures are to be carried out is very large. Bureau of Energy Efficiency (BEE) shall initiate action in this regard. BEE would also make available the estimated conservation and DSM potential, its staged implementation along with cost estimates for consideration in the planning process for National Electricity Plan.

5.9.3 Periodic energy audits have been made compulsory for power intensive industries under the Energy Conservation Act. Other industries may also be encouraged to adopt energy audits and energy conservation measures. Energy conservation measures shall be adopted in all Government buildings for which saving potential has been estimated to be about 30% energy. Solar water heating systems and solar passive architecture can contribute significantly to this effort.

5.9.4 In the field of energy conservation initial approach would be voluntary and self-regulating with emphasis on labelling of appliances. Gradually as awareness increases, a more regulatory approach of setting standards would be followed.

5.9.5 In the agriculture sector, the pump sets and the water delivery system engineered for high efficiency would be promoted. In the industrial sector, energy efficient technologies should be used and energy audits carried out to indicate scope for energy conservation measures. Motors and drive system are the major source of high consumption in Agricultural and Industrial Sector. These need to be addressed. Energy efficient lighting technologies should also be adopted in industries, commercial and domestic establishments.

5.9.6 In order to reduce the requirements for capacity additions, the difference between electrical power demand during peak periods and off-peak periods would have to be reduced. Suitable load management techniques should be adopted for this purpose. Differential tariff structure for peak and off peak supply and metering arrangements (Time of Day metering) should be conducive to load management objectives. Regulatory Commissions should ensure adherence to energy efficiency standards by utilities.

5.9.7 For effective implementation of energy conservation measures, role of Energy Service Companies would be enlarged. Steps would be taken to encourage and incentivise emergence of such companies.

5.9.8 A national campaign for bringing about awareness about energy conservation would be essential to achieve efficient consumption of electricity.

5.9.9. A National Action Plan has been developed. Progress on all the proposed measures will be monitored with reference to the specific plans of action.

5.10 ENVIRONMENTAL ISSUES

5.10.1 Environmental concerns would be suitably addressed through appropriate advance action by way of comprehensive Environmental Impact Assessment and implementation of Environment Action Plan (EAP).

5.10.2 Steps would be taken for coordinating the efforts for streamlining the procedures in regard to grant of environmental clearances including setting up of 'Land Bank' and 'Forest Bank'.

5.10.3 Appropriate catchment area treatment for hydro projects would also be ensured and monitored.

5.10.4 Setting up of coal washeries will be encouraged. Suitable steps would also be taken so that utilization of fly ash is ensured as per environmental guidelines.

5.10.5 Setting up of municipal solid waste energy projects in urban areas and recovery of energy from industrial effluents will also be encouraged with a view to reducing environmental pollution apart from generating additional energy.

5.10.6 Full compliance with prescribed environmental norms and standards must be achieved in operations of all generating plants.

5.11 TRAINING AND HUMAN RESOURCE DEVELOPMENT

In the new reforms framework ushered by Electricity Act 2003, it is particularly important that the electricity industry has access to properly trained human resource. Therefore, concerted action would be taken for augmenting training infrastructure so that adequate well-trained human resource is made available as per the need of the industry. Special attention would need to be paid by the industry for establishing training infrastructure in the field of electricity distribution, regulation, trading and power markets. Efforts should be made so that personnel of electricity supply industry both in the private and public sector become more cost-conscious and consumer-friendly.

5.12 COGENERATION AND NON-CONVENTIONAL ENERGY SOURCES

5.12.1 Non-conventional sources of energy being the most environment friendly there is an urgent need to promote generation of electricity based on such sources of energy. For this purpose, efforts need to be made to reduce the capital cost of projects based on non-conventional and renewable sources of energy. Cost of energy can also be reduced by promoting competition within such projects. At the same time, adequate promotional measures would also have to be taken for development of technologies and a sustained growth of these sources.

5.12.2 The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the SERCs by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made applicable for the tariffs to be determined by the SERCs at the earliest. Progressively the share of electricity from non-conventional sources would need to be increased as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the Commission may determine an appropriate differential in prices to promote these technologies.

5.12.3 Industries in which both process heat and electricity are needed are well suited for cogeneration of electricity. A significant potential for cogeneration exists in the country, particularly in the sugar industry. SERCs may promote arrangements between the co-generator and the concerned distribution licensee for purchase of surplus power from such plants. Cogeneration system also needs to be encouraged in the overall interest of energy efficiency and also grid stability.

5.13 PROTECTION OF CONSUMER INTERESTS AND QUALITY STANDARDS

5.13.1 Appropriate Commission should regulate utilities based on pre-determined indices on quality of power supply. Parameters should include, amongst others, frequency and duration of interruption, voltage parameters, harmonics, transformer failure rates, waiting time for restoration of supply, percentage defective meters and waiting list of new connections. The Appropriate Commissions would specify expected standards of performance.

5.13.2 Reliability Index (RI) of supply of power to consumers should be indicated by the distribution licensee. A road map for declaration of RI for all cities and towns up to the District Headquarter towns as also for rural areas, should be drawn by up SERCs. The data of RI should be compiled and published by CEA.

5.13.3 It is advised that all State Commissions should formulate the guidelines regarding setting up of grievance redressal forum by the licensees as also the regulations regarding the Ombudsman and also appoint/designate the Ombudsman within six months.

5.13.4 The Central Government, the State Governments and Electricity Regulatory Commissions should facilitate capacity building of consumer groups and their effective representation before the Regulatory Commissions. This will enhance the efficacy of regulatory process.

6.0 COORDINATED DEVELOPMENT

6.1 Electricity being a concurrent subject, a well-coordinated approach would be necessary for development of the power sector. This is essential for the attainment of the objective of providing electricity-access to all households in next five years and providing reliable uninterrupted quality power supply to all consumers. The State Governments have a major role, particularly in creation of generation capacity, state level transmission and distribution. The Central Government would assist the States in the attainment of this objective. It would be playing a supportive role in fresh capacity addition and a major role in development of the National Grid. The State Governments need to ensure the success of reforms and restoration of financial health in distribution, which alone can enable the creation of requisite generation capacity. The Regulatory Commissions have the responsibility of ensuring that the regulatory processes facilitate the attainment of this objective. They also have a developmental role whose fulfillment would need a less formal and a consultative process.

The Electricity Act, 2003 also provides for mechanisms like "Coordination forum" and "Advisory Committees" to facilitate consultative process. The Act also requires the Regulatory Commissions to ensure transparency in exercise of their powers and in discharge of their functions. This in no way means that the Regulatory Commissions should follow formal judicial approach. In fact, quick disposal of matters would require an approach involving consultations with stakeholders.

6.2 Under the Act, the Regulatory Commissions are required to perform wide-ranging responsibilities. The appropriate Governments need to take steps to attract regulatory personnel with required background. The Govt. of India would promote the institutional capability to provide training to raise regulatory capacity in terms of the required expertise and skill sets. The appropriate Governments should provide financial autonomy to the Regulatory Commissions. The Act provides that the appropriate Government shall constitute a Fund under section 99 or section 103 of the Act, as the case may be, to be called as Regulatory Commission Fund. The State Governments are advised to establish this Fund expeditiously.

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RESOLUTION

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TARIFF POLICY

1.0 INTRODUCTION

1.1. In compliance with section 3 of the Electricity Act 2003 the Central Government hereby notifies the Tariff policy in continuation of the National Electricity Policy (NEP) notified on 12th February 2005.

1.2. The National Electricity Policy has set the goal of adding new generation capacity of more than one lakh MW during the 10th and 11th Plan periods to have per capita availability of over 1000 units of electricity per year and to not only eliminate energy and peaking shortages but to also have a spinning reserve of 5% in the system. Development of the power sector has also to meet the challenge of providing access for electricity to all households in next five years.

1.3. It is therefore essential to attract adequate investments in the power sector by providing appropriate return on investment as budgetary resources of the Central and State Governments are incapable of providing the requisite funds. It is equally necessary to ensure availability of electricity to different categories of consumers at reasonable rates for achieving the objectives of rapid economic development of the country and improvement in the living standards of the people.

1.4. Balancing the requirement of attracting adequate investments to the sector and that of ensuring reasonability of user charges for the consumers is the critical challenge for the regulatory process. Accelerated development of the power sector and its ability to attract necessary investments calls for, inter alia, consistent regulatory approach across the country. Consistency in approach becomes all the more necessary considering the large number of States and the diversities involved.

2.0 LEGAL POSITION

2.1 Section 3 (1) of the Electricity Act 2003 empowers the Central Government to formulate the tariff policy. Section 3 (3) of the Act enables the Central Government to review or revise the tariff policy from time to time.

2.2 The Act also requires that the Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERCs) shall be guided by the tariff policy in discharging their functions including framing the regulations under section 61 of the Act.

2.3 Section 61 of the Act provides that Regulatory Commissions shall be guided by the principles and methodologies specified by the Central Commission for determination of tariff applicable to generating companies and transmission licensees.

2.4 The Forum of Regulators has been constituted by the Central Government under the provisions of the Act which would, inter alia, facilitate consistency in approach specially in the area of distribution.

3.0 EVOLUTION OF THE POLICY

The tariff policy has been evolved in consultation with the State Governments and the Central Electricity Authority (CEA) and keeping in view the advice of the Central Electricity Regulatory Commission and suggestions of various stakeholders.

4.0 OBJECTIVES OF THE POLICY

The objectives of this tariff policy are to:

(a) Ensure availability of electricity to consumers at reasonable and competitive rates;

(b) Ensure financial viability of the sector and attract investments;

(c) Promote transparency, consistency and predictability in regulatory approaches across jurisdictions and minimise perceptions of regulatory risks;

(d) Promote competition, efficiency in operations and improvement in quality of supply.

5.0 GENERAL APPROACH TO TARIFF

5.1 Introducing competition in different segments of the electricity industry is one of the key features of the Electricity Act, 2003. Competition will lead to significant benefits to consumers through reduction in capital costs and also efficiency of operations. It will also facilitate the price to be determined competitively. The Central Government has already issued detailed guidelines for tariff based bidding process for procurement of electricity by distribution licensees for medium or long-term period vide gazette notification dated 19th January, 2005.

All future requirement of power should be procured competitively by distribution licensees except in cases of expansion of existing projects or where there is a State controlled/owned company as an identified developer and where regulators will need to resort to tariff determination based on norms provided that expansion of generating capacity by private developers for this purpose would be restricted to one time addition of not more than 50% of the existing capacity.

Even for the Public Sector projects, tariff of all new generation and transmission projects should be decided on the basis of competitive bidding after a period of five years or when the Regulatory Commission is satisfied that the situation is ripe to introduce such competition.

5.2 The real benefits of competition would be available only with the emergence of appropriate market conditions. Shortages of power supply will need to be overcome. Multiple players will enhance the quality of service through competition. All efforts will need to be made to bring power industry to this situation as early as possible in the overall interests of consumers. Transmission and distribution, i.e. the wires business is internationally recognized as having the characteristics of a natural monopoly where there are inherent difficulties in going beyond regulated returns on the basis of scrutiny of costs.

5.3 Tariff policy lays down following framework for performance based cost of service regulation in respect of aspects common to generation, transmission as well as distribution. These shall not apply to competitively bid projects as referred to in para 6.1 and para 7.1 (6). Sector specific aspects are dealt with in subsequent sections.

a) Return on Investment

Balance needs to be maintained between the interests of consumers and the need for investments while laying down rate of return. Return should attract investments at par with, if not in preference to, other sectors so that the electricity sector is able to create adequate capacity. The rate of return should be such that it allows generation of reasonable surplus for growth of the sector.

The Central Commission would notify, from time to time, the rate of return on equity for generation and transmission projects keeping in view the assessment of overall risk and the prevalent cost of capital which shall be followed by the SERCs also. The rate of return notified by CERC for transmission may be adopted by the State Electricity Regulatory Commissions (SERCs) for distribution with appropriate modification taking into view the higher risks involved. For uniform approach in this matter, it would be desirable to arrive at a consensus through the Forum of Regulators.

While allowing the total capital cost of the project, the Appropriate Commission would ensure that these are reasonable and to achieve this objective, requisite benchmarks on capital costs should be evolved by the Regulatory Commissions.

Explanation: For the purposes of return on equity, any cash resources available to the company from its share premium account or from its internal resources that are used to fund the equity commitments of the project under consideration should be treated as equity subject to limitations contained in (b) below.

The Central Commission may adopt the alternative approach of regulating through return on capital.

The Central Commission may adopt either Return on Equity approach or Return on Capital approach whichever is considered better in the interest of the consumers.

The State Commission may consider 'distribution margin' as basis for allowing returns in distribution business at an appropriate time. The Forum of Regulators should evolve a comprehensive approach on "distribution margin" within one year. The considerations while preparing such an approach would, inter-alia, include issues such as reduction in Aggregate Technical and Commercial losses, improving the standards of performance and reduction in cost of supply.

b) Equity Norms

For financing of future capital cost of projects, a Debt : Equity ratio of 70:30 should be adopted. Promoters would be free to have higher quantum of equity investments. The equity in excess of this norm should be treated as loans advanced at the weighted average rate of interest and for a weighted average tenor of the long term debt component of the project after ascertaining the reasonableness of the interest rates and taking into account the effect of debt restructuring done, if any. In case of equity below the normative level, the actual equity would be used for determination of Return on Equity in tariff computations.

c) Depreciation

The Central Commission may notify the rates of depreciation in respect of generation and transmission assets. The depreciation rates so notified would also be applicable for distribution with appropriate modification as may be evolved by the Forum of Regulators.

The rates of depreciation so notified would be applicable for the purpose of tariffs as well as accounting.

There should be no need for any advance against depreciation.

Benefit of reduced tariff after the assets have been fully depreciated should remain available to the consumers.

d) Cost of Debt

Structuring of debt, including its tenure, with a view to reducing the tariff should be encouraged. Savings in costs on account of subsequent restructuring of debt should be suitably incentivised by the Regulatory Commissions keeping in view the interests of the consumers.

e) Cost of Management of Foreign Exchange Risk

Foreign exchange variation risk shall not be a pass through. Appropriate costs of hedging and swapping to take care of foreign exchange variations should be allowed for debt obtained in foreign currencies. This provision would be relevant only for the projects where tariff has not been determined on the basis of competitive bids.

f) Operating Norms

Suitable performance norms of operations together with incentives and dis-incentives would need be evolved along with appropriate arrangement for sharing the gains of efficient operations with the consumers. Except for the cases referred to in para 5.3 (h)(2), the operating parameters in tariffs should be at “normative levels” only and not at “lower of normative and actuals”. This is essential to encourage better operating performance. The norms should be efficient, relatable to past performance, capable of achievement and progressively reflecting increased efficiencies and may also take into consideration the latest technological advancements, fuel, vintage of equipments, nature of operations, level of service to be provided to consumers etc. Continued and proven inefficiency must be controlled and penalized.

The Central Commission would, in consultation with the Central Electricity Authority, notify operating norms from time to time for generation and transmission. The SERC would adopt these norms. In cases where operations have been much below the norms for many previous years, the SERCs may fix relaxed norms suitably and draw a transition path over the time for achieving the norms notified by the Central Commission.

Operating norms for distribution networks would be notified by the concerned SERCs. For uniformity of approach in determining such norms for distribution, the Forum of Regulators should evolve the approach including the guidelines for treatment of state specific distinctive features.

g) Renovation and Modernisation

Renovation and modernization (it shall not include periodic overhauls) for higher efficiency levels needs to be encouraged. A multi-year tariff (MYT) framework may be prescribed which should also cover capital investments necessary for renovation and modernization and an incentive framework to share the benefits of efficiency improvement between the utilities and the beneficiaries with reference to revised and specific performance norms to be fixed by the Appropriate Commission. Appropriate capital costs required for pre-determined efficiency gains and/or for sustenance of high level performance would need to be assessed by the Appropriate Commission.

(h) **Multi Year Tariff**

1) Section 61 of the Act states that the Appropriate Commission, for determining the terms and conditions for the determination of tariff, shall be guided inter-alia, by multi-year tariff principles. The MYT framework is to be adopted for any tariffs to be determined from April 1, 2006. The framework should feature a five-year control period. The initial control period may however be of 3 year duration for transmission and distribution if deemed necessary by the Regulatory Commission on account of data uncertainties and other practical considerations. In cases of lack of reliable data, the Appropriate Commission may state assumptions in MYT for first control period and a fresh control period may be started as and when more reliable data becomes available.

2) In cases where operations have been much below the norms for many previous years the initial starting point in determining the revenue requirement and the improvement trajectories should be recognized at "relaxed" levels and not the "desired" levels. Suitable benchmarking studies may be conducted to establish

the "desired" performance standards. Separate studies may be required for each utility to assess the capital expenditure necessary to meet the minimum service standards.

3) Once the revenue requirements are established at the beginning of the control period, the Regulatory Commission should focus on regulation of outputs and not the input cost elements. At the end of the control period, a comprehensive review of performance may be undertaken.

4) Uncontrollable costs should be recovered speedily to ensure that future consumers are not burdened with past costs. Uncontrollable costs would include (but not limited to) fuel costs, costs on account of inflation, taxes and cess, variations in power purchase unit costs including on account of hydro-thermal mix in case of adverse natural events.

5) Clear guidelines and regulations on information disclosure may be developed by the Regulatory Commissions. Section 62 (2) of the Act empowers the Appropriate Commission to require licensees to furnish separate details, as may be specified in respect of generation, transmission and distribution for determination of tariff.

(i) **Benefits under CDM**

Tariff fixation for all electricity projects (generation, transmission and distribution) that result in lower Green House Gas (GHG) emissions than the relevant base line should take into account the benefits obtained from the Clean Development Mechanism (CDM) into consideration, in a manner so as to provide adequate incentive to the project developers.

5.4 While it is recognized that the State Governments have the right to impose duties, taxes, cess on sale or consumption of electricity, these could potentially distort competition and optimal use of resources especially if such levies are used selectively and on a non- uniform basis.

In some cases, the duties etc. on consumption of electricity is linked to sources of generation (like captive generation) and the level of duties levied is much higher as compared to that being levied on the same category of consumers who draw power from grid. Such a distinction is invidious and inappropriate. The sole purpose of freely allowing captive generation is to enable industries to access reliable, quality and cost effective power. Particularly, the provisions relating to captive power plants which can be set up by group of consumers has been brought in recognition of the fact that efficient expansion of small and medium industries across the country will lead to faster economic growth and creation of larger employment opportunities.

For realizing the goal of making available electricity to consumers at reasonable and competitive prices, it is necessary that such duties are kept at reasonable level.

5.5 Though, as per the provisions of the Act, the outer limit to introduce open access in distribution is 27.1.2009, it would be desirable that, in whichever states the situation so permits, the Regulatory Commissions introduce such open access earlier than this deadline.

6.0 GENERATION

Accelerated growth of the generation capacity sector is essential to meet the estimated growth in demand. Adequacy of generation is also essential for efficient functioning of power markets. At the same time, it is to be ensured that new capacity addition should deliver electricity at most efficient rates to protect the interests of consumers. This policy stipulates the following for meeting these objectives.

6.1 Procurement of power

As stipulated in para 5.1, power procurement for future requirements should be through a transparent competitive bidding mechanism using the guidelines issued by the Central Government vide gazette notification dated 19th January, 2005. These guidelines provide for procurement of electricity separately for base load requirements and for peak load requirements. This would facilitate setting up of generation capacities specifically for meeting peak.

6.2 Tariff structuring and associated issues

(1) A two-part tariff structure should be adopted for all long term contracts to facilitate Merit Order dispatch. According to National Electricity Policy, the Availability Based Tariff (ABT) is to be introduced at State level by April 2006. This framework would be extended to generating stations (including grid connected captive plants of capacities as determined by the SERC). The Appropriate Commission may also introduce differential rates of fixed charges for peak and off peak hours for better management of load.

(2) Power Purchase Agreement should ensure adequate and bankable payment security arrangements to the Generating companies. In case of persisting default in spite of the available payment security mechanisms like letter of credit, escrow of cash flows etc. the generating companies may sell to other buyers.

(3) In case of coal based generating stations, the cost of project will also include reasonable cost of setting up coal washeries, coal beneficiation system and dry ash handling & disposal system.

6.3 Harnessing captive generation

Captive generation is an important means to making competitive power available. Appropriate Commission should create an enabling environment that encourages captive power plants to be connected to the grid.

Such captive plants could inject surplus power into the grid subject to the same regulation as applicable to generating companies. Firm supplies may be bought from captive plants by distribution licensees using the guidelines issued by the Central Government under section 63 of the Act.

The prices should be differentiated for peak and off-peak supply and the tariff should include variable cost of generation at actual levels and reasonable compensation for capacity charges.

Alternatively, a frequency based real time mechanism can be used and the captive generators can be allowed to inject into the grid under the ABT mechanism.

Wheeling charges and other terms and conditions for implementation should be determined in advance by the respective State Commission, duly ensuring that the charges are reasonable and fair.

Grid connected captive plants could also supply power to non-captive users connected to the grid through available transmission facilities based on negotiated tariffs. Such sale of electricity would be subject to relevant regulations for open access.

6.4 Non-conventional sources of energy generation including Co-generation:

(1) Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall fix a minimum percentage for purchase of energy from such sources taking into account availability of such resources in the region and its impact on retail tariffs. Such percentage for purchase of energy should be made applicable for the tariffs to be determined by the SERCs latest by April 1, 2006.

It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. Therefore, procurement by distribution companies shall be done at preferential tariffs determined by the Appropriate Commission.

(2) Such procurement by Distribution Licensees for future requirements shall be done, as far as possible, through competitive bidding process under Section 63 of the Act within suppliers offering energy from same type of non-conventional sources. In the long-term, these technologies would need to compete with other sources in terms of full costs.

(3) The Central Commission should lay down guidelines within three months for pricing non-firm power, especially from non–conventional sources, to be followed in cases where such procurement is not through competitive bidding.

7.0 TRANSMISSION

The transmission system in the country consists of the regional networks, the inter-regional connections that carry electricity across the five regions, and the State networks. The national transmission network in India is presently under development. Development of the State networks has not been uniform and capacity in such networks needs to be augmented. These networks will play an important role in intra-State power flows and also in the regional and national flows. The tariff policy, insofar as transmission is concerned, seeks to achieve the following objectives:

1. Ensuring optimal development of the transmission network to promote efficient utilization of generation and transmission assets in the country;
2. Attracting the required investments in the transmission sector and providing adequate returns.

7.1 Transmission pricing

(1) A suitable transmission tariff framework for all inter-State transmission, including transmission of electricity across the territory of an intervening State as well as conveyance within the State which is incidental to such inter-state transmission, needs to be implemented with the objective of promoting effective utilization of all assets across the country and accelerated development of new transmission capacities that are required.

(2) The National Electricity Policy mandates that the national tariff framework implemented should be sensitive to distance, direction and related to quantum of power flow. This would be developed by CERC taking into consideration the advice of the CEA. Such tariff mechanism should be implemented by 1st April 2006.

(3)Transmission charges, under this framework, can be determined on MW per circuit kilometer basis, zonal postage stamp basis, or some other pragmatic variant, the ultimate objective being to get the transmission system users to share the total transmission cost in proportion to their respective utilization of the transmission system. The overall tariff framework should be such as not to inhibit planned development/augmentation of the transmission system, but should discourage non-optimal transmission investment.

(4) In view of the approach laid down by the NEP, prior agreement with the beneficiaries would not be a pre-condition for network expansion. CTU/STU should undertake network expansion after identifying the requirements in consonance with the National Electricity Plan and in consultation with stakeholders, and taking up the execution after due regulatory approvals.

(5) The Central Commission would establish, within a period of one year, norms for capital and operating costs, operating standards and performance indicators for transmission lines at different voltage levels. Appropriate baseline studies may be commissioned to arrive at these norms.

(6) Investment by transmission developer other than CTU/STU would be invited through competitive bids. The Central Government will issue guidelines in three months for bidding process for developing transmission capacities. The tariff of the projects to be developed by CTU/STU after the period of five years or when the Regulatory Commission is satisfied that the situation is right to introduce such competition (as referred to in para 5.1) would also be determined on the basis of competitive bidding.

(7) After the implementation of the proposed framework for the inter-State transmission ,a similar approach should be implemented by SERCs in next two years for the intra-State transmission, duly considering factors like voltage, distance, direction and quantum of flow.

(8) Metering compatible with the requirements of the proposed transmission tariff framework should be established on priority basis. The metering should be compatible with ABT requirements, which would also facilitate implementation of Time of Day (ToD) tariffs.

7.2 Approach to transmission loss allocation

(1) Transactions should be charged on the basis of average losses arrived at after appropriately considering the distance and directional sensitivity, as applicable to relevant voltage level, on the transmission system. Based on the methodology laid down by the CERC in this regard for inter- state transmission, the Forum of Regulators may evolve a similar approach for intra-state transmission.

The loss framework should ensure that the loss compensation is reasonable and linked to applicable technical loss benchmarks. The benchmarks may be determined by the Appropriate Commission after considering advice of CEA.

It would be desirable to move to a system of loss compensation based on incremental losses as present deficiencies in transmission capacities are overcome through network expansion.

(2) The Appropriate Commission may require necessary studies to be conducted to establish the allowable level of system loss for the network configuration, and the capital expenditure required to augment the transmission system and reduce system losses. Since additional flows above a level of line loading leads to significantly higher losses, CTU/STU should ensure upgrading of transmission systems to avoid the situations of overloading. The Appropriate Commission should permit adequate capital investments in new assets for upgrading the transmission system.

7.3 Other issues in transmission

(1) Financial incentives and disincentives should be implemented for the CTU and the STU around the key performance indicators (KPI) for these organisations. Such KPIs would include efficient network construction, system availability and loss reduction.

(2) All available information should be shared with intending users by the CTU/STU and the load dispatch centers, particularly information on available transmission capacity and load flow studies.

8.0 DISTRIBUTION

Supply of reliable and quality power of specified standards in an efficient manner and at reasonable rates is one of the main objectives of the National Electricity Policy. The State Commission should determine and notify the standards of performance of licensees with respect to quality, continuity and reliability of service for all consumers. It is desirable that the Forum of Regulators determines the basic framework on service standards. A suitable transition framework could be provided for the licensees to reach the desired levels of service as quickly as possible. Penalties may be imposed on licensees in accordance with section 57 of the Act for failure to meet the standards.

Making the distribution segment of the industry efficient and solvent is the key to success of power sector reforms and provision of services of specified standards. Therefore, the Regulatory Commissions need to strike the right balance between the requirements of the commercial viability of distribution licensees and consumer interests. Loss making utilities need to be transformed into profitable ventures which can raise necessary resources from the capital markets to provide services of international standards to enable India to achieve its full growth potential.

Efficiency in operations should be encouraged. Gains of efficient operations with reference to normative parameters should be appropriately shared between consumers and licensees.

8.1 Implementation of Multi-Year Tariff (MYT) framework

1) This would minimise risks for utilities and consumers, promote efficiency and appropriate reduction of system losses and attract investments and would also bring greater predictability to consumer tariffs on the whole by restricting tariff adjustments to known indicators on power purchase prices and inflation indices. The framework should be applied for both public and private utilities.

2) The State Commissions should introduce mechanisms for sharing of excess profits and losses with the consumers as part of the overall MYT framework .In the first control period the incentives for the utilities may be asymmetric with the percentage of the excess profits being retained by the utility set at higher levels than the percentage of losses to be borne by the utility. This is necessary to accelerate performance improvement and reduction in losses and will be in the long term interest of consumers by way of lower tariffs.

3) As indicated in para 5.3 (h), the MYT framework implemented in the initial control period should have adequate flexibility to accommodate changes in the baselines consequent to metering being completed.

4) Licensees may have the flexibility of charging lower tariffs than approved by the State Commission if competitive conditions require so without having a claim on additional revenue requirement on this account in accordance with Section 62 of the Act .

5) At the beginning of the control period when the "actual" costs form the basis for future projections, there may be a large uncovered gap between required tariffs and the tariffs that are presently applicable. The gap should be fully met through tariff charges and through alternative means that could inter-alia include financial restructuring and transition financing.

6) Incumbent licensees should have the option of filing for separate revenue requirements and tariffs for an area where the State Commission has issued multiple distribution licenses, pursuant to the provisions of Section 14 of the Act read with para 5.4.7 of the National Electricity Policy.

7) Appropriate Commissions should initiate tariff determination and regulatory scrutiny on a suo moto basis in case the licensee does not initiate filings in time. It is desirable that requisite tariff changes come into effect from the date of commencement of each financial year and any gap on account of delay in filing should be on account of licensee.

8.2 Framework for revenue requirements and costs

8.2.1 The following aspects would need to be considered in determining tariffs:

(1) All power purchase costs need to be considered legitimate unless it is established that the merit order principle has been violated or power has been purchased at unreasonable rates. The reduction of Aggregate Technical & Commercial (ATC) losses needs to be brought about but not by denying revenues required for power purchase for 24 hours supply and necessary and reasonable O&M and investment for system upgradation. Consumers, particularly those who are ready to pay a tariff which reflects efficient costs have the right to get uninterrupted 24 hours supply of quality power. Actual level of retail sales should be grossed up by normative level of T&D losses as indicated in MYT trajectory for allowing power purchase cost subject to justifiable power purchase mix variation (for example, more energy may be purchased from thermal generation in the event of poor rainfall) and fuel surcharge adjustment as per regulations of the SERC.

(2) ATC loss reduction should be incentivised by linking returns in a MYT framework to an achievable trajectory. Greater transparency and nurturing of consumer groups would be efficacious. For government owned utilities improving governance to achieve ATC loss reduction is a more difficult and complex challenge for the SERCs. Prescription of a MYT dispensation with different levels of consumer tariffs in succeeding years linked to different ATC loss levels aimed at covering full costs could generate the requisite political will for effective action to reduce theft as the alternative would be stiffer tariff increases. Third party verification of energy audit results for different areas/localities could be used to impose area/locality specific surcharge for greater ATC loss levels and this in turn could generate local consensus for effective action for better governance. The SERCs may also encourage suitable local area based incentive and disincentive scheme for the staff of the utilities linked to reduction in losses.

The SERC shall undertake independent assessment of baseline data for various parameters for every distribution circle of the licensee and this exercise should be completed latest by March, 2007.

The SERC shall also institute a system of independent scrutiny of financial and technical data submitted by the licensees.

As the metering is completed upto appropriate level in the distribution network, latest by March, 2007, it should be possible to segregate technical losses. Accordingly technical loss reduction under MYT framework should then be treated as distinct from commercial loss reduction which require a different approach.

(3) Section 65 of the Act provides that no direction of the State Government regarding grant of subsidy to consumers in the tariff determined by the State Commission shall be operative if the payment on account of subsidy as decided by the State Commission is not made to the utilities and the tariff fixed by the State Commission shall be applicable from the date of issue of orders by the Commission in this regard. The State Commissions should ensure compliance of this provision of law to ensure financial viability of the utilities. To ensure implementation of the provision of the law, the State Commission should determine the tariff initially, without considering the subsidy commitment by the State Government and subsidised tariff shall be arrived at thereafter considering the subsidy by the State Government for the respective categories of consumers.

(4) Working capital should be allowed duly recognising the transition issues faced by the utilities such as progressive improvement in recovery of bills. Bad debts should be recognised as per policies developed and subject to the approval of the State Commission.

(5) Pass through of past losses or profits should be allowed to the extent caused by uncontrollable factors. During the transition period controllable factors should be to the account of utilities and consumers in proportions determined under the MYT framework.

(6) The contingency reserves should be drawn upon with prior approval of the State Commission only in the event of contingency conditions specified through regulations by the State Commission. The existing practice of providing for development reserves and tariff and dividend control reserves should be discontinued.

8.2.2. The facility of a regulatory asset has been adopted by some Regulatory Commissions in the past to limit tariff impact in a particular year. This should be done only as exception, and subject to the following guidelines:

a. The circumstances should be clearly defined through regulations, and should only include natural causes or force majeure conditions. Under business as usual conditions, the opening balances of uncovered gap must be covered through transition financing arrangement or capital restructuring;

b. Carrying cost of Regulatory Asset should be allowed to the utilities;

c. Recovery of Regulatory Asset should be time-bound and within a period not exceeding three years at the most and preferably within control period;

d. The use of the facility of Regulatory Asset should not be repetitive.

e. In cases where regulatory asset is proposed to be adopted, it should be ensured that the return on equity should not become unreasonably low in any year so that the capability of the licensee to borrow is not adversely affected.

8.3 Tariff design : Linkage of tariffs to cost of service

It has been widely recognised that rational and economic pricing of electricity can be one of the major tools for energy conservation and sustainable use of ground water resources.

In terms of the Section 61 (g) of the Act, the Appropriate Commission shall be guided by the objective that the tariff progressively reflects the efficient and prudent cost of supply of electricity.

The State Governments can give subsidy to the extent they consider appropriate as per the provisions of section 65 of the Act. Direct subsidy is a better way to support the poorer categories of consumers than the mechanism of cross-subsidizing the tariff across the board. Subsidies should be targeted effectively and in transparent manner. As a substitute of cross-subsidies, the State Government has the option of raising resources through mechanism of electricity duty and giving direct subsidies to only needy consumers. This is a better way of targetting subsidies effectively.

Accordingly, the following principles would be adopted:

1. In accordance with the National Electricity Policy, consumers below poverty line who consume below a specified level, say 30 units per month, may receive a special support through cross subsidy. Tariffs for such designated group of consumers will be at least 50% of the average cost of supply. This provision will be re-examined after five years.

2. For achieving the objective that the tariff progressively reflects the cost of supply of electricity, the SERC would notify roadmap within six months with a target that latest by the end of year 2010-2011 tariffs are within ± 20 % of the average cost of supply. The road map would also have intermediate milestones, based on the approach of a gradual reduction in cross subsidy.

For example if the average cost of service is Rs 3 per unit, at the end of year 2010-2011 the tariff for the cross subsidised categories excluding those referred to in para 1 above should not be lower than Rs 2.40 per unit and that for any of the cross-subsidising categories should not go beyond Rs 3.60 per unit.

3. While fixing tariff for agricultural use, the imperatives of the need of using ground water resources in a sustainable manner would also need to be kept in mind in addition to the average cost of supply. Tariff for agricultural use may be set at different levels for different parts of a state depending of the condition of the ground water table to prevent excessive depletion of ground water. Section 62 (3) of the Act provides that geographical position of any area could be one of the criteria for tariff differentiation. A higher level of subsidy could be considered to support poorer farmers of the region where adverse ground water table condition requires larger quantity of electricity for irrigation purposes subject to suitable restrictions to ensure maintenance of ground water levels and sustainable ground water usage.

4. Extent of subsidy for different categories of consumers can be decided by the State Government keeping in view various relevant aspects. But provision of free electricity is not desirable as it encourages wasteful consumption of electricity besides, in most cases, lowering of water table in turn creating avoidable problem of water shortage for irrigation and drinking water for later generations. It is also likely to lead to rapid rise in demand of electricity putting severe strain on the distribution network thus adversely affecting the quality of supply of power. Therefore, it is necessary that reasonable level of user charges are levied. The subsidized rates of electricity should be permitted only up to a pre-identified level of consumption beyond which tariffs reflecting efficient cost of service should be charged from consumers. If the State Government wants to reimburse even part of this cost of

electricity to poor category of consumers the amount can be paid in cash or any other suitable way. Use of prepaid meters can also facilitate this transfer of subsidy to such consumers.

5. Metering of supply to agricultural / rural consumers can be achieved in a consumer friendly way and in effective manner by management of local distribution in rural areas through commercial arrangement with franchisees with involvement of panchayat institutions, user associations, cooperative societies etc. Use of self closing load limitors may be encouraged as a cost effective option for metering in cases of "limited use consumers" who are eligible for subsidized electricity.

8.4 Definition of tariff components and their applicability

1. Two-part tariffs featuring separate fixed and variable charges and Time differentiated tariff shall be introduced on priority for large consumers (say, consumers with demand exceeding 1 MW) within one year. This would also help in flattening the peak and implementing various energy conservation measures.
2. The National Electricity Policy states that existing PPAs with the generating companies would need to be suitably assigned to the successor distribution companies. The State Governments may make such assignments taking care of different load profiles of the distribution companies so that retail tariffs are uniform in the State for different categories of consumers. Thereafter the retail tariffs would reflect the relative efficiency of distribution companies in procuring power at competitive costs, controlling theft and reducing other distribution losses.
3. The State Commission may provide incentives to encourage metering and billing based on metered tariffs, particularly for consumer categories that are presently unmetered to a large extent. The metered tariffs and the incentives should be given wide publicity.
4. The SERCs may also suitably regulate connection charges to be recovered by the distribution licensee to ensure that second distribution licensee does not resort to cherry picking by demanding unreasonable connection charges. The connection charges of the second licensee should not be more than those payable to the incumbent licensee.

8.5 Cross-subsidy surcharge and additional surcharge for open access

8.5.1 National Electricity Policy lays down that the amount of cross-subsidy surcharge and the additional surcharge to be levied from consumers who are permitted open access should not be so onerous that it eliminates competition which is intended to be fostered in generation and supply of power directly to the consumers through open access.

A consumer who is permitted open access will have to make payment to the generator, the transmission licensee whose transmission systems are used, distribution utility for the wheeling charges and, in addition, the cross subsidy surcharge. The computation of cross subsidy surcharge, therefore, needs to be done in a manner that while it compensates the distribution licensee, it does not constrain introduction of competition through open access. A consumer would avail of open access only if the payment of all the charges leads to a benefit to him. While the interest of distribution licensee needs to be protected it would be essential that this provision of the Act, which requires the open access to be introduced in a time-bound manner, is used to bring about competition in the larger interest of consumers.

Accordingly, when open access is allowed the surcharge for the purpose of sections 38,39,40 and sub-section 2 of section 42 would be computed as the difference between (i) the tariff applicable to the relevant category of consumers and (ii) the cost of the distribution licensee to supply electricity to the consumers of the applicable class. In case of a consumer opting for open access, the distribution licensee could be in a position to discontinue purchase of power at the margin in the merit order. Accordingly, the cost of supply to the consumer for this purpose may be computed as the aggregate of (a) the weighted average of power purchase costs (inclusive of fixed and variable charges) of top 5% power at the margin, excluding liquid fuel based generation, in the merit order approved by the SERC adjusted for average loss compensation of the relevant voltage level and (b) the distribution charges determined on the principles as laid down for intra-state transmission charges.

Surcharge formula:

$$S = T - [C (1 + L / 100) + D]$$

Where

S is the surcharge

T is the Tariff payable by the relevant category of consumers;

C is the Weighted average cost of power purchase of top 5% at the margin excluding liquid fuel based generation and renewable power

D is the Wheeling charge

L is the system Losses for the applicable voltage level, expressed as a percentage

The cross-subsidy surcharge should be brought down progressively and, as far as possible, at a linear rate to a maximum of 20% of its opening level by the year 2010-11.

8.5.2 No surcharge would be required to be paid in terms of sub-section (2) of Section 42 of the Act on the electricity being sold by the generating companies with consent of the competent government under Section 43(A)(1)(c) of the Electricity Act, 1948 (now repealed) and on the electricity being supplied by the distribution licensee on the authorisation by the State Government under Section 27 of the Indian Electricity Act, 1910 (now repealed), till the current validity of such consent or authorisations.

8.5.3 The surcharge may be collected either by the distribution licensee, the transmission licensee, the STU or the CTU, depending on whose facilities are used by the consumer for availing electricity supplies. In all cases the amounts collected from a particular consumer should be given to the distribution licensee in whose area the consumer is located. In case of two licensees supplying in the same area the licensee from whom the consumer was availing supply shall be paid the amounts collected.

8.5.4 The additional surcharge for obligation to supply as per section 42(4) of the Act should become applicable only if it is conclusively demonstrated that the obligation of a licensee, in terms of existing power purchase commitments, has been and continues to be stranded, or there is an unavoidable obligation and incidence to bear fixed costs consequent to such a contract. The fixed costs related to network assets would be recovered through wheeling charges.

8.5.5 Wheeling charges should be determined on the basis of same principles as laid down for intra-state transmission charges and in addition would include average loss compensation of the relevant voltage level.

8.5.6 In case of outages of generator supplying to a consumer on open access, standby arrangements should be provided by the licensee on the payment of tariff for temporary connection to that consumer category as specified by the Appropriate Commission.

9.0 Trading Margin

The Act provides that the Appropriate Commission may fix the trading margin, if considered necessary. Though there is a need to promote trading in electricity for making the markets competitive, the Appropriate Commission should monitor the trading transactions continuously and ensure that the electricity traders do not indulge in profiteering in situation of power shortages. Fixing of trading margin should be resorted to for achieving this objective.

Sd/-

(U.N. PANJIAR)
Additional Secretary to the Government of India

To

The Manager,
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NATIONAL ACTION PLAN ON CLIMATE CHANGE

GOVERNMENT OF INDIA

PRIME MINISTER'S COUNCIL ON CLIMATE CHANGE

CONTENTS

National Action Plan on Climate Change

1. Overview

India is faced with the challenge of sustaining its rapid economic growth while dealing with the global threat of climate change. This threat emanates from accumulated greenhouse gas emissions in the atmosphere, anthropogenically generated through long-term and intensive industrial growth and high consumption lifestyles in developed countries. While engaged with the international community to collectively and cooperatively deal with this threat, India needs a national strategy to firstly, adapt to climate change and secondly, to further enhance the ecological sustainability of India's development path.

Climate change may alter the distribution and quality of India's natural resources and adversely affect the livelihood of its people. With an economy closely tied to its natural resource base and climate-sensitive sectors such as agriculture, water and forestry, India may face a major threat because of the projected changes in climate.

India's development path is based on its unique resource endowments, the overriding priority of economic and social development and poverty eradication, and its adherence to its civilizational legacy that places a high value on the environment and the maintenance of ecological balance.

In charting out a developmental pathway which is ecologically sustainable, India has a wider spectrum of choices precisely because it is at an earlystage of development. Our vision is to create a prosperous, but not wasteful society, an economy that is self-sustaining in terms of its ability to unleash the creative energies of our people and is mindful of our responsibilities to both present and future generations.

Recognizing that climate change is a global challenge, India will engage actively in multilateral negotiations in the UN Framework Convention on Climate Change, in a positive, constructive and forward-looking manner. Our objective will be to establish an effective, cooperative and equitable global approach based on the principle of common but differentiated responsibilites and respective capabilities, enshrined in the United Nations Framework Convention on Climate Change (UNFCCC). Such an approach must be based on a global vision inspired by Mahatma Gandhi's wise dictum —The earth has enough resources to meet people's needs, but will never have enough to satisfy people's greed. Thus we must not only promote sustainable production processes, but equally, sustainable lifestyles across the globe.

Finally, our approach must also be compatible with our role as a responsible and enlightened member of the international community, ready to make our contribution to the solution of a global challenge, which impacts on humanity as a whole. The success of our national efforts would be significantly enhanced provided the developed countries affirm their responsibility for accumulated greenhouse gas emissions and fulfill their commitments under the UNFCCC, to transfer new and additional financial resources and climate friendly technologies to support both adaptation and mitigation in developing countries.

We are convinced that the principle of equity that must underlie the global approach must allow each inhabitant of the earth an equal entitlement to the global atmospheric resource.

In this connection, India is determined that its per capita greenhouse gas emissions will at no point exceed that of developed countries even as we pursue our development objectives.

2. Principles

Maintaining a high growth rate is essential for increasing living standards of the vast majority of our people and reducing their vulnerability to the impacts of climate change. In order to achieve a sustainable development path that simultaneously advances economic and environmental objectives, the National Action Plan for Climate Change (NAPCC) will be guided by the following principles:

- Protecting the poor and vulnerable sections of society through an inclusive and sustainable development strategy, sensitive to climate change.
- Achieving national growth objectives through a qualitative change in direction that enhances ecological sustainability, leading to further mitigation of greenhouse gas emissions.
- Devising efficient and cost-effective strategies for end use Demand Side Management.
- Deploying appropriate technologies for both adaptation and mitigation of greenhouse gases emissions extensively as well as at an accelerated pace.
- Engineering new and innovative forms of market, regulatory and voluntary mechanisms to promote sustainable development.
- Effecting implementation of programmes through unique linkages, including with civil society and local government institutions and through public-private-pa rtnersh i p.
- Welcoming international cooperation for research, development, sharing and transfer of technologies enabled by additional funding and a global IPR regime that facilitates technology transfer to developing countries under the UNFCCC.

3. Approach

The NAPCC addresses the urgent and critical concerns of the country through a directional shift in the development pathway, including through the enhancement of the current and planned programmes presented in the Technical Document.

The National Action Plan on Climate Change identifies measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively. It outlines a number of steps to simultaneously advance India's development and climate change-related objectives of adaptation and mitigation.

4. The Way Forward: Eight National Missions

In dealing with the challenge of climate change we must act on several fronts in a focused manner simultaneously. The National Action Plan hinges on the development and use of new technologies. The implementation of the Plan would be through appropriate institutional mechanisms suited for effective delivery of each individual Mission's objectives and include public private partnerships and civil society action. The focus will be on promoting understanding of climate change, adaptation and mitigation, energy efficiency and natural resource conservation.

There are Eight National Missions which form the core of the National Action Plan, representing multi-pronged, long-term and integrated strategies for achieving key goals in the context of climate change. While several of these programmes are already part of our current actions, they may need a change in direction, enhancement of scope and effectiveness and accelerated implementation of time-bound plans.

4.1. National Solar Mission

A National Solar Mission will be launched to significantly increase the share of solar energy in the total energy mix while recognizing the need to expand the scope of other renewable and non-fossil options such as nuclear energy, wind energy and biomass.

India is a tropical country, where sunshine is available for longer hours per day and in great intensity. Solar energy, therefore, has great potential as future energy source. It also has the advantage of permitting a decentralized distribution of energy, thereby empowering people at the grassroots level. Photovoltaic cells are becoming cheaper with new technology. There are newer, reflector-based technologies that could enable setting up megawatt scale solar power plants across the country. Another aspect of the Solar Mission would be to launch a major R&D programme, which could draw upon international cooperation as well, to enable the creation of more affordable, more convenient solar power systems, and to promote innovations that enable the storage of solar power for sustained, long-term use.

4.2. National Mission for Enhanced Energy Efficiency

The Energy Conservation Act of 2001 provides a legal mandate for the implementation of the energy efficiency measures through the institutional mechanism of the Bureau of Energy Efficiency (BEE) in the Central Government and designated agencies in each state. A number of schemes and programmes have been initiated and it is anticipated that these would result in a saving of 10,000 MW by the end of 11th Five Year Plan in 2012.

To enhance energy efficiency, four new initiatives will be put in place. These are:

- A market based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy-intensive large industries and facilities, through certification of energy savings that could be traded.
- Accelerating the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable.
- Creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings.
- Developing fiscal instruments to promote energy efficiency

4.3. National Mission on Sustainable Habitat

A National Mission on Sustainable Habitat will be launched to make habitat sustainable through improvements in energy efficiency in buildings, management of solid waste and modal shift to public transport. The Mission will promote energy efficiency as an integral component of urban planning and urban renewal through three initiatives.

i.The Energy Conservation Building Code, which addresses the design of new and large commercial buildings to optimize their energy demand, will be extended in its application and incentives provided for retooling existing building stock.

ii.Recycling of material and Urban Waste Management will be a major component of ecologically sustainable economic development. India already has a significantly higher rate of recycling of waste compared to developed countries. A special area of focus will be the development of technology for producing power from waste. The National Mission will include a major R&D programme, focusing on bio chemical conversion, waste water use, sewage utilization and recycling options wherever possible.

iii. Better urban planning and modal shift to public transport. Making long term transport plans will facilitate the growth of medium and small cities in ways that ensure efficient and convenient public transport.

In addition, the Mission will address the need to adapt to future climate change by improving the resilience of infrastructure, community based disaster management, and measures for improving the warning system for extreme weather events. Capacity building would be an important component of this Mission.

4.4. National Water Mission

A National Water Mission will be mounted to ensure integrated water resource management helping to conserve water, minimize wastage and ensure more equitable distribution both across and within states. The Mission will take into account the provisions of the National Water Policy and develop a framework to optimize water use by increasing water use efficiency by 20% through regulatory mechanisms with differential entitlements and pricing. It will seek to ensure that a considerable share of the water needs of urban areas are met through recycling of waste water, and ensuring that the water requirements of coastal cities with inadequate alternative sources of water are met through adoption of new and appropriate technologies such as low temperature desalination technologies that allow for the use of ocean water.

The National Water Policy would be revisited in consultation with states to ensure basin level management strategies to deal with variability in rainfall and river flows due to climate change. This will include enhanced storage both above and below ground, rainwater harvesting, coupled with equitable and efficient management structures.

The Mission will seek to develop new regulatory structures, combined with appropriate entitlements and pricing. It will seek to optimize the efficiency of existing irrigation systems, including rehabilitation of systems that have been run down andalso expand irrigation, where feasible, with a special effort to increase storage capacity. Incentive structures will be designed to promote water-neutral or water-positive technologies, recharging of underground water sources and adoption of large scale irrigation programmes which rely on sprinklers, drip irrigation and ridge and furrow irrigation.

4.5. National Mission for Sustaining the Himalayan Ecosystem

A Mission for sustaining the Himalayan Ecosystem will be launched to evolve management measures for sustaining and safeguarding the Himalayan glacier and mountain eco-system. Himalayas, being the source of key perennial rivers, the Mission would, *inter-alia,* seek to understand, whether and the extent to which, the Himalayan glaciers are in recession and how the problem could be addressed. This will require the joint effort of climatologists, glaciologists and other experts. We will need to exchange information with the South Asian countries and countries sharing the Himalayan ecology.

An observational and monitoring network for the Himalayan environment will also be established to assess freshwater resources and health of the ecosystem. Cooperation with neighbouring countries will be sought to make the network comprehensive in its coverage.

The Himalayan ecosystem has 51 million people who practice hill agriculture and whose vulnerability is expected to increase on account of climate change. Community-based management of these ecosystems will be promoted with incentives to community organizations and panchayats for protection and enhancement of forested lands. In mountainous regions, the aim will be to maintain two-thirds of the area under forest cover in order to prevent erosion and land degradation and ensure the stability of the fragile eco-system.

4.6. National Mission for a Green India

A National Mission will be launched to enhance eco-system services including carbon sinks to be called Green India. Forests play an indispensable role in the preservation of ecological balance and maintenance of bio-diversity. Forests also constitute one of the most effective carbon-sinks.

The Prime Minister has already announced a Green India campaign for the afforestation of 6 million hectares. The national target of area under forest and tree cover is 33% while the current area under forests is 23%.

The Mission on Green India will be taken up on degraded forest land through direct action by communities, organized through Joint Forest Management Committees and guided by the Departments of Forest in state governments. An initial corpus of over Rs 6000 crore has been earmarked for the programme through the Compensatory Afforestaion Management and Planning Authority (CAMPA) to commence work. The programme will be scaled up to cover all remaining degraded forest land. The institutional arrangement provides for using the corpus to leverage more funds to scale up activity.

4.7. National Mission for Sustainable Agriculture

The Mission would devise strategies to make Indian agriculture more resilient to climate change. It would identify and develop new varieties of crops and especially thermal resistant crops and alternative cropping patterns, capable of withstanding extremes of weather, long dry spells, flooding, and variable moisture availability.

Agriculture will need to be progressively adapted to projected climate change and our agricultural research systems must be oriented to monitor and evaluate climate change and recommend changes in agricultural practices accordingly.

This will be supported by the convergence and integration of traditional knowledge and practice systems, information technology, geospatial technologies and biotechnology. New credit and insurance mechanisms will be devised to facilitate adoption of desired practices.

Focus would be on improving productivity of rainfed agriculture. India will spearhead efforts at the international level to work towards an ecologically sustainable green revolution.

4.8. Natinal Mission on *Strategic Knowledge for Climate Change*

To enlist the global community in research and technology development and collaboration through mechanisms including open source platforms, a Strategic Knowledge Mission will be set up to identify the challenges of, and the responses to, climate change. It would ensure funding of high quality and focused research into various aspects of climate change.

The Mission will also have, on its research agenda, socio-economic impacts of climate change including impact on health, demography, migration patterns and livelihoods of coastal communities. It would also support the establishment of dedicated climate change related academic units in Universities and other academic and scientific research institutions in the country which would be networked. A Climate Science Research Fund would be created under the Mission to support research. Private sector initiatives for development of innovative technologies for adaptation and mitigation would be encouraged through venture capital funds. Research to support policy and implementation would be undertaken through identified centres. The Mission will also focus on dissemination of new knowledge based on research findings.

5. Implementation of Missions

These National Missions will be institutionalized by respective ministries and will be organized through inter-sectoral groups which include in addition to related Ministries, Ministry of Finance and the Planning Commission, experts from industry, academia and civil society. The institutional structure would vary depending on the task to be addressed by the Mission and will include providing the opportunity to compete on the best management model.

Each Mission will be tasked to evolve specific objectives spanning the remaining years of the

11th Plan and the 12th Plan period 2012-13 to 2016-17. Where the resource requirements of the Mission call for an enhancement of the allocation in the 11th Plan, this will be suitably considered, keeping in mind the overall resources position and the scope for re-prioritisation.

Comprehensive Mission documents detailing objectives, strategies, plan of action, timelines and monitoring and evaluation criteria would be developed and submitted to the Prime Minister's Council on Climate Change by December 2008. The Council will also periodically review the progress of these Missions. Each Mission will report publicly on its annual performance.

Building public awareness will be vital in supporting implementation of the NAPCC. This will be achieved through national portals, media engagement, civil society involvement, curricula reform and recognition/ awards, details of which will be worked out by an empowered group. The Group will also consider methods of capacity building to support the goals of the National Missions.

We will develop appropriate technologies to measure progress in actions being taken in terms of avoided emissions, wherever applicable, with reference to business as usual scenarios. Appropriate indicators will be evolved for assessing adaptation benefits of the actions.

These Eight National Missions, taken together, with enhancements in current and ongoing programmes included in the Technical Document, would not only assist the country to adapt to climate change, but also, importantly, launch the economy on a path that would progressively and substantially result in mitigation through avoided emissions.

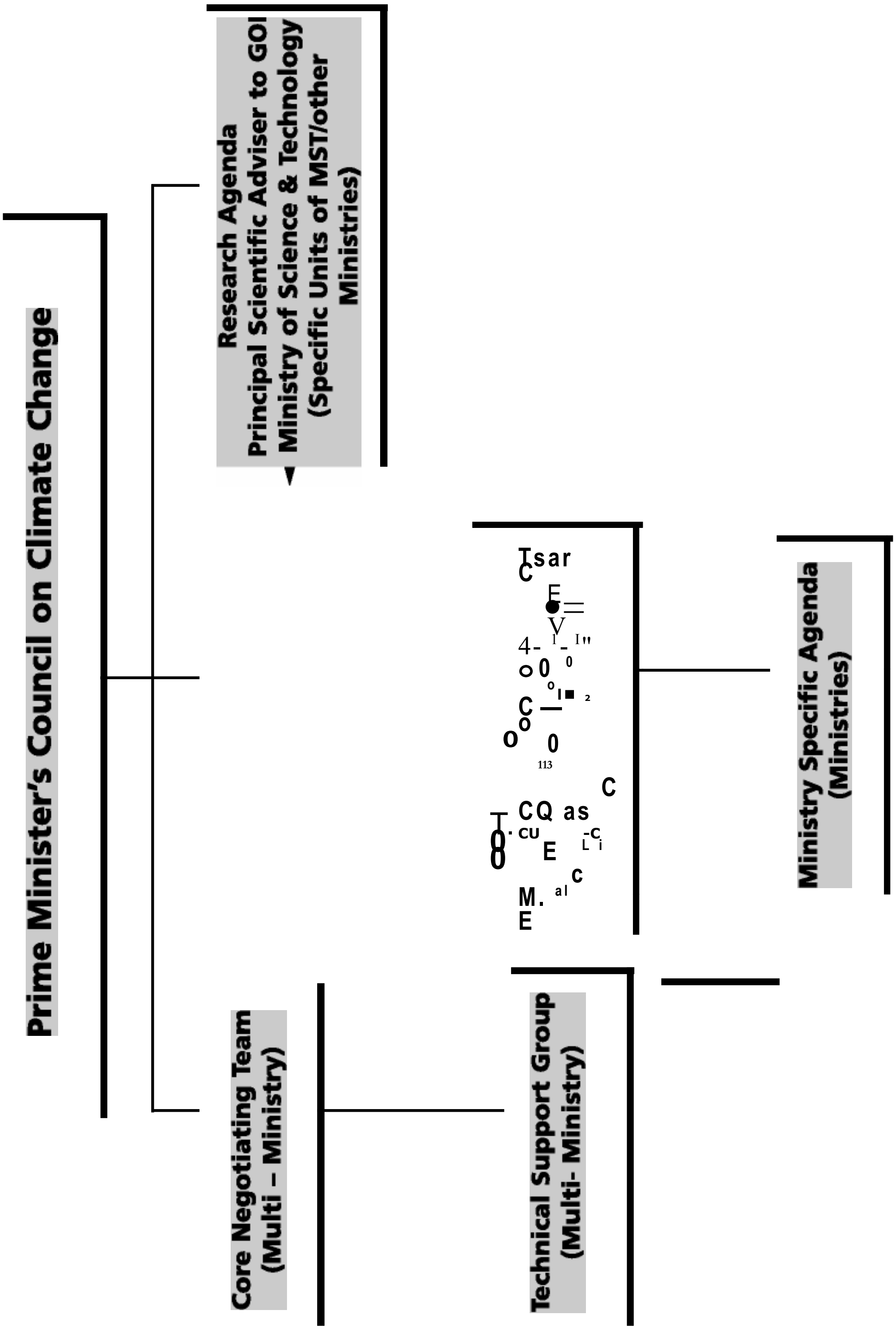
5.1. Institutional Arrangements for Managing Climate Change Agenda

In order to respond effectively to the challenge of climate change, the Government has created an Advisory Council on Climate Change, chaired by the Prime Minister. The Council has broad based representation from key stake-holders, including Government, Industry and Civil Society and sets out broad directions for National Actions in respect of Climate Change. The Council will also provide guidance on matters relating to coordinated national action on the domestic agenda and review of the implementation of the National Action Plan on Climate Change including its R&D agenda.

The Council chaired by the Prime Minister would also provide guidance on matters relating to international negotiations including bilateral, multilateral programmes for collaboration, research and development. Details of the institutional arrangement are at Annexure 1.

The NAPCC will continue to evolve, based on new scientific and technical knowledge as they emerge and in response to the evolution of the multilateral climate change regime including arrangements for international cooperation.

Annexure - I


Prime Minister's Council on Climate Change
Research Agenda
Principal Scientific Adviser to GOI
Ministry of Science & Technology
(Specific Units of MST/other Ministries)
Core Negotiating Team
(Multi – Ministry)
Technical Support Group
(Multi- Ministry)
Ministry Specific Agenda
(Ministries)

TECHNICAL DOCUMENT

CONTENTS

1. Background to India's National Action Plan on Climate Change

The Fourth Assessment report of the Intergovernmental Panel on Climate Change (IPCC-AR4)[1] concluded from direct observations of changes in temperature, sea level, and snow cover in the northern hemisphere during 1850 to the present, that the warming of the earth's climate system is unequivocal. The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm in 2005. Multi-model averages show that the temperature increases during 2090-2099 relative to 1980-1999 may range from 1.1 to 6.4°C and sea level rise from 0.18 to 0.59 meters. These could lead to impacts on freshwater availability, oceanic acidification, food production, flooding of coastal areas and increased burden of vector borne and water borne diseases associated with extreme weather events..

The Prime Minister's Council on Climate Change, in its first meeting on 13th July, 2007, had decided that *"A National Document compiling action taken by India for addressing the challenge of Climate Change, and the action it proposes to take"* be prepared.

The National Action Plan for Climate Change responds to the decision of the PM's Council, as well as updates India's national programmes relevant to addressing climate change. It identifies measures that promote our development objectives, while also yielding co-benefits for addressing climate change effectively. It lists specific opportunities to simultaneously advance India's development and climate related objectives of both adaptation as well as greenhouse gas (GHG) mitigation.

India's development agenda focuses on the need for rapid economic growth as an essential pre-condition to poverty eradication and improved standards of living. Meeting this agenda, which will also reduce climate —related vulnerability, requires large-scale investment of resources in infrastructure, technology and access to energy. Developing countries may lack the necessary financial and technological resources needed for this and thus have very low coping capacity to meet threats from climate changes. Only rapid and sustained development cangenerate the required financial, technological and human resources. In view of the large uncertainties concerning the spatial and temporal magnitude of climate change impacts, it is not desirable to design strategies exclusively for responding to climate change. Rather, the need is to identify and prioritize strategies that promote development goals while also serving specific climate change objectives.

It is imperative to identify measures that promote our development objectives, while also yielding co-benefits for addressing climate change effects. Cost- effective energy efficiency and energy conservation measures are of particular importance in this connection. Similarly, development of clean energy technologies, though primarily designed to promote energy security, can also generate large benefits in terms of reducing carbon emissions. Many health — related local pollution controls can also generate significant co-benefits in terms of reduced greenhouse gas emissions. This document identifies specific opportunities to simultaneously advance India's development and climate related objectives of adaptation and GHG mitigation.

It also describes India's willingness and desire, as a responsible member of the global community, to do all that is possible for pragmatic and practical solutions for all, in accordance with the principle of common but differentiated responsibilities and respective capabilities. The purpose of this document is also to create awareness among representatives of the public at large, different agencies of the government, scientists, industry — in short, the community as a whole — on the threat posed by climate change and the proposed steps to counter it.

1.1. The Imperative of Poverty Alleviation

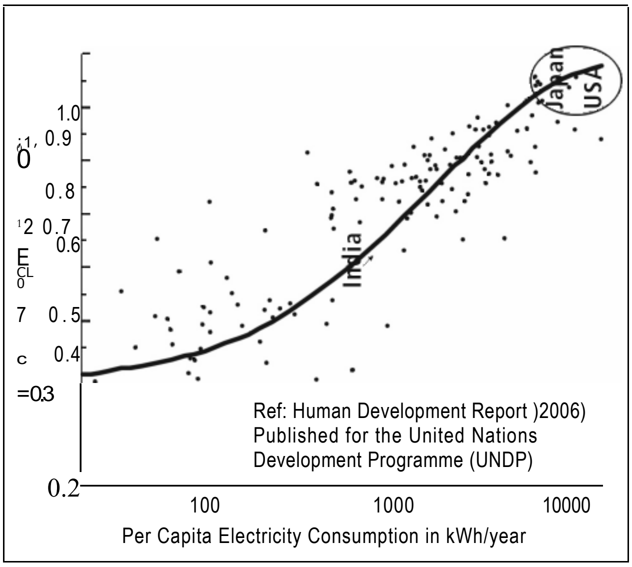
Economic reforms, implemented since 1991, have resulted in faster growth of the Indian economy. GDP growth rates have averaged roughly 8% during 2004-2008. However, 27.5% of the population still lived below the poverty line in 2004-05 and 44% are still without access to electricity. The Approach Paper to the Eleventh Plan emphasizes that rapid economic growth is an essential prerequisite to reduce poverty. The poor are the most vulnerable to climate change. The former Prime Minister, late Smt. Indira Gandhi, had stated: *'poverty is the worst polluter'*. Therefore, development and poverty eradication will be the best form of adaptation to climate change.

The impacts of climate change could prove particularly severe for women. With climate change, there would be increasing scarcity of water, reduction in yields of forest biomass, and increased risks to human health with children, women and the elderly in a household becoming the most vulnerable. With the possibility of decline in availability of foodgrains, the threat of malnutrition may also increase. All these would add to deprivations that women already encounter and so in each of the Adaptation programmes, special attention should be paid to the aspects of gender.

1.2 Relationship between Human Development Index and Energy Consumption

The strong positive correlation between energy use and human development is well recognized (Figure 1.2.1). It is obvious that India needs to substantially increase its per capita energy consumption to provide a minimally acceptable level of well being to its people.

Figure 1.2.1: Human Development Index versus per capita electricity consumption



1.3 Current Carbon Dioxide Emissions in India

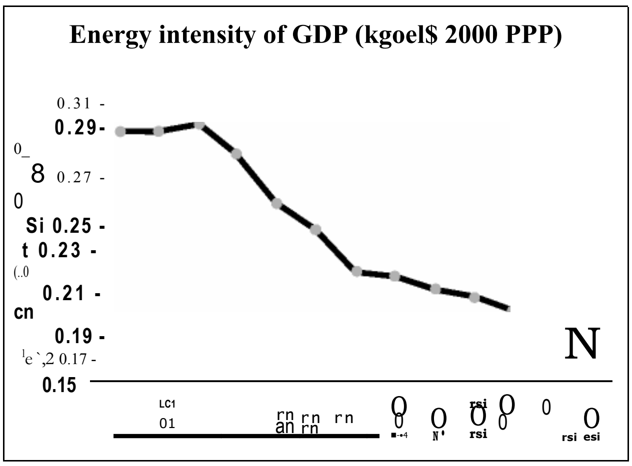
India's CO_2 emissions per capita are well below the world's average[2]. Per capita carbon dioxide emissions of some regions in the world in 2004 are as follows:

Table 1.3.1: A comparison of India's per capita GHG emissions with some other countries

Country	**Per-Capita Carbon-dioxide emissions (metric tons)**
USA	20.01
EU	9.40
Japan	9.87
China	3.60
Russia	11.71
India	*1.02*
World Average	**4.25**

India has a well-developed policy, legislative, regulatory, and programmatic regime for promotion of energy efficiency, renewable energy, nuclear power, fuel switching, energy pricing reform, and addressing GHG emissions in the energy sector. As a consequence of these measures, India's energy intensity of the economy has come down sharply since the 1980s and compares favourably with the least energy intensive developed countries[3].

Figure 1.3.2: India's Energy intensity of GDP based on International Energy Agency data[4]



1.4. Observed Changes in Climate and Weather Events in India

There are some observed changes in climate parameters in India. India's Initial National Communication, 2004 (NATCOM 1)[5] to UNFCCC has consolidated some of these. Some highlights from NATCOM I and others are listed here. No firm link between the documented changes described below and warming due to anthropogenic climate change has yet been established.

•Surface Temperature

At the national level, increase of — 0.4° C has been observed in surface air temperatures over the past century. A warming trend has been observed along the west coast, in central India, the interior peninsula, and north-eastern India. However, cooling trends have been observed in north-west India and parts of south India.

•Rainfall

While the observed monsoon rainfall at the all-India level does not show any significant trend, regional monsoon variations have been recorded. A trend of increasing monsoon seasonal rainfall has been found along the west coast, northern Andhra Pradesh, and north-western India (+10% to +12% of the normal over the last 100 years) while a trend of decreasing monsoon seasonal rainfall has been observed over eastern Madhya Pradesh, north-eastern India, and some parts of Gujarat and Kerala (-6% to —8% of the normal over the last 100 years).

•Extreme Weather Events

Instrument records over the past 130 years do not indicate any marked long-term trend in the frequencies of large-scale droughts and floods. Trends are however observed in multi-decadal periods of more frequent droughts, followed by less severe droughts. There has been an overall increasing trend in severe storm incidence along the coast at the rate of 0.011 events per year. While the states of West Bengal and Gujarat have reported increasing trends, a decline has been observed in Orissa. Goswami[6] et al, by analysing a daily rainfall data set, have shown (i) a rising trend in the frequency of heavy rain events, and (ii) a significant decrease in the frequency of moderate events over central India from 1951 to 2000.

•Rise in Sea Level

Using the records of coastal tide gauges in the north Indian Ocean for more than 40 years, Unnikrishnan and Shankar[7] have estimated, that sea level rise was between 1.06-1.75 mm per year. These rates are consistent with 1-2 mm per year global sea level rise estimates of IPCC.

•Impacts on Himalayan Glaciers

The Himalayas possess one of the largest resources of snow and ice and its glaciers form a source of water for the perennial rivers such as the Indus, the Ganga, and the Brahmaputra. Glacial melt may impact their long-term lean-season flows, with adverse impacts on the economy in terms of water availability and hydropower generation.

The available monitoring data on Himalayan glaciers indicates that while recession of some glaciers has occurred in some Himalayan regions in recent years, the trend is not consistent across the entire mountain chain. It is accordingly, too early to establish long-term trends, or their causation, in respect of which there are several hypotheses.

Under the National Action Plan, these data will be updated and refined continuously and additional reliable data will be collected.

1.5. Some Projections of Climate Change over India for the 21st Century

Some modelling and other studies have projected the following changes due to increase in atmospheric GHG concentrations arising from increased global anthropogenic emissions:

- Annual mean surface temperature rise by the end of century, ranging from 3 to 5° C under A2 scenario and 2.5 to 4° C under B2 scenario of IPCC, with warming more pronounced in the northern parts of India, from simulations by Indian Institute of Tropical Meteorology (IITM), Pune.

• Indian summer monsoon (ISM) is a manifestation of complex interactions between land, ocean and atmosphere. The simulation of ISM's mean pattern as well as variability on interannual and intraseasonal scales has been a challenging ongoing problem. Some simulations by IITM, Pune, have indicated that summer monsoon intensity may increase beginning from 2040 and by 10% by 2100 under A2 scenario of IPCC.

• Changes in frequency and/ or magnitude of extreme temperature and precipitation events. Some results show that fine-scale snow albedo influence the response of both hot and cold events and that peak increase in extreme hot events are amplified by surface moisture feedbacks.

1.6. Possible Impacts of Projected Climate Change

1.6.1. IMPACTS ON WATER RESOURCES

Changes in key climate variables, namely temperature, precipitation, and humidity, may have significant long-term implications for the quality and quantity of water. River systems of the Brahmaputra, the Ganga, and the Indus, which benefit from melting snow in the lean season, are likely to be particularly affected by the decrease in snow cover. A decline in total run-off for all river basins, except Narmada and Tapti, is projected in India's NATCOM I. A decline in run-off by more than two-thirds is also anticipated for the Sabarmati and Luni basins. Due to sea level rise, the fresh water sources near the coastal regions will suffer salt intrusion.

1.6.2. IMPACTS ON AGRICULTURE AND FOOD PRODUCTION

Food production in India is sensitive to climate changes such as variability in monsoon rainfall and temperature changes within a season. Studies by Indian Agricultural Research Institute (IARI) and others indicate greater expected loss in the Rabi crop. Every 1 °C rise in temperature reduces wheat production by 4-5 Million Tonnes. Small changes in temperature and rainfall have significant effects on the quality of fruits, vegetables, tea, coffee, aromatic and medicinal plants, and basmati rice. Pathogens and insect populations are strongly dependent upon temperature and humidity, and changes in these parameters may change their population dynamics. Other impacts on agricultural and related sectors include lower yields from dairy cattle and decline in fish breeding, migration, and harvests. Global reports indicate a loss of 10-40% in crop production by 2100.

1.6.3. IMPACTS ON HEALTH

Changes in climate may alter the distribution of important vector species (for example, malarial mosquitoes) and may increase the spread of such diseases to new areas. If there is an increase of 3.8 °C in temperature and a 7% increase in relative humidity the transmission windows i.e., months during which mosquitoes are active, will be open for all 12 months in 9 states in India. The transmission windows in Jammu and Kashmir and in Rajasthan may increase by 3-5 months. However, in Orissa and some southern states, a further increase in temperature is likely to shorten the transmission window by 2-3 months.

1.6.4. IMPACTS ON FORESTS

Based on future climate projections of Regional Climate Model of the Hadley Centre (HadRM3) using A2 and B2 scenarios and the BIOME4 vegetation response model, Ravindranath et. al.[8] show that 77% and 68% of the forest areas in the country are likely to experience shift in forest types, respectively under the two scenarios, by the end of the century, with consequent changes in forests produce, and, in turn, livelihoods based on those products. Correspondingly, the associated biodiversity is likely to be adversely impacted. India's NATCOM I projects an increase in the area under xeric scrublands and xeric woodlands in central India at the cost of dry savannah in these regions.

1.6.5. VULNERABILITY TO EXTREME EVENTS

Heavily populated regions such as coastal areas are exposed to climatic events,such as cyclones, floods, and drought, and large declines in sown areas in arid and semi-arid zones occur during climate extremes. Large areas in Rajasthan, Andhra Pradesh, Gujarat, and Maharashtra and comparatively small areas in Karnataka, Orissa, Madhya Pradesh, Tamil Nadu, Bihar, West Bengal, and Uttar Pradesh are frequented by drought. About 40 million hectares of land is flood-prone, including most of the river basins in the north and the north-eastern belt, affecting about 30 million people on an average each year. Such vulnerable regions may be particularly impacted by climate change

1.6.6. IMPACTS ON COASTAL AREAS

A mean Sea Level Rise (SLR) of 15-38 cm is projected along India's coast by the mid 21st century and of 46-59 cm by 2100. India's NATCOM I assessed the vulnerability of coastal districts based on physical exposure to SLR, social exposure based on population affected, and economic impacts. In addition, a projected increase in the intensity of tropical cyclones poses a threat to the heavily populated coastal zones in the country (NATCOM, 2004).

2. Some Current Actions for Adaptation and Mitigation

Adaptation, in the context of climate change, comprises the measures taken to minimize the adverse impacts of climate change, e.g. relocating the communities living close to the sea shore, for instance, to cope with the rising sea level or switching to crops that can withstand higher temperatures. Mitigation comprises measures to reduce the emissions of greenhouse gases that cause climate change in the first place, e.g. by switching to renewable sources of energy such as solar energy or wind energy, or nuclear energy instead of burning fossil fuel in thermal power stations.

Current government expenditure in India on adaptation to climate variability, as shown in Figure 2.1, exceeds 2.6% of the GDP, with agriculture, water resources, health and sanitation, forests, coastal-zone infrastructure and extreme weather events, being specific areas of concern.

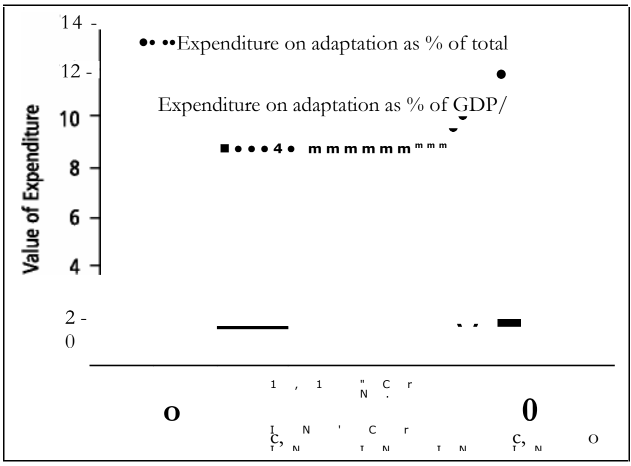


Figure 2.1: Expenditure on Adaptation Programmes in India

2.1 Some Existing Adaptation related Programmes

2.1.1. CROP IMPROVEMENT

The present programmes address measures such as development of arid-land crops and pest management, as well as capacity building of extension workers and NGOs to support better vulnerability reducing practices.

2.1.2. DROUGHT PROOFING

The current programmes seek to minimize the adverse effects of drought on production of crops and livestock, and on productivity of land, water and human resources, so as to ultimately lead to drought proofing of the affected areas. They also aim to promote overall economic development and improve the socio-economic conditions of the resource poor and disadvantaged sections inhabiting the programme areas.

2.1.3. FORESTRY

India has a strong and rapidly growing afforestation programme. The afforestation process was accelerated by the enactment of the Forest Conservation Act of 1980, which aimed at stopping the clearing and degradation of forests through a strict, centralized control of the rights to use forest land and mandatory requirements of compensatory afforestation in case of any diversion of forest land for any non-forestry purpose. In addition an aggressive afforestation and sustainable forest management programme resulted in annual reforestation of 1.78 mha during 1985-1997, and is currently 1.1 mha annually. Due to this, the carbon stocks in Indian forests have increased over the last 20 years to 9 -10 gigatons of carbon (GtC) during 1986 to 2005.

2.1.4. WATER

The National Water Policy (2002) stresses that non-conventional methods for utilization of water, including inter-basin transfers, artificial recharge of groundwater, and desalination of brackish or sea water, as well as traditional water conservation practices like rainwater harvesting, including roof-top rainwater harvesting, should be practised to increase the utilizable water resources. Many states now have mandatory water harvesting programmes in several cities.

2.1.5. COASTAL REGIONS

In coastal regions, restrictions have been imposed in the area between 200m and 500m of the HTL (high tide line) while special restrictions have been imposed in the area up to 200m to protect the sensitive coastal ecosystems and prevent their exploitation. This, simultaneously, addresses the concerns of the coastal population and their livelihood. Some specific measures taken in this regard include construction of coastal protection infrastructure and cyclone shelters, as well as plantation of coastal forests and mangroves.

2.1.6. HEALTH

The prime objective of these programmes is the surveillance and control of vector borne diseases such as Malaria, Kala-azar, Japanese Encephalitis, Filaria and Dengue. Programmes also provide for emergency medical relief in the case of natural calamities, and to train and develop human resources for these tasks.

2.1.7. RISK FINANCING

Two risk-financing programmes support adaptation to climate impacts. The Crop Insurance Scheme supports the insurance of farmers against climate risks, and the Credit Support Mechanism facilitates the extension of credit to farmers, especially for crop failure due to climate variability.

2.1.8. DISASTER MANAGEMENT

The National Disaster Management programme provides grants-in-aid to victims of weather related disasters, and manages disaster relief operations. It also supports proactive disaster prevention programmes, including dissemination of information and training of disaster-management staff.

2.2. Some of India's Actions Relating to GHG Mitigation

2.2.1. INDIA'S POLICY STRUCTURE RELEVANT TO GHG MITIGATION

India has in place a detailed policy, regulatory, and legislative structure that relates strongly to GHG mitigation: The Integrated Energy Policy was adopted in 2006. Some of its key provisions are:

- Promotion of energy efficiency in all sectors
- Emphasis on mass transport
- Emphasis on renewables including biofuels plantations
- Accelerated development of nuclear and hydropower for clean energy
- Focused R&D on several clean energy related technologies

Several other provisions relate to reforming energy markets to ensure that energy markets are competitive, and energy prices reflect true resource costs. These include: Electricity Act 2005, Tariff Policy 2003, Petroleum & Natural Gas Regulatory Board Act, 2006, etc. The provisions taken together are designed to:

- Remove entry barriers and raise competition in

exploration, extraction, conversion, transmission and distribution of primary and secondary energy
- Accomplish price reform, through full competition at point of sale
- Promote tax reform to promote optimal fuel choices
- Augment and diversify energy options, sources and energy infrastructure
- Provide feed-in tariffs for renewables (solar, wind, biomass cogeneration)
- Strengthen, and where applicable, introduce independent regulation

The Rural Electrification Policy, 2006, promotes renewable energy technologies where grid connectivity is not possible or cost-effective. The New and Renewable Energy Policy, 2005, promotes utilization of sustainable, renewable energy sources, and accelerated deployment of renewables through indigenous design, development and manufacture.

The National Environment Policy, 2006, and the Notification on Environment Impact Assessment (EIA), 2006, reform India's environmental assessment regime. A number of economic activities are required to prepare environment impact assessments, and environment management plans, which are appraised by regulatory authorities prior to start of construction. The EIA provisions strongly promote environmental sustainability.

2.2.2. INTRODUCTION OF LABELLING PROGRAMME FOR APPLIANCES

An energy labelling programme for appliances was launched in 2006, and comparative star-based labelling has been introduced for fluorescent tubelights, air conditioners, refrigerators, and distribution transformers. The labels provide information about the energy consumption of an appliance, and thus enable consumers to make informed decisions. The Bureau of Energy Efficiency has made it mandatory for refrigerators to display energy efficiency label and is expected to do so for air conditioners as well. The standards and labelling programme for manufacturers of electrical appliances is expected to lead to significant savings in electricity annually.

2.2.3. ENERGY CONSERVATION BUILDING CODE

An Energy Conservation Building Code (ECBC) was launched in May, 2007, which addresses the design of new, large commercial buildings to optimize the buildings' energy demand based on their location in different climatic zones. Commercial buildings are one of the fastest growing sectors of the Indian economy, reflecting the increasing share of the services sector in the economy. Nearly one hundred buildings are already following the Code, and compliance with the Code has been incorporated into the mandatory Environmental Impact Assessment requirements for large buildings. It has been estimated that if all the commercial space in India every year conform to ECBC norms, energy consumption in this sector can be reduced by 30-40%.Compliance with ECBC norms is voluntary at present but is expected to soon become mandatory.

2.2.4. ENERGY AUDITS OF LARGE INDUSTRIAL CONSUMERS

In March 2007 the conduct of energy audits was made mandatory in large energy-consuming units in nine industrial sectors. These units, notified as "designated consumers" are also required to employ "certified energy managers", and report energy consumption and energy conservation data annually.

2.2.5. Mass TRANSPORT

The National Urban Transport Policy emphasizes extensive public transport facilities and non-motorized modes over personal vehicles. The expansion of the Metro Rail Transportation System in Delhi and other cities and other mass transit systems, such as the Metro Bus project in Bangalore, are steps in its implementation. The state government of Maharashtra recently announced that it will impose a congestion tax to discourage the use of private cars in cities where it has created "sufficient public transport capacity".

2.2.6. CLEAN AIR INITIATIVES

In urban areas, one of the major sources of air pollution is emissions from transport vehicles. Steps taken to reduce such pollution include (i) introduction of compressed natural gas (CNG) in Delhi and other cities; (ii) retiring old, polluting vehicles; and (iii) strengthening of mass transportation as mentioned above. Some state governments provide subsidies for purchase and use of electric vehicles. For thermal power plants, the installation of electrostatic precipitators is mandatory. In many cities, polluting industrial units have either been closed or shifted from residential areas.

2.2.7 PROMOTION OF ENERGY SAVING DEVICES

The Bureau of Energy efficiency has introduced "The Bachat Lamp Yojana", a programme under which households may exchange incandescent lamps for CFLs (compact fluorescent lamps) using clean development mechanism (CDM) credits to equate purchase price. Some states have made mandatory the installation of solar water heaters in hospitals, hotels and large government and commercial buildings. Subsidy is provided for installation of solar water heaters in residential buildings.

2.2.8. PROMOTION OF BIOFUELS

The Biodiesel Purchase Policy mandates biodiesel procurement by the petroleum industry. A mandate on Ethanol Blending of Gasolene requires 5% blending of ethanol with gasolene from 1st January, 2003, in 9 States and 4 Union Territories.

3. The Way Forward: Eight National Missions

The experience gained so far enables India to embark on an even more proactive approach. The following subsections describe the various programmes that may be taken up under the National Action Plan.

3.1. National Solar Mission

The National Solar Mission would promote the use of solar energy for power generation and other applications. Where necessary for purposes of system balance or ensuring cost-effectiveness and reliability, it would also promote the integration of other renewable energy technologies, for example, biomass and wind, with solar energy options.

India is largely located in the equatorial sun belt of the earth, thereby receiving abundant radiant energy from the sun. The country receives about 5,000 trillion kWh/year equivalent energy through solar radiation. In most parts of India, clear sunny weather is experienced 250 to 300 days a year. The annual global radiation varies from 1600 to 2200 kWh/m^2, which is typical of the tropical and subtropical regions. The average solar insolation incident over India is about 5.5 kWh/m^2 per day. Just 1% of India's land area can meet India's entire electricity requirements till 2030.

Solar based power technologies are an extremely clean form of generation with practically no form of emissions at the point of generation. They would lead to energy security through displacement of coal and petroleum. T&D losses are very low in decentralized systems. Deployment can be done independently of the national grid and integrated with the national grid when needed.

3.1.1. SOLAR THERMAL POWER GENERATION

Solar Thermal Power Generating Systems (STPG) or Concentrating Solar Power (CSP) use concentrated solar radiation as high temperature energy source (> 500°C) to produce electricity.

The working mechanism for solar heat to electricity is fundamentally similar to that of traditional thermal power plants. STPG technologies are now on the verge of significant scale commercialization. Major technologies include parabolic trough or dish, dish-engine system, central tower receiver system, and solar chimney (which drives an air draft turbine, and does not raise steam).

Solar power is, obviously available only during sunlight hours. There are also significant seasonal variations. Moreover, the need to track the movement of the sun during the day, as also the seasonal variations in orientation, although fully predictable, may add significantly to cost in respect of dish collector systems. However, design variants are available that require movement of only the heat collector at the focus, or only of individual mirrors in an array, thus reducing costs.

The cyclical (diurnal, annual) and episodic (cloud cover) variations of solar insolation, and the impossibility of regulating the solar flux means that in order to ensure steady power supply, meet peaking requirements, as well as to ensure optimal utilization of steam turbines and generators, it is necessary to either hybridize solar thermal systems with alternative means of raising steam, or provide for high temperature thermal energy storage. The former may be accomplished by hybridization with conventional fuels, or by biomass combustion systems. The latter may be accomplished by insulated storage of molten salts; however, in their case the rate of heat loss may be significant, and storage for more than 10-12 hours is uneconomic.

The investment cost of stand-alone (i.e. without hybridization) solar thermal power plants are in the range of Rs 20-22 cr/MW. It usually includes the cost of the solar concentrators, balance of system (BOS), receiver (turbine) with generator and control equipments, etc. The estimated unit cost of generation is currently in the range of 20-25 Rs/KWh. (Source Scientific American, January 2008)

Proposed R&D activities in respect of Solar Thermal power generation would cover design and development of concentrating solar thermal power systems, including parabolic troughs, central receiver systems, and dish/engine systems. The R&D effort should be directed mainly at reducing costs of production and maintenance, and include both production design and fabrication/assembly techniques. In addition, R&D should cover balance of systems issues involved in hybridization with biomass combustion based systems and/or molten salts thermal storage.

3.1.2. SOLAR PHOTOVOLTAIC GENERATION

In photovoltaic generation, solar energy is directly converted to electricity using a semi-conductor, usually a silicon diode. However, while there are other semi-conductors (e.g. cadmium telluride) that may be used for power generation, most of them are at various stages of R&D.

The investment costs of solar PV based power systems are in the range of Rs. 30-35cr/MW.This includes the cost of the solar panels and balance of system (BOS). The unit cost of generation is still in the range of Rs. 15-20 KWh, but may fall significantly for thin-film based systems.

Proposed R&D activities in respect of Solar Photovoltaic generation, for the near and medium term would include improvement in solar cell efficiency to 15% at commercial level; improvements in PV module technology with higher packing density and suitability for solar roofs; and development of lightweight modules for use in solar lanterns and similar applications.

3.1.3. R&D COLLABORATION, TECHNOLOGY TRANSFER, AND CAPACITY BUILDING

In specific areas of both solar thermal and solar PV systems, it would be useful to enter into collaboration with institutions working elsewhere, with sharing of the resulting IPRs.

Technology transfer in both Solar Thermal technologies and the PV technologies will be required in respect of cost-effective and efficient technologies suitable for use in India. Support to commercial demonstration by entrepreneurs of Solar Thermal and Solar PV, both stand-alone and distributed generation systems, in particular in remote locations, and using these as training facilities for local entrepreneurs and O&M personnel would also help develop this sector.

The National Solar Mission would be responsible for: (a) the deployment of commercial and near commercial solar technologies in the country; (b) establishing a solar research facility at an existing establishment to coordinate the various research, development and demonstration activities being carried out in India, both in the public and private sector; (c) realizing integrated private sector manufacturing capacity for solar material, equipment, cells and modules (d) networking of Indian research efforts with international initiatives with a view to promoting collaborative research and acquiring technology where necessary, and adapting the technology acquired to Indian conditions; (e) providing funding support for the activities foreseen under (a) to (d) through government grants duly leveraged by funding available under global climate mechanisms, and earnings from deployment of research sponsored by the Mission. Policy and Regulatory measures for promotion of solar technologies would also be enhanced as common to all renewables based technologies.

Over the 11th and 12th Plan periods (till 2017) the Mission would aim to deliver at least 80% coverage for all low temperature (<150° C), and at least 60% coverage for medium temperature (150° to 250° C) applications of solar energy in all urban areas, industries, and commercial establishments. Rural solar thermal applications would also be pursued under public-private partnerships where feasible. Commensurate local manufacturing capacity to meet this level of deployment, with necessary technology tie-ups, where desirable, would be established. Further, the Mission would aim for local Photovoltaic (PV) production from integrated facilities at a level of 1000 MW/annum within this time frame. It would also aim to establish at least 1000 MW of Concentrating Solar Power (CSP) generation capacity, again, with such technical tie-ups as essential within the stated time frame.

The untapped energy potential of each of the three generic solar based energy approaches (i.e. solar PV, solar thermal, and biomass) is well beyond current usage levels. In the long term the Mission would aim to network Indian research efforts in solar technology with global initiatives in these three areas, so as to enable delivery of solar solutions to India's energy needs in tandem with developments worldwide.

In the long-term, the Mission would direct Indian solar research initiatives to deliver truly disruptive innovations that cut across more than one approach or technology. These include: (a) getting the same electrical, optical, chemical and physical performance from cheap materials as that delivered by expensive materials; (b) developing new paradigms for solar cell design that surpass current efficiency limits; (c) finding catalysts that enable inexpensive, efficient conversion of solar energy into chemical fuel; (d) identify novel methods of self-assembly of molecular components into functionally integrated systems; and (e) developing new materials for solar energy conversion infrastructure, such as robust, and inexpensive, thermal management materials.

The ultimate objective of the Mission would be to develop a solar industry in India that is capable of delivering solar energy competitively against fossil options from the Kilowatt range of distributed solar thermal and solar PV to the Gigawatt scale of base load priced and dispatchable CSP within the next 20-25 years.

3.2. National Mission for Enhanced Energy Efficiency in Industry

The industry sector is the largest user of commercial energy in India, accounting for 42% of the country's total commercial energy use during 2004-05. The Indian industry sector, comprising large, medium, and small enterprises registered a growth of 10.6% in April–December 2006 (MoF, 2007). Since the industry sector is viewed as central for economic growth, it would continue to play a major role in the overall development of India.

The industrialization policies of the country have helped in setting up of several energy–intensive primary manufacturing facilities such as iron and steel, cement, fertilizer, refineries, with investment targets fixed in successive Five-year Plans of the Government of India. The planners also encouraged various small scale industries, providing huge employment. The small scale sector produces close to 7500 items in which 326 items are reserved by the Government of India (MoSSI, 2007) to be exclusively produced by small units.

As per the national greenhouse inventory, the direct CO_2 emissions from industrial sources accounted for nearly 31 % of the total CO_2 emissions from the country (data for base year 1994) (NATCOM, I). The CO_2 emissions from the industrial sector can be broadly categorized into two heads, i.e. process related emissions, and emissions due to fuel combustion in industries. Of the total estimated 250 million tonnes of direct CO_2 emissions from the industry in 1994, nearly 60% were accounted for by energy use (NATCOM, I).

3.2.1. GHG MITIGATION OPTIONS IN THE INDUSTRY SECTOR

GHG Mitigation options in the industry sector can be broadly grouped under three heads as given below:

- Sector specific technological options
- Cross—cutting technologies options
- Fuel switch options

3.2.2. SECTOR SPECIFIC TECHNOLOGICAL OPTIONS

Various GHG mitigation technology options in respect of the Chlor-Alkali, Cement, Aluminum, Fertilizer, Iron and Steel, Pulp and Paper, and Textile sectors are currently being investigated.

3.2.3. CROSS-CUTTING TECHNOLOGICAL OPTIONS

Apart from sector—specific options, there are certain cross-cutting energy efficient technological options that could be adopted in a wide range of industries. In general, in the industries sector, approximately 50% of the industrial energy use is accounted for by cross-cutting technologies.

The estimated energy saving potential for a large number of plants is of the order of 5% to 15%.

3.2.4. FUEL SWITCH

With the increasing availability of natural gas in the country (both as imported LNG [liquefied natural gas] and likely increased domestic natural gas supply), industries may have the option to switch over from coal to the use of natural gas. Fuel—switch to natural gas generally leads to increase in energy use efficiency.

Another option is switching over from fossil fuels to producer gas from biomass fuels for various thermal applications. Industries with low temperature requirements (upto 100°C) (for example, textiles and pharmaceuticals) may also use solar thermal systems for water heating.

3.2.5 POTENTIAL FOR EMISSIONS REDUCTION

Although the efficiency of most large industrial sectors has been improving over time, and the specific energy consumption of many of the large plants compares well with the world's best, it is estimated that CO_2 emissions from fuel and electricity use in the industry sector could be further reduced by about 605 million tonnes (approximately 16% reduction from the BAU scenario) in the year 2031. However, this will involve major incremental investment costs, as well as, overall, large economic costs, besides technology transfer.

3.2.6. CO-BENEFITS

Energy-efficiency measures in the industrial sector also have some co-benefits due to reduction in fuel and material use leading to reduced emission of air-pollutants, solid waste, and waste water. In addition, some options also lead to improvement in the quality of product.

3.2.7 TECHNOLOGY TRANSFER

Relevant technologies under development that would reduce specific energy consumption need to be transferred to India when commercially viable.

3.2.8. FINANCING

The move to efficient technologies in the industry sector generally involves significant incremental investment, and in many cases, economic costs. These would have to be provided by multilateral funding arrangements. In particular, special financing mechanisms would need to be put in place for the SMEs. Bundling and/or programmatic CDM could be a possible financing route for these units.

3.2.9. CAPACITY-BUILDING NEEDS

Cooperative approaches by the government and industry are needed to enhance awareness of energy-efficient options, and upgrade relevant technical knowledge. The financial sector also needs capacity building in appraisal of specific energy efficiency improvement investments in existing industries.

3.2.10. POLICY AND REGULATORY OPTIONS

Under the Energy Conservation Act (2001), 9 energy intensive industrial sectors, i.e. thermal power stations, fertilizer, cement, iron and steel, chlor-alkali, aluminum, railways, textile and pulp and paper, are required to employ a certified energy manager, conduct energy audits periodically, and adhere to specific energy-consumption norms that may be prescribed.

Currently, almost every industrial sector is characterized by a wide band of energy efficiencies in different units. Several of them are at global frontier levels, but some others have relatively poor performance. As an approach to enhancement of overall energy efficiency in each sector, the efficiency band-width of the sector is divided into 4 bands. The energy efficiency improvement target, in percentage, from current levels for each unit varies with its band, being highest for the least energy efficient, and the least for the most efficient. These targets would have to be achieved within a period of 3 to 5 years within each group.

Given the fact of fertilizer subsidies, individual fertilizer units have little incentive to undertake energy-efficiency investments. It is, therefore, imperative that fertilizer subsidies be restructured to eliminate such absence of incentive.

To promote technology upgradation in the SME (small and medium enterprise) sector, it would be essential to evolve sector—specific integrated programmes for technology development. This would require external support for significantly longer durations to address various technological barriers and promote energy efficiencies at the unit level. The information or knowledge gap is more pronounced in case of small industries and "hand-holding" to help industries install energy efficient technologies as well as to ensure their optimum performance through best operating practices will be required.

Most of the energy-efficient equipment require higher upfront investment. An accelerated depreciation up to 80% in the first year on energy-efficient equipment would help their deployment. Further, reduced rate VAT (value added tax) on energy- efficient equipment would also help in reducingthe required upfront investment.

To further enhance energy efficiency, four new initiatives may be considered. These are:

- Mandated specific energy consumption decreases in large energy consuming industries and facilities that have been notified as Designated Consumers under the Energy Conservation Act, and provide a framework to certify energy savings in excess of the mandated savings. The certified excess savings may be traded amongst companies to meet their mandated compliance requirements, or banked for the next cycle of energy savings requirements.

- Tax incentives for promotion of energy efficiency, including differential taxation on appliances that have been certified as energy efficient through energy labeling programme.

- Creation of energy efficiency financing platforms for enabling public-private-partnerships to capture energy savings through demand side management programmes in the municipal, buildings, and agricultural sectors.

- Fiscal Incentives

3.2.11. DELIVERY OPTIONS

The key delivery options for energy efficiency in industry are:

- Projects, including retrofits, by the corporate sector, with institutional finance
- Activities related to cluster development, particularly in SMEs
- Promotion of ESCOs (Energy Service Companies) for providing energy efficiency solutions across industry sectors

The Energy Efficiency Financing Platform initiated by the Bureau of Energy Efficiency, in conjunction with a robust ESCO industry could provide the necessary impetus to energy efficiency. In respect of each delivery mode, carbon finance through the CDM would also be relevant.

3.3 National Mission on Sustainable Habitat

The Mission comprises three components, i.e. promoting energy efficiency in the residential and commercial sector, management of municipal solid waste, and promotion of urban public transport. These are presented below:

3.3.1. PROMOTING ENERGY EFFICIENCY IN THE RESIDENTIAL AND COMMERCIAL SECTOR

The residential sector accounts for around 13.3% of total commercial energy use in India. While several households, especially in the rural areas, continue to use biomass for cooking in traditional cookstoves, which leads to high levels of indoor air pollution and poses a major health risk especially to women and children, the use of modern fuels such as LPG (liquefied petroleum gas) and kerosene is increasing rapidly. During 1990-2003, consumption of LPG increased at an annual rate of 11.26%, while electricity use increased at 8.25% annually in the residential sector.

Electricity consumption in the residential sector is primarily for lighting, space conditioning, refrigeration, and other appliances. According to a study on energy consumption in the residential sector in the city of Delhi, while lighting accounted for around 8%-14% of total electricity consumption, space-conditioning accounted for nearly 52%, and refrigerators accounted for around 28% (in the summer months). Accordingly, energy saving measures related with space conditioning (heating and cooling), refrigeration, and lighting have great significance in moving towards sustainable residential energy use.

The commercial sector comprises various institutional establishments such as banks, hotels, restaurants, shopping complexes, offices, and public buildings. Electricity consumption has increased at the rate of 7.4% annually between 1990-2003 in the commercial sector. It is estimated that on average, in a typical commercial building in India around 60% of the total electricity is consumed for lighting, 32% for space conditioning, and 8% for refrigeration. However, the end-use consumption varies significantly with space conditioning needs. While a fully airconditioned office building could have about 60% of the total electricity consumption accounted for byair conditioning, followed by 20% for lighting, in a non-airconditioned building the consumption patterns would be significantly different.

Energy use in residential and commercial buildings also varies significantly across income groups, building construction typology, climate, and several other factors. There exists significant scope to reduce energy use, while also providing the requisite energy services in case of both existing as well as new constructions. Although the saving potential of each option may vary with typology, climate, space conditioning needs, and the initial base design proposed by the client/designer, on an average it is estimated that the implementation of energy efficient options would help in achieving around 30% electricity savings in new residential buildings and 40% electricity savings in new commercial buildings. In case of existing buildings, the energy saving potential for residential buildings is estimated to be around 20%, and that for commercial buildings around 30%.

Various studies have established that substantial energy savings can be achieved in the residential and commercial sectors. Implementing carbon mitigation options in buildings is associated with a wide range of co-benefits, including improved energy security and system reliability. Other co-benefits of energy efficiency investments include the creation of jobs and business opportunities, while the energy savings may lead to greater access to energy for the poor, leading to their improvement and well-being. Other co-benefits include improved indoor and outdoor air quality, and thereby improved health and quality of life.

3.3.1.1. COSTS AND FINANCING

The incremental cost of implementation of energy-efficient measures is estimated to vary between 3%5% for residential buildings and 10%-15% for commercial buildings on a case-to-case basis. Economic savings over the lifetime of the appliances would depend upon the specific- usage patterns. Also, it is expected that in general, private home-owners would seek shorter pay-back periods than owners of commercial property.

While the use of more efficient appliances can play a key role in reducing final energy demands, energy-efficient appliances typically have higher up-front costs than their non-labeled counterparts. Given that significant incremental investment costs are associated with the efficient technologies, appropriate financing mechanisms need to be adopted in order to promote these technologies.

Adoption of energy-efficient lighting and space-conditioning technologies should be integrated into housing finance schemes of financial institutions, appliance financing schemes need to incentivize purchase of energy-efficient equipment, and utility- based programmes should be put in place to pay for the higher upfront capital costs of lighting systems in the utility bills.

Carbon-market financing would enable access to these technologies where there are higher investment costs, or higher economic costs of the required energy service, or both. This may be especially useful in view of the "split incentive" problem in such cases, that is, the persons who incur the additional investment costs are different from those that might realize the energy savings.

3.3.1.2. RESEARCH & DEVELOPMENT

The R&D needs for the residential and commercial sectors is mainly related to energy efficient technologies. It needs to focus on the development of energy-efficient products for the following applications:

- Energy-efficient buildings and building components
- Development of energy efficient windows
- Development of low-cost insulation material
- Development of simulation software to predict the energy used in buildings
- Energy efficient appliances
- Development of energy-efficient ceiling fans
- Development of very-low-energy-consuming circuits for stand-by power
- Development of low-cost light-emitting diode (LED)-based lamps for space lighting

The SAC-C (Scientific Advisory Committee of the Cabinet) has recommended the launch of a National Networked Initiative for R&D on the development of the next generation of LEDs, particularly white LEDs.

3.3.1.3. *TECHNOLOGY TRANSFER AND CAPACITY BUILDING*

The energy efficient lighting and space conditioning technologies developed internationally are generally superior as compared to those available within the country. There is therefore a need for technology transfer from the developed countries. However adopting these internationally developed technologies is associated with payment of additional costs due to the IPR component associated with these technologies. Mechanisms need to be put in place so that these costs do not impose an additional burden on the consumers.

Solar evacuated tubular panel technology is available internationally for solar water heating systems, but needs to be transferred for diffusion in the Indian market.

Lack of awareness of energy-saving options and potential among architects, engineers, interior designers, and professionals in the building industry including plumbers and electricians is a major barrier to the construction of low-energy buildings. Realizing the potential of energy saving requires an integrated design process involving all the stakeholders, with full consideration of opportunities for passively reducing building energy demands.

Builders and developers need to be trained and made aware of the options to save energy in new constructions. There is a need to create comprehensive integrated programmes at universities and other professional establishments to impart such training for designing and constructing low-energy buildings.

3.3.1.4. *POLICY AND REGULATORY ENHANCEMENTS*

A diverse portfolio of policy instruments would be required to address the barriers to efficient energy use in the residential and commercial sectors.

There is a need to continuously update appliance energy norms and building energy codes and labeling, move towards rational energy pricing based on long-term average economic cost, and provide fiscal benefits for efficiency improvements.

The ECBC (Energy Conservation Building Code) was developed after the adoption of the Energy Conservation Act (2001). The ECBC aims to reduce the baseline energy consumption by supporting adoption and implementation of efficiency sayings and savings in GHG emissions, besides other benefits. ECBC intervention has encouraged design innovation in the building envelope and system design and specification, which have resulted in 50% energy savings (as measured in ECBC compliant buildings) when compared to conventional constructions.

Given the scale of energy savings that can be achieved by the implementation of ECBC, it is important to direct policy towards encouraging/mandating energy savings. As an example, it would be pertinent to address the cost of CFL (Compact Fluorescent Lamp) and T5 (Efficient Tube Light) which is a barrier to their wide spread use, and implement measures to increase the demand in order to reduce prices through scale effects. Large-scale availability of appropriate materials and equipment to meet the requirement of ECBC is also urgently needed. The energy codes are still new in India and the products (insulation, efficient glass, efficient HVAC systems, and so on) and services required by buildings to comply with the code requirements are not readily and abundantly available, or competitively priced. Market power monopoly of a handful of manufacturers of energy efficient products has resulted in a non-competitive market for products like insulations, chillers, and so on.

In addition to the above, the MoEF (Ministry of Environment and Forests) has developed a manual on norms and standards for environmental clearance for large construction projects after wide consultation with experts from different disciplines. The manual would be used as a technical guideline to assist the project proponents/ stakeholders/ consultants for the preparation environmental impact assessments of projects and obtain environmental clearance. Both the EACs (Expert Appraisal Committee) at MoEF and SEACs (State Expert Appraisal Committee) at the state/ UT level appraise and grade all new construction projects requiring environmental clearances on the basis of the manual. The state pollution control boards are required to verify the compliance of the Environmental Management Plan and the observance of the criteria of gradation by the project proponents.

Successful implementation of performance-based codes requires education and training of building officials and inspectors and demonstration projects. Setting flexible performance-based codesrather than technology/options prescriptions can help keep compliance costs low and may provide incentives for innovation.

3.3.1.5. DELIVERY OPTIONS

The BLY (Bachat Lamp Yojana) model needs to be pursued to promote energy efficient and high quality CFLs as replacement for incandescent bulbs in households. Comprehensive implementation of the BLY can lead to a reduction of 10,000 MW (Megawatt) of electricity demand. The BLY depends upon CDM (clean development mechanism) revenues to meet the incremental investment cost as well as the incremental economic cost that would be the case in many participating households.

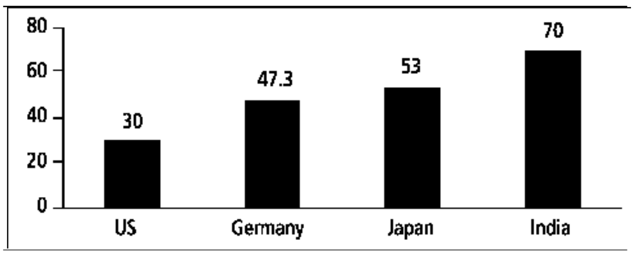
ESCOs (Energy Service Companies) need to be promoted as vehicles to deliver energy-efficiency improvements, in particular because of the "split incentives" problem, and facilitate access to carbon finance through bundled CDM projects.

The energy efficient options in the residential and commercial sectors should be promoted as bundles of programmatic CDM options.

3.3.2 MANAGEMENT OF MUNICIPAL SOLID WASTE (MSW)

Municipal solid waste (MSW) generation reflects not just income levels, but also lifestyle choices. Recycling of materials is an important option for reducing environmental pressures. Figure 3.3.2.1 below indicates that India has a significantly higher rate of recycling of materials in MSW than developed countries.

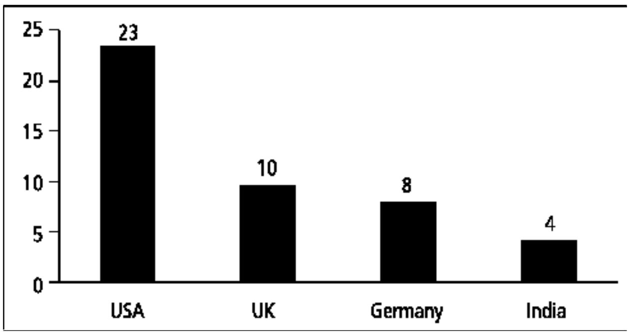
Figure 3.3.2.1: Average rate of recycling (in %), excluding re-use



Source: TERI (2006)

GHG emissions from MSW in India are also much lower than in developed countries, reckoned per unit of consumption (in $ 1000 at PPP), Figure 3.3.2.2 below:

Figure 3.3.2.2: GHG emissions intensity from waste generation (in gm/$1000 at PPP GDP)



Source: TERI (2006)

MSW generation in Indian cities (around 5100 ULBs) is estimated to have increased from 6 million tonnes in 1947 to 48 million tonnes in 1997, and to 69 million tonnes in 2006 (Central Pollution Control Board 2000, TERI 2001). In addition, Indian consumption of plastics is around 4 MTPA (million tonnes per annum). About 60% of this comprises polyolefins, which are primarily used as packaging material. About 2.0 MTPA of total consumption is generated as plastic waste of which around 70% is recycled, mostly by the informal sector. The decadal growth in consumption of plastics during the period 1991-2001 was around 14% (Indian Centre for Plastics in the Environment and Central Institute of Plastic Engineering Technology 2003). Although the quantity of plastic waste reaching disposal sites is fairly low (0.62% on a dry weight basis), testifying to the high rate of recycling/reuse, the management of thin plastic bags remains a matter of concern due to low collection efficiency in their case. The plastic waste-recycling sector therefore needs to be strengthened.

Table 3.3.2.1: Characteristics of MSW in 59 cities

Parameter	**Unit**	**Range**
Compostable	%	30 - 73
Recyclable (Plastics,		
Paper, Metal, Glass etc)	%	10 - 37
Moisture	%	17 - 65
Carbon/Nitrogen (C/N)	Ratio	14 - 53
HCV	kcal/kg	520 - 3766

Source: CPCB, 2005

There is a trend of increase in the percentage of recyclables, accompanied by decreases in the percentage of biodegradable matter in the waste stream.

Table 3.3.2.2: Change in waste composition in selected cities

City	**Compostables** (%)		**Recyclables** (%)	
	1982-1990	2005	1982-1990	2005
Lucknow	60.31	47.41	6.72	15.53
Kolkata	46.58	50.56	2.58	11.48
Kanpur	53.34	47.52	2.57	11.93
Mumbai	59.37	62.44	3.85	16.66
Delhi	57.71	54.42	8.24	15.52
Chennai	56.24	41.34	6.60	16.34
Bangalore	75.00	51.84	2.70	22.43
Ahemdabad	48.95	40.81	7.57	11.65

Source: 1982-90: Planning Commission; 1995, 2005: CPCB

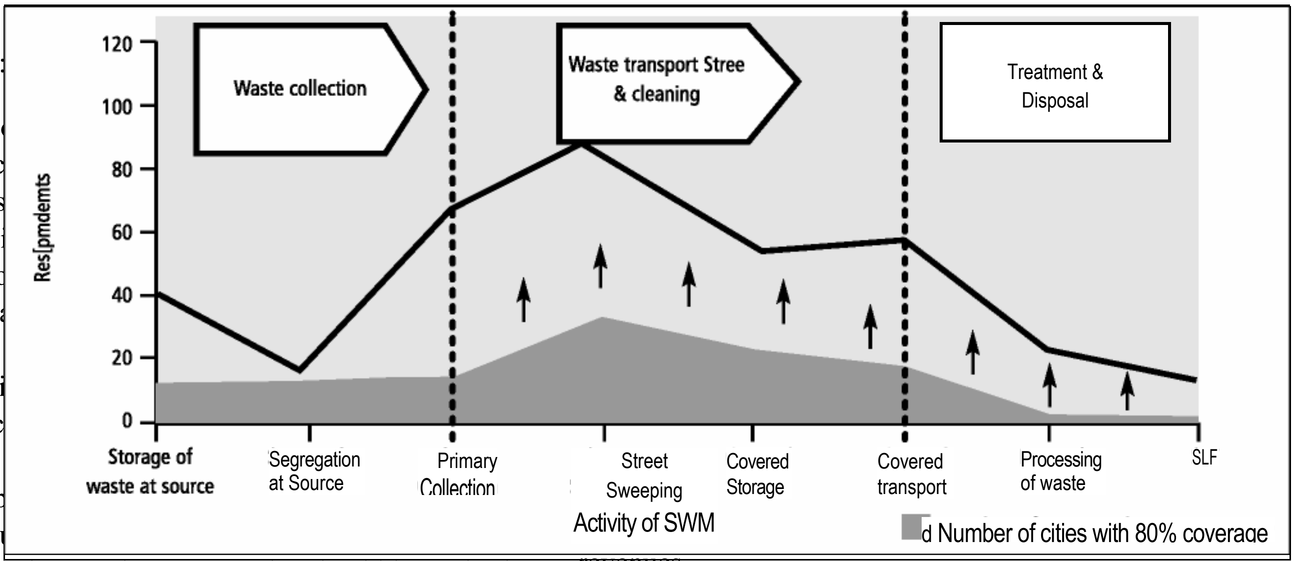
3.3.2.1 POLICIES AND REGULATIONS

The 74th Constitutional Amendment (1992) transferred the responsibility for collection, treatment and disposal of MSW from State Governments to the Urban Local Bodies (ULBs). The outbreak of plague at Surat (1994) focused policy attention on the importance of proper systems for MSW in the ULBs. In response to direction by the Supreme Court in a PIL (WP No. 888/1996) MSW Rules 2000 were promulgated, MSW service from generation to disposal was mandated, and Local Governments made responsible for compliance. Since then ULBs have gradually improved the systems of collection and transport of MSW. However, major gaps exist in respect of treatment and disposal. In particular, in respect of disposal, the compliance is poor (<5%), and while there are an increasing number of projects incorporating safe disposal, most have inadequate capacity.

Efforts at composting, and generating energy from waste have generally not been successful for a variety of systemic, technology, and pricing issues, including variable quality of waste, insufficient segregation of MSW, opposition to siting the facilities from local residents, and accordingly, the practice of open dumping continues. The dominant technology choice remains composting.

In addition, experience has made clear that

Figure 3.3.2.1: Compliance Status of MSW Rules (Survey: 2004)



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procedu
and techniques. The MSW Rules should be revised to focus instead on performance or outcome norms that are to be met, irrespective of particular systems and procedures, or technologies. This would provide benchmarks for monitoring and enforcement, as well as give space for innovation in systems, procedures, and technologies.

There is an emerging consensus that MSW Rules should enable (but not require) the sharing of infrastructure, including transport and treatment facilities, across a given region, including towns and villages. This would help realize scale economies, besides access to better and more cost-effective systems and treatment options for the smaller urban centres and habitations.

Broad guidelines for policy reform in the MSW sector include:Common Regional Facilities: In respect of smaller towns and villages located in a

revenues.

While there are several potential benefits in implementing MSW operations through public-private partnerships, including cost-effectiveness, as compared to operations carried out by the local bodies on their own, it is imperative that municipal finances are placed on a sound footing prior to outsourcing this function. While the issue of municipal finance reform is complex with many dimensions, and needs to be pursued independent of MSW issues, a pre-requisite is separation of the accounts of the local bodies in respect of their different responsibilities, such as MSW, water supply, sewage disposal and roads. This separation would firstly, provide guidance to setting user charges (however collected), and a benchmark against which bids for provision of MSW services may be judged.

The National Environment Policy, 2006, provides for:

•Removal of barriers (incentives, regulation) for beneficial utilization of non-hazardous materials
•Implementing viable PPPs for operation of hazardous and non-hazardous waste disposal facilities on payment of user fees, taking into account concerns of local communities
•Survey and preparation of national inventory of toxic and hazardous waste sites and online monitoring of their movement
•Giving legal recognition to and strengthening informal sector systems of, collection and recycling and enhancing their access to finance and technology

The significance of the last is that while the informal recycling sector is the backbone of India's highly effective recycling system, unfortunately, a number of municipal regulations impede the operation of the recyclers, owing to which they remain at a tiny scale without access to finance or improved recycling technologies.

3.3.2.2. R&D NEEDS

Technological requirements are listed as follows:

•Biomethanation technology for waste to energy including its decentralised application for segregated waste streams like vegetable market waste, slaughterhouse waste and dairy waste.
•Development of indigenous gas engines for waste to energy applications to reduce the overall cost of the package.
•Upgrading plastic waste recycling technologies to reduce occupational and environmental hazards.
•Recycling technologies for construction and demolition wastes and e-waste streams.

3.3.2.3. FINANCING

The 10th Plan emphasized provision of important infrastructure facilities and 100% coverage of urban population with water supply facilities, and 75% of urban population with sewerage and sanitation by the end of the plan period. Under the JNURM, till January 2008, funds amounting to Rs 900 crores were released to ULBs. The required funding for upgrading MSW facilities in all cities and towns would be much greater.

3.3.3. PROMOTION OF URBAN PUBLIC TRANSPORT

An increase in the demand for transportation services for both passengers and freight is inevitable, given economic growth and increase of population. The total number of registered motor vehicles in India has increased from 21.4 million in 1991 to 72.7 million in 2004 at a CAGR of 9.9%, with the two wheeler segment comprising of motorcycles, scooters, and mopeds growing most rapidly amongst personalized modes of transportation. Road based transportation is the main source of GHG emissions in the transportation sector.

Various studies have estimated that policy and technological measures can lead to significant energy and thereby emission savings in the transport sector. Estimates of the Planning Commission indicate an energy saving potential of 115 mtoe (million tonnes of oil equivalent) in the year 2031/32 by increasing the share of railways and improving efficiencies of different modes of transport (Planning Commission, 2006). Similarly, TERI estimates indicate an energy saving of 144 mtoe in 2031 by including efficiency improvement across modes as well as considering enhanced use of public transportation and rail based movement, use of bio-diesel as compared to business-as-usual trends. The corresponding CO_2 emissions reduction is estimated at 433 million tonnes in 2031.

3.3.3.1. TRANSPORT OPTIONS

Mass transport options including buses, railways and mass rapid transit systems, etc. are the principal option for reducing energy use in the urban transport sector, and mitigating associated GHG emissions and air pollution. The use of CNG has helped reduce air pollution due to diesel use in some cities because of its lower particulates emissions. Regarding biofuels, ethanol blending of gasoline upto 5% is required in 9 states, and is expected that this limit would be increased to10%. R&D has to be carried out on the combustion characteristics of motor engines for blending of higher content of ethanol in petrol. Bio-diesel production from *Jatropha curcas* and *Pongamia* shrubs is also increasing. The National Mission on Bio-diesel aims in the first (demonstration) phase to establish biodiesel plantations in 26 states, while the second phase will lead to the production of sufficient bio-diesel to enable a 20% blend in vehicle diesel in 2011/12. However, the oil content of bio-diesel crops from different parts of India is highly variable. R&D has to be carried to identify superior genotypes and collect seeds, which need to be inventorised, documented and stored under different agro-climatic zones. Introduction of bio-fuels should not divert land marked for food production and thus decrease the availability of food-grains to population. There is also some controversy about the net GHG emission of some biofuels.

Hydrogen has the potential to replace fossil fuels in the future. In recent years, significant progress has been reported by several countries for overcoming problems in its storage and production. In India, a National Hydrogen Energy Road Map has been prepared. Some organisations have already developed prototypes of two-and three-wheelers and buses to run on hydrogen fuel. However, large scale penetration of the market by hydrogen propelled vehicles is not expected till a few decades from now.

3.3.3.2. COSTS AND FINANCING

Most of the energy-efficiency measures require huge investments in the creation of new infrastructure. Efforts to reduce CO_2 emissions by the way of introduction of MRTS (mass-rapid transit system) would involve diverting resources from other priority claims on fiscal resources.

Moreover, the possibility of substantially reducing the dependence on petroleum products is constrained by the significantly higher costs of most alternative fuel options as of now. The main barrier to the use of hydrogen based fuel cell vehicles (FCVs) is that of high FCV drive-train costs.

3.3.3.3. CO-BENEFITS

Mitigation options such as enhanced shares of public transport or rail-based movement, efficiency improvements, and increased adoption of bio-diesel or CNG have important co-benefits at the regional and local levels.

Pricing, taxes, and charges, apart from raising revenue for governments, are expected to influence travel demand and choice of transportation modes, thereby decreasing fuel demand and GHG emissions. Transport pricing can offer important gains in social welfare by simultaneously reducing local pollution and GHG emissions, accidents, noise and congestion, as well as generating state revenue for enhancing social wel-being and/or infrastructure construction and maintenance.

FCVs fuelled by hydrogen have zero CO_2 emission and high efficiency, address air quality (zero tailpipe emissions), and may promote energy security since hydrogen can be produced from a wide range of sources.

With an expanding automobile sector, recycling of recoverable materials at end-of-life of automobiles would lead to considerable energy savings[9]. It is estimated that by 2020, recoverable materials annually will be of the order of 1.5 million tons of steel, 180,000 tons of aluminium and 75,000 tons each of rubber and plastics. Recycling of these materials will also reduce mining, depletion of natural resources, and degradation of environment. India has no formal regulations regarding recyclability and disposal of end-of-life vehicles.

The following actions are proposed for the transport sector:

- Promoting the use of coastal shipping and inland waterways, apart from encouraging the attractiveness of rail-based movement relative to long-distance road based movement
- Encouraging energy R&D in the Indian Railways
- Introducing appropriate transport pricing measures to influence purchase and use of vehicles in respect of fuel efficiency and fuel choice
- Tightening of regulatory standards such as enforcing fuel-economy standards for automobile manufacturers
- Establishing mechanisms to promote investments in development of high capacity public transport systems (e.g. offer equity participation and/or via-

bility gap funding to cover capital cost of public transport systems)
- Abandoning of old vehicles to be made illegal with suitable legislation and fixing the responsibility of handing over the end-of-life vehicle to collection centers on the last owner of the vehicle
- Setting up of a demonstration unit to take up recycling of vehicles, especially two wheelers, which require new techniques
- Setting up a Combustion Research Institute to facilitate R&D in advanced engine design
- Providing tax benefits and investment support for recovery of materials from scrap vehicles

3.4. National Water Mission

India gets on an average 1197 mm of rainfall every year. This amounts to a total precipitation of 4000 billion m^3. However, 3000 billion m^3 of this is lost due to run off, and only 1000 billion m^3 is available as surface and ground water sources, amounting to c.1000 m^3 per year per capita water availability. This is about 115^{th} –$1/10^{th}$ of that of many industrialised countries. Many parts of India are water stressed today and India is likely to be water scarce by 2050. The problem may worsen due to climate change impacts. It is therefore important to increase the efficiency of water use, explore options to augment water supply in critical areas, and ensure more effective management of water resources. New regulatory structures with appropriate entitlements and pricing and incentives to adopt water-neutral and water positive technologies may be required. Integrated water policies will help to cope with variability in rainfall and river flows at the basin level. Some specific aspects related to water resources are discussed in more detail below.

3.4.1 STUDIES ON MANAGEMENT OF SURFACE WATER RESOURCES

Rivers and lakes, the most visible sources of surface water, often indicate the state of the environment more clearly than many other indicators. Such resources also have economic significance in the form of waterways for transport, sources of clean energy in the form of hydropower, and vital inputs to agriculture in the form of irrigation. Key elements on surface water studies include the following:
- Estimating river flows in mountainous areas
- Customizing climate change models for regional water basins
- Extending isotopic-tracer-based techniques of monitoring river water discharge to all major river monitoring stations
- Developing digital elevation models of flood-prone areas for forecasting floods
- Mapping areas likely to experience floods and developing schemes to manage floods
- Strengthening the monitoring of glacial and seasonal snow covers to assess the contribution of snowmelt to water flows of Indian rivers that originate in the Himalayas
- Establishment of a wider network of automatic weather status and automated rain gauge stations
- Planning of watershed management in mountain ecosystems

3.4.2. MANAGEMENT AND REGULATION OF GROUNDWATER RESOURCES

Groundwater accounts for nearly 40% of the total available water resources in the country and meets nearly 55% of irrigation requirements, 85% of rural requirements and 50% of urban and industrial requirements. However, overexploitation of the resource has sharply lowered the water table in many parts of the country, making them increasingly vulnerable to adverse impacts of climate change. Key areas in this programme may include the following:
- Mandating water harvesting and artificial recharge in relevant urban areas
- Enhancing recharge of the sources and recharge zones of deeper groundwater aquifers
- Mandatory water assessments and audits; ensuring proper industrial waste disposal
- Regulation of power tariffs for irrigation

3.4.3. UPGRADING STORAGE STRUCTURES FOR FRESH WATER AND DRAINAGE SYSTEMS FOR WASTEWATER

To address the problems of droughts and floods triggered by extreme weather events, it is essential to both augment storage capacity and improve drainage systems. Effective drainage is also essential to reclaim waterlogged and saline-alkali lands and to prevent the degradation of fertile lands. Key areas are listed below:

- Prioritizing watersheds vulnerable to flow changes and developing decision support systems to facilitate quick and appropriate responses
- Restoration of old water tanks
- Developing models of urban storm water flows and estimating drainage capacities for storm-water and for sewers based on the simulations
- Strengthen links with afforestation programmes and wetland conservation
- Enhancing storage capacities in multipurpose hydro projects, and integration of drainage with irrigation infrastructure

3.4.4. CONSERVATION OF WETLANDS

Wetlands provide a range of ecological services, including water conservation, recharge of ground-water, and preservation of flora and fauna, including species and varieties at risk and are a source of livelihood to many. Wetlands face the threat of conversion to other uses, which means a loss of their ecological services, making those who depend on them vulnerable. Actions identified for conserving wetlands are listed below:

- Environmental appraisal and impact assessment of developmental projects on wetlands
- Developing an inventory of wetlands, especially those with unique features
- Mapping of catchments and surveying and assessing land use patterns with emphasis on drainage, vegetation cover, silting, encroachment, conversion of mangrove areas, human settlements, and human activities and their impact on catchments and water bodies.
- Creating awareness among people on importance of wetland ecosystems
- Formulating and implementing a regulatory regime to ensure wise use of wetlands at the national, the state, and district levels

3.4.5. DEVELOPMENT OF DESALINATION TECHNOLOGIES

In India, desalination has been recognized as a possible means to argument the water supply through natural resources for meeting the growing needs of water due to population and industrial growth. Since desalination is an energy intensive process (the energy required may vary from about 3 kWh to 16 kWh for separating 1000 litres depending on the type of process used), the application of desalination technology for increasing regional water supplies strongly links to energy issues and thus GHG emissions. Development activities have been initiated in various laboratories in the country. Desalination has been recognized as an important cross disciplinary technology area for R&D in the 11th Plan. Technologies are being developed for the following:

- Seawater desalination using Reverse Osmosis and multistage flash distillation to take advantage of low-grade heat energy e.g. from power plants located in the coastal regions or by using renewable energy such as solar
- Brackish water desalination
- Water recycle and reuse
- Water purification technologies

3.5. National Mission for Sustaining the Himalayan Ecosystem

The Himalayan ecosystem is vital to the ecological security of the Indian landmass, through providing forest cover, feeding perennial rivers that are the source of drinking water, irrigation, and hydropower, conserving biodiversity, providing a rich base for high value agriculture, and spectacular landscapes for sustainable tourism. At the same time, climate change may adversely impact the Himalayan ecosystem through increased temperature, altered precipitation patterns, and episodes of drought.

Concern has also been expressed that the Himalayan glaciers, in common with other entities in the global cryosphere, may lose significant ice-mass, and thereby endanger river flows, especially in the lean season, when the North Indian rivers are largely fed by melting snow and ice. Studies by several scientific institutions in India have been inconclusive on the extent of change in glacier mass, and whether climate change is a significant causative factor.

It is accordingly, necessary to continue and enhance monitoring of the Himalayan ecosystem, in particular the state of its glaciers, and the impacts of change in glacial mass on river flows. Since several other countries in the South Asian region share the Himalayan ecosystem, appropriate forms of scientific collaboration and exchange of information may be considered with them to enhance understanding of ecosystem changes and their effects.

It is also necessary, with a view to enhancing conservation of Himalayan ecosystems, to empower local communities, in particular through the Panchayats, to assume greater responsibility for management of ecological resources.

The National Environment Policy, 2006, inter-alia provides for the following relevant measures for conservation of mountain ecosystems:

- Adopt appropriate land-use planning and water-shed management practices for sustainable development of mountain ecosystems

- Adopt "best practice" norms for infrastructure construction in mountain regions to avoid or minimize damage to sensitive ecosystems and despoiling of landscapes

- Encourage cultivation of traditional varieties of crops and horticulture by promotion of organic farming enabling farmers to realize a price premium

- Promote sustainable tourism through adoption of "best practice" norms for tourism facilities and access to ecological resources, and multistakeholder partnerships to enable local communities to gain better livelihoods, while leveraging financial, technical, and managerial capacities of investors

- Take measures to regulate tourist inflows into mountain regions to ensure that these remain within the carrying capacity of the mountain ecology
- Consider particular unique mountain scapes as entities with "Incomparable Values", in developing strategies for their protection

3.6. National Mission for a -Green India-

Forests are repositories of genetic diversity, and supply a wide range of ecosystem services thus helping maintain ecological balance. Forests meet nearly 40% of the energy needs of the country overall, and over 80% of those in rural areas, and are the backbone of forest-based communities in terms of livelihood and sustenance. Forests sequester billions of tons of carbon dioxide in the form of biomass and soil carbon. The proposed national programme will focus on two objectives, namely increasing the forest cover and density as a whole of the country and conserving biodiversity.

3.6.1. INCREASE IN FOREST COVER AND DENSITY

The report of the Working Group on Forests for the 11^{th} Five-Year Plan puts the annual rate of planting during 2001/02 to 2005/06 at 1.6 million hectares and proposes to increase it to 3.3 million hectares during the 11^{th} Plan. The final target is to bring one-third of the geographic area of India under forest cover.

The Greening India Programme has already been announced. Under the programme, 6 million hectares of degraded forest land would be afforested with the participation of Joint Forest Management Committees (JFMCs), with funds to the extent of Rs 6000 crores provided from the accumulated additional funds for compensatory afforestation under a decision of the Supreme Court in respect of forest lands diverted to non-forest use.

The elements of this Programme may include the following:

- Training on silvicultural practices for fast- growing and climate- hardy tree species
- Reducing fragmentation of forests by provision of corridors for species migration, both fauna and flora
- Enhancing public and private investments for raising plantations for enhancing the cover and the density of forests
- Revitalizing and upscaling community-based initia-

tives such as Joint Forest Management (JFM) and Van Panchayat committees for forest management

- Implementation of the Greening India Plan
- Formulation of forest fire management strategies

3.6.2. CONSERVING BIODIVERSITY

Conservation of wildlife and biodiversity in natural heritage sites including sacred groves, protected areas, and other biodiversity 'hotspots' is crucial for maintaining the resilience of ecosystems. Specific actions in this programme will include:

- In-situ and ex-situ conservation of genetic resources, especially of threatened flora and fauna
- Creation of biodiversity registers (at national, district, and local levels) for documenting genetic diversity and the associated traditional knowledge
- Effective implementation of the Protected Area System under the Wildlife Conservation Act
- Effective implementation of the National Biodiversity Conservation Act, 2001

3.7. National Mission for Sustainable Agriculture

Contributing 21% to the country's GDP, accounting for 11 % of total exports, employing 56.4% of the total workforce, and supporting 600 million people directly or indirectly, agriculture is vital to India's economy and the livelihood of its people. The proposed national mission will focus on four areas crucial to agriculture in adapting to climate change, namely dryland agriculture, risk management, access to information, and use of biotechnology.

3.7.1. Dryland Agriculture

Out of the net cultivated area of approximately 141 million hectares , about 85 million hectares (60%) falls under the dryland/rain-fed zone. Accordingly, to realise the enormous agricultural growth potential of the drylands in the country and secure farm-based livelihoods, there is a need to prevent declines in agricultural yields during climatic stress. Priority actions on dryland agriculture with particular relevance to adaptation will be as follows:

- Development of drought- and pest-resistant crop varieties
- Improving methods to conserve soil and water
- Stakeholder consultations, training workshops and demonstration exercises for farming communities, for agro-climatic information sharing and dissemination
- Financial support to enable farmers to invest in and adopt relevant technologies to overcome climate related stresses

3.7.2. RISK MANAGEMENT

The agricultural sector may face risks due to extreme climatie events. Priority areas are as follows:

- Strengthening of current agricultural and weather insurance mechanisms
- Development and validation of weather derivative models (by insurance providers ensuring their access to archival and current weather data)
- Creation of web-enabled, regional language based services for facilitation of weather-based insurance
- Development of GIS and remote-sensing methodologies for detailed soil resource mapping and land use planning at the level of a watershed or a river basin
- Mapping vulnerable eco-regions and pest and disease hotspots
- Developing and implementing region-specific contingency plans based on vulnerability and risk scenarios

3.7.3. ACCESS TO INFORMATION

Although many information channels are available to farmers, none of them offers need-based information in an interactive mode. Supplying customized information can boost farm productivity and farm incomes, and the following areas deserve priority:

- Development of regional databases of soil, weather, genotypes, land-use patterns and water resources.
- Monitoring of glacier and ice-mass, impacts on

water resources, soil erosion, and associated impacts on agricultural production in mountainous regions

•Providing information on off-season crops, aromatic and medicinal plants, greenhouse crops, pasture development, agro-forestry, livestock and agro-processing.

•Collation and dissemination of block-level data on agro-climatic variables, land-use, and socio-economic features and preparation of state-level agro-climatic atlases

3.7.4 USE OF BIOTECHNOLOGY

Biotechnology applications in agriculture relate to several themes, including drought proofing, taking advantage of elevated CO_2 concentrations, increased yields and increased resistance to disease and pests. Priority areas include:

•Use of genetic engineering to convert C-3 crops to the more carbon responsive C-4 crops to achieve greater photosynthetic efficiency for obtaining increased productivity at higher levels of carbon dioxide in the atmosphere or to sustain thermal stresses

•Development of crops with better water and nitrogen use efficiency which may result in reduced emissions of greenhouse gases or greater tolerance to drought or submergence or salinity

•Development of nutritional strategies for managing heat stress in dairy animals to prevent nutrient deficiencies leading to low milk yield and productivity

3.8. National Mission on Strategic Knowledge for Climate Change

This national mission envisages a broad-based effort that would include the following key themes:

•Research in key substantive domains of climate science where there is an urgent need to improve the understanding of key phenomena and processes, including, for example, monsoon dynamics, aerosol science and ecosystem responses

•Global and regional climate modelling to improve the quality and specificity of climate change projections over the Indian sub-continent, including changes in hydrological cycles

•Strengthening of observational networks and data gathering and assimilation, including measures to enhance the access to and availability of relevant data

•Creation of essential research infrastructure, such as high performance computing and very large bandwidth networks to enable scientists to access and share computational and data resources

These broad themes are elaborated in the sub-sections below:

3.8.1. CLIMATE MODELLING AND ACCESS TO DATA

Although the IPCC-AR4 has addressed the general global trends on climate change, spatially detailed assessments are not available for India. This is because of inadequate computing power available, difficulties in getting climate related data, and dearth of trained human resources amongst climate modelling research groups in India. The following actions will be taken:

3.8.2. ENHANCED RESEARCH ON CLIMATE MODELLING IN INDIA

There is a need to develop high resolution Air Ocean General Circulation Models (AOGCM) and nested Regional Climate Models (RCM) that simulate regional climate change, in particular monsoon behaviour, by pooling institutional capabilities and computational resources.

In respect of General Circulation Models (GCM), there is a need to build national level core climate modelling groups to develop high resolution coupled AOGCM that effectively simulate monsoon behaviour. These would be employed for multi-ensemble and multi-year simulations of the present and future climate. Indigenous Regional Climate Models (RCM) are necessary to generate accurate future climate projections upto (at least) district level. Regional data re-analysis projects should be encouraged. A Regional Model Inter-comparison

Project (RMIP) for climate is required to **minimize** uncertainty **in** future **climate projections.**

3.8.3. PROMOTING DATA ACCESS

There are several databases that are relevant for **climate research, along with the respective agencies that are responsible** for **collecting and supplying that data. It is** suggested that **each of these Ministries and Departments may appoint a** 'facilitator', **who will provide access** to the data. **A** concept of 'registered **users' has been proposed, who will have easier access to climate related data held by the various scientific Ministries and** Departments **of the Government. There is a need to review the** restrictions **on data access. The Ministries and their agencies should also take action to digitize the data, maintain databases of global quality, and streamline the procedures governing access. Existing databases that will need to be expanded and improved are listed below.**

Table 3.8.3 Some Databases for Climate Research

S. No.	Database	Data Collecting and Supplying Agency	Facilitator reporting to
1	**Oceans** Sea surface temperature Salinity **Sea level rise**	Ministry of Earth Sciences	Secretary, Ministry of Earth Sciences
2	**Cryosphere** Snow cover Glacial data	a)National Remote Sensing Agency **(NRSA)** b)**Geological** Survey of **India** c) **Snow and** Avalanche **Studies Establishment (SASE),** Defence Research **and Development Organization**	a)Secretary, Department of Space b)Secretary, Ministry of Mines c) Secretary, Department of Defence Research and **Development**
3	**Meteorology** **Precipitation** Humidity Surface temperature Air temperature **Evaporation** data	India **Meteorological Department,** Ministry of Earth Sciences.	Secretary, Ministry of Earth Sciences
4	**Land Surface** Topography Erosion Imagery (vegetation map) Forest cover	a)Survey of India b)National Remote Sensing Agency (NRSA)	a)Secretary, Department of Science and Technology b)Secretary, Department of Space
5	**Hydrological** **Ground water** **Water** quality **River water** **Water utilization**	a)Central **Water Commission** **b)State Water Resource Organizations**	a)Secretary, Ministry of Water Resources b)Chief Secretaries of the respective States
6	**Agriculture** Soil profile Area under cultivation Production and yield Cost of cultivation	Ministry of Agriculture	a)Secretary, **Department** of Agriculture and Co-operation b)Secretary, Department of Agricultural Research and Education
7	**Socio-Economic** Demography Economic status	Census of India	Registrar General India, Ministry of Home Affairs
8	**Forests** Forest resources Plant and animal species distribution	a)Forest Survey of India b)State Forest Department c)Botanical Survey of India **a)Zoological** Survey of India e) Department of Space	a)Secretary, Ministry of Environment and Forests b)Chief Secretaries of the respective States a)Secretary, Ministry of **Environment** and Forests c)Secretary, Ministry of Environment and Forests e) Secretary, Department of Space
9	**Health Related Data**	Department of Health Research	Secretary, Department of Health Research

3.8.4. STRENGTHENING NETWORKS

The creation of an integrated National Knowledge Network (scalable and ultimately of multi-10 Gbps capacity) as suggested by the National Knowledge Commission and the Principal Scientific Adviser's Office would obviously benefit climate modellers. The upcoming Grid Computing stands out as a unique technology for handling terabytes of experimental data requiring hundreds of teraflops of computing power. Various Ministries of the Government are also taking steps to augment their super-computing resources in the Eleventh Plan.

3.8.5. HUMAN RESOURCE DEVELOPMENT

In order to meet the new challenges related to climate change, human resources would require to be enhanced through changes in curricula at the school and college levels, introduction of new programmes at the university level, and training of professionals and executives in relevant fields. An overall assessment of additional skills required will have to be carried out at the national, state and local levels, so that necessary measures can be undertaken for enhancing the quality and quantum of human resource required in the coming years and decades. The latter would have to be viewed also in the context of the current difficulties faced in attracting young people to careers in science in general, to overcome which steps are being taken during the 11th Plan.

4. Other Initiatives

4.1. GHG Mitigation in Power Generation

The present energy mix in India for electricity generation is shown in Table 4.1 below:

Table 4.1: Present Energy Mix in Electricity Generation in India

Source	Percentage
Coal	55
Hydropower	26
Oil and gas	10
Wind and solar power	6
Nuclear power	3

At present, fossil fuels account for 66% of the total, and are responsible for most of the GHG emissions from the energy sector. During the 11th Five-Year Plan, utility-based generation capacity is expected to increase by 78,000 MW. A significant proportion of this increase will be thermal-coal based. While the new investments in the thermal power sector, which are substantial, have high efficiencies, the aggregate efficiency of the older plants is low. In addition, high ATCL (aggregate technical and commercial loss) in power transmission and distribution is a key concern

There are three ways of lowering the emissions from coal based plants: increasing efficiency of existing power plants; using clean coal technologies (relative emissions are c.78% of conventional coal-thermal), and switching to fuels other than coal, where possible. These measures are complementary and not mutually exclusive. Another option that has been suggested is carbon capture and sequestration (CCS). However, feasible technologies for this have not yet been developed and there are serious questions about the cost as well permanence of the CO_2 storage repositories.

Approximately 5000 MW out of total of 73,500 MW of present installed capacity (at the end of November, 2007) of coal thermal plants have low capacity utilization of less than 5%, as well as low conversion efficiency. During the 11th Plan, these units would be retired, and during the 12th Plan, an additional 10,000 MW of the least efficient operating plants would be retired, or reconditioned to improve their operating efficiency.

4.1.1. SUPERCRITICAL TECHNOLOGIES

Supercritical and ultra-supercritical plants can achieve efficiencies of - 40 and - 45% respectively, compared to about 35% achieved by subcritical plants. Since coal-based power generation will continue to play a major role in the next 30-50 years, it would be useful, wherever cost-effective and otherwise suitable, to adopt supercritical boilers, which is a proven technology, in the immediate future, and ultra-supercritical boilers when their commercial viability under Indian conditions is established. At present, construction of several supercritical coal based power projects is in progress.

Research and development with regard to ultra-supercritical technology needs to focus on the following areas:

- Development of materials for use in steam generator tubes, main steam piping, and high-pressure turbines that can withstand high pressure and high temperatures of more than 600°C, and are resistant to oxidation, erosion, and corrosion
- Development of know-how related to heat transfer, pressure drop, and flow stability at ultra-supercritical conditions

4.1.2. INTEGRATED GASIFICATION COMBINED CYCLE (IGCC) TECHNOLOGY

Integrated gasification combined cycle technology can make coal-based power generation - 10% more efficient. For every 1% rise in efficiency, there is a 2% decrease in CO_2 release. Besides, there is a substantial reduction in NOx emissions. Demonstration of plants using high-ash, low-sulphur Indian coal needs to be pursued, while recognizing constraints such as high costs and availability of superior imported coal. Recent research has shown that these plants should be based on the Pressurized Fluidized Bed (PFB) approach.

Bharat Heavy Electricals Ltd. (BHEL) already has 3 R&D plants based on PFB, which have provided design information to scale up this technology". BHEL and APGENCO have signed an agreement recently to set up a 125 MW plant at Vijayawada using indigenous IGCC technology.

4.1.3. NATURAL GAS BASED POWER PLANTS

Natural gas based power generation is cleaner than coal-based generation as CO_2 emissions are only - 50% compared to coal. Besides, natural gas can be used for electricity generation by adopting advanced gas turbines in a combined cycle mode. Introduction of advance class turbines with inlet temperature in the range 1250 °C - 1350° C has led to combined cycle power plant efficiency of about 55% under Indian conditions. Many such plants are in operation in India. With the discovery of significant reserves of natural gas in the Godavari basin, setting up more combined cycle natural gas plants is an attractive GHG mitigation option in India.

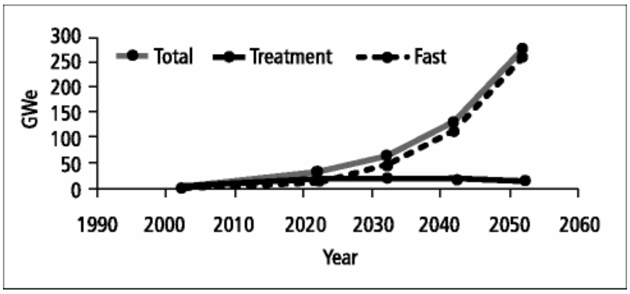
4.1.4. CLOSED CYCLE THREE STAGE NUCLEAR POWER PROGRAMME

Promotion of nuclear energy through enhancing nuclear capacity and adoption of fast breeder and thorium-based thermal reactor technology in nuclear power generation would bring significant benefits in terms of energy security and environmental benefits, including GHG mitigation.

India's uranium resources are limited but the country has one of the largest resources of thorium in the world. Therefore, right from inception, India has adopted a programme that will maximize the energy yield from these materials. This is the three-stage nuclear power programme. The first stage of nuclear power generation is based on PHWR (Pressurized Heavy Water Reactor) technology using indigenous natural uranium. The second stage is based on FBR (Fast Breeder Reactor) technology using plutonium extracted by reprocessing of the spent fuel obtained from the first stage. The third stage consists of using thorium resources.

The current installed capacity of nuclear power plants is 4200 MW, accounting for nearly 3% of total installed capacity. A 500 MW fast breeder reactor is under construction and is expected to go on stream in about three years. A 300 MW Advanced Heavy Water Reactor (AHWR) has been designed. Its construction is due to begin in the 11th Plan. The projected installed nuclear power by Department of Atomic Energy (DAE) is shown in Figure 4.1 below.

Figure 4.1.4: Nuclear Power Generation Projections upto 2050 by DAE


300
250
200
150
100
50
0
GWe
Total
Treatment
Fast
1990
2000
2010
2020
2030
2040
2050
2060
Year

For sustainability of nuclear energy as a mitigation option in the long term, it is important to close the nuclear fuel cycle[1] [1]. In this way one can produce several tens of times more energy from the existing uranium resources if the plutonium from the spent fuel is recycled in fast breeder reactors and this potential can be increased by another order of magnitude by closing the nuclear fuel cycle with thorium. Therefore, the three stage nuclear programme of India based on the closed fuel cycle philosophy assumes greater significance in the context of climate change mitigation. The closed fuel cycle, in comparison to the once-through cycle, also reduces the volumes of radioactive waste requiring treatment and disposal.

4.1.5. EFFICIENT TRANSMISSION AND DISTRIBUTION

India's current technical losses during transmission and distribution are as high as 16%-19%. By adopting HVAC (high voltage AC) and HVDC (high voltage DC) transmission, the figure can be brought down to 6%-8% by using amorphous core transformers and up-grading the distribution system (avoiding congestion etc.). Distribution losses can also be reduced by adopting energy-efficient transformers, which use high-grade steel in the transformer core.

4.1.6. HYDROPOWER

The CEA (Central Electricity Authority) has estimated India's hydropower potential at 148,700 MW. The hydroelectric capacity currently under operation is about 28,000 MW, while 14,000 MW capacity is under various stages of development. The CEA has also identified 56 sites for pumped storage schemes with an estimated aggregate installed capacity of 94,000 MW. In addition, a potential of 15,000 MW in terms of installed capacity is estimated from small, mini, and micro-hydel projects. Of this only about 2000 MW has been exploited at present. These projects are important, in particular, for electrification of remote hilly areas, where it may not be feasible for the grid electricity to reach. Large-scale hydropower with reservoir storage is the cheapest conventional power source in India. However, resettlement of displaced population due to submergence of large areas of habitation lands has to be attended to with care.

4.2. Other Renewable Energy Technologies Programmes

Renewable energy sources, i.e. based on primary energy sources that are regenerated naturally in time-spans that are meaningful in terms of policy and planning horizons, represent genuine supply side sustainability of global energy systems.

Renewable energy technologies (RETs) have several well-recognized advantages in relation to conventional, largely fossil fuels based, energy systems. First, by displacing use of fossil fuels, in particular, petroleum based fuels, they promote energy security. Second, they are amenable to adoption at different scales – from hundreds of megawatts capacity to a few kilowatts. In many cases they may be deployed in modular, standardized designs. This enables RETS to be matched closely with end-use scales, enabling decentralized deployment, and thus avoiding the risk of failures, and unauthorized access to large networks, which leads to non-commercial losses. The feasibility of location close to the load or consuming centres enables reduction of technical transmission and distribution losses. However, where centralized grids (networks) exist, they may be inserted as individual modules in the grid (network) supply. Third, they can help promote sustainable development, broadly defined, through increased opportunities for local employment, especially the rural poor, and environmental improvement through reducing GHG emissions, local air pollutants, solid waste and waste-water generation, and (in case of forestry-based sources), soil and water conservation, and maintaining habitats of wild species.

On the other hand, several RETs also have disadvantages. First, some primary energy flows (e.g. solar, wind) are intermittent, and insufficiently predictable, requiring hybridization with systems more under human control. For another, some RETs forms, such as biofuels compete with arable land and irrigation water with food crops. If not implemented with great care, they may have adverse social and economic consequences, RETs easily have the potential to replace all current and foreseeable use of fossil fuels, for power generation, transportation, and industrial use, for all time to come. RETs represent a range of specific conversion pathways and technologies. These are at different stages of deployment, innovation, and basic research. Some that are fully established commercially, e.g. biomass combustion and gasification based power generation need up-scaling through policies and regulations that would permit some unique deployment models to be operationalized. In other cases, where commercial scale operation has been demonstrated, but costs are still high, with the possibility that increased scale and further innovation in both technology and deployment models will reduce costs, tariff and regulatory support for a limited period may be needed. Where technologies have been demonstrated at laboratory scale, further R&D to enable pilot and commercial scale demonstration may involve facilitation of industry and research laboratory partnerships, and may also involve public fiscal (investment) support.

4.2.1. RETs FOR POWER GENERATION

Power generation technologies based on renewable energy flows comprise the following major primary sources: Biomass, Hydropower, Solar, and Wind. Technologies in each of these primary sources have already been deployed in India at commercial scale, but there remain several challenges in respect of policies and regulations, R&D and transfer of technologies, costs and financing, and deployment models, that need to be addressed in order to ensure their mainstreaming in the commercial power sector.

4.2.1.1. BIOMASS BASED POWER GENERATION TECHNOLOGIES

Biomass based technologies include those involving primary biomass combustion, and those that do not involve direct biomass combustion, but may involve conversion to a secondary energy form.

Historically, primary biomass combustion has been the main source of energy for India. The Integrated Energy Policy (Planning Commission, 2006) has estimated that around 80 mtoe is currently used in the rural household sector. In addition, the Ministry of New and Renewable Energy has estimated state-wise gross and net availability of agro-residues for power generation.

There are two basic technology pathways for biomass for power options currently being implemented. These technologies are *Straight Biomass Combustion* and Biomass *Gasification.*

4.2.1.1.1. COSTS AND FINANCING

Plant capacities for straight primary biomass combustion are not very large due to limited radius of economic biomass collection. Investment cost for biomass combustion based power projects or co-generation projects varies between Rs. 4 to Rs. 5 crores per MW, depending upon project site, design and operation related factors. The cost of electricity generation is around Rs. 3/kWh depending upon specific fuel consumption, which in turn depends on type of fuel and operating pressure of the boiler and steam turbine. This technology is, thus, generally cost-competitive with conventional power delivered by the grid to rural areas.

In respect of biomass gasification technologies, the investment cost, with IC engines as source of power generation, comes between Rs. 25,000 – 60,000 / kW, depending on the type of gasification system and type of fuel, including costs of gasifier and IC engine. The cost of electricity generation cost varies between Rs.3 kWh to Rs. 5/kWh for the currently available technologies in India.

In both cases, the costs of biomass collection and transportation are key issues, which limit scale of operation of individual units.

4.2.1.1.2. CO-BENEFITS

Biomass based power technologies avoid problems associated with ash disposal from coal based plants. The ash from the biomass combustion may be returned to the fields to enhance agricultural productivity. If the biomass is grown in energy plantations on wastelands or common/panchayat lands, there would be increase in rural employment, besides water, and soil conservation. T&D losses would be very low especially in decentralized systems, and deployment can be done independently of the national grid and integrated with the national grid when extended.

4.2.1.1.3 RESEARCH & DEVELOPMENT

The technology for power generation through straight primary biomass combustion is mature, with significant commercial deployment. R&D is required for compacting different types of biomass for transportation, and improved boiler design to enable the use of multiple biomass feedstocks.

One significant area of R&D is development of hot gas cleaning systems and optimum integration with the gasifiers. Another is the development of gasifier systems based on charcoal and pyrolized biomass, since volatile distillates of biomass feedstock may have significant economic value, which would be lost if the biomass is directly burned.

4.2.1.1.4. TECHNOLOGY TRANSFER AND CAPACITY BUILDING

Biomass gasifiers available in the country are of very low capacity compared to European and American gasifiers, where the capacities vary from 1 MW to 100 MW. Biomass gasifiers with capacities upto 100 MW based on Circulating Fluidised Bed (CFB), Bubbling Fluidised Bed (BFB) and Pressurised Fluidised bed (PFB) are available in the USA, Finland and UK. Transfer of these technologies, and where necessary adaptive R&D, would enable deployment models involving energy plantations on wastelands or common/panchayat lands which would not compete with food crops.

Capacity building needs include support to commercial demonstration by entrepreneurs of biomass based distributed generation systems and using these as training facilities for local entrepreneurs and O&M personnel. Such demonstration and skills development would enable accelerated deployment of these technologies.

***4.2.1.2.** SMALL-SCALE HYDROPOWER*

Hydropower, both large (reservoir storage) and small scale, accounts for 18% of the total electricity generated in India. Of the total estimated large hydropower potential of 148,700 MW (storage and run-of-river), so far only 35,000 MW has been utilized. In addition, there are 56 assessed sites for pumped storage hydropower, totaling 94,000 MW. The total small hydropower (upto 25 MW) potential is 15,000 MW, of which only 1905 MW has been utilized. Large-scale hydropower with reservoir storage is the cheapest conventional power source in India. Small-scale hydropower is cost competitive with conventional generation options, in particular for rural electrification. In remote rural locations far away from the grid, it may be the only feasible and economic power option.

The technology options for hydropower at all scales are commercially well established, except in the pico-turbine ranges i.e. < 1 kW.

4.2.1.2.1. COSTS AND FINANCING

The cost of generation ranges from Rs. 2 to 4 per kWh. The capital costs are higher than for conventional power, and usually in the range of Rs. 7 crore per MW.

4.2.1.2.2. CO-BENEFITS

Small hydropower displaces diesel gensets, thereby avoiding local pollution. By thus avoiding consumption of petroleum products, it also promotes energy security. Small hydropower is generally more predictable than solar or wind based sources, with variations occurring over the year, rather than on a hourly or daily basis.

4.2.1.2.3. RESEARCH & DEVELOPMENT AND CAPACITY BUILDING

The following are priorities for R& D:

- Design of pico turbines (< 500W range): This would enable very small scale generation at the household level, based on local hydro resources
- Electronic Load Controller for micro hydro: This would enable supply of power from micro-hydel sources to village level grids
- Cost reductions in E&M
- Standardizing the modules and optimizing the usage of materials is critical for reducing equipment, and hence generation, costs
- Support to commercial demonstration by entrepre-

neurs of small/micro-hydel based distributed generation systems, in particular in remote locations, and using these as training facilities for local entrepreneurs and O&M personnel would help develop this sector.

4.2.1.3. WIND ENERGY

The installed capacity for using wind energy has gone up rapidly during the last few years (presently about 8000 MW). However, the capacity utilization factors are low due to the variations in the wind flow. Action is required to design, develop and manufacture small wind energy generators (WEGs) upto 10 kW capacity, that can generate power at very low speeds (- 2 to 2.5 m/sec). Effort is also required for the development of low weight carbon fiber and other new generation composites, etc. for use in wind turbines.

An encouraging sign is the strong interest of the private sector in the wind area. Some Indian private companies are involved in setting up wind turbines in other countries in a big way.

4.2.2 GRID CONNECTED SYSTEMS

The Electricity Act, 2003 and the National Tariff Policy, 2006, provide for both the Central Electricity Regulatory Commission (CERC) and the State Electricity Regulatory Commissions (SERC) to prescribe a certain percentage of total power purchased by the grid from renewable based sources. It also prescribes that a preferential tariff may be followed for renewables based power.

The following enhancements in the regulatory/tariffs regime may be considered to help mainstream renewables based sources in the national power system:

•(i) A dynamic minimum renewables purchase standard (DMRPS) may be set, with escalation each year till a pre-defined level is reached, at which time the requirements may be revisited. It is suggested that starting 2009-10, the national renewables standard (excluding hydropower with storage capacity in excess of daily peaking capacity, or based on agriculture based renewables sources that are used for human food) may be set at 5% of total grids purchase, to increase by 1% each year for 10 years. SERCs may set higher percentages than this minimum at each point in time.

•(ii) Central and state governments may set up a verification mechanism to ensure that the renewables based power is actually procured as per the applicable standard (DMRPS or SERC specified). Appropriate authorities may also issue certificates that procure renewables based power in excess of the national standard. Such certificates may be tradeable, to enable utilities falling short to meet their renewables standard obligations. In the event of some utilities still falling short, penalties as may be allowed under the Electricity Act 2003 and rules thereunder may be considered.

•(iii) Procurement of renewables based power by the SEBs/other power utilities should, in so far as the applicable renewables standard (DMRPS or SERC specified) is concerned, be based on competitive bidding, without regard to scheduling, or the tariffs of conventional power (however determined). Further, renewables based power may, over and above the applicable renewables standard, be enabled to compete with conventional generation on equal basis (whether bid tariffs or cost-plus tariffs), without regard to scheduling (i.e. renewables based power supply above the renewables standard should be considered as displacing the marginal conventional peaking capacity). All else being equal, in such cases, the renewables based power should be preferred to the competing conventional power.

4.2.3. RETS FOR TRANSPORTATION AND INDUSTRIAL FUELS

Internal combustion engine based power plants for transportation modes require liquid or gaseous fuels. In addition, rail (inc. LRT) modes, and some niche personal transportation modes are based on storage battery power, which may be recharged from mains outlets. The focus in this section is on liquid fuels of biological origin for transportation, and industrial applications (prime-movers, heating fuels).

4.2.3.1. TECHNOLOGY PATHWAYS

There are several possible pathways for deriving transportation and industrial fuels (not being feedstocks where the chemical composition rather than energy content is the main consideration).

At present, only biodiesel sourced from Jatropha or Pongamia plantations, and bioethanol using spoilt foodgrains are cost-effective in relation to petroleum based fuels. While significant R&D is being carried out in several countries, including in India, in respect of technologies based on several of the above pathways, at present, the costs are not competitive with petroleum. However, it is probable that several biofuels technologies would eventually become competitive with petroleum, and the policy/regulatory regime must enable them to be commercially deployed when that happens.

4.3. Disaster Management Response to Extreme Climate Events

With projected increases in the frequency and intensity of extreme events including cyclones, droughts, and floods attributable to climate change, disaster management needs greater attention. In the 11th Plan, the approach towards disaster management has moved from relief to prevention, mitigation, and preparedness. Two main planks of the new approach are mainstreaming disaster risk reduction into infrastructural project design and strengthening communication networks and disaster management facilities at all levels.

4.3.1. REDUCING RISK TO INFRASTRUCTURE THROUGH BETTER DESIGN

As a planned adaptation strategy, reducing risks from natural disasters needs to be a part of infrastructure project design, especially in areas vulnerable to extreme events. It is generally much cheaper to incorporate appropriate features in the initial design and construction of infrastructure projects, including siting, than to undertake retrofits later. The various elements of this Programme may include:

- Disaster-specific vulnerability assessments and sectoral impacts assessments at the state and district level for preparing contingency plans
- Maintenance of critical facilities such as health care services and water supplies
- Collaboration with insurance providers to insure infrastructure, mainstreaming disaster risk reduction into Sarva Shiksha Abhiyan, Jawaharlal Nehru National Urban Renewal Mission and Indira Awas Yojana
- Capacity building among design engineers, project planners and financial institutions on incorporating elements of disaster management
- Development of prefabricated structures instead of cast-in-place construction in vulnerable areas
- Enforcement of building codes; better urban planning and zoning of vulnerable areas

4.3.2. STRENGTHENING COMMUNICATION NETWORKS AND DISASTER MANAGEMENT FACILITIES

Ensuring that communication channels are not severed during disasters can protect lives and expedite relief and rehabilitation operations. Furthermore, it is essential to have a regular monitoring programme in place to provide early warning of imminent disasters to facilitate a planned response, including evacuation from vulnerable areas to minimize the impact of disasters. Specific action areas will include:

- Upgrading forecasting, tracking and early warning system for cyclones, floods, storms and tsunami
- Monitoring river flows and mapping flood zones
- Generation of regional scenarios based on single or multi-hazard mapping
- Disaster response training at the community level to build infrastructure and human resources for medical preparedness and emergency medical response to manage mass casualties during extreme events

4.4. Protection of Coastal Areas

The coastal areas are an important and critical region for India not only because of the vast 7500-km coast-line but also because of the density of population and livelihoods dependant on coastal resources. Coastal zones are particularly vulnerable and sensitive to such impacts of climate change as rise in the sea level, rise in the high-tide level, and cyclones and storms, which are projected to become more frequent and intense. The programme will focus on two elements, namely (1) coastal protection and (2) early warning systems. Priority areas on coastal zones include:

•Development of a regional ocean modelling system especially in the Bay of Bengal and the Arabian Sea
•High-resolution coupled ocean–atmosphere variability studies in tropical oceans, in particular the Indian Ocean
•Development of a high-resolution storm surge model for coastal regions
•Development of salinity-tolerant crop cultivars
•Community awareness on coastal disasters and necessary action; plantation and regeneration of mangroves
•Timely forecasting, cyclone and flood warning systems
•Enhanced plantation and regeneration of mangroves and coastal forests

4.5 Health Sector

The proposed programme comprises two main components, namely provision of enhanced public health care services and assessment of increased burden of disease due to climate change. Areas that can contribute to enhanced health care services include the following:

•Providing high-resolution weather and climate data to study the regional pattern of disease
•Development of a high-resolution health impact model at the state level
•GIS mapping of access routes to health facilities in areas prone to climatic extremes
•Prioritization of geographic areas based on epidemiological data and the extent of vulnerability to adverse impacts of climate change
•Ecological study of air pollutants and pollen (as the triggers of asthma and respiratory diseases) and how they are affected by climate change
•Studies on the response of disease vectors to climate change
•Enhanced provision of primary, secondary, and tertiary health care facilities and implementation of public health measures, including vector control, sanitation, and clean drinking water supply

4.6. Creating Appropriate Capacity at Different Levels of Government

In view of several new initiatives that would be required, both in respect of adaptation and mitigation, creation of knowledge and suitable capacity at each level of Government to facilitate implementation of appropriate measures assumes great importance.

At the level of the central government, there would be a need to carry out the following:

There should be support to relevant policy research to ensure that adaptation and mitigation takes place in a manner that enhances human well-being, while at the same time minimizing societal costs. This should lead to the design of suitable legal, fiscal and regulatory measures.

Appropriate capacity for implementing R&D activities and promoting large-scale public awareness and information dissemination on various aspects of climate change is required. For adequate R&D activities a proactive approach favouring partnerships between research organizations and industry would be efficient and productive.

At the level of state governments, several agencies would need to enlarge and redefine their goals and areas of operation. For instance, State Electricity Regulatory Commissions would need to concern themselves with regulatory decisions that ensure higher energy efficiency, greater use of renewable energy, and other low carbon activities that would ensure energy security, reduced local pollution, and increased access to energy in areas where distributed and decentralized forms of energy production would be economically superior to conventional methods. State governments may also employ fiscal instruments to promote appropriate options and measures.

Local bodies would need to create capacity on regulatory measures, particularly for ensuring energy efficiency in new buildings as well as through a programme of retrofits. In respect of adaptation measures, local capacity and the involvement of communities in actions to adapt to the impacts of climate change would be crucial.

Public awareness on climate change would have to be spearheaded and driven by government at all levels. Emphasis on schools and colleges is essential.

In some cases legislation may be required at the central and state levels to arrive at appropriate delegation of responsibility and authority for meeting some of the goals mentioned above.

5. International Cooperation: the Multilateral Regime on Climate Change

As a party to the UN Framework Convention on Climate Change and its Kyoto Protocol, India plays an active role in multilateral cooperation to address climate change. These agreements are based on the principle of *"common but differentiated responsibilities and respective capabilities"* of Parties. Thus, they incorporate certain common commitments for all Parties, including an obligation to *"formulate and implement programmes containing measures to mitigate climate change"*. Additionally, the Convention requires the developed countries (listed in its Annex I) to stabilize and reduce their greenhouse gas emissions and the Kyoto Protocol establishes quantified, time-bound targets in this regard. Countries with the most advanced economies (listed in Annex II of the convention) are also required to transfer financial resources and technology to developing countries for purposes of mitigation and adaptation.

The Convention specifically notes that *"per capita emissions in developing countries are still relatively low and...the share of global emissions originating in developing countries will rise to meet their social and development needs."* The Convention also recognizes that *"economic and social developmentand poverty eradication are the first and overriding priorities of the developing country parties."* Thus, developing countries are not required to divert resources from development priorities by implementing projects involving incremental costs – unless these incremental costs are borne by developed countries and the needed technologies are transferred.

The Global Environmental Facility (GEF) finances implementation of projects in developing countries under the Convention. Additionally, the Kyoto Protocol created the Clean Development Mechanism (CDM), which allows developed countries to meet part of their emission reduction commitments by purchasing credits from emission reduction projects in developing countries, thus serving the dual objective of facilitating compliance by developed countries of their emission reduction commitments and of assisting developing countries to achieve sustainable development.

5.1. Some Technology Development and Transfer Issues

In the move towards a low-carbon economy, technology has a vital role to play. Technology solutions are also very important for enhancing adaptive capacity and reducing vulnerability to climate change and its impacts. In this respect, international cooperation in science and technology assumes great significance.

It is important to ensure that within the multilateral process under the UNFCCC, the menu of cooperation mechanisms is not constrained, and indeed, proactive measures are taken for these mechanisms to be used. The stage of the technology in terms of its progression from research to widespread market adoption will play an important role in determining the mechanisms that are appropriate and relevant.

For example, when the technology solutions are at a very early stage of development, the primary focus is usually on cooperation in basic scientific research. India has always been very actively engaged in, and is making key contributions to international scientific programmes that may have significant implications for the transition to a sustainable energy future, such as the International Thermonuclear Experimental Reactor (ITER). At the individual and institutional level, Indian participation in scientific networks is also very strong. From a long-term perspective, this scientific cooperation will remain very important.

As ideas progress from the laboratory closer towards the market, the focus shifts towards technology design and development. Mechanisms that enable joint technology development involving public and private sector entities and with suitable norms for financing and IPR-sharing would be important for ensuring that the process of technology development and commercialization happens more rapidly and effectively.

For the final stage of deployment and market adoption of technologies in developing countries, two different contexts may be identified. For technologies that are already mature and deployed in the developed countries, appropriate financing models are essential, which may become operational through multilateral institutions, carbon markets and mechanisms like the CDM. However, as was noted earlier, given the somewhat limited role that the CDM appears to have played with regard to technology transfer, this issue will merit detailed examination.

However, the transition to a more sustainable energy future will require a much more rapid progression towards a variety of newer, low-carbon and energy efficient technologies in different areas. The usual mechanism considered for this purpose is that of technology transfer from the developed to the developing countries. The conventional model of technology transfer, considers that technology developed in the North is first established there, before it is supplied to the South. The rapid changes in the global economic and technology environment are making this model less applicable. As the experience so far also suggests, this model may be inadequate in terms of satisfying the scale and scope of the technology response required. New models and mechanisms for technology transfer will need to incorporate at least three key elements: appropriate funding modalities and approaches; a facilitative IPR environment, and enhancing the absorptive capacity within developing countries.

New multilateral technology cooperation funds may be required that would finance the development, deployment, diffusion and transfer of technologies for both mitigation and adaptation to developing countries.

One of the main barriers to technology adoption lies in the low absorptive capacities of developing countries. It is vital that mechanisms for technology transfer include measures that will enable the enhancement of absorptive capacities, keeping in mind the targets of such technology interventions.

5.2. Clean Development Mechanism

India has given host-country approval for 969 CDM projects as of June 2008. Renewable energy, including renewable biomass, accounted for the largest number of projects (533), followed by energy efficiency (303). Very few projects in the forestry (6) and municipal solid waste (18) sectors were included, despite their large potential. The expected investments in these 753 projects (if all go on stream) is about Rs. 106,900 crores.

Of the 969 projects, 340 projects have been registered by the multilateral Executive Board (CDM EB). India accounts for about 32% of the world total of 1081 projects registered with the CDM EB, followed by China (20%), Brazil (13%), and Mexico (10%) (Source: UNFCCC). About 493 million certified emission reductions (CERs) are expected to be generated until 2012 if all these host-country approved projects in India go on stream (National CDM Authority, November 2007). As of June 2008, 152.4 million CERs had been issued to projects worldwide, of which India accounted for 28.16%%, China (29.25%), Korea (17.87%), and Brazil (14.13%).

Some cross-cutting challenges in CDM implementation in India are listed below:

- The projects from India are generally small. Of the 283 projects registered with the CDM EB till October 2007, 63% are small-scale projects (in terms of the Protocol definition)
- The portfolio is dominated by unilateral projects,

i.e. the investors are Indian parties, employ locally available technologies, and use domestic financial resources. While this has provided a significant impetus to local innovation, CDM has not led to the technology transfer from industrialized to developing countries envisaged by the Protocol

- Industrialized countries have not participated significantly in project financing and the project risks are mostly taken up by the host industries
- Insurance companies in general have shown little interest in CDM, which is unfortunate since they can catalyse carbon trading by providing risk and financial analysis skills
- There is much subjectivity in the multilateral CDM process, and divergent interpretations are given by different designated operating entities (DOEs) accredited by the CDM EB
- High transactions costs prevent the small-scale sector (in the Indian definition) from participating in CDM
- In the absence of an international transactions log (ITL), there is lack of reliable information in the carbon market on CDM transactions

Despite the above, there is encouraging response from Indian entrepreneurs to the CDM across different sectors. Besides, several recent enhancements of CDM such as bundling and programmatic CDM need to be mainstreamed. Alongside the carbon market under the Kyoto Protocol, a voluntary (non-compliance) carbon market is emerging involving trades in VERB (verified emission reductions). This market may grow substantially in the future.

5.3. Enhanced Implementation of the UNFCCC

India looks forward to enhanced international cooperation under the UNFCCC. Overall, future international cooperation on climate change should address the following objectives:

- Minimizing the negative impacts of climate change through suitable adaptation measures in the countries and communities affected and mitigation at the global level
- Provide fairness and equity in the actions and measures
- Uphold the principle of common but differentiated responsibilities in actions to be taken, such as concessional financial flows from the developed countries, and access to technology on affordable terms

India as a large democracy, with the major challenge of achieving economic and social development and eradicating poverty, will engage in negotiations and other actions at the international level in the coming months that would lead to efficient and equitable solutions at the global level.

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ANNEXURE P- 4

FORUM OF REGULATORS

OPEN ACCESS – THEORY AND PRACTICE

NOVEMBER 2008

FORUM OF REGULATORS
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EXECUTIVE SUMMAARY

Open access has been envisaged in the Electricity Act, 2003 (EA 2003) as a framework for encouraging competition in the electricity sector and for enabling consumers to choose their suppliers. The Act provides for non-discriminatory open access in transmission from the outset. In distribution, open access is to be introduced in phases by the State Commissions with due consideration of constraints like cross-subsidy etc.

The National Electricity Policy and Tariff Policy framed under the Act lay emphasis on proper implementation of this competitive framework which has the potential of: (i) desired market signal for investment; (ii) inducing improved service from the existing utilities; and (iii) enabling consumers to get power from any source of their choice.

The Central Electricity Regulatory Commission (CERC) has framed regulations on inter-State open access. There have been large numbers of transactions involving the generating companies, traders and distribution companies through open access in inter-State transmission. At the State level, regulations have been framed by the State Commissions, phasing out open access for consumers. Transmission charges, wheeling charges and surcharge have also been determined by most SERCs. However, implementation of open access at the distribution level has not been encouraging.

The Forum of Regulators (FOR) has been deliberating on the issues concerning implementation of open access for quite some time. At its meeting in June 2008, the Forum felt the need for a detailed examination of operational constraints in implementation of open access. The Forum thus constituted a Working Group consisting of the **Chairpersons** of some State Commissions with the mandate to examine all such issues and suggest measures for overcoming the constraints for the framework of open access to be implemented in its true spirit. The Group submitted its report which was considered by the FOR in its meeting at Chennai on January 30, 2009.

The report, as adopted by the Forum, makes a detailed examination with recommendations concerning the following issues: (i) legal and policy provisions and the status of their implementation; (ii) identification of problem areas with the conclusion , inter alia, that the weakest link is the State Load Dispatch Centre (SLDC) which, unless made truly independent, will frustrate all effort at open access; (iii) measures for ring-fencing of SLDC; (iv) structural and financial re-modelling, including technological upgradation; (v) staffing pattern; (vi) incentive and disincentive scheme; and (vii) fees and charges for the SLDCs.

The report also emphasises the need for: (i) rationalization of various open access charges including surcharge; (ii) uniform standby arrangement for back-up supply to make open access a reality; (iii) monitoring of open access transactions by the State Commission; and (iv) display of illustrative examples of charges for open access to help the potential consumer take an informed decision on the open access option.

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1 Introduction

1.1 Constitution of the Working Group

1.1.1 The FOR was constituted by Notification of February 16, 2005 in accordance with section 166(2) of EA 2003 and comprises the Chairperson of CERC and the Chairpersons of the State Electricity Regulatory Commissions (SERCs). The Chairperson of CERC is the Chairperson of the FOR.

1.1.2 In order to meet the objectives of smooth and coordinated development of the power system in the country and to evaluate and address various issues in operationalising open access, the FOR decided to constitute a Working Group on "Open Access: Theory and Practice" during its meeting on June 13, 2008.

1.1.3 The scope of work of the Working Group was, inter-alia, to consider the relevant provisions of the National Electricity Policy, Tariff Policy, experience in operationalising open access over the State networks, and to give its recommendation on the following:

a. Strengthening the SLDCs in terms of equipment and skill sets;

b. Ring-fencing of the SLDCs with the objective of ensuring their functional independence;

c. Creating a system of monitoring the grant of open access by SLDCs in an expeditious and non-discriminatory manner;

d. Rationalising open access charges, including the envisaged reduction in cross-subsidy surcharge;

e. Facilitating standby power supply arrangement for open access consumers; and

f. Any other relevant issue.

1.1.4 The Chairperson of the FOR was authorised to nominate various SERCs on the Working Group, and accordingly the Working Group on "Open Access: Theory and Practice" was constituted as follows:

(i)	Chairperson, CERC	...	Chairperson
(ii)	Chairperson, CSERC	…	Member
(iii)	Chairperson, JSERC	…	Member

(iii)	Chairperson, MERC	…	Member
(iv)	Chairperson, RERC	…	Member
(v)	Secretary, CERC	…	Member
(vi)	Deputy Chief (**Regulatory Affairs**), CERC	…	Coordinator.

1.1.5 The Secretariat of the FOR acted as the secretariat of the Working Group. MERC offered to support the FOR Secretariat for this Working Group, through its representative Regulatory Experts.

1.2 Deliberations of the Working Group

1.2.1 The first meeting of the Working Group was convened at Lonavala on July 20, 2008, with the following participants:

1. Dr. Pramod Deo, CERC
2. Shri. J.L. Barkakati, Assam Electricity Regulatory Commission (AERC)
3. Dr. J.L. Bose, Madhya Pradesh Electricity Regulatory Commission (MPERC)
4. Shri. A. Velayutham, Maharashtra Electricity Regulatory Commission (MERC)
5. Shri. V.J. Talwar, Uttarkhand Electricity Regulatory Commission (UERC)
6. Shri. K.L. Vyas , Rajasthan Electricity Regulatory Commission (RERC)
7. Shri. Rajupandi , Tamil Nadu Electricity Regulatory Commission (TNERC)
8. Shri. Alok Kumar, CERC
9. Shri. S. K. Chatterjee, CERC
10. Shri S.K. Soonee, Executive Director (SO), **POWERGRID**, New Delhi (special invitee)

1.2.2 To facilitate a focussed discussion on the issues related to implementation of open access, the Regulatory Experts of MERC, which acted as the Secretariat of this Working Group, was requested to make a presentation on the issues.

1.2.3 A Draft Report summarising the deliberations of the Working Group and issues finalised during the first meeting was circulated for further consideration. The Discussion Summary has been classified under the following three categories:

- Issues and action plan finalised during the meeting
- Issues to be finalised in the next meeting

- Issues to be considered after detailed study

1.2.4 The second Meeting of the Working Group was convened at Bhubaneshwar on November 14, 2008 to finalise the recommendations and to deliberate further on the outstanding issues with the following participants:

1. Dr. Pramod Deo, CERC
2. Shri S.K. Misra, CSERC
3. Shri Mukhtiar Singh, JSERC
4. Shri B.K. Das, Orissa Electricity Regulatory Commission (OERC)
5. Shri A. Velayutham, MERC
6. Shri K.L. Vyas , RERC
7. Shri R. Rajupandi , TNERC
8. Shri Alok Kumar, CERC
9. Shri. Kulamani Biswal, CERC
10. Shri. S. K. Chatterjee, CERC
11. Shri S.K. Soonee, Executive Director (SO), **POWERGRID**, New Delhi (special invitee)

1.2.5 During the deliberations at Bhubaneswar on November 14, 2008, Shri S.K. Soonee, Executive Director (SO), **POWERGRID** made three presentations, appended as follows:

- Appendix-I : Presentation on inter-State short-term Open Access (OA)
- Appendix-II : Presentation on ULDC Upgradation Summary
- Appendix-III : Presentation on Software Development for Short-Term OA

1.2.6 The Working Group listed the following key factors in successful implementation of OA in inter-State transmission:

1.2.6.1 **Clear control area demarcation and adequate boundary metering**: The foremost reason for successful implementation of OA in inter-State transmission is clear demarcation of the control areas and scheduling and dispatch responsibility. Boundary Metering (SEM) has been provided at all seams and interfaces of control areas.

1.2.6.2 **Robust transmission system**: In India, the transmission system is planned in a coordinated manner in accordance with the Central Electricity Authority's (CEA's) planning criteria and provisions of the grid code. The margins that are inherent in design, or due to variations in power flows and also due to in-built spare transmission capacity, created to cater to the future load growth or generation addition are being gainfully utilised through OA.

1.2.6.3 **Assessment of transfer capability**: For successful implementation of OA, the assessment of available transfer capability (ATC) is very important. A pessimistic approach in assessing the ATC will lead to under utilisation of the transmission system. Similarly, over assessment of ATC will place the grid security in danger. All RLDCs are fully geared up for assessment of the ATC. When the flows crossed the declared total transfer capability (TTC), there was a violation of security standards.

1.2.6.4 **Balancing mechanism**: The balancing mechanism is one of the four pillars of the design of any power market, without which no market mechanism can exist. The balancing mechanism in the form of Unsheduled Interchange (**UI**) tariff provides an instrument for settlement of the Open Access Market.

1.2.6.5 **Transmission charge sharing mechanism**: Transmission is the basic platform for development of any power market. Transmission is not a product and, therefore, the transmission charge sharing mechanism is also a key issue in the development of any power market. Presently, OA transmission charges are defined in terms of Rs./MWh. The present transmission charge sharing mechanism is easy to understand and implement in a non-discriminatory fashion. According to the provisions of the National Electricity Policy, the tariff mechanism has to be sensitive to distance, direction and related quantum of flow. Further work is required on this.

1.2.6.6 **Treatment of transmission losses**: The treatment of losses is also important for the successful implementation of OA. At present, the average regional transmission losses are applied to all transactions. The present mechanism is also easy to understand and implement in a non-discriminatory fashion. According to the Tariff Policy, transactions may be charged on the basis of average losses, considering distance and direction sensitivity. The CERC is already considering this matter.

1.2.6.7 **Streamlined scheduling and settlement mechanism**: All RLDCs are fully geared up to streamline the entire scheduling process. A number of software programmes have been developed in-house to streamline the scheduling process and a sound settlement mechanism is in place.

1.2.6.8 **Transparency and non-discriminatory implementation**: To ensure transparency and non-discriminatory implementation of the provisions of CERC regulations, complete information is displayed on the RLDC website. This includes the 52-week average transmission losses, ATC/TTC details, approved OA transactions details, schedules of each constituent, etc.

1.2.7 The Working Group has finalised its recommendations in respect of each issue identified under the Terms of Reference which are organised under following chapters:

a. Chapter-2: Capacity building at SLDC
b. Chapter-3: Ring-fencing of SLDC for functional independence
c. Chapter-4: Monitoring mechanism for grant of open access
d. Chapter-5: Rationalisation of open access charges and regulatory framework
e. Chapter-6: Facilitative standby power supply arrangement
f. Chapter-7: Summary of recommendations

2 Capacity Building at SLDC

2.1 Statutory framework

2.1.1 The SLDC has been entrusted with the following functional responsibilities:

a. Optimal scheduling and despatch of electricity within a State, meeting the terms contracted with the licensees or generating companies operating in that State;
b. Monitoring grid operations;
c. Keeping accounts of quantity of electricity transmitted through the State grid;
d. Exercising supervision and control over the intra-State transmission system; and
e. Responsibility for carrying out real time operation for grid control and despatch of electricity within the State through secure and economic operation of the State grid in accordance with Grid Standards.

2.1.2 In order to facilitate this, the SERCs have to ensure that the SLDCs are equipped with state-of-art communication and data acquisition capability on real-time basis. In this context, the relevant extract from para 5.3.3 of the National Electricity Policy is reproduced below:

> "*Regulatory Commissions need to provide facilitative framework for non-discriminatory open access. <u>This requires load despatch facilities with State-of-the art communication and data acquisition capability on real time basis</u>. While this is the case currently at RLDCs, <u>Appropriate State Commissions must ensure</u> that matching facilities with technology upgrades are provided at the State level, where necessary and realized not later than June 2006*"(<u>emphasis added</u>)

2.2 Key issues addressed

2.2.1 In view of this position, the following issues were discussed by the Working Group:

Issue 1: Organisational structure of SLDC

- Is the current SLDC organisational structure capable of addressing the requirements of OA transactions?

- What are the modifications necessary for the SLDC organisational structure to undertake the responsibilities assigned?

Issue 2: Regulatory intervention

The areas for urgent regulatory intervention were noted as being:

- Manpower related: total manpower, manpower skill-set requirements, deputation and selection process, training requirements and budget approval for this.
- Technology related: energy accounting, software requirement, operational requirement, and visibility of OA transactions.

2.3 Summary of deliberations

2.3.1 SLDCs need to be directed to submit long-term Business Plans for approval of SERCs, and SERCs may be advised to address manpower and organisational structure aspects while approving the Business Plans.

2.3.2 The Central Transmission Utility (CTU) and National Load Despatch Centre (NLDC) may be requested to provide a basic plan for technological upgradation of SLDCs.

2.3.3 Minimum qualification and certification criteria need to be introduced for inducting any personnel in SLDC functions and this need to be enforced through the Indian Electricity Grid Code (IEGC) and State Grid Code Regulations.

2.3.4 Regular training needs to be imparted to SLDC personnel to develop requisite skill sets in System Operations, Energy Accounting and Computer Software skills as deemed necessary.

2.3.5 A communication backbone should be created in advance along with a security system in the SLDC for unlimited sharing of data.

2.4 Future course of action

2.4.1 After considering these comments and suggestions, the Working Group concluded that at present, the capability of the SLDCs in several States is inadequate due to the deployment of persons from State Transmission Utilities (STU) with inadequate training. The Working Group also recognised the need to provide for an appropriate pay structure for SLDC staff to attract talent with specialised skill sets and, to that extent, a difference in pay structure between STU and SLDC may be necessary.

Recommendations

2.4.2 The minimum qualifications and certification of competence of personnel to be deployed in RLDCs should be incorporated in the Grid Code. This may be done first by the CERC which would serve as a model for SERCs.

2.4.3 A model scheme for technological upgradation of SLDCs, with the objective of providing appropriate connectivity for transmission of data for system operations up to SLDCs has been prepared by ED (SO), PGCIL. For this purpose, the scheme of ULDC Control Centre Upgradation was reviewed, and the Summary is presented in **Annexure-1.1**. The Group also agreed to consider SLDC-Rajasthan as a pilot project. The current status of technologies and upgradation requirements for SLDC-Rajasthan is summarised in **Annexure-1.2**. The upgradation requirement from the communication perspective at the national level is summarised in **Annexure-1.3**. This model scheme could be sent to all SLDCs for implementation for which the CTU would provide technical guidance. By associating the CTU and NLDC with technological upgradation of SLDCs, the objective of compatibility of technologies across the system would also be achieved. Necessary software and skill sets should be identified, along with adequate system security, so that data is protected and safe from viruses.

2.4.4 The recommended staffing pattern, organisation structure and incentives for attracting qualified personnel in Load Despatch Centres (LDCs) are the key issues to be deliberated upon by the Working Group. In this context, the Group notes that these issues were extensively dealt with in the Report of the Committee constituted by the Ministry of Power on Manpower, Certification and Incentives for System Operation and Ring-fencing of LDCs. The Manpower Requirement and Organisation Structure as suggested in the Committee's Report for SLDCs is covered in **Annexure-2.0**. In particular, Recommendation-4 of this Report deals with the issue of compensation and incentive structure, enclosed in **Annexure-**

2.1. This may be considered by SERCs while approving the budgets of the SLDCs.

2.4.5 Training of LDC personnel, addressed by Recommendation-3 of the Report, is summarised in **Annexure-2.2**. A template for periodic training of personnel deployed in LDCs needs to be prepared in line with these recommendations, to include system operation, market operations, logistics and regulatory matters.

3 Ring-fencing of SLDCs for functional independence

3.1 Statutory framework

3.1.1 Section 31 of EA 2003 outlines the statutory framework for constitution of SLDCs. It stipulates that State governments shall establish SLDCs for exercising powers and discharge of statutory functions.

3.1.2 The SLDC shall be operated by a government company or any authority or corporation established or constituted by or under any State Act, as may be notified by the State Government. This is subject to the proviso that until a government company or authority or corporation is notified by the State Government, the State Transmission Utility (STU) shall operate the SLDC.

3.1.3 The need for deliberating on ring-fencing of SLDCs has arisen as several instances have come before the CERC where SLDCs have allegedly acted in a partial manner in granting OA, thereby violating the provisions of EA 2003 for non-discriminatory treatment of OA transactions.

3.2 Key issues addressed

3.2.1 In view of this, the following issues were discussed during the deliberations of the Working Group:

Issue 1: How to ensure functional independence of SLDC operations?

- Accounting segregation from STU operations
- Utilisation of revenues from SLDC fees and charges
- Approval of business plan and SLDC budget
- Financial delegation of powers
- Manpower deputation tenure

Issue 2: What should be the mechanism for monitoring the performance of SLDCs and ensuring compliance of directives by them?

- Parameters for performance monitoring of SLDCs
- Compliance of directives

3.3 Summary of deliberations

3.3.1 In order to ensure the financial and functional independence of SLDCs, an option of creating a separate subsidiary or separate accounting division within the STU for SLDC operations needs to be explored.

3.3.2 In addition, the reporting channel for SLDC personnel should be insulated from the normal reporting channel for **TRANSCO/DISCOMs**. The issue to be addressed is separation of functional reporting requirement vis-à-vis administrative reporting requirements on the lines of reporting practices followed in RLDCs. While the RLDC staff reports to Director (Operations) of PGCIL, its functional reporting is independent from its administrative reporting requirements. Functionally, RLDCs are to operate within the ambit of the Indian Electricity Grid Code (IEGC) and CERC Orders. The stability and smooth operation of the power system in that region are discussed in the Regional Power Committees (RPCs). Accordingly, SLDCs can be made functionally independent and should function in accordance with the State Grid Code and directions and orders of the SERCs. Matters concerning the smooth operation of the State Grid should be discussed in the State Power Committees (SPCs) or Grid Co-ordination Committees (GCCs), as required.

3.3.3 For regulatory reporting and regulatory compliance requirements, SERCs should address the SLDCs directly and seek their direct participation in the regulatory process instead of routing such requirements through STUs.

3.3.4 In order to ensure effective functional independence of SLDCs, the SERCs should provide statutory advice to the State Government to be proactive in devising the organisational structure of SLDCs and ensuring its financial independence. For this, the Working Group has considered Recommendation-1 in the Report of the Committee constituted by Ministry of Power for Ring-fencing of LDCs, summarised in **Annexure-2.3**. To ensure financial independence, the Working Group has considered Recommendation-2 which is enclosed in **Annexure-2.4**.

3.3.5 The suggested draft guiding principles for determination of SLDC Fees and Charges and their recovery have been discussed in **Annexure-2.5**.

3.4 Future course of action

3.4.1 After considering these comments and suggestions, the Working Group concluded as follows:

Recommendations:

3.4.2 For effective ring-fencing of SLDCs, there is an urgent need to delegate financial powers to SLDCs and to put in place an appropriate reporting system for administrative control and recording of confidential remarks. Currently, there is a serious conflict of interest as the SLDCs report to the STU and often cannot take any action against the **DISCOM**, as top management personnel are sometimes common for **Discoms** and STUs. The SLDCs may remain under the administrative control of STUs until a separate government company is established for SLDC operations. Creation of a subsidiary of the transmission utility can be a stop-gap arrangement during the transition phase but, in the long run, a separate entity for system operation and load despatch has to be created at the Central and State level. Further, during the transition phase for proper ring-fencing of SLDCs, the practice of their reporting to STUs along with DISCOMs or state trading companies should be discontinued. Irrespective of whether the SEB has been reorganised, the reporting channels going to the top for SLDCs and **Discoms** have to be separate and distinct, not only in terms of position but also in terms of top management personnel. This should also be formally communicated to the respective governments by the ERCs under sections 79 and 86 for promoting competition through open access.

3.4.3 Additionally, to ensure functional independence, the State Government needs to ensure that SLDCs do not directly or indirectly report to any other power sector entity such as distribution or trading licensee. The reporting requirements should be similar to that of the State Electoral Officer under the Election Commission.

3.4.4 The State Governments should also be advised to phase out the single buyer model with a definite time frame and change over to a multi-buyer and multi-seller market model in the State as the single buyer model creates a conflict of interest and brings pressure upon SLDCs to favour incumbent distribution licensees.

3.4.5 The CERC may formulate regulations for fees and charges to be levied by RLDCs to ensure that they not only recover operating and capital servicing costs but also generate adequate surpluses to provide equity for future investments. The State Governments should establish a separate investment fund for SLDCs apart from transfer of existing assets. The revenues for SLDCs, excluding operational expenses, should be escrowed to such a fund. Lenders would be willing to fund capex expansion plans of SLDCs, as approved by ERC, on the basis of such funds. Depreciation should be allowed in view of the pace of obsolescence of IT equipment. The SLDCs should also have full autonomy in expenditure for their operational expenses.

3.4.6 The SERCs may thereafter frame regulations for SLDCs as these are essential for ensuring financial autonomy.

4 Monitoring Mechanism for grant of Open Access

4.1 Key issues addressed

4.1.1 A monitoring mechanism for grant of OA is essential for ensuring that OA for Transmission Open Access Users (TOAU) and Distribution Open Access Users (DOAU) is granted in a non-discriminatory manner. In this context, the following issues were discussed by the Working Group:

Issue-1: Devising monitoring mechanism

- Should this be restricted to 'Short Term OA' alone to begin with? (STU is the nodal agency for long-term OA transactions).
- Should a distinction be made in terms of TOA and DOA transactions? How?

Issue-2: Addressing information asymmetry

- Is there any information asymmetry while processing OA applications?
- Have the timelines for grant of OA been adhered to?

4.2 Summary of deliberations

4.2.1 SERCs may need to monitor, on a monthly basis, the manner in which OA cases are handled by nodal agencies.

4.2.2 For visibility of OA transactions, the SLDCs are the best placed to monitor them at the transmission level, whereas for OA transactions at the distribution or sub-transmission level, it is the concerned distribution licensees who are best placed to monitor and facilitate such transactions. Accordingly, many SERCs have ruled that distribution licensees should act as the nodal agencies for DOA transactions whereas STUs and SLDCs should be the nodal agencies for long-term and short-term **TOA** transactions, respectively. In view of this, the Working Group concluded that monitoring of OA transactions should be ensured, and that ensuring transmission open access (TOA) should be prioritised at the start, followed by Distribution Open Access transactions.

4.2.3 Information regarding OA data should be regularly updated on the SLDC websites and reasoning given for rejection of any OA application.

4.2.4 Long-term and short-term OA should not be treated differently as the Act does not discriminate between them. However, the issue of long-term transmission capacity build-up and recovery of transmission charges for varying utilisation patterns under changing electricity market structures needs to be addressed.

4.2.5 The STUs are responsible for planning adequate evacuation facilities and this may be taken up either by the STU or other transmission licensees through private sector participation, both for conventional as well as renewable energy projects.

4.2.6 The SERCs should ensure that SLDCs display information on their websites about available transfer capability on different transmission corridors and flow-gates, particularly for congested lines of transmission licensees, and this information should be updated every month. In addition, SLDCs should also publish information about the rejected OA cases on account of congestion, highlighting the congested elements of transmission system.

4.3 Future course of action

4.3.1 After considering these comments and suggestions, the Working Group concluded as follows:

Recommendations:

4.3.2 It is necessary to first resolve the hurdles being faced in short-term OA on State transmission networks. Accordingly, the SERC should separately monitor the cases for short-term OA in transmission on a monthly basis. The cases for short-term OA in distribution may be monitored in a separate format to also include OA on STU networks. Compilation by the FOR should similarly be done.

4.3.3 Open Access is basically intended to utilise the surplus capacity available by virtue of inherent design margins, margins available due to variation in power flows and margins available due to in-built spare transmission capacity created to cater to future load growth or generation addition. Open Access obviously also requires grid connectivity to be in place. Moreover, long–term access to the transmission system requires grid connectivity, based on long-term commitment to pay transmission charges and sufficient evacuation capacity, and does not require case by case grant of OA.

4.3.4 The software being used by RLDCs for receiving and processing OA applications electronically should also be adopted by SLDCs.

5 Rationalisation of OA charges and regulatory framework

5.1 Background

5.1.1 The FOR held a meeting on the issue of rationalisation of OA charges on November 16 and 17, 2005 when the following recommendations were made:

- State Commissions to endeavour to rationalise various charges and as far as practicable club them into a single charge;
- Till intra-State ABT is implemented, grid support charges, parallel operation charges, and other charges to be clubbed into one charge;
- Once intra-State ABT is introduced, there would be no rationale for levy of such charges;
- For emergency drawal from the grid, charges should relate to period and quantum of energy drawal;
- Wheeling charges and transmission charges to be applied at relevant voltage level. Only technical losses should be applied on the basis of relevant voltage level;
- Losses should be applied in kind; and
- Reactive energy charges for OA users should be on par with other users.

5.2 Key issues addressed

5.2.1 To take this forward, a discussion was initiated on similar lines and the following issues were examined:

Issue-1: Transmission charges and wheeling charges

- Applicability of transmission and wheeling charges
- Principles for determination of transmission and wheeling charges (voltage-wise)

Issue-2: Transmission loss and wheeling loss

- Applicability of transmission and wheeling losses for OA transactions
- Principles for determination of transmission and wheeling losses (voltage-wise)

Issue-3: Cross-subsidy surcharge

- Applicability of surcharge in some cases
- Principles for setting trajectory for reduction in surcharge

Issue-4: Treatment for renewable energy (RE) based OA transactions

- Should any distinction be made for OA charges on RE transactions?
    - For OA charges?
    - For loss compensation?
- Will the distinction lead to discrimination between renewables and conventional OA transactions?

Issue-5: Technical requirements for availing of OA and handling of disputes

5.3 Summary of deliberations

5.3.1 A matrix of OA charges applicable under different circumstances should be specified by SERCs and uploaded on the SERC websites. The computation of total OA charges should be clarified, illustrated with examples. In this context of determination and applicability of wheeling charges, the observations of the Appellate Tribunal for Electricity (ATE) under its Judgement dated October 31, 2007 (Appeal no. 3 of 2007 and IA no. 5 of 2007) on the Appeal filed by Hindalco against WBERC Order, are relevant. The ATE observed that the wheeling charges should be applicable only to the extent of utilisation of network and the OA user should not be asked to bear the cost of the entire distribution network. The relevant extract of the Judgement is as follows:

"11. CESC has various systems for supply of electricity. It has EHT system, 33 KV Distribution System, 20KV, 11KV, 6 KV & 33 KV distribution system and LT system. There is no reason for the Commission to ask the appellant to pay wheeling charges for the entire distribution system when electricity is transmitted through its 33 KV distribution system. It does not stand to reason why 33 KVA consumers should pay for the LT lines which are not being used for transmission of electricity to it. The WBERC has fixed 83.54 paise/KWH as the wheeling charges. The relevant provisions that govern the wheeling charges are Regulations 14.3(b) of the West Bengal Electricity Regulatory Commission

(Terms and Conditions) Regulations, 2005 and clause 4.2 of the West Bengal Electricity Regulatory Commission (Terms and Conditions for Open Access – Schedule of Charges, Fees and Format for Open Access) Regulations, 2005.

………………

14. The aforesaid Regulations do not state that the wheeling charges are to be based on total or entire network cost. The Judgment rendered by the Tribunal dated July 11, 2006, clearly lays down that cost shall be calculated on the basis of 'applicable network.' Simple question to be asked is, which is the 'applicable network' for transmitting electricity to the appellant. The answer obviously is that applicable network is the 33 KV distribution system on which the electricity is being rolled to the appellant. No further elaboration is required."

5.3.2 Losses for transmission and wheeling should be applied on the basis of applicable voltage for delivery of power at 11 kV and above. However, for OA at LT voltage, the losses at 11 kV may only be considered. Open Access transactions should not be subjected to commercial losses prevalent in the system. Accordingly, only technical losses based on estimate or voltage-wise technical studies should be applied for OA transactions. For OA outside DISCOM, additional inter-State and intra-State transmission losses shall be applicable.

5.3.3 The 'FOR' secretariat has analysed the surcharge applicable in different States. A comparison of cross-subsidy surcharge across States has been summarised in **Annexure-4**.

5.3.4 A summary of all OA charges for sample illustration of 11 kV OA consumer in three States has been compiled by the FOR secretariat in **Annexure-3(A)**. It is evident that despite a reasonable quantum of OA charges, OA transactions are limited mainly due to non-availability of surplus power in the system.

5.3.5 In order to promote renewable energy sources in the State, preferential OA charges may be considered. However, the loss compensation should be uniform across all types of OA transactions depending on the loss at each voltage level.

5.4 Future course of action

5.4.1 After considering these comments and suggestions, the Working Group concluded as follows:

Recommendations:

5.4.2 The applicability of transmission and wheeling charges in different cases of OA should be clarified in the Orders of the SERCs with the help of illustrations. Such a matrix has been provided by MERC and TNERC in their Orders, which are in Annexure-3(B). All SERCs should display illustrative cases of applicable OA charges on their websites for sample consumer categories.

5.4.3 Losses for transmission and wheeling should be applied on the basis of voltage for delivery of power at 11 kV and above. However, for OA at LT voltage, the losses at 11 kV may only be considered as most losses below this voltage level are commercial losses and OA consumers should not be asked to bear these. Only technical losses, based on estimate or voltage-wise technical studies, should be applied for OA transactions.

5.4.4 To promote RE sources, the transmission and wheeling charges may be partly waived for OA transactions based 1on non-firm, that is, non- schedulable RE sources with lower capacity utilisation factors for wheeling of power within the State. However, transmission and wheeling losses may be applied uniformly based on voltage level. Further, in case RE is being sold to other States, no concession in transmission and wheeling charges need be given to RE projects, since the State utilities may have spent significantly to evacuate the power generated by the RE project.

5.4.5 The cross-subsidy surcharge needs to be calculated in accordance with the formula in the Tariff Policy, unless there are valid reasons for deviation. In case there is shortage of electricity, there is no rationale for imposition of any surcharge since the licensee is unable to serve the entire needs of the consumer who is forced to source the remaining quantum from other sources.

5.4.6 The cross-subsidy surcharge should reduce progressively as stipulated in section 42 of the EA 2003 and also the Tariff Policy. The surcharge rates should be notified in advance for the next few years to provide confidence to OA consumers. Some SERCs as in Rajasthan have already done this.

5.4.7 There is urgent need to ensure uniformity of technical requirements of metering, data communication etc. for OA applicants across the country. Therefore, SERCs may review their Grid Codes and OA Regulations to make them consistent with the Grid Code specified by CERC as provided in section 86(1)(h) of the EA 2003 and the Metering Regulations specified by CEA.

5.4.8 All disputes concerning intra-State OA would come before the concerned SERC under its relevant regulation. Similarly, all disputes in inter-State OA should come before CERC, including the role of SLDC, in such cases.

6 Facilitative standby power supply arrangement

6.1 Background

6.1.1 In the absence of a stipulation of Standby Power Supply arrangement and charges, incumbent licensees may levy high standby charges in the event of failure of OA supply, so as to discourage OA. Hence, the need for Facilitative Standby Power Supply was felt.

6.1.2 Besides, para 8.5.6 of the Tariff Policy stipulates that:

> "*In case of outage of Generator supply to a consumer on open access, standby arrangements should be provided by the licensees on the payment of tariff for temporary connection to that consumer category as specified by the Appropriate Commission*".

6.2 Key issues addressed

6.2.1 In view of this, the following issues were discussed by the Working Group:

Issue -1: Clarity on various aspects of standby power

- Purpose of standby power – capacity or energy or both?
- Extent of standby power and reduction in contract demand
- Maximum and minimum period for standby power supply

Issue -2: Requirement of standby power

- Distinction between TOAU and DOAU

Issue -3: Operationalising standby power supply arrangement

- Operationalising standby power supply arrangement under multi-discom scenario
- Who provides standby support?
- Compensation requirements of host distribution licensee
- Banking vs. standby in case of RE sources
- Alternatives for pricing of standby power supply arrangements

6.3 Summary of deliberations

6.3.1 SERCs may evaluate Temporary Connection charges vis-à-vis marginal cost of power procurement for standby power supply arrangements for OA transactions.

6.3.2 Standby capacity should be equated to captive capacity or OA capacity contracted by the OA consumer.

6.3.3 Temporary tariff in many States is too high whereas the spirit of the Tariff Policy is to ensure that excessive OA charges should not render OA a non-starter. Thus standby power should be charged at marginal tariff and there should be no fixed burden for availing of standby support. A detailed description of the methodology for standby support as prescribed by TNERC is enclosed in Annexure-5.

6.3.4 The duration of standby support should also be fixed while ensuring that such energy drawal takes place only under forced or planned outage period.

6.4 Future course of action

6.4.1 After considering these comments and suggestions, the Working Group concluded as follows:

Recommendations:

6.4.2 The Tariff Policy seeks to ensure that excessive OA charges should not render OA a non-starter. Hence, the standby arrangement for OA consumers should be provided by the incumbent licensee to the extent of OA load sanctioned at day ahead notice, by levying the retail tariff applicable for consumer categories only for the period when such standby support is requested. This would harmonise the approach towards temporary connection charges envisaged in the Tariff Policy. To avoid misuse of standby support, it should be provided for a maximum period of six weeks in a year, to be counted on the basis of number of days. Beyond this duration, the OA consumer should have to avail of regular supply from the distribution licensee.

6.4.3 Standby support should also be extended only to OA consumers; OA generators would need start-up power support.

6.4.4 The charges for standby power support should comprise only energy charge for the days when standby support is requested, and the demand charge for the six-week period may be uniformly spread across the year. No fixed demand charges should be levied on OA consumers beyond this period of six weeks.

7 Summary of Recommendations

This section summarises the recommendations of the Working Group:

7.1 Capacity building at SLDC

7.1.1 The minimum qualifications and certification of competence of personnel to be deployed in RLDCs should be incorporated in the Grid Code. This may be done first by the CERC and this would serve as a model for SERCs.

7.1.2 A model scheme has been prepared for technological upgradation of SLDCs to provide appropriate connectivity for transmission of data relating to system operations up to SLDCs. This scheme could be sent to all SLDCs for implementation for which CTU would provide technical guidance.

7.1.3 The recommendations of the Committee constituted by the Ministry of Power on Manpower, Certification and Incentives for System Operation and Ring-fencing of LDCs, for staffing pattern, organisation structure and incentives to attract qualified personnel in LDCs may be considered by the SERCs while approving the budgets of SLDCs. A template for periodical training of personnel deployed in LDCs needs to be prepared in line with the recommendations of this Committee, to include system operation, market operations, logistics and regulatory matters.

7.2 Ring-fencing of SLDC for functional independence

7.2.1 For effective ring-fencing of SLDCs, there is an urgent need to delegate financial powers to SLDCs and also an appropriate reporting system for administrative control and recording of confidential remarks. The SLDCs may remain under the administrative control of STUs until a separate government company is established for their operation. The creation of a subsidiary of the transmission utility can work as a stop-gap arrangement during the transition phase. However, in the long run, a separate entity for system operation and load despatch will have to be created at the Central and State levels.

7.2.2 During the transition phase, for proper ring-fencing of SLDCs, the practice of their reporting to STUs along with Discoms or state trading companies should be discontinued. Irrespective of whether the SEB has been reorganised or not, the reporting channels right up to the top for SLDCs and Discoms have to be separate and distinct, in terms of both position and top management personnel. This may be formally communicated to the State governments by the ERCs as advice under section 79 and 86 for promoting competition through OA.

7.2.3 State governments need to ensure that SLDCs do not report directly or indirectly to any other power sector entity such as distribution or trading licensee. The reporting requirements ought to be kept similar to the reporting pattern for State Electoral Officers under the Election Commission.

7.2.4 State governments should phase out the single buyer model with definite timeframe, to pave the way for multi-buyer and multi-seller market models within the State, as the single buyer model creates a conflict of interest and brings pressure upon SLDCs to favour incumbent distribution licensees.

7.2.5 CERC may formulate regulations for fees and charges levied by RLDCs to ensure that they not only recover operating and capital servicing costs but also generate surpluses to provide equity for future investments. The State governments should also establish separate investment funds for SLDCs apart from transfer of existing assets. The revenues for SLDCs, excluding operational expenses, should be escrowed to such a fund. Lenders would be willing to fund capex expansion plans of SLDCs, as approved by ERC, on the basis of such funds. Depreciation should be allowed in view of the pace of obsolescence of IT equipment. The SLDCs should also have full autonomy in expenditure for their operational expenses.

7.2.6 The SERCs may thereafter frame regulations for SLDCs as these are essential for ensuring financial autonomy.

7.3 Monitoring mechanism for grant of open access

7.3.1 The SERCs should monitor cases for short-term OA in transmission separately, on a monthly basis. Cases for short-term OA in distribution may be monitored in a separate format which may also include OA on STU networks. Compilation by the FOR may similarly be done.

7.3.2 Open Access is intended to utilise the surplus capacity available by virtue of inherent design margins, margins available due to variation in power flows, and margins available due to in-built spare transmission capacity created to cater to future load growth or generation addition. Hence, OA will also require grid connectivity. Long–term access to the transmission system requires connectivity to the grid based on long-term commitment to pay transmission charges and sufficient evacuation capacity, and does not require case by case grant of OA.

7.3.3 The software being used by RLDCs for receiving OA applications electronically and for processing them should be adopted by the SLDCs.

7.4 Rationalisation of OA charges

7.4.1 The applicability of transmission and wheeling charges in different cases of OA should be clarified in the Orders of the SERCs with the help of illustrations. All SERCs should display illustrative cases of OA charges on their websites for sample consumer categories.

7.4.2 Losses for transmission and wheeling should be applied on the basis of applicable voltage for delivery of power at 11 kV and above. However, for OA at LT voltage, the losses at 11 kV may only be considered as most losses below this voltage level are commercial losses and OA consumers should not be asked to bear them. Only technical losses, based on estimate or voltage-wise technical studies, should be applied for OA transactions.

7.4.3 To promote RE sources, the transmission and wheeling charges may be partly waived for OA transactions based on non-firm, that is, non- schedulable RE sources with lower capacity utilisation factors for wheeling of power within the State. However, transmission and wheeling losses may be applied uniformly based on applicable voltage level. Further, in case RE is being sold to other States, no concession in transmission and wheeling charges need be given to RE projects.

7.4.4 The cross-subsidy surcharge needs to be calculated in accordance with the formula in the Tariff Policy, unless there are valid reasons for deviation. In case there is shortage of electricity, there is no rationale for imposition of any surcharge as the licensee is unable to serve the entire needs of the consumer, and the consumer is forced to source remaining quantum from other sources.

7.4.5 Cross-subsidy surcharge should reduce progressively as stipulated in section 42 of

EA 2003 and the Tariff Policy. The surcharge rates should be notified in advance for the next few years to provide confidence to OA consumers.

7.4.6 There is urgent need to ensure uniformity of technical requirements of metering, data communication etc. for OA applicants across the country. The SERCs may review their Grid Codes and OA regulations to make them consistent with the Grid Code specified by CERC as provided in section 86(1)(h) of EA 2003 and the Metering Regulations specified by CEA.

7.4.7 All disputes of intra-State OA would come before the SERC under its regulations. Similarly, all the disputes in inter-State OA should come before the CERC, including the role of SLDCs in such cases.

7.5 Facilitative standby power supply arrangement

7.5.1 Standby arrangements for OA consumers should be provided by the incumbent licensee to the extent of OA load sanctioned at day ahead notice, by levying the retail tariff as applicable to respective consumer categories only for the period during which such standby support is requested. This would harmonise the approach towards temporary connection charges envisaged in the Tariff Policy. To avoid misuse of standby support, it should be provided for a maximum period of six weeks in a year, to be counted on the basis of number of days. Beyond this duration of six weeks, the OA consumer should avail of regular supply from the distribution licensee.

7.5.2 Standby support should be extended only to OA consumers; besides, OA generators would need start-up power support.

7.5.3 The charges for standby power support should comprise only energy charges for the days when standby support is requested, and the demand charge for the six-week period may be uniformly spread across the year. No fixed demand charges should be levied on OA consumers beyond this period of six weeks.

ANNEXURES

ANNEXURE-1: Technological Upgradation requirements

Annexure-1.1: ULDC Control Centre Upgrade -Summary

1. **BACKGROUND**:

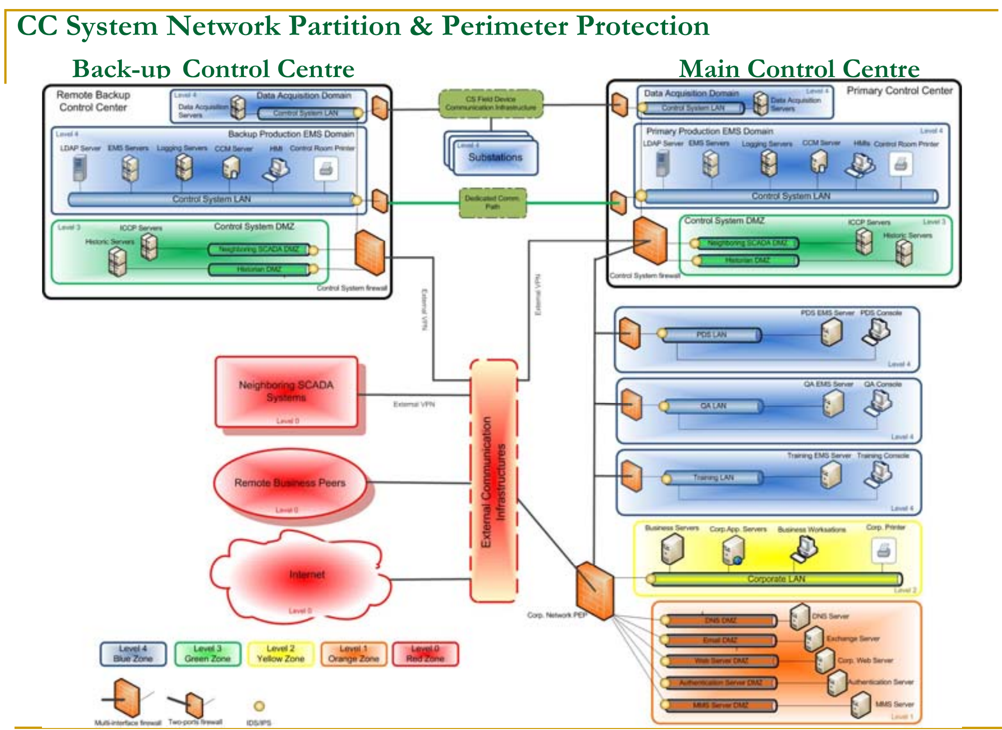
- POWERGRID established ULDC schemes in all five (5) regions in close association with State Power utilities.
- The control centers were in a hierarchical manner - Regional Load Despatch Center (RLDC), State LDC, Sub LDC – a three (3) level hierarchy.
- The scheme established Control Centers, Remote Terminal Units, PLCC, Optic Fiber cable and Microwave Communication network.
    - The RTUs acquire and forward (analog & digital data) voltage, frequency, MW, MVAR, breaker & isolator etc. to nearest control centre (Sub-LDC/ SLDC/RLDC) over PLCC and or digital communication channels in real time.
    - The Dual Redundant control centre hardware (SCADA/EMS ISR, NMS, ICCP servers with peripheral and VPS) are interconnected on LAN.
    - The control centers are connected through digital communication links over OFC and Microwave.
    - All the existing substations and generating stations of the central sector were covered under ULDC scheme. Substations/generating stations of central sector commissioned subsequent to commissioning of ULDC projects have also been integrated with the SCADA system of ULDC.
    - In the state sector the only selected substations were included in the ULDC project and many of the substations commissioned after commissioning of ULDC project have not been integrated with the SCADA system.

2. Issues:

The existing control centres were designed during 1996-2002 period, prior to ABT introduction. These control centres have the provision for expansion. The wide band communication facilities created under ULDC covers only around 30-40% of the RTU locations. The following environmental changes impact functionality for a LDC:

- **Structural Changes** in the Power Sector and phenomenal growth in system (load, stations, lines)
- **Decentralized Scheduling** & Frequency Band Regime- ABT
- **Electricity Act 2003** –
    - Traders introduced
    - Open access in transmission introduced.
    - Granting of Short Term Open Access is responsibility of LDC.
    - Available Transfer Capacity calculation vital and declaration required
    - Power Exchange information need integration
- **Information Availability** to several users is required necessitating Web Interface to SCADA system and associated security tools.

These issues can be addressed with changes in the LDC by introducing new architecture with network partition for SCADA/EMS, Web and control centre interface; applications for security, logging, authentication etc. (The suggested structure **is meant for Transmission System Operation** and need to be reviewed if Distribution Company's requirement is also to be addressed)



Source – VLPGO/CIGRE D2.24

3. **Approach**

The approach to handle control centre communication and stations (RTU) need to be different as elaborate below:

- **Power System Interface (Station):** Power System is Dynamic and control centre can not wait for en block addition/replacement of existing SCADA/RTU system.

The present scheme was designed with feature of expandability and interoperability. By defining interoperability parameters, control center and RTUs can be integrated with the existing system. This approach shall continue for monitoring new stations and utilities. However, the existing substations which have yet not been integrated with control centres would require integration immediately.

- **Control Centre**: An introduction of backup SLDC to address business continuity aspect and security issues. The backup SLDC, for SLDCs with immediate need of upgrade, can add functional flexibility and in future the same can take over as main SLDC with all features. An existing Sub-LDC can also be replaced through redundancy in communication. Further all the New control centre upgrade need to target:
    - Main and Back-up control centre
    - Structure with security feature
    - Full SCADA functionality with ABT & UI
    - Network and Reliability Application
    - PMU integration

  The database handling can be harmonized by standardizing the data model using CIM in Indian Context and centralized server for data modeling as service at all RLDCs.

- **Communication Infrastructure:** This shall be continuously upgraded on need basis. In case of multiple new RTUs access communication links have to be augmented with sufficient redundancy. Other issues for improvement in communication infrastructure are:
    - PLCC Congestion- New Wideband Node to be created
    - Microwave- To be replaced by OFC as Frequency band taken back by DOT
    - Network Redundancy is required in most of the cases.

The wide band communication network needs to be expanded on the following basis.

- All important EHV s/s may be connected on OPGW based fibre optic network at least from one direction.
- All critical grid EHV s/s may be connected on OPGW based fibre optic network atleast in two directions.
- All end user equipment shall use/be compatible with IP protocol.
- Future technology based upon WAMS would work only on FO based communication network.

4. **Cost:**

Control Center Cost Projection: Cost for Control Center up gradation needs to be based on the following issues:

- Vendor inputs as required for realistic cost calculation.
- Cost should have consideration for product Life cycle.
- Parallel creation of Control Centers.
- Communication
- No of substations where RTUs are to be installed.

There is a need of adjustment for Annual Maintenance cost, escalation and addition for new application software e.g. Markets, power tracing. The Communication cost varies greatly with choice of network. However, it would be advisable that all the new substations are provided with either substation automation system or RTU for data communication with the control centres along with the substation equipment and the new transmission lines are provided with OPGW in place of earth wire so as to avoid enblock requirement of RTUs and communication infrastructure.

5. Future Technology:

Transmission Grids require sufficient and reliable capacity to support vital energy markets, and maintain high system reliability. In pursuit of better utilization of existing transmission system, grid needs to be operated closer to its **technical limit** while maintaining system security. Hence:

- Steady state view of SCADA systems needs to be replaced by faster, additional and more precise information through uses of Wide Area Monitoring Systems (WAMS) using Phasor Measurement Units - PMUs.
- POWERGRID has undertaken initiative to infuse PMUs for better monitoring and control of Indian Grid.
- The wide area control system (WACS) supported by a developed IT & Communication resource, have potential to replace present day Grid SCADA solutions.
- The control Centre Needs to be ready for future infusion of above technology.

Annexure-1.2: SLDC Upgradation requirements

State Load Dispatch Centre

Meeting Future Expectations

Tools existing in Rajasthan SLDC (Heerapura)

SCADA FUNCTIONS

- DATA ACQUISITION
- SUPERVISORY CONTROL
- DATA EXCHANGE WITH CC
- HISTORICAL INFORMATION STORAGE & RETRIEVAL (ISR)

EMS FUNCTIONS

1. OPERATION SCHEDULING
2. LOAD GENERATION BALANCE
3. POWER SYSTEM ANALYSIS

NMS

Sub LDC :

1. SCADA ONLY

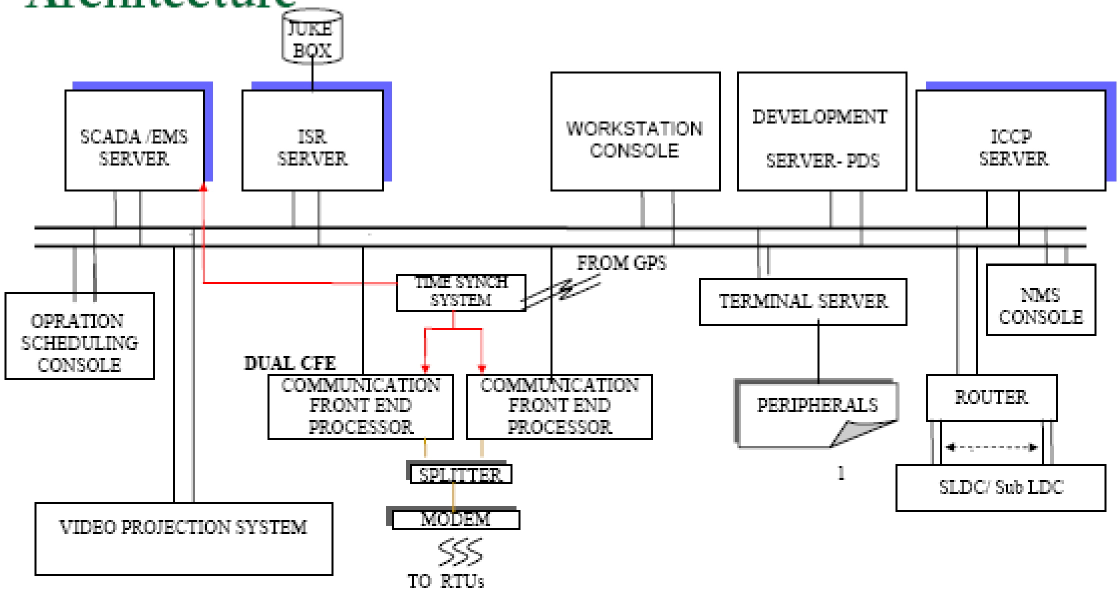
Control Centre need to be upgraded for:

- **Power Sector Growth:**
- Existing RTU (400/220/132kV) : 75 no
- Stations (400kV/220kV/generating station):
- **New Requirement:**
- A new Efficient Whole Sale Electricity Market is expected to operate.
- Multifold increase in Open Access Requirement need new tools integrated with SCADA/EMS.
- **Technological Challenge:**
- Emergence of 68510 & IEC-104, Cyber security, Web interface:
- Power Data Warehouse Needs to be created for various corporate user/ Stakeholders/ web users etc.

Control Centre: Needs to Evolve

- To meet the future demand
- To find & implement the end-state of Future EMS Architecture.
- To provide a high level of interoperability between:
  - RTU to SCADA (Existing)
  - Between control centre
    - Real Data Exchange SCADA to SCADA (ICCP) - existing
    - Data modeling among heterogeneous system - required
    - Within control center application to application - required.
- New technology issues: -
  - RTU-SCADA-only 101 interface
  - IEC-104 & 68510 Required
  - Cyber security required

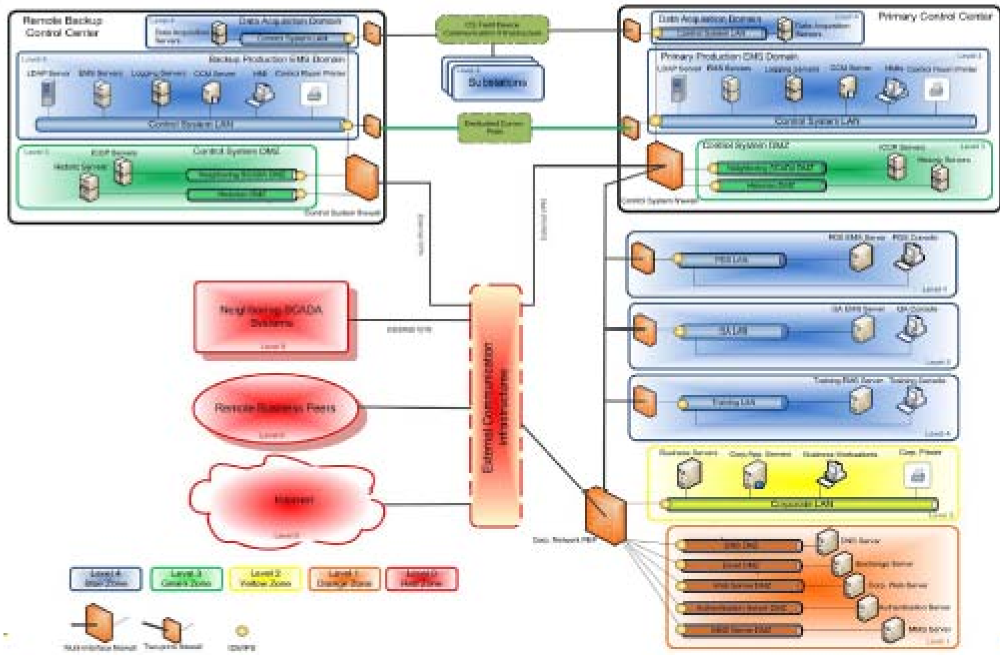
Existing- SLDC CONTROL CENTRE Architecture



Next Generation Control Centre :

- Control Centre Network partition
  - To facilitate security policies
- Control Centre Application Architecture
  - "A Standard integration layer" based solution.

CC System Network Partition & Perimeter Protection



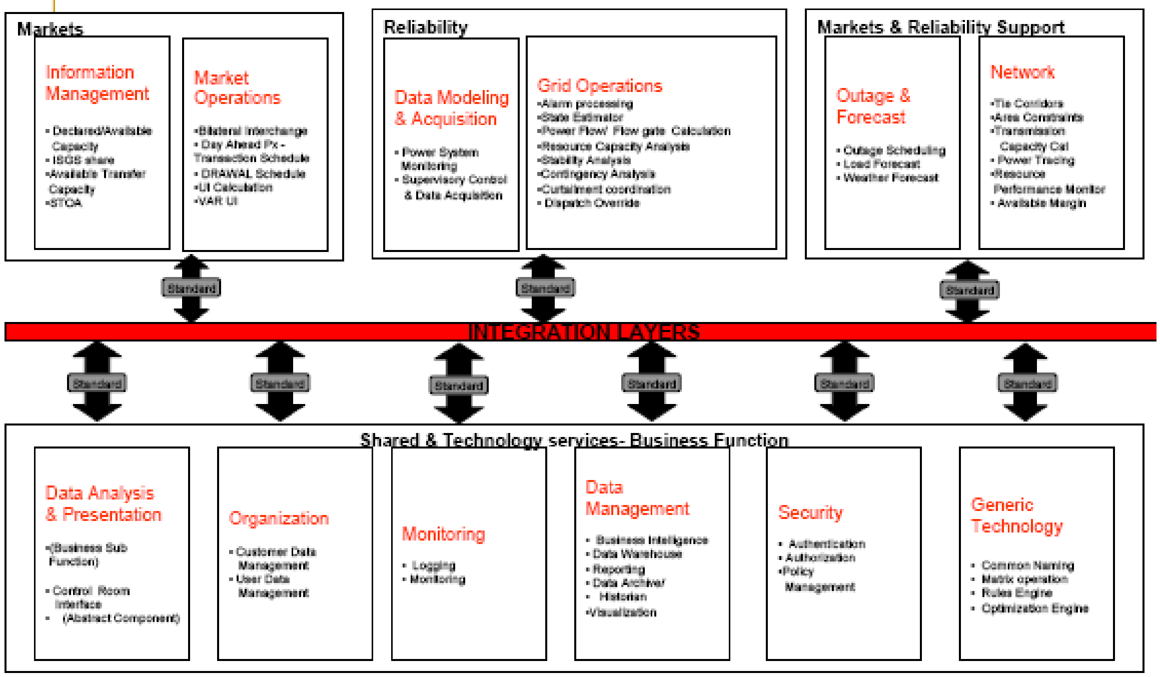
Source: CIGRE Paper WGDD2.24- EMS Architecture

The GAP

Between Present & Future Solution:

- Solution for Market Management –Still evolving.
- Pre internet Architecture design makes existing EMS/SCADA platform vulnerable to cyber attacks.
- Standardised Data models representing electricity network - CIM
- Multiplicity of GUI at present needs to be replaced by similar GUI.
- State estimation to state measurement

High Level/ Futuristic Architectural Overview



Salient Features of Future Control Centre Architecture:

- SOA Adoption - Service Oriented Architecture will be built around highly modularized, reusable components over a standardized messaging bus or "A standard Integration Layer".
- CIM Compatibility – System Vendors & 3rd party providers will adopt the Common Information Model.
- Built-In-Security - System Resistant to cyber attacks
- Platform Independence – It will facilitate the implementation of multi vendor solution & migration of business logic to future tech.
- Unified Graphical Interface: Dispatchers will have an application independent user interface.
- PMU Support: This architect will accommodate the high performance requirement associated with Synchrophasors.

Annexure-1.3: Communication Upgradation Requirements

PRESENT vs FUTURE NATIONAL SCENARIO

DESCRIPTION	PRESENT	FUTURE (by 2012)
S/s connected with data contol centres	1250	2500
Control Centres	29	29
Fibre Optic Transmission System (FOTS) for ULDC	9383 kms	25038
Microwave (MW) for ULDC	165 HOPS	-
Communication Types	Async/ Sync	IP based alongwith Sync/Async.
Bit rate	300bps - STM 1/STM4 (155/625Mbps)	10-20 Gbit/s
Media RTU-CC	PLCC/MW	Analog & Digital PLCC / FO/ unlicensed Radio
CC-CC	MW/FO	FO

CURRENT COMMUNICATION TECHNOLOGIES

- Fiber Optic Transmission Systems based on STM1/STM4 capacity.
- MW in 2.3 -2.5 GHZ with 4 E1 capacity.
- Analog PLCC with 300 -1200 bps
- Standard 2 W/4W phones, Fax machines
- Different interfaces like V.35, V.21, RS232, G.703, Ethernet.
- Presently only 1/3 RTUs are on wide band nodes.
- Digital PLCC equipment with flexible interfaces, embedded Protection Signaling besides the speech over data channels.
- Unlicensed band radio equipment in 2 & 5 GHz limited to short spans & dispersed users.

CONSTRAINTS FORESEEN

• Growth in data for SCADA and other Value-Added Services (VAS) like e-mail, internet, VOIP, on-demand services etc. can only be met with the fiber optics based network.

• Seamless communication required w.r.t existing and upcoming interfaces, technologies & media.

• Limitations of existing wireless networks upto 4 E1 only in the 2.3 -2.5 GHz band. This band is being withdrawn by the regulatory body in the near future.

• PLCC links becoming congested due to frequency crunch & low bandwidth.

• Futuristic technologies such as Wide Area Measurement (WAM), System Integrated Protection (SIP) etc. can work successfully only on Fiber Optic.

• IT based enabling & flexibility of user databases/presentations desired.

CRITERIA FOR FUTURE REQUIREMENTS

• All wideband networks shall be fiber optics based as the regulator has proposed not to use the 2.3 -2.5 Ghz Microwave band in Power Sector and in view of meeting the requirements of the futuristic technologies.

• All Important EHV s/s may be connected through OPGW based fiber optic network at least from one direction.

• All Critical grid EHV s/s may be connected through OPGW based fiber optic network from at least two directions for redundancy.

• Wide-Area Measurement Systems (WAMS) require more bandwidth and least latency. This can only be achieved through fiber optic networks.

• All end user equipment shall use / be compatible with IP protocol.

COST & EXPANSION PROJECTIONS

• Utilities like MSETCL, UPPCL have planned state-wide OPGW based fiber optic n/w for future grid s/s & g/s which are more than two –fold of the present network.

• The average length of OPGW based fiber n/w for such large sized states is approximately 2500 kms per state.

• The average cost of OPGW based fiber optic n/w for such large sized states is Rs 150 crores per state.

• The state-wide growth in the substations to be covered under SCADA is also seen as 100%.

• The communication cost per s/s is approximately Rs 40 lacs based on the above criteria, which is negligible as compared to the cost of the s/s.

Annexure-2: Report of Committee on Ring-fencing of LDCs:

Manpower Requirement at LDC

Top management- Expert level (5)

S. No	Position	Department	Level	No.
1	Head- LDC	–	E8- E10	1
2	Divisional Head- System Operation	System Operation	E7- E8	1
3	Divisional Head- Market Operation	Market Operation	E7- E8	1
4	Divisional Head- System Logistics	Logistics	E7- E8	1
5	Divisional Head- Establishment Services	Services	E7- E8	1

Middle management- Proficient level (15)

S. No	Position	Department	Level	No.
6	Shift Charge Manager- Real-time	System Operation	E6 - E7	5
7	Chief- Reliability Coordinator	System Operation	E6- E7	1
8	Chief- Grid Ancillary Services Coordinator	System Operation	E6- E7	1
9	Chief- Open Access & Scheduling Coordinator	Market Operation	E6- E7	1
10	Chief- Settlement System Coordinator	Market Operation	E6- E7	1
11	Chief- Pool Account Administrator	Market Operation	E6- E7	1
12	Chief- Logistics (SCADA)	Logistics	E6 - E7	1
13	Chief- Logistics (IT & Communication)	Logistics	E6 – E7	1
14	Chief- Establishment Services	Services	E6 - E7	1
15	Chief- Regulatory Affairs	Services	E6- E7	1
16	Chief- Human Resources	Services	E6- E7	1

Executives-Basic level [Real-time]- (15)

S. No	Position	Department	Level	No.
17	Executive- Power System Security	System Operation	E2 - E5	5
18	Executive- Resource Scheduling	Market Operation	E2 – E5	5
19	Executive- Open Access	Market Operation	E2 – E5	5

Executives- Basic level [Off-line] – (33)

S. No	Position	Department	Level	No.
20	Executive- Grid Ancillary Services	System Operation	E2 - E5	1
21	Executive- Analysis & Offline Simulations	System Operation	E2 – E5	1
22	Executive- Energy Management System	System Operation	E2 – E5	1
23	Executive- System Protection Coordination	System Operation	E2 – E5	1
24	Executive- Planned Outage Coordination	System Operation	E2 – E5	1
25	Executive- Dispatcher Training Simulator	System Operation	E2 – E5	1
26	Executive- Documentation	System Operation	E2 – E5	1
27	Executive- Power System Information	System Operation	E2 – E5	1
28	Executive- Coordination Committee	System Operation	E2 – E5	1

S. No	Position	Department	Level	No.
29	Executive- Metering System Design	Market Operation	E2 – E5	1
30	Executive- Metering System Maintenance	Market Operation	E2 – E5	1
31	Executive- Meter data Collection	Market Operation	S1 – E2	1
32	Executive- Meter data Validation & Processing	Market Operation	S1 – E2	1
33	Executive- Energy Accounting	Market Operation	E2 – E5	2
34	Executive- Settlement	Market Operation	E2 – E5	1
35	Executive- Pool Account Administration	Market Operation	E2 – E5	1
36	Executive- SCADA Hardware	Logistics	E2 – E5	1
37	Executive- SCADA Software	Logistics	E2 – E5	1
38	Executive- Telemetry	Logistics	E2 – E5	1
39	Executive- Online Database Development	Logistics	S1 – E2	1
40	Executive- Online Database Maintenance	Logistics	E2 – E5	1
41	Executive- IT software development	Logistics	E2 – E5	1
42	Executive- IT systems maintenance	Logistics	S1- E2	1
43	Executive- Applied R & D	Logistics	E2 – E5	1
44	Executive- Communication System	Logistics	S1 – E2	1
45	Executive- LDC Fees and Charges	Services	E2 – E5	1
46	Executive- Human Resource Management	Services	E2 – E5	1
47	Executive- Law and Regulatory Affairs	Services	E2 – E5	1
48	Executive- Procurement & Outsourcing	Services	E2 – E5	1
49	Executive- Administration (Library, Canteen, DG etc.)	Services	E2 – E5	1
50	Executive- Establishment (Payroll, claims, incentives)	Services	S1 – E2	2
51	Executive- CSR, Renewables, Energy Efficiency	Services	E2- E5	1

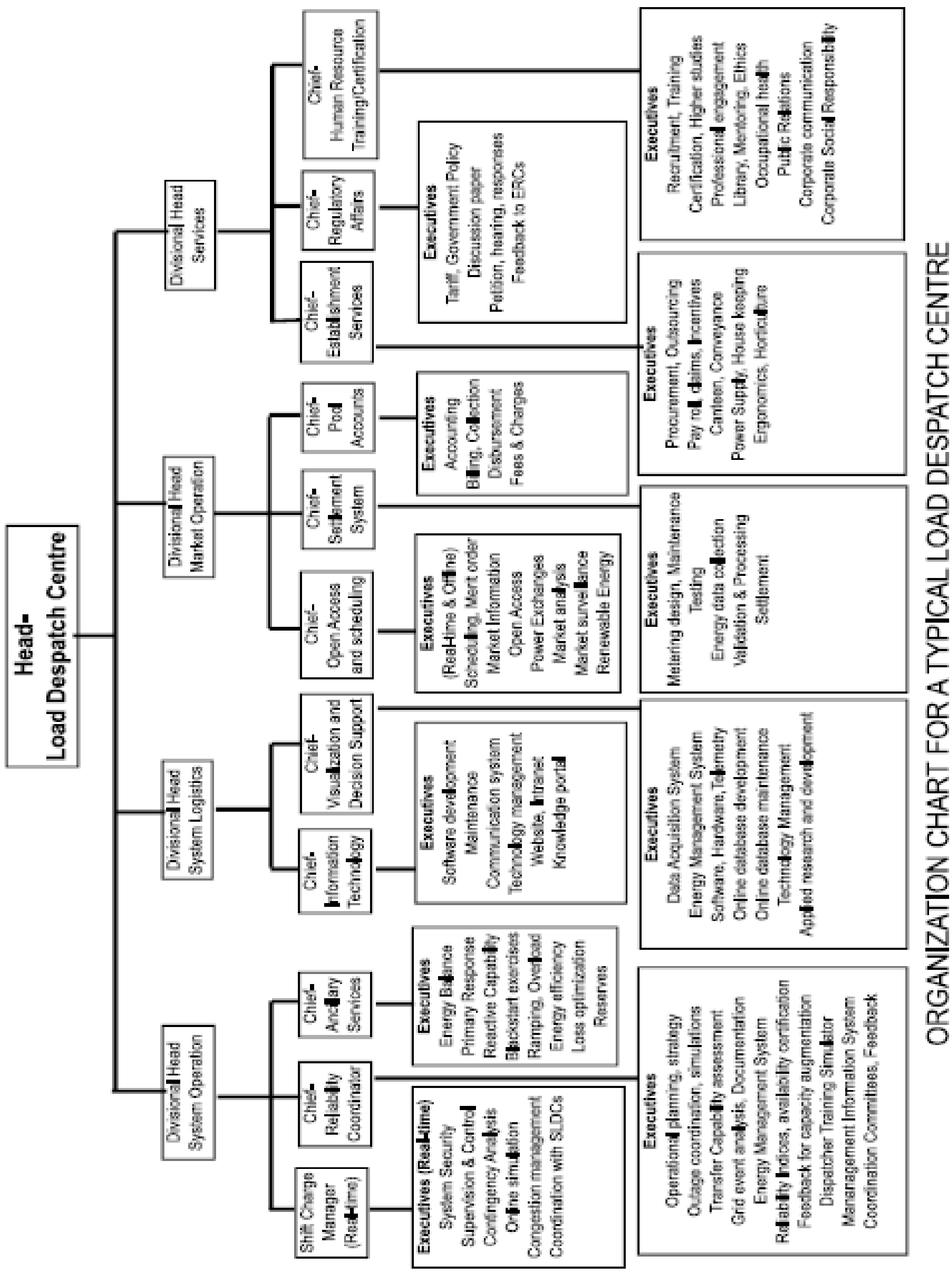
Total executives in a typical LDC: 60 - 70

Total estimated number for all India with 39 control centres: 2250 - 2750

Assumptions:

LDCs would focus on their core activities and outsource the routine and non-core activities to improve their productivity.

Typical Organisation Structure for LDC



Annexure-2.1: Compensation Structure and Incentive for LDC personnel

Recommendation-4:

The highly specialised technical nature of LDC function necessitates a suitable compensation structure to attract and retain talent. The Committee recommends:

a) The compensation structure for LDC personnel should be substantially higher than comparable companies in the power sector both in the public as well as private.

b) Apart from compensation structure, innovative incentive schemes, such as sabbaticals for higher learning and opportunities for Professional Engagement (PE) in the form of attending seminars/workshops and conferences both in India and abroad must be provided.

c) Once the certification system is introduced, monetary incentives similar to Air Traffic Controllers can be provided to the System Operators based on their ratings.

Annexure-2.2: Training Requirements for LDC personnel

Recommendation-3:

The Committee recommends:

a) Introduction of a system of certification of System Operators by an independent Central body, similar to the system followed in case of Air Traffic Controllers.

b) Establishment of a Central Institute for training of System Operators. Initially, the National Power Training Institute (NPTI) may be entrusted with the responsibility of training and certification.

c) Within the next one year, all the course material, system and procedures required for administrating a 'basic level' of training and certification should be developed.

d) All LDCs must ensure that all the personnel of LDCs undergo this 'basic level' training and certification and only certified personnel staff the LDCs within two years from the release of this Report. The appropriate Electricity Regulatory Commissions would be furnished with an Annual Compliance Report of this requirement. Subsequently, advanced level training and certification programme must be introduced.

e) Fresh recruitment at regular intervals for lowering the average age of the work force in the LDCs.

f) Introduction of suitably designed courses in the Indian Institute of Technology and National Institutes of Technology for ensuring availability of skilled manpower.

g) Active collaboration of LDCs with educational institutes for research and development related to Indian power system and electricity market operation.

Annexure-2.3: Organisational Structure for SLDCs

Recommendation-1:

The Committee recommends that the LDCs should be ring-fenced suitably to ensure their functional autonomy by taking the following steps:

a) The Appropriate Government should take suitable steps to facilitate independent functioning of the Load Despatch Centres in line with the Electricity Act 2003 and National Electricity Policy. To begin with, the State Governments are urged to create a separate representative board structure for governance of LDCs on the lines of wholly owned subsidiary being created for the independent System Operation of RLDCs and NLDC.

b) The financial accounts should be separated for all LDCs by 31st March 2009, with the Appropriate Electricity Regulatory Commissions (ERCs) specifying the fees and charges payable.

c) Capital Expenditure (CAPEX) plans for modernisation of all LDCs during 2009-12 should be submitted and the approval of the respective Electricity Regulatory Commission (ERC) should be obtained by 31st March 2009. The Central Transmission Utility (CTU) and Regional Load Despatch Centres (RLDCs) should extend the necessary assistance to SLDCs in this area.

d) In the next stage, rolling 5-year CAPEX plans should be prepared by each LDC and got approved by the respective ERCs to take care of the system expansion, associated real-time data requirements as well as technological innovations and obsolescence of control centre equipment. ERCs may examine CAPEX proposal considering a shorter life cycle of 7-10 years for such equipment.

Annexure-2.4: Ensuring Financial Independence of SLDCs

Recommendation-2:
For making LDCs financially self-reliant, the Electricity Regulatory Commissions (ERCs) should recognise the three distinct revenue streams:

e) Fees and charges for system operation.

f) Tariff for decision support system and IT infrastructure (currently only ULDC tariff)

g) Operating charges for scheduling, metering and settlement for market players.

All Generating Companies and licensees using the services of the LDCs would make all the above payments. In addition, the LDCs could provide value added services (studies, manpower development, reports, access to data archives etc.) on chargeable basis.

Annexure-2.5: Suggested Principles for SLDC Fees and Charges

(a) SLDC charges and Fees can comprise three components

i. Registration or Connection Fees

ii. Annual SLDC Fees – corresponding to annualized capital cost recovery component linked to 'specified period' to be payable on semi-annual basis.

iii. SLDC Operating Charges – corresponding to annual operating costs recovery component comprising Employee expense, R&M expense, A&G expense, interest on working capital and RLDC fees and charges, payable monthly in arrears.

(b) **Annual SLDC Fees** – shall be determined based on annualized capital cost recovery component based on approved capex schemes and approved 'specified period' for annualisation depending on nature of scheme. The annualized capital cost shall comprise cost of amortization over specified period, interest and financing cost including return on equity, if any. The SLDC should submit investment plan alongwith capex plan for approval for each scheme separately, for capex amount exceeding say, Rs 250 Lakh. Annual SLDC fees should include depreciation on capitalized costs and interest cost of borrowing corresponding to SLDC assets and return on equity, wherever applicable. Until separate accounting for SLDC function is maintained, STUs will have to submit 'Allocation Statement' for asset base and operating costs corresponding to SLDC function.

(c) **SLDC Operating charges** - corresponding to annual operating costs comprising Employee expense, R&M expense, A&G expense, interest on working capital and RLDC related fees and charges, payable monthly in arrears.

(d) **Payment Modalities**: Recovery of Annual SLDC Fees and Annual SLDC Operating Charges should be shared between Generating Companies and Distribution licensees on 50:50 basis. Further, such charges should be levied on distribution licensees and long term transmission open access users in proportion to their maximum demand (MW) met during previous year and in case of generating company it should be levied on installed capacity (MW) of the generating station. Annual SLDC Fees should be recovered on semi-annual basis on 10th April and 10th October of each fiscal year, whereas Annual SLDC Operating Charges should be recovered on monthly basis, in arrears.

(e) **Rescheduling Charges**: To be levied on generating companies, distribution licensees, trading companies, transmission OA users, as the case may be, at the rate of Rs 3000 per schedule for revision in schedule upon finalization of schedules by SLDC on day-ahead basis or for non-submission of schedule as per State Grid Code requirements.

Annexure-3 (A): Summary of Open Access Charges across eight States

Chhattisgarh Electricity Regulatory Commission

Case 1 Charges for 5 MW at 33 KV industrial consumer availing short-term open access for 1 month (based on TO 2007-08)						
S.No.	**Particulars**			**Calculations**		
1	Load at drawal point (Consumer)			A	MW	5
2	Transmission Charges in kind			B	%	4.03
3	Wheeling Charges in kind			C	%	6
4	For users using both transmission and distribution system - Transmission and Wheeling Charges in kind			D	%	6
5	Load at injection point			E=A/(1-6/100)	MW	5.32
6	Base Energy Consumption			F=Ax1000x24x30	kwh	3600000
7	Energy injected into system			G=F/(1-6/100)	kwh	3829787.23
8	For users using both transmission and distribution system the energy injected into distribution system			H=Gx(1-B/100)	kwh	3675446.81
9	**Injection Voltage level / Drawal Voltage Level**				132/33	33/33
10	**Charges**	**Applicable Tariff (Charges)**		**Calculations**	**Rs.**	**Rs.**
11	Transmission Charges	Rs. / MW / day	518	I=518xEx30	82659.57	0
12	Wheeling Charges	paise per kwh	15	J=15xG/100 (for 33/33), J=15xH/100 (for 132/33)	551317.02	674468.09
13	Operating Charge (SLDC Charges)	Rs. Per day	1000	K	30000	30000
14	Reactive Energy Charges*	paise per kvarh		L	As per actual	As per actual
15	Cross Subsidy Surcharge 132 KV	paise per kwh	65	M	NA	NA
	. 33 kV	paise per kwh	38	N=Fx38/100	1368000	1368000
16	Additional surcharge	Nil		O	NA	NA
17	Interconnection Charges	Nil		P	NA	NA
18	Standby Charges	Nil		Q	NA	NA
19	Parallel operation charges*	Rs / kVA / month	10	R	NA	NA
	Other charge			S	NA	NA
	Connectivity Charges	Nil		T	NA	NA
20	OA Application Registration Fee**	Rs.	5000	U	NA	NA
21	OA agreement Fee**	Rs.	5000	V	NA	NA
22	Net Open Access Charge	Rs.		W=SUM (I:V)	2031976.59	1972468.08
23	Effictive Open Access Charge (per Unit)	Rs./kwh		X=W/F	0.58	0.55

Note: * Open Access Application fee and Open Access agreement fees are one time charge and it is not billed on monthly basis

** Parallel Operation charges and reative energy charge is leveled only to captive generating plants.

There is no transmission charge for users using distribution system only (33 kV)

Himachal Pradesh Electricity Regulatory Commission
CASE-I Charges for 5MW at 11 KV industrial consumer availing Intra-State Open Access for 1 Month
Monthly Open Access Charges:

S.No.	Particular	Charges	Calculation	Total (Rs.)	Charges for 5 MW capacity for 1 Month (Rs.)	
	Total Power transferred in a Month (Units)		5000x30x24	3600000 Units		A
1	Transmission Charges	Rs. 43621.00 /MW/Month	43621.00x5		218,105.00	B
	Transmission Loss of % in kind which will be deducted from the energy input	3.71%	0.0371x5x43621.00		8092	C
	Net Transmission Charges		B+C		226,197.00	D
2	Wheeling Charges	Rs. 0.75/Unit	3600000x0.75		2,700,000.00	E
	Wheeling Loss of % in kind which will be deducted from the energy input	7.50%	3600000x0.75x0.75		202,506	F
	Net Wheeling Charges		E+F		2,902,500.00	G
3	Operating Charge (SLDC Charges)	Rs. 1000.00 per day, considering one transaction per day	1000.00x30		30,000.00	H
4	Reactive Energy Charges	Nil				I
5	Cross Subsidy Surcharge	Nil				J
6	Additional surcharge	Nil				K
7	Interconnection Charges	Nil				L
8	Standby Charges	Nil				M
9	Parallel operation charges	Nil				N
10	Other Charges	Nil				O
	Connectivity Charges	Nil				P
	OA Application Registration Fee	Rs.100000.00			100000	Q
	OA agreement fee	Nil				R
	Net Open Access Charge		D+G+H+I+J+K+L+M+N+O+P+Q+R		3258697	S
	Effective Open Access Charge (per unit)		S/A		0.90/unit	Rs./Unit

CASE-II Tariff for consumer taking power from licensee (5MW at 11 KV) as per HPERC Tariff order May 30, 2008 by considering power factor 0.9, Contract Demand as 90% of the Connected load & Peak Load Exemption 25% of the Contract Demand

S.No.	Particulars	Charges	Calculation	Total	Remarks	
1	Energy consumption in a month off peak load		5000x30x21	3150000 Unit		A
2	Unit consumed in peak load		1250x3x30	112500 Unit	PLE= 25% of the contract demand for 3 hrs	B
3	Unit consumed in the night hours		5000x6x30	900000 Unit		C
4	Total unit consumed		A+B	3262500 Unit		O
5	Demand Charges	90% of the contract demand of KVA @ 225(RS/KVA/per month)	5556x0.90x225	Rs. 11,25,090.00	Peak load consumption charges	D
6	Addl. Demand Charges on expected load i.e. PLEC (Rs./KVA/month)	50 (Rs./KVA/Per month)	1250x50.00	Rs. 62500.00	By considering total contract demand i.e. 1250 KVA for allowing peak load exemption. As per Utility policy initiated for peak load exemption i.e. 25% of the contract demand or the captive generation installed at the industry whichever is less, for 1 MVA and above. The type of industry will also be taken into consideration while allowing the peak load exemption.	E
7	Total demand Charges		D+E	Rs. 1187590.00		
8	Energy charges for peak hours	5.00 (Rs/KVAh)	1250x30x3x5.00	Rs. 562500.00		F
9	Energy charges for consumption at first tariff slab	2.50 (Rs/KVAh) upto 300 KVAh/month	5000x300x2.50	Rs. 3750000.00		G

10	Energy charges for consumption at second tariff slab	2.65 (Rs/KVAh) remaining energy per month	(3150000-1500000)x2.65	Rs. 4372500.00		H
11	Night time concession	@ 20 P/KVAh	90,00,00x0.20	Rs. 180000.00		I
12	Total energy charges	F+G+H-I		Rs. 8505000.00		J
13	Consumer service charges	250 Rs/month		Rs. 250.00		K
14	Total charges per month		J+K+(D+E)	Rs.9692840.00		L
15	Low voltage supply surcharge	3% of energy charges	8505000.00x0.03	Rs. 255150.00	As per HPERC Tariff order May 20, 2008. The standard supply voltage to the Connected load 2001 JW upto 10000 KW is 33 or 66 KV (50 Hz). For supply at 11 KV in this case there is provision of 3% low voltage supply surcharge	M
16	Net effective monthly bill		L+M	Rs.9947990.00		N
17	Effective charges Rs/unit		N/O	Rs./Unit 3.04		

Punjab State Electricity Regulatory Commission, Chandigarh

Case 1 : Charges for 5 MW at 11 KV Industrial consumers availing Intra-State Open Access for 1 month

Monthly Open Access Charges:

S. No.	Particular	Charges for 5 MW Capacity for 1 month (Rs.)
1	No. of units to be delivered to the consumer.	36,00,000 units
2	T & D Losses at 11 KV	9.75% (50% of T&D loss determined by the Commission)
3	Units required to be injected in the System	$\frac{36,00,000}{0.9025}$ = 39,88,920 units
4	Transmission & Wheeling Charges @ 11 paise unit	Rs.4,38,781
5	Operating Charge @ Rs.1000/day	Rs.30,000
6	Reactive Energy Charges	-
7	Cross Subsidy Surcharge	-
8	Additional Surcharge	-
9	Interconnection Charges	-
10	Standby Charges	-
11	Parallel Operating Charges	-
12	Other Charge	-
	Connectivity Charges	-
	OA Application Registration Fee	Rs.10,000
	OA Agreement Fee	-
	Net Open Access Charge	Rs.4,78,781
	Effective Open Access Charge (unit)	13.3 paise/unit

Note:
1. The 5 MW load as per General conditions of Tariff is to be released on 66 KV, where the T&D loss is 5.85% (30% of T&D loss determined by the Commission). Calculations at 11 KV
2. The Open Access customer will also have to bear the cost of 3,88,920 units lost in
3. Electricity Duty and Octroi are statutory levies which are chargeable as per State

Case-II: Tariff for consumer taking power from Licensee (5MW at 11 KV)

S. No.	Charges	Calculation	Total (Rs.)
1	Monthly Consumption	5000x30x24	36,00,000 units
2	Energy Charges (Monthly)@Rs.3.95 per unit	36,00,000 x 3.95	1,42,20,000
3	Demand Charges (Monthly)		Nil
4	Subsidy by Government		Nil
5	Any other Charges (Please specify) 5 MW is supplied at 66KV only.Surcharge, if supplied at 11 kv@17.5%	1,42,20,000x17.5%	24,88,500
6	Electricity Duty @ 10% advalorem	1,67,08,500	16,70,850
7	Octroi @ 10 paise/unit	36,00,000 x 0.10	3,60,000
8	Total Charges per month		1,87,39,350
9	**Effective Charges Rs./unit**	1,87,39,350/36,00,000	Rs.5.20 per unit

Orissa Electricity Regulatory Commission

CASE-I: Charges for 5 MW at 11 kV industrial consumer availing Intra-State Open Access for 1 Month

Monthly Open Access Charges:

S. No.	Particular	Charges	Calculation	Total (Rs.)	Charges for 5 MW capacity for 1 Month (Rs.)	
	Total Power transferred in a Month (Units)		**5000 x 30 x 24**	**3600000 units**		A
1	Transmission Charges	1260 MW per day		189,000.00		B
	Transmission Loss of % in kind which will be deducted from the energy input.	Additional injection to be made to make up the transmission loss @ 4.5%				C
	Net Transmission Charges		B+C	189,000		D
2	Wheeling Charges	* In case of WESCO-52 P/U (Separate sheet enclosed)		1,872,000		E
	Wheeling Loss of % in kind which will be deducted from the energy input	Additional injection to be made to make up the wheeling loss @ 8.0%				F
	Net Wheeling Charges		E+F	1,872,000		G
3	Operating Charge (SLDC Charges)	Rs.1000/- per day		30,000		H
4	Reactive Energy Charges	Yet to be determied				I
5	Cross Subsidy Surcharge	* In case of WESCO-47 P/U (Separate sheet enclosed)		1,692,000		J
6	Additional Surcharge	Not determined				K
7	Interconnection Charges	Nil				L
8	Standby Charges	Nil				M
9	Parallel operating charges	Nil				N
10	Other Charge	Meter Rent as applicable				O
	Connectivity Charges	Nil				P
	OA Application Registration Fee			5,000		Q
	OA Agreement Fee					R
	Net Open Access Charge	Rs.	D+GH+I+J+K+L+M +N+O+P+Q+R	3,788,000.00		S
	Effective Open Access Charge (per unit)		S/A	1.05		Rs./unit

CASE-II: Tariff for consumer taking power from licensee (5 MW at 11 kV)

S. No.	Charges	Calculation	Total (Rs.)	
1	Monthly Consumption	5000 x 30 x 24	3,60,000 unit	a
2	Energy Charges (Monthly)	260.50 P/U	9,378,000	b
3	Demand Chages (Monthly)	30.44 P/U	1,095,840	c
4	Subsidy by Govt.			d
5	Any Other Charges (Please specify)	Customer Service Charge	700	e
	Meter Rent as Applicable			
6	Total Charges per month	b+c+d+e	10,474,540	f
	Effective Charge Rs./unit		**2.91**	**Rs./unit**

*** Surcharge for HT for 2008-09**

		WESCO	NESCO	SOUTHCO (Revised)	CESU
Wheeling ch.p/u		**52**	**64**	**85**	**74**
Load Factor%	**Tariff (HT) p/u**	**Surcharge for HT for 2008-09**			
100%	291	47	69	108	84
90%	299	54	77	116	92
80%	309	64	87	125	102
70%	321	77	100	138	115
60%	338	94	117	155	132
50%	361	116	139	178	154
40%	376	132	154	193	170
30%	401	157	180	218	195
20%	452	208	231	269	246

Uttar Pradesh Electricity Regulatory Commission

CASE-I: Charges for 5 MW at 11 KV industrial consumer availing Intra-State Open Access for 1 Month

Monthly Open Access Charges: **(Short-Term Open Access)**

S. No.	Particular	Charges	Calculation	Total (Rs.)	Charges for 5 MW capacity for 1 Month (Rs.)	
	Total Power transferred in a Month (Units)		5000x30x24	3600000 Units		A
1	Transmission Charges	Rs.0.05/kWH	3600000x0.05		180000	B
	Transmission Loss of % in kind which will be deducted from the energy input.	5.00%	180000x0.05		9000	C
	Net Transmission Charges		B+C		189000	D
2	Wheeling Charges	Rs.0.11/kWH	3600000x0.11		396000	E
	Wheeling Loss of % in kind which will be deducted from the energy input	8.00%	396000x0.08		31680	F
	Net Wheeling Charges		E+F		427680	G
3	Operating Charge (SLDC Charges)	embeded in Transmission Charges				H
4	Reactive Energy Charges	as specified by CERC from time to time				I
5	Cross Subsidy Surcharge	0				J
6	Additional Surcharge	0				K
7	Interconnection Charges	0				L
8	Standby Charges	0				M
9	Parallel operating charges	0				N'
10	Other Charge	0				O
	Connectivity Charges	0				P
	OA Application Registration Fee	Rs.5000			5000	Q
	OA Agreement Fee	Rs.20000			20000	R
	Net Open Access Charge	**Rs.**	D+G+H+I+J+K+L+M+N +O+P+Q+R		641680	s
	Effective Open Access Charge (per unit)		S/A		**0.178**	**Rs./unit**
					Say Rs.0.18/unit	

CASE: II: Tariff for consumer taking power from licensee (5MW at 11 KV)

S. No.	Charges	Calculation	Total (Rs.)	
1	Monthly Consumption	5000x30x24	3600000 Units	a
2	Energy Charges (Monthly)	3600000xRs.4.00/kVAh	14400000	b
3	Demand Chages (Monthly)	5000xRs.210/kVA	1050000	c
4	Subsidy by Govt.			d
5	Any Other Charges (Please specify)			e
6	Total Charges per month	b+c+d+e	15450000	f
	Effective Charge Rs./unit	f/a	**4.29**	**Rs./unit**

Note: 1. Energy Charges under Urban Schedule shall be billed as per TOD rates as applicable to the hour of operation as follows: (refer UPERC's Tariff Order dt. 15th April, 2008 page 285-286 for Discoms Tranco)

(a) The consumer shall be entitled to a rebate of 7.5% during 22 hrs-06 hrs.

(b) The consumer shall pay extra 15% during 17 hrs.-22hrs

Whereas the Consumer under Rural Schedule shall be billed without TOD rates and shall be entitled to a rebate of 15% on Energy Charge.

2. Consumer, in case of no arrears, shall be eligible for graded Load Factor Rebate as per UPERC's Tariff Order dt.15th April, 2008 page 287-288

Haryana Electricity Regulatory Commission, Panchkula

Case 1 Charges for 5MW at 11 KV industrial consumers availing Intra-State Open Access for 1 Month

Monthly Open Access Charges:

S.No.	Particular	Charges	Calculation	Total (Rs.)	Charges for 5 MW Capacity for 1 Month (Rs.)	
	Total Power transferred in a Month (Units)		5000 X 3 0 X 24	3600000 Units		A
1	Transmission Charges	Rs.0.19 per kWH	3600000 X 0.19	684000	684000	B
	Transmission Loss of % in kind which will be deducted from the energy input.	2.1% of the power transferred =75600 Units	75600 X 0.19	14364	14364	C
	Net Transmission Charges		B+C	698364	698364	D
2	Wheeling Charges	Rs.025 per kWH	3600000 X 0.25	900000	900000	E
	Wheeling Loss of % in kind which will be deductedfrom the energy input.	6% of the power transferred = 216000	216000 X 0.25	54000	54000	F
	Net Wheeling Charges		E + F	954000	954000	G
3	Operating Charge (SLDC Charges)	Rs. 1000 per day	1000 X 30	3000	3000	H
4	Reactive Energy Charges	Nil (Please see Note given below)				I
5	Cross Subsidy Surcharge	Nil				J
6	Additional Surcharge	Nil				K
7	Interconnection Charges	Nil				L
8	Standby Charges	Nil				M
9	Parallel Operation charges	Nil				N
10	Other Charge	Nil				O
	Connectivity Charges	Nil				P
	OA Application Registration Fee	Rs.5000		5000	5000	Q
	OA Agreement fee	Nil				R
	Net Open Access Charge	**Rs.**	**D+G+H+I+J+K+L+M+N+O+P+Q+R**		**1687364**	**S**
	Effective Open Access Charge (Unit)		**S/A**		**0.468**	**Rs.0.468/Unit**

Note: Will be decided on case to case basis

Case-II Tariff for consumer taking power from licensee (5MW at 11 KV)

S.No.	Charges	Calculation	Total (Rs.)	
1	Monthly Consumption	5000 X 30 X 24	3600000 Units	a
2	Energy Charges (Monthly)	3600000 X 4.55 (including Rs.0.46/Unit FSA)	16380000	b
3	Demand Charges (Monthly)	Nil		c
4	Subsidy by Govt.	Nil		d
5	Any other Charges (Please specify)	Power Factor Surcharge (As per Note given below)		e
6	Total Charges per month	b+c+d+e	16380000	f
	Effective Charges Rs./Unit	**f/a**	**Rs.4.55**	**Rs.4.55/Unit**

Note: Power Factor Surcharge

The monthly average power factor of the plant and apparatus installed by the consumer shall not be less than 90% lagging. The monthly average power facor shall mean the ratio expressed, as percentage of total kWh to total kVAH supplied during the month. The ratio shall be rounded up to two figures. In case the monthly average power factor falls below 90% lagging, the consumer shall have to pay a surcharge of 1% of SOP charges for every 1% decrease in the power factor up to 80% and 2% of SOP charges for every 1% decrease in Power Factor below 80%. Rebate of 0.5% on SOP will be allowed for every 1% increase in Power Factor above 90% as per HERC Order on Distribution and Retail Supply ARR and Tariff-2000

Rajasthan Electricity Regulatory Commission					
CASE I:- Charge for 5 MW at 33 kV Industrial consumer avaling Intra-State Open Access for 1 month=5000 x 30 x 24 = 3600000					
Monthly Open Access Charges					
S.No.	Particular	Rate	Units	Charges in Rs.	
1	Transmission Charges	94780 Rs./MW/month	3600000	473900	A
	Transmission Loss of % in kind which will be deducted from the energy input.	4.40%	158400		B
	Net Transmission Charges			473900	C
2	Wheeling Charges	0.11 Rs./kwh		396000	D
	Wheeling Loss of % in kind which will be deducted from the energy input.	3.80%	136800		E
	Net Wheeling Charges			396000	F
3	Operating Charge (SLDC Charges)	100 Rs./MW/day		15000	G
4	Reactive Energy Charges	5.50 paisa/KVArh			H
5	Cross Subsidy Surcharge	0.38 Rs/kwh	3600000	1368000	I
6	Additional Surcharge				J
7	Interconnection Charges				K
8	Standby Charges				L
9	Parallel operation charges				M
10	Other Charges				N
	Connectivity Charges				O
	OA Application Registration fee	5000 Rs/year			P
	OA agreement fee				Q
11	Net Open Access Charges (C+F+G+I)			2252900	R
12	Effective Open Access Charge (per unit)	R/A	3600000	0.6258	

CASE II:- Tariff for consumer taking power from licensee (5MW at 33 kV) for 1 month=5000 x 30 x 24 = 3600000					
S.No.	Charges	Rate	Units	Total (Rs.)	
1	Energy Charges (Monthly)	4.01 Rs./kWh	3600000	14436000	a
2	Demand Charges (Monthly)	90 Rs/kVA/month		47368	b
3	Rebate	1.00%		144834	c
4	Any other Charges (Please Specify)			0	d
5	Total Charges per month (Rs.) (a+b-c+d)			14338534	e
	Effective Charges Rs./Unit	e/a	3600000	3.9829	

Karnataka Electricity Regulatory Commission-BESCOM

Charges for 5MW at 11 KV industrial consumer availing Intra-State Open Access for 1 Month-BESCOM

Monthly Open Access Charges:

S. No.	Particular	Charges	Calculation	Total (Rs.)	Charges for 5 MW capacity for 1 Month (Rs.)	
	Total Power transfered in a Month(Units)		**5000x30x24**	**3600000 Units**	**3600000**	A
1	Transmission Charges [Per MW basis]		5x95869	479345		B
	Transmission Loss of % in kind which will be deducted from the energy input.		4.03%	20129		C
	Net Transmission Charges		B+C	**499474**	**499474**	D
2	Wheeling Charges for BESCOM [Per unit basis]		3600000x0.06	216000		E
	Wheeling Loss of % in kind which will be deducted from the energy input.		4.06%	9141		F
	Net Wheeling Charges		E+F	**225141**	**225141**	G
3	Operating Charge (SLDC Charges)	SLDC charges included in Transmissiion charges				H
4	Reactive Energy Charges per Kvar $					I
5	Cross Subsidy Surcharge per unit basis for BESCOM		3600000x0.78	**2808000**	**2808000**	J
6	Additional surcharge		case to case basis			K
7	Interconnection Charges		Not applicable			L
8	Standby Charges [Minimum]*		(200/.745)x5000	**1342282**	**1342282**	M
10	Parallel operation charges/Grid support charges		((5000/0.9)*.75*180)	**750000**	**750000**	N
13	Other Charge[Meter reading cahrges]		1*1000	**1000**	**1000**	O
	Connectivity Charges		not applicable			P
	OA Application Registration Fee + Processing fee**		5000+30000	**35000**		Q
	OA agreement fee					R
	Net Open Access Charge	Rs	D+G+H+I+J+K+LM+N+O+P+Q+R		**5625896**	S
	Effective Open Access Charge(per Unit)		S / A		**1.56**	**Rs/Unit**

CASE-II **Tariff for consumer taking power from licensee (5MW at 11 KV)**

S. No.	Charges	Calculation	Total (Rs.)			
1	**Monthly Consumption**	**5000x30x24**	**3600000 Units**	a	**3600000**	
2	Energy Charges (Monthly)	)0000*3.55+3500000*3.9	**14180000**	b	**14180000**	
3	Demand Charges (Monthly)	(5000/0.9)*.75*180)	**750000**	c	**750000**	
4	Subsidy by Govt.		0	d	**0**	
7	Any Other Charges (Please Specify)		0	e	**0**	
8	Total Charges per month	b+c-d+e	14930000	f	**14930000**	
	Effective Charge Rs/Unit	f / a		**Rs/Unit**	**4.15**	
	$ The Consumer has to maintain PF at 0.90.					
	* assuming no energy is drawn. If energy is drawn Rs. 6/unit is to be paid.					
	* *One time fee and therefore not included in per unit cost.					
	Note: 1. For NCE sources Transmission & wheeling charges are in Kind only and is fixed at 5%.In addition for wind & Mini-hydel Banking charges at 2% is levied.					
	2. The above charges are as per the latest order issued by the Commission, which is challenged befor APTEL.					

Karnataka Electricity Regulatory Commission-CESC

CASE I **Charges for 5MW at 11 KV industrial consumer availing Intra-State Open Access for 1 Month-CESC**

Monthly Open Access Charges:

S. No.	Particular	Charges	Calculation	Total (Rs.)	Charges for 5 MW capacity for 1 Month (Rs.)	
	Total Power transfered in a Month(Units)		**5000x30x24**	**3600000 Units**	**3600000**	A
1	Transmission Charges [Per MW basis]		5x95869	479345		B
	Transmission Loss of % in kind which will be deducted from the energy input.		4.03%	20129		C
	Net Transmission Charges		B+C	**499474**	**499474**	D
2	Wheeling Charges for BESCOM [Per unit basis]		3600000x0.16	576000		E
	Wheeling Loss of % in kind which will be deducted from the energy input.		7.81%	48797		F
	Net Wheeling Charges		E+F	**624797**	**624797**	G
3	Operating Charge (SLDC Charges)	SLDC charges included in Transmissiion charges				H
4	Reactive Energy Charges per Kvar $					I
5	Cross Subsidy Surcharge per unit basis for BESCOM		3600000x0.20	**720000**	**720000**	J
6	Additional surcharge		case to case basis			K
7	Interconnection Charges		Not applicable			L
8	Standby Charges [Minimum]*		(200/.745)x5000	**1342282**	**1342282**	M
10	Parallel operation charges/Grid support charges		((5000/0.9)*.75*170)	**708333**	**708333**	N
13	Other Charge[Meter reading cahrges]		1*1000	**1000**	**1000**	O
	Connectivity Charges		not applicable			P
	OA Application Registration Fee + Processing fee**		5000+30000	**35000**		Q
	OA agreement fee					R
	Net Open Access Charge	Rs	D+G+H+I+J+K+LM+N+O+P+Q+R		**3895886**	S
	Effective Open Access Charge(per Unit)		S / A		**1.08**	**Rs/Unit**

CASE-II **Tariff for consumer taking power from licensee (5MW at 11 KV)**

S. No.	Charges	Calculation	Total (Rs.)		
1	**Monthly Consumption**	**5000x30x24**	**3600000 Units**	a	**3600000**
2	Energy Charges (Monthly)	(100000*3.55+3500000*3.95)	**14180000**	b	**14180000**
3	Demand Charges (Monthly)	(5000/0.9)*.75*170)	**708333.3333**	c	**708333.3333**
4	Subsidy by Govt.		0	d	**0**
7	Any Other Charges (Please Specify)		0	e	**0**
8	Total Charges per month	b+c-d+e	14888333.33	f	**14888333.33**
	Effective Charge Rs/Unit	f / a		**Rs/Unit**	**4.14**

$ The Consumer has to maintain PF at 0.90.

* assuming no energy is drawn. If energy is drawn Rs. 6/unit is to be paid.

* *One time fee and therefore not included in per unit cost.

Note: 1. For NCE sources Transmission & wheeling charges are in Kind only and is fixed at 5%.In addition for wind & Mini-hydel Banking charges at 2% is levied.

2. The above charges are as per the latest order issued by the Commission, which is challenged befor APTEL.

Karnataka Electricity Regulatory Commission-GESCOM

CASE I **Charges for 5MW at 11 KV industrial consumer availing Intra-State Open Access for 1 Month-GESCOM**

Monthly Open Access Charges:

S. No.	Particular	Charges	Calculation	Total (Rs.)	Charges for 5 MW capacity for 1 Month (Rs.)	
	Total Power transfered in a Month(Units)		**5000x30x24**	**3600000 Units**	**3600000**	A
1	Transmission Charges [Per MW basis]		5x95869	479345		B
	Transmission Loss of % in kind which will be deducted from the energy input.		4.03%	20129		C
	Net Transmission Charges		B+C	**499474**	**499474**	D
2	Wheeling Charges for BESCOM [Per unit basis]		3600000x0.20	720000		E
	Wheeling Loss of % in kind which will be deducted from the energy input.		6.01%	46039		F
	Net Wheeling Charges		E+F	**766039**	**766039**	G
3	Operating Charge (SLDC Charges)	SLDC charges included in Transmissiion charges				H
4	Reactive Energy Charges per Kvar $					I
5	Cross Subsidy Surcharge per unit basis for BESCOM		3600000x0.67	**2412000**	**2412000**	J
6	Additional surcharge		case to case basis			K
7	Interconnection Charges		Not applicable			L
8	Standby Charges [Minimum]*		(200/.745)x5000	**1342282**	**1342282**	M
10	Parallel operation charges/Grid support charges		((5000/0.9)*.75*170)	**708333**	**708333**	N
13	Other Charge[Meter reading cahrges]		1*1000	**1000**	**1000**	O
	Connectivity Charges		not applicable			P
	OA Application Registration Fee + Processing fee**		5000+30000	**35000**		Q
	OA agreement fee					R
	Net Open Access Charge	Rs	D+G+H+I+J+K+LM+N+O+P+Q+R		**5729128**	S
	Effective Open Access Charge(per Unit)		S / A		**1.59**	**Rs/Unit**

CASE-II **Tariff for consumer taking power from licensee (5MW at 11 KV)**

S. No.	Charges	Calculation	Total (Rs.)		
1	**Monthly Consumption**	**5000x30x24**	**3600000 Units**	a	**3600000**
2	Energy Charges (Monthly)	(100000*3.55+3500000*3.95)	**14180000**	b	**14180000**
3	Demand Charges (Monthly)	(5000/0.9)*.75*170)	**708333.3333**	c	**708333.3333**
4	Subsidy by Govt.		0	d	**0**
7	Any Other Charges (Please Specify)		0	e	**0**
8	Total Charges per month	b+c-d+e	14888333.33	f	**14888333.33**
	Effective Charge Rs/Unit	f / a		**Rs/Unit**	**4.14**

$ The Consumer has to maintain PF at 0.90.

* assuming no energy is drawn. If energy is drawn Rs. 6/unit is to be paid.

* *One time fee and therefore not included in per unit cost.

Note: 1. For NCE sources Transmission & wheeling charges are in Kind only and is fixed at 5%.In addition for wind & Mini-hydel Banking charges at 2% is levied.

2. The above charges are as per the latest order issued by the Commission, which is challenged befor APTEL.

Karnataka Electricity Regulatory Commission-HESCOM						
CASE I	**Charges for 5MW at 11 KV industrial consumer availing Intra-State Open Access for 1 Month-HESCOM**					
Monthly Open Access Charges:						
S. No.	**Particular**	**Charges**	**Calculation**	**Total (Rs.)**	**Charges for 5 MW capacity for 1 Month (Rs.)**	
	Total Power transfered in a Month(Units)		**5000x30x24**	**3600000 Units**	**3600000**	A
1	Transmission Charges [Per MW basis]		5x95869	479345		B
	Transmission Loss of % in kind which will be deducted from the energy input.		4.03%	20129		C
	Net Transmission Charges		B+C	**499474**	**499474**	D
2	Wheeling Charges for BESCOM [Per unit basis]		3600000x0.17	612000		E
	Wheeling Loss of % in kind which will be deducted from the energy input.		12.54%	87748		F
	Net Wheeling Charges		E+F	**699748**	**699748**	G
3	Operating Charge (SLDC Charges)		SLDC charges included in Transmissiion charges			H
4	Reactive Energy Charges per Kvar $					I
5	Cross Subsidy Surcharge per unit basis for BESCOM		3600000x0.22	**792000**	**792000**	J
6	Additional surcharge		case to case basis			K
7	Interconnection Charges		Not applicable			L
8	Standby Charges [Minimum]*		(200/.745)x5000	**1342282**	**1342282**	M
10	Parallel operation charges/Grid support charges		((5000/0.9)*.75*170)	**708333**	**708333**	N
13	Other Charge[Meter reading cahrges]		1*1000	**1000**	**1000**	O
	Connectivity Charges		not applicable			P
	OA Application Registration Fee + Processing fee**		5000+30000	**35000**		Q
	OA agreement fee					R
	Net Open Access Charge	Rs	D+G+H+I+J+K+LM+N+O+P+Q+R		**4042837**	S
	Effective Open Access Charge(per Unit)		S / A		**1.12**	**Rs/Unit**
CASE-II	**Tariff for consumer taking power from licensee (5MW at 11 KV)**					
S. No.	**Charges**	**Calculation**	**Total (Rs.)**			
1	**Monthly Consumption**	**5000x30x24**	**3600000 Units**	a	**3600000**	
2	Energy Charges (Monthly)	(100000*3.55+3500000*3.95)	**14180000**	b	**14180000**	
3	Demand Charges (Monthly)	(5000/0.9)*.75*170)	**708333.3333**	c	**708333.3333**	
4	Subsidy by Govt.		0	d	**0**	
7	Any Other Charges (Please Specify)		0	e	**0**	
8	Total Charges per month	b+c-d+e	14888333.33	f	**14888333.33**	
	Effective Charge Rs/Unit	f / a		**Rs/Unit**	**4.14**	
	$ The Consumer has to maintain PF at 0.90.					
	* assuming no energy is drawn. If energy is drawn Rs. 6/unit is to be paid.					
	* *One time fee and therefore not included in per unit cost.					
	Note: 1. For NCE sources Transmission & wheeling charges are in Kind only and is fixed at 5%.In addition for wind & Mini-hydel Banking charges at 2% is levied.					
	2. The above charges are as per the latest order issued by the Commission, which is challenged befor APTEL.					

Karnataka Electricity Regulatory Commission-MESCOM

CASE I **Charges for 5MW at 11 KV industrial consumer availing Intra-State Open Access for 1 Month-MESCOM**

Monthly Open Access Charges:

S. No.	Particular	Charges	Calculation	Total (Rs.)	Charges for 5 MW capacity for 1 Month (Rs.)	
	Total Power transfered in a Month(Units)		**5000x30x24**	**3600000 Units**	**3600000**	A
1	Transmission Charges [Per MW basis]		5x95869	479345		B
	Transmission Loss of % in kind which will be deducted from the energy input.		4.03%	20129		C
	Net Transmission Charges		B+C	**499474**	**499474**	D
2	Wheeling Charges for BESCOM [Per unit basis]		3600000x0.17	612000		E
	Wheeling Loss of % in kind which will be deducted from the energy input.		6.22%	40591		F
	Net Wheeling Charges		E+F	**652591**	**652591**	G
3	Operating Charge (SLDC Charges)		SLDC charges included in Transmissiion charges			H
4	Reactive Energy Charges per Kvar $					I
5	Cross Subsidy Surcharge per unit basis for BESCOM		3600000x0.34	**1224000**	**1224000**	J
6	Additional surcharge		case to case basis			K
7	Interconnection Charges		Not applicable			L
8	Standby Charges [Minimum]*		(200/.745)x5000	**1342282**	**1342282**	M
10	Parallel operation charges/Grid support charges		((5000/0.9)*.75*170)	**708333**	**708333**	N
13	Other Charge[Meter reading cahrges]		1*1000	**1000**	**1000**	O
	Connectivity Charges		not applicable			P
	OA Application Registration Fee + Processing fee**		5000+30000	**35000**		Q
	OA agreement fee					R
	Net Open Access Charge	Rs	D+G+H+I+J+K+LM+N+O+P+Q+R		**4427680**	S
	Effective Open Access Charge(per Unit)		S / A		**1.23**	**Rs/Unit**

CASE-II **Tariff for consumer taking power from licensee (5MW at 11 KV)**

S. No.	Charges	Calculation	Total (Rs.)		
1	**Monthly Consumption**	**5000x30x24**	**3600000 Units**	a	**3600000**
2	Energy Charges (Monthly)	(100000*3.55+3500000*3.95)	**14180000**	b	**14180000**
3	Demand Charges (Monthly)	(5000/0.9)*.75*170)	**708333**	c	**708333**
4	Subsidy by Govt.		0	d	**0**
7	Any Other Charges (Please Specify)		0	e	**0**
8	Total Charges per month	b+c-d+e	14888333	f	**14888333**
	Effective Charge Rs/Unit	f / a		**Rs/Unit**	**4.14**

$ The Consumer has to maintain PF at 0.90.

* assuming no energy is drawn. If energy is drawn Rs. 6/unit is to be paid.

* *One time fee and therefore not included in per unit cost.

Note: 1. For NCE sources Transmission & wheeling charges are in Kind only and is fixed at 5%.In addition for wind & Mini-hydel Banking charges at 2% is levied.

2. The above charges are as per the latest order issued by the Commission, which is challenged befor APTEL.

Annexure-3 (B): Open Access Charges (Maharashtra)

Annexure-3.1: EXPLANATORY NOTE

1. **Applicability of Wheeling Charge**: The Commission had determined wheeling charges and wheeling loss for use of distribution network of various distribution licensees under its MYT Order for FY 2007-08 and under its APR Orders for FY 2008-09 for each distribution licensee, separately. For example, following APR Orders forms basis for applicable wheeling charges for use of distribution network of the concerned distribution licensee:
   - Case 72 of 2007 : APR Order for MSEDCL for FY 2008-09
   - Case 69 of 2007 : APR Order for TPC-D for FY 2008-09
   - Case 66 of 2007 : APR Order for REL-D for FY 2008-09
   - Case 104 of 2007: APR Order for Transmission Tariff for InSTS for FY 2008-09.

2. **Wheeling Charge for MSEDCL network:** The Commission has determined the wheeling charges for MSEDCL network under APR Order for FY 2008-09 as under: **(*Ref. Cl 6.6, Page 221/224 of Order in Case No 72 of 2007*)**

Voltage Level	Wheeling Charge (Rs./ kW/ month)
33 kV	20
22 kV/11 kV	110
LT level	191

3. **Wheeling loss for MSEDCL network**: The Commission has ruled that the wheeling losses applicable to open access transaction for MSEDCL network under APR Order for FY 2008-09 shall be as under: **(*Ref. Cl 6.6, Page 221/224 of Order in Case No 72 of 2007*)**

Voltage Level	Wheeling loss (%)
33 kV	6%
22 kV/11 kV	9%
LT level	14%

4. **Transmission Tariff for InSTS**: In addition, the Commission has separately determined transmission tariff for use of InSTS under its Transmission Tariff Order (Case 104 of 2007) for FY 2008-09 as under: ***(ref. cl. 9 page 4 of Order in Case 104 of 2007)***

Item Description	**Units**	**FY 2008-09**
Transmission Tariff (long-term)	Rs/kW/month	150.37
Transmission Tariff (long-term)	Rs/MW/day	4944.00
Transmission Tariff (short-term)	Rs/MW/day	1236.00

Further, in case of short-term open access transactions, the Commission has clarified as under:

> *Transmission Tariff for short-term open access transactions for FY 2008-09, shall be* ***Rs 1236.00 per MW per day or Rs 51.50 per MW per hour*** *Further, it is clarified that as stipulated under Para 3.2.5.6 of Order on Transmission Pricing Framework, the short-term transmission charges shall be payable for minimum 6 hours duration within a day and shall be accordingly 1/4th of short term transmission open access charge per day. The recovery from short term transmission open access charges shall be used to reduce total transmission system charge (TTSC) for the intra-State transmission system and in turn benefit long term transmission system users.*

5. **Transmission loss for InSTS**: The Commission had ruled that applicable Transmission loss for InSTS for FY 2008-09 shall be 4.85%. However, actual transmission loss shall be borne by all TSUs on pro-rata basis based on their energy drawal depending on actual transmission loss level. ***(ref. Cl. 19 page 8 of Order in Case No. 104 of 2008 and cl. 26,27 of Order in Case no 31 of 2006)***

6. **Wheeling Charge and Wheeling loss for TPC-D:** The Commission has determined wheeling charge and wheeling loss for use of distribution network of TPC-D under Order in Case No. 69 of 2007 as under: ***(ref. cl. 5.6 page 98 of Order in Case No 69 of 2007)***

Item Description	**Wheeling Charge** (Rs/kW/month)	**Wheeling Loss (%)**

HT level	101	2.4%
LT level	196	2.4%

7. **Wheeling Charge and Wheeling loss REL-D:** The Commission has determined wheeling charge and wheeling loss for use of distribution network of REL-D under Order in Case No. 66 of 2007 as under: ***(ref. cl. 5.6 page 129 of Order in Case No 66 of 2007)***

Item Description	**Wheeling Charge** (Rs/kW/month)	**Wheeling Loss (%)**
HT level	122	2.4%
LT level	140	9.3%

8. Depending on nature of open access transaction, the injection point(s) and drawal point(s) for open access wheeling transaction could lead to use of distribution assets of multiple distribution licensees and/or use of intra-state transmission system. Even in case of particular distribution licensees, the wheeling charges applicable for a particular open access transaction shall depend on voltage level at injection point(s) and drawal point(s), as wheeling charges are determined in accordance with voltage level. Accordingly, transmission charges, transmission losses, wheeling charges and wheeling losses applicable for a particular transaction have to be ascertained on the basis of use of assets of concerned licensee and extent of use at a particular voltage level.

9. A summary of applicable transmission charge, transmission loss, wheeling charge and wheeling loss for various cases of open access wheeling transaction is presented below in tabular form for ease of understanding.

Table 1.1: Summary of Transmission charge, Transmission loss, wheeling charge and wheeling loss for different distribution licensees at various voltage levels

Transmission Charge and Transmission loss	**Units**	**Transmission Charge**	**Transmission loss**	**Reference of Order**
Transmission Tariff (long-term)	Rs/kW/month	150.37	4.85%	MERC Transmission tariff Order (FY 2008-09), (Case No. 104 of 2007) Cl. 9 of Page 4
Transmission Tariff (long-term)	Rs/MW/day	4944.00	4.85%	
Transmission Tariff (short-term)	Rs/MW/day	1236.00	4.85%	

Wheeling Charges and Wheeling losses		**Wheeling Charge**	**Wheeling loss**	
MSEDCL				
-132 kV	Rs/kW/month	0	0%	Ref. Cl 6.6, Page 221/224 of Order in Case No 72 of 2007
-33 kV	Rs/kW/month	20	6%	
-22 kV/ 11 kV	Rs/kW/month	110	9%	
LT level	Rs/kW/month	191	14%	
TPC-D				
-33kV/22 kV/ 11kV(HT)	Rs/kW/month	101	2.4%	Ref. cl. 5.6 page 98 of Order in Case No 69 of 2007
LT level	Rs/kW/month	196	2.4%	
REL-D				
-33kV/22 kV/ 11kV (HT)	Rs/kW/month	122	2.4%	ref. cl. 5.6 page 129 of Order in Case No 66 of 2007
LT level	Rs/kW/month	140	9.3%	

Nomenclature used for wheeling charge and wheeling loss of various distribution licensees at various voltage levels is given in following table 1.2 for ease of reference:

Table 1.2: Nomenclature adopted for wheeling charge and wheeling loss for different distribution licensees

Nomenclature	Wheeling charge (wc)	Wheeling loss (wl)
MSEDCL_ 132 kV	$M_{wc}132$	$M_{wl}132$
MSEDCL_33 kV	$M_{wc}33$	$M_{wl}33$
MSEDCL_11 Kv	$M_{wc}11$	$M_{wl}11$
MSEDCL_LT	$M_{wc}lt$	$M_{wl}lt$
TPC_HT	$T_{wc}ht$	$T_{wl}ht$
TPC_LT	$T_{wc}lt$	$T_{wl}lt$
REL_HT	$R_{wc}ht$	$R_{wl}ht$
REL_LT	$R_{wc}lt$	$R_{wl}lt$

Table 1.3: Applicable Wheeling charge for open access wheeling transaction with different Injection Point(s) and Drawal Point(s)

Table for Wheeling Cost		Rs/kW/ month	$M_{wc}132$	$M_{wc}33$	$M_{wc}11$	$M_{wl}lt$	$T_{wc}ht$	$T_{wl}lt$	$R_{wc}ht$	$R_{wl}lt$
		Injection	I1	I2	I3	I4	I5	I6	I7	I8
Rs/kW /month	Drawal		MSE_ 132 kV	MSE_ 33kV	MSE_ 11V	MSE_LT	TPC_HT	TPC_ LT	REL_ HT	REL_ LT
$M_{wc}132$	D1	MSE_132kV	0	$M_{wc}33$	$M_{wc}11$	$M_{wc}lt$	$T_{wc}ht$	$T_{wc}lt$	$R_{wc}ht$	$R_{wc}lt$
$M_{wc}33$	D2	MSE_33kV	$M_{wc}33$	$M_{wc}33$	$M_{wc}11$	$M_{wc}lt$	$M_{wc}33 + T_{wc}ht$	$M_{wc}33 + T_{wc}lt$	$M_{wc}33 + R_{wc}ht$	$M_{wc}33 + R_{wc}lt$
$M_{wc}11$	D3	MSE_11V	$M_{wc}11$	$M_{wc}11$	$M_{wc}11$	$M_{wc}lt$	$M_{wc}11 + T_{wc}ht$	$M_{wc}11 + T_{wc}lt$	$M_{wc}11 + R_{wc}ht$	$M_{wc}11 + R_{wc}lt$
$M_{wc}lt$	D4	MSE_LT	$M_{wc}lt$	$M_{wc}lt$	$M_{wc}lt$	$M_{wc}lt$	$M_{wc}lt+ T_{wc}ht$	$M_{wc}lt+ T_{wc}lt$	$M_{wc}lt+ R_{wc}ht$	$M_{wc}lt+ R_{wc}lt$
$T_{wc}ht$	D5	TPC_HT	$T_{wc}ht$	$M_{wc}33+ T_{wc}ht$	$M_{wc}11+ T_{wc}ht$	$M_{wc}lt+ T_{wc}ht$	$T_{wc}ht$	$T_{wc}lt$	$T_{wc}ht+ R_{wc}ht$	$T_{wc}ht+ R_{wc}lt$
$T_{wc}lt$	D6	TPC_LT	$T_{wc}lt$	$M_{wc}33+ T_{wc}lt$	$M_{wc}11+ T_{wc}lt$	$M_{wc}lt+ R_{wc}ht$	$T_{wc}lt$	$T_{wc}lt$	$T_{wc}lt+ R_{wc}ht$	$T_{wc}lt$ $R_{wc}lt$
$R_{wc}ht$	D7	REL_HT	$R_{wc}ht$	$M_{wc}33+ R_{wc}ht$	$M_{wc}11+ R_{wc}ht$	$M_{wc}lt+ R_{wc}ht$	$T_{wc}ht+ R_{wc}ht$	$T_{wc}lt+ R_{wc}ht$	$R_{wc}ht$	$R_{wc}lt$
$R_{wc}lt$	D8	REL_LT	$R_{wc}lt$	$M_{wc}33+ R_{wc}lt$	$M_{wc}11+ R_{wc}lt$	$M_{wc}lt+ R_{wc}lt$	$T_{wc}ht+ R_{wc}lt$	$T_{wc}lt+ R_{wc}lt$	$R_{wc}lt$	$R_{wc}lt$

Table for Wheeling Cost		Rs/kW/month	0	20	110	191	101	196	122	140
		Injection	I1	I2	I3	I4	I5	I6	I7	I8
Rs/kW /month	Drawal		MSE_ 132kV	MSE_ 33kV	MSE_ 11kV	MSE_ LT	TPC_ HT	TPC_ LT	REL_ HT	REL_ LT
0	D1	MSE_ 132kV	0	20	110	191	101	196	122	140
20	D2	MSE_ 33kV	20	20	110	191	121	216	142	160
110	D3	MSE_ 11V	110	110	110	191	211	306	232	250
191	D4	MSE_ LT	191	191	191	191	292	387	313	331
101	D5	TPC_ HT	101	121	211	292	101	196	223	241
196	D6	TPC_ LT	196	216	296	387	196	196	318	336
122	D7	REL_ HT	122	142	232	313	223	318	122	140
140	D8	REL_ LT	140	160	250	331	241	336	140	140

In addition to above wheeling charge, transmission charge (long-term or short-term), as the case, shall be applicable, in case Intra-State Transmission system (InSTS) is being used for the purpose of open access wheeling transaction.

Table 1.4: Applicable Wheeling loss for open access wheeling transaction with different Injection Point(s) and Drawal Point(s)

Table for Wheeling loss		%	$M_{wl}132$	$M_{wl}33$	$M_{wl}11$	$M_{wl}lt$	$T_{wl}ht$	$T_{wl}lt$	$R_{wl}ht$	$R_{wl}lt$
		Injection	I1	I2	I3	I4	I5	I6	I7	I8
%	Drawal		MSE_ 132kV	MSE_ 33kV	MSE_ 11V	MSE_ LT	TPC_ HT	TPC_ LT	REL_ HT	REL_ LT
$M_{wl}132$	D1	MSE_ 132kV	0	$M_{wl}33$	$M_{wl}11$	$M_{wl}lt$	$T_{wl}ht$	$T_{wl}lt$	$R_{wl}ht$	$R_{wl}lt$
$M_{wl}33$	D2	MSE_ 33kV	$M_{wl}33$	$M_{wl}33$	$M_{wl}11$	$M_{wl}lt$	$T_{wl}ht + M_{wl}33$	$T_{wl}lt+ M_{wl}33$	$R_{wl}ht+ M_{wl}33$	$R_{wl}lt+ M_{wl}33$
$M_{wl}11$	D3	MSE_ 11V	$M_{wl}11$	$M_{wl}11$	$M_{wl}11$	$M_{wl}lt$	$T_{wl}ht + M_{wl}11$	$T_{wl}lt+ M_{wl}11$	$R_{wl}ht+ M_{wl}11$	$R_{wl}lt+ M_{wl}11$
$M_{wl}lt$	D4	MSE_ LT	$M_{wl}lt$	$M_{wl}lt$	$M_{wl}lt$	$M_{wl}lt$	$T_{wl}ht+ M_{wl}lt$	$T_{wl}lt+ M_{wl}lt$	$R_{wl}ht+ M_{wl}lt$	$R_{wl}lt+ M_{wl}lt$
$T_{wl}ht$	D5	TPC_ HT	$T_{wl}ht$	$M_{wl}33+ T_{wc}ht$	$M_{wl}11+ T_{wc}ht$	$M_{wl}lt + T_{wc}ht$	$T_{wl}ht$	$T_{wl}lt$	$R_{wl}ht+ T_{wl}ht$	$R_{wl}lt+ T_{wl}ht$
$T_{wl}lt$	D6	TPC_ LT	$T_{wl}lt$	$M_{wl}33+ T_{wc}lt$	$M_{wl}11+ T_{wc}lt$	$M_{wl}lt + T_{wc}lt$	$T_{wl}lt$	$T_{wl}lt$	$R_{wl}ht+ T_{wl}lt$	$R_{wl}lt+ T_{wl}lt$
$R_{wl}ht$	D7	REL_ HT	$R_{wl}ht$	$M_{wl}33+ R_{wl}ht$	$M_{wl}11+ R_{wl}ht$	$M_{wl}lt + R_{wl}ht$	$T_{wl}ht + R_{wl}ht$	$T_{wl}lt+ R_{wl}ht$	$R_{wl}ht$	$R_{wl}lt$
$R_{wl}lt$	D8	REL_ LT	$R_{wl}lt$	$M_{wl}33+ R_{wl}lt$	$M_{wl}11+ R_{wl}lt$	$M_{wl}lt + R_{wl}lt$	$T_{wl}ht + R_{wl}lt$	$T_{wl}lt+ R_{wl}lt$	$R_{wl}lt$	$R_{wl}lt$

Table for Wheeling loss		%	0	6%	9%	14%	2.4%	2.4%	2.4%	9.3%
		Injection	**I1**	**I2**	**I3**	**I4**	**I5**	**I6**	**I7**	**I8**
%	**Drawal**			**MSE_ 33kV**	**MSE_ 11V**	**MSE_ LT**	**TPC_ HT**	**TPC_ LT**	**REL_ HT**	**REL_LT**
0	**D1**	**MSE_ 132kV**	0	6%	9%	14%	2.4%	2.4%	2.4%	9.3%
6%	**D2**	**MSE_ 33kV**	6%	6%	9%	14%	8.4%	8.4%	8.4%	15.3%
9%	**D3**	**MSE_ 11V**	9%	9%	9%	14%	11.4%	11.4%	11.4%	18.3%
14%	**D4**	**MSE_ LT**	14%	14%	14%	14%	16.4%	16.4%	16.4%	23.3%
2.4%	**D5**	**TPC_ HT**	2.4%	8.4%	11.4%	16.4%	2.4%	2.4%	4.8%	11.7%
2.4%	**D6**	**TPC_ LT**	2.4%	8.4%	11.4%	16.4%	2.4%	2.4%	4.8%	11.7%
2.4%	**D7**	**REL_ HT**	2.4%	8.4%	11.4%	16.4%	4.8%	4.8%	2.4%	9.3%
9.3%	**D8**	**REL_ LT**	9.3%	15.3%	18.3%	23.3%	11.7%	11.7%	9.3%	9.3%

In addition to above wheeling loss, transmission loss, shall be applicable, in case Intra-State Transmission system (InSTS) is being used for the purpose of open access wheeling transaction.

10. Sample illustration in respect of the following case scenarios of the open access wheeling transaction is summarized in the following section:-
    - Case Scenario-1: Injection at 132 kV (InSTS) and Drawal at 132 KV(InSTS)
    - Case Scenario-2: Injection at 132 kV (InSTS) and Drawal at 33 KV(MSEDCL, TPC, REL)
    - Case Scenario-3: Injection at 132 kV (InSTS) and Drawal at 11 KV(MSEDCL, TPC, REL)
    - Case Scenario-4: Injection at 132 kV (InSTS) and Drawal at LT level (MSEDCL, TPC, REL)

<u>Assumption for the purpose of Sample Illustration</u>

Open Access wheeling capacity	-	25 MW
Load Factor/ capacity utilization factor	-	80%
Cost of OA generation (ex-bus)	-	Rs. 2.50 per kWh

Annexure-3.2: SAMPLE ILLUSTRATION:

11. Sample Illustration with effective landed cost for Open Access wheeling transaction of the OA consumer for short-term open access wheeling of 25 MW power under various case scenarios is summarized in the following **Table 1.5**.

The working for effective landed cost takes into consideration applicable transmission tariff, transmission loss, wheeling charge and wheeling loss as elaborated under earlier paragraph 9.

Table1.5. Sample Illustration for 25 MW Short-term Open Access wheeling Transaction at various Voltage levels

Charges as Per APR Orders		**MSEDCL**	**TPC**	**REL**
Transmission Charge (Rs./kW/month)	Short-term	37.59		
	Long-term	150.37		
Transmission loss Compensation		4.85%		
Wheeling Charges (Rs./kW/month)	33kV	20	101	122
	22/11kV	110		
	LT level	191	196	140
Wheeling Loss Compensation	33kV	6%	2.40%	2.40%
	22/11kV	9%		
	LT level	14%		9.30%
Cross Subsidy Surcharge		NIL	NIL	NIL
Additional Surcharge	TO BE DECIDED ON CASE TO CASE BASIS			
Default Service Charges*	Rs/month/ connection	250		200
	Rs/kWh	12.00	Not Specified	13.27**
Balancing Market Charge	On Marginal Pricing basis as per Intra-State ABT Order, Currently applicable only for full TOAU (Transmission Open Access Users)			

* Default Service Charges have been considered same as HT Temporary Tariff.

** includes 27 Paise/kWh of standby charges and 250 Paise/kWh of expensive power charges

The working for Sample Illustration is given in the following **Table 1.6.**

Table 1.6: Background workings for the Sample Illustration

Parameter Description	**Case 1**	**Case 2**	**Case 3**	**Case 4**
Generator Voltage(kV) (injection Point)	132	132	132	132
Consumer Voltage (kV) (drawal point)	132	33	11	LT
Open access at generator end (MW)	25	25	25	25
Load Factor %	80	80	80	80
Energy Injected (Mu)	14.4	14.4	14.4	14.4
Nature of Open Access	Short-term	Short-term	Short-term	Short-term
Cost of Generation (Rs/kWh)	2.5	2.5	2.5	2.5
MSEDCL				
Energy Drawn at Transmission end (MU)	13.70	13.70	13.70	13.70
Energy Drawn at consumer end (MU)	13.70	12.88	12.47	11.78
Amount Paid to generator (Rs Mn)	36.00	36.00	36.00	36.00
Transmission Charge (Rs. Mn)	0.94	0.94	0.94	0.94
Wheeling Charge (Rs Mn)	0.00	0.50	2.75	4.78
Cross-subsidy surcharge (Rs Mn)	0.00	0.00	0.00	0.00
Additional surcharge (Rs Mn)	0.00	0.00	0.00	0.00
Total Charges Paid	36.94	37.44	39.69	41.72
Effective Rate (Rs/kWh)	2.70	2.91	3.18	3.54
TPC				
Energy Drawn at Transmission end (MU)	13.70	13.70	13.70	13.70
Energy Drawn at consumer end (MU)	13.70	13.37	13.37	13.37
Amount Paid to generator (Rs Mn)	36.00	36.00	36.00	36.00
Transmission Charge (Rs. Mn)	0.94	0.94	0.94	0.94
Wheeling Charge (Rs Mn)	0.00	2.53	2.53	4.90
Cross-subsidy surcharge (Rs Mn)	0.00	0.00	0.00	0.00
Additional surcharge (Rs Mn)	0.00	0.00	0.00	0.00
Total Charges Paid	36.94	39.47	39.47	41.84
Effective Rate (Rs/kWh)	2.70	2.95	2.95	3.13
REL				
Energy Drawn at Transmission end (MU)	13.70	13.70	13.70	13.70
Energy Drawn at consumer end (MU)	13.70	13.37	13.37	12.43
Amount Paid to generator (Rs Mn)	36.00	36.00	36.00	36.00
Transmission Charge (Rs. Mn)	0.94	0.94	0.94	0.94
Wheeling Charge (Rs Mn)	0.00	3.05	3.05	3.05
Cross-subsidy surcharge (Rs Mn)	0.00	0.00	0.00	0.00
Additional surcharge (Rs Mn)	0.00	0.00	0.00	0.00
Total Charges Paid	36.94	39.99	39.99	39.99
Effective Rate (Rs/kWh)	2.70	2.99	2.99	3.22

Annexure-4: Comparison of Cross-Subsidy Surcharge

CROSS-SUBSIDY SURCHARGE STATUS IN DISTRIBUTION (01.10.08)

S. No.	States		Cross-Subsidy Surcharge (Paise/Unit)					Surcharge Methodology	Year
1	Andhra Pradesh		yet to be decided for year 2008-09					Embedded Cost method	2008-09
2	Assam	LT General Supply	6					Cost of Supply method	2007-08
		Public Water Works	77						
		Bulk(Educational)	46						
		HT bulk Supply	38						
		HT Industries I	47						
		HT Industries II	35						
		Tea & Coffee	148						
		Oil & Coal	41						
3	Bihar	132KV EHT	170					-	2007-08
		33KV HT	141						
4	Chhattisgarh	132kV & above	65					Average cost method	
		33kV	38						
5	Delhi		Industrial	Non-Domestic	Railway			As per Tariff Policy	2008-09
	BRPL	Above 66KV	119.79	198.35	88.05				
		At 33/66KV	92.76	171.32	61.02				
		At 11 KV	20.93	99.49	-				
		At LT	-	12.2	-				
	BYPL	Above 66KV	107.16	198.59	-				
		At 33/66KV	78.76	170.19	-				
		At 11 KV	2.48	93.91	-				
	NDPL	Above 66KV	97.03	193.3	67.74				
		At 33/66KV	72.98	169.25	43.69				
		At 11 KV	-	87.18	-				
		At LT	-	15.17	-				
6	Gujarat		100					Annually approved on submission of ARR	2007-08
7	Haryana		Yet to be decided					Embedded Cost	2008-09
8	H.P.		Nil					Avoided Cost/Embedded Cost (acc to Tariff Policy)	2007-08
9	Jharkhand	EHT(132KV)	29					Average Cost of Supply	
		HT(33KV)	39						
10	J&K		0					-	2007-08
12	Karnataka		**BESCOM**	**MESCOM**	**CESC**	**HESCOM**	**GESCOM**	Cost of Supply	2008-09
		EHT	93	62	52	66	86		
		HT bulk supply	78	34	20	22	67		
11	Kerala		5					As specified in Tariff Policy	2008-09
13	MP	132kV & above	94					As specified in Tariff Policy	2007-08
		33kV & above	63						
14	Maharashtra		Nil					-	2008-09
15	Meghalaya		Yet to be decided					-	
16	Orissa		determined					Avoided Cost	2008-09
17	Punjab		-					Surcharge shall be equal to one-half(50%) of the current level of cross subsidy	
18	Rajasthan	LIP-EHV	55.00					Embedded Cost	2008-09
		LIP-33KV	38.00						
		LIP-11KV	16.00						
		ML-132KV	44.00						
		ML-33KV	28.00						
		ML-11KV	5.00						
		NDS-132KV	147.00						
		NDS-33KV	130.00						
		NDS-11KV	108.00						
19	Tamil Nadu	Injection Voltage	Drawl Voltage	Industrial consumer	Educational Inst	Commercial Consumer		As per Tariff Policy	2006-07
		22KV/11KV	22KV/11KV	97.17	91.71	274.87			
		33 KV	22KV/11KV	105.47	100.01	283.17			
		110 KV	22KV/11KV	108.49	103.03	286.19			
		110 KV	33 KV	116.8	111.34	294.5			
		110 KV	110 KV	119.82	114.36	297.52			
		230 KV	22KV/11KV	110.76	105.3	288.46			
		230 KV	33 KV	119.06	113.6	296.46			
		230 KV	110 KV	122.08	116.62	299.78			
		230 KV	230 KV	124.35	118.89	302.05			
20	Tripura		Yet to be decided					-	
21	Uttarakhand		Nil						2008-09
22	Uttar Pradesh		Nil					As per Tariff Policy	2008-09
23	West Bengal		CESC LTD	WBSEDCL	DPSC LTD	DPL		Avoided Cost	2007-08
			192.75	239.88	307.93	118.42			

Annexure-5: TNERC Order for Standby support

5.22 GRID AVAILABILITY CHARGES

5.22.1 As per Regulation 9 (7) of the TNERC Intra-State open access regulations 2005, the distribution licensee is entitled to collect grid availability charges for providing standby arrangements (backup supply from grid) to open access customers in the following cases.

i. In case of outages of generator supplying to a consumer on open access, and when the generator who happens to be an open access customer is permitted to avail start up power from the grid at the charges to be determined by the Commission.

ii. When the scheduled generation is not maintained and when the drawal by the consumer is in excess of the schedule.

5.22.2 The TNEB have not submitted any proposal for determining grid support charges.

5.22.3 **Outage of Generator conditions and providing Start up Power**:

Para 8.5.6 of the National Tariff policy stipulates that in case of outages of generator supplying to a consumer on open access, standby arrangements should be provided by the licensee on payment of tariff for **temporary connection to that consumer category as specified by the Appropriate Commission**. The Commission has not specified any tariff for temporary supply to HT categories. However, it has been specified in the tariff order in force from 16-3-2003 , that, the industries requiring HT supply during construction period shall be charged under HT tariff III (Applicable to commercial establishment and other categories of consumers not covered under HT tariff – IA, IIA, IIB and V) Accordingly, in case of outages of generator supplying to a consumer on open access, standby arrangements should be provided by the licensee to meet the demand of the open access beneficiary, on payment of consumption charges (energy charges plus the energy equated demand charges) applicable to HT tariff III , which is presently 621.81 paise per unit. Similarly, in case of drawal by the generator for start up power from the Licensee, the generator shall be permitted to draw the start up power on payment of consumption charges (energy charges plus the energy equated demand charges) applicable to HT tariff III, which is presently 621.81 paise per unit.

5.22.4 **When the scheduled generation is not maintained and / or when the drawal by the consumer is in excess of the schedule.**

The Open Access regulations specified by the Commission stipulates that "*the applicable tariff of that consumer category shall be allowed as grid support charges till ABT regime is implemented and as and when ABT regime is implemented the grid availability charges shall be UI charges or the tariff applicable for that particular category whichever is higher.*"

In this context, the applicable tariff as referred above, consist of energy charges and demand charges.

a) Energy Charges applicable: When the generator is synchronized with the Grid, energy charges shall be payable by the open access customer, for the units supplied by the Distribution Licensee (i.e. balance units arrived at after subtracting the units supplied by the generator from the total consumption of the user during the billing month) at the applicable rate for that category. The time of day consumption (TOD) shall be charged for the nett consumption only (deducting the generated energy from the energy consumed during the respective time slots).

b) Demand charges applicable: In addition to energy charges stipulated above, the open access customer shall pay applicable demand charges as detailed below:

There are 2880 time blocks of 15 minutes interval in a billing month. It is not feasible to segregate precisely the quantum of demand supplied in each time block in the billing month to the open access user by the generator and by the licensee distinctly. This segregation may be computed by matching the demand recorded in each time block at the generator end (A) with the demand recorded in the corresponding time block at the open access users end (B) then

Case 1: If (B) is lesser than (A), it means there is no supply of demand by the licensee to the open access user.

Case 2: If (B) is greater than (A), it means that there is supply of demand by the licensee in that respective time block.

As per the tariff order, a demand charge in a billing month by any HT consumer is 90% of sanctioned demand or recorded demand which ever is higher. As the demand is recorded at every 15 minutes time block, the recorded demand will show the maximum demand recorded in any of the 15 minutes time block in that billing period of one month.

The probability of occurrence of case 1 is zero and the probability of licensee supplying the demand in any one of the time blocks in a billing month as in case 2 is 100 percent. In such a scenario, whether the licensee is entitled to receive the demand charges in full, even though the generator is also injecting the demand into the grid continuously, needs to be addressed. It is no doubt that, all the fluctuation in the generator end and user end is met by the licensee. However, the percentage of the demand, injected by generator is also to be taken for consideration and to that extent, the demand charges receivable by the Licensee is to be restricted.

Till a mechanism is put in place to ascertain the relation between the demand generated in each of the 2880 fifteen minutes time blocks and the demand recorded at the consumer end in the related time blocks, a reasonable approximation has to be followed to arrive at the demand supplied by the generator. Since the variation in meeting the demand of the open access customer by the two parties involved, is possible in the full range of 0 to 100 %

and only the actual energy generated is available at the generation end, it is considered prudent to convert 51 % of the energy generated for the open access user, into an equated demand with reasonable approximations as the deemed demand supplied by the generator. In line with such an approximation, a deemed demand concept is proposed.

The demand charges for a open access user shall, accordingly, be such percentage as specified for the **"deemed demand"** supplied by the generator plus 100% of the applicable demand charges for that category of Open access user for the balance demand supplied by the Distribution Licensee.(i.e. the difference between the maximum demand recorded and the deemed demand subject to the tariff order issued then and there on demand charges).

Deemed demand charges: The transmission losses in each voltage play a vital role in deciding the deemed demand. The loss levels at each voltage are given above. The loss factor depends on the voltage at which the power is injected and the voltage at which the open access user draws. Since various combinations are possible, a simple methodology is adopted to approximate the loss factor under various scenarios. Even though the power, in an interconnected grid, flows by displacement and does not actually traverse the whole distance from point of injection to the point of travel, the accepted principle, in general is, that the loss estimation shall be based on the theoretical route of flow. For example, even though the generated power is injected by a generator at 11 kV and is also drawn at the same voltage of 11 kV at a distant place , the power is supposed to have been transformed through the higher voltages of 33, 110,230 kV etc., again transformed into the lower levels and reach the point of drawal. To emulate such scenarios it is assumed that the said power, flows in an upward and downward direction as indicated below, through various voltage transformation levels and undergoes 50 % of the loss, in each direction, in that level.

Injection voltage level and 50% of the loss		Drawal voltage level and 50% of the loss	
5	230 kV (0.5 %)	230 kV (0.5 %)	6
4	110 kV (0.75 %)	110 kV (0.75 %)	7
3	66 kV (0.25 %)	66 kV (0.25 %)	8
2	33 kV (0.75 %)	33 kV (0.75 %)	9
1	22 kV/11 kV (2.75 %)	22 kV/11 kV (2.75 %)	10

The loss factor in each level is estimated to be as follows:

Injection voltage / box no	Drawal voltage / box no	Route	Total loss	Loss factor = (100-% loss) /100
22 kV/ 11 kV (1)	22 kV / 11 kV (10)	1 to 5 & 6 to 10	(2.75+0.75 +0.25+0.75+0.5) & (0.5+0.75+0.25+0.75+2.75) = 10.00 %	0.90
33 kV (2)	22 kV / 11 kV (10)	2 to 5 & 6 to 10	(+0.75 +0.25+0.75+0.5) & (0.5+0.75+0.25+0.75+2.75) = 7.25 %	0.9275
110 kV (4)	22 kV / 11 kV (10)	4 to 5 & 6 to 10	(0.75+0.5) & (0.5+0.75+0.25+0.75+2.75) = 6.25 %	0.9375
110 kV (4)	33 kV (9)	4 to 5 & 6 to 9	(0.75+0.5) & (0.5+0.75+0.25+0.75) = 3.50 %	0.965
110 kV (4)	110 kV (7)	4 to 5 & 6 to 7	(0.75+0.5) & (0.5+0.75) = 2.50 %	0.975
230 kV (5)	22 kV / 11 kV (10)	5 & 6 to 10	(0.5) & (0.5+0.75+0.25+0.75+2.75) = 5.5 %	0.945
230 kV (5)	33 kV (9)	5 & 6 to 9	(0.5) & (0.5+0.75+0.25+0.75) = 2.75 %	0.9725
230 kV (5)	110 kV (7)	5 & 6 to 7	(0.5 %) + (0.5 %+ 0.75 %) = 1.75 %	0. 9825
230 kV (5)	230 kV (6)	5 & 6	(0.5 % + 0.5 %) = 1.0 %	0.99

c). Deemed Demand Charges: The percentage of deemed demand supplied by the Licensee, for typical cases of injection and drawal and based on the loss factors as above, is arrived at as below:

Cases	Loss factor { (100 - %loss)/100}	% of deemed units supplied at generator end { 51 / Loss factor}	Deemed demand supplied by gnerator {(3) / pf}	% of deemed demand supplied by the licensee {100 – (4)}
(1)	(2)	(3)	(4)	(5)
Injection at 11/22 KV and drawal at 11/22 KV	0.90	51 / 0.90 = 56.667	56.667/0.9 = 62.96	100 – 62.96 = 37.04
Injection at 33 KV and drawal at 22/11 KV	0.9275	51 / 0.9275 = 54.987	54.987 / 0.9 = 61.10	100 – 61.10 = 38.90
Injection at 110 KV and drawal at 22/11 KV	0.9375	51 / 0.9375 = 54.40	54.40/ 0.9 = 60.44	100 – 60.44 = 39.56
Injection at 110 KV and drawal at 33 KV	0.965	51 / 0.965 = 52.850	52.850/ 0.9 = 58.72	100 – 58.72 = 41.28
Injection at 110 KV and drawal at 110 KV	0.975	51 / 0.975 = 52.308	52.308/ 0.9 = 58.12	100 – 58.12 = 41.88
Injection at 230 KV and drawal at 22/11 KV	0.945	51 / 0.945 = 53.968	53.968 / 0.9 = 59.96	100 - 59.96 = 40.04
Injection at 230 KV and drawal at 33 KV	0.9725	51 / 0.9725 = 52.442	52.442 / 0.9 = 58.27	100 - 58.27 = 41.73
Injection at 230 KV and drawal at 110 KV	0.9825	51 / 0.9825 = 51.908	51.908 / 0.9 = 57.68	100 - 57.68 = 42.32
Injection at 230 KV and drawal at 230 KV	0.99	51 / 0.99 = 51.515	51.515 / 0.9 = 57.24	100 - 57.24 = 42.76

The billing of monthly consumption is segregated into two parts:

(i) Quantum of energy supplied by the generator at open access user end and;

(ii) Quantum of energy supplied by Distribution licensee to open access user.

The demand charges in a billing month are to be arrived at as detailed below:

(a) The maximum demand recorded in a month shall be segregated into demand supplied by the generator and the demand supplied by the licensee taking into account the actual energy consumed in units, the actual energy in units supplied by the generator and average power factor maintained at the consumption point in the billing month.

(b) The demand charges payable by the open access customer will be calculated as below:

Case 1:

Injection Voltage 110 kV

Drawal Voltage 33 kV

Percentage of deemed demand as per the table = 41.28

Sanction Demand 1000 Kva

Recorded Demand 855 Kva

Units consumed 650000 units

Power factor 0.95

Units supplied by generator (at consumption point) : 500000 units

Demand supplied by generator = 500000/720*0.95 = 659.72 Kva

Demand supplied by the licensee = 855-659.72 = 195.28 Kva

Billable demand –supplied by licensee = 900 – 659.72 = 240.28
(at 90% of the sanctioned demand)

Demand charges payable = (659.72*0.4128*300)+(240.28*300)
= 81699.72 + 72084 = 153783.72

Case 2:

Injection Voltage 230 kV

Drawal Voltage 22 / 11 kV

Percentage of deemed demand as per the table above = 40.04

Sanction Demand 1000 Kva

Recorded Demand 950 Kva

Units consumed 700000 units

Power factor 0.92

Units supplied by generator (at consumption point): 700000 units

Demand supplied by generator = 700000/720*0.92 = 894.44 Kva

Demand supplied by the licensee = 950-894.44 = 55.56 Kva

Billable demand –supplied by licensee = 950 – 894.44 = 55.56 Kva

Demand charges payable = (894.44*0.4004*300)+(55.56*300)
= 107440.13 + 16668 = 124108.13

ANNEXURE P- 5

Report
On
Development of Conceptual Framework
For
Renewable Energy Certificate Mechanism for India

Submitted to

Ministry of New and Renewable Energy

(Government of India)

Prepared by

ABPS Infrastructure Advisory Private Limited

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Disclaimer

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ABBREVIATION

CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
CUF	Capacity Utilisation Factor
DERC	Delhi Electricity Regulatory Commission
DMRPS	Dynamic Minimum Renewable Purchase Standard
EA 2003	Electricity Act 2003
FOR	Forum of Regulators
GW	Giga Watt
KWh	Kilo Watt Hour
MNRE	Ministry of New and Renewable Energy
MW	Mega Watt
MWh	Mega Watt Hour
NAPCC	National Action Plan for Climate Change
NEP	National Electricity Policy
OA	Open Access
ORER	Office of Renewable Energy Regulator
PV	Photo Voltaic
RE	Renewable Energy
REC	Renewable Energy Certificate
RLDC	Regional Load Despatch Centre
RO	Renewable Obligation
ROC	Renewable Obligation Certificate
RPS	Renewable Purchase Specification
RPO	Renewable Purchase Obligation
RPC	Regional Power Committee
Rs	Rupees
SERC	State Electricity Regulatory Commission
SLDC	State Load Despatch Centre
SNA	State Nodal Agency
STU	State Transmission Utility
UI	Unscheduled Interchange

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1. Executive Summary

National Action Plan for Climate Change (NAPCC) announced by the Hon. Prime Minister of India on June 30, 2008 envisages several measures to address global warming. One of the important measures identified involves increasing the share of renewable energy in total electricity consumption in the country. NAPCC has set the target of 5% renewable energy purchase for FY 2009-10 against current level of around 3.5%. Further, NAPCC envisages that such target will increase by 1% for next 10 years. This would mean NAPCC envisages renewable energy to constitute approx 15% of the energy mix of India. This would require quantum jump in deployment of renewable energy across the country. Here, it should be noted that, in India, small hydro plants with capacity of less than 25MW are considered as renewable. Strong policy measures and proactive regulatory framework and innovative financing instruments would be required, if the desired level of penetration of renewable energy is to be achieved. One such policy instrument prescribed in NAPCC is **Renewable Energy Certificate (REC) Mechanism** which would enable large number of stakeholders to purchase renewable energy in a cost effective manner.

Accordingly, **Ministry of New and Renewable Energy (MNRE)** initiated a study to develop such mechanism and mandated **ABPS Infrastructure Advisory Private Limited (ABPS Infra)** to develop 'Conceptual Framework for Proposed REC Mechanism in India'. While developing the Conceptual Framework for the development of REC Mechanism in India, ABPS Infra has studied the existing REC schemes prevailing in various countries, their applicability and relevance with respect to India. Further, ABPS Infra has identified the various options for the development of REC Mechanism in India upon detailed consultation with various experts. ABPS Infra has also deliberated the proposed scheme at FOR - Task Force for Renewable Energy Certificate mechanism and has carefully considered their view point while finalising the scheme. This document presents the important features of the proposed conceptual framework for REC Mechanism in India.

1.1 Drivers for REC Mechanism in India

Although India is abundantly gifted with variety of renewable energy (RE) sources, not all States are endowed with same level of renewable energy sources. While some States have very high renewable energy potential, some States have very little renewable energy potential. The Electricity Act 2003 (EA 2003) stimulated the development of RE based power generation by mandating **State Electricity Regulatory Commissions**

(SERC) with the function of RE promotion within the State. Under EA 2003, the SERCs set targets for distribution companies to purchase certain percentage of their total power requirement from renewable energy sources. This target is termed as **Renewable Purchase Obligation (RPO)**. However, there are certain limitations of State specific approach when RE development strategies are to be deployed at national level.

Existing legal framework under EA 2003 puts responsibility for promotion of renewable energy on SERCs. As a result, the regulations developed by the SERCs differ from each other on many counts. Further, these regulations do not recognize purchase of renewable energy from outside the State for the purpose of fulfilment of RPO target set by the SERC for the distribution utility in the State. The requirement of scheduling and prohibitive long term open access charges poses major barrier for RE abundant States to undertake inter-State sale of their surplus RE based power to the States which do not have sufficient RE based power. Consequently, the States with lower RE potential have to keep their RPO target at lower level.

In addition, the unit cost of the RE based non-firm power is higher than the conventional power sources. As a result, while RE abundant States have no motivation to produce RE based power more than that required to satisfy the RPO mandate within the State. On the other hand, RE scarce States are not able to procure RE generation from other States.

1.2 Possible Objectives for REC Mechanism in India

If the challenges mentioned above are analyzed, it can be construed that a mechanism which will enable and recognize the inter-State RE transactions is critically required for further promotion and development of RE sources. Such a mechanism will also enable all the SERCs to raise their States' RPO targets even if necessary resources are not available in their own State. While effective implementation of inter-state transactions would be primary objective for the REC mechanism in India, some of the other objectives identified for REC mechanism are:

- Effective implementation of RPO regulation in all States in India
- Increased flexibility for participants to carry out RE transactions
- Overcoming geographical constraints to harness available RE sources
- Reduce transaction costs for RE transactions

- Create competition among different RE technologies
- Development of all encompassing incentive mechanism
- Reduce risks for local distribution licensee.

1.3 Approach and Methodology

Renewable Energy Certificate (REC) mechanism is a market-based instrument to promote renewable energy and facilitate renewable energy purchase obligations amongst various stakeholders. RECs have been used extensively as a successful market based policy instrument to promote renewable energy in many countries, such as Australia, Japan, US, Netherlands, Denmark and UK. However, these schemes vary in detail and need to be customized for local legislations and market situations. Further federal structure of governance as found in India and electricity being part of the concurrent list poses unique challenges for development of such scheme.

Accordingly, we recognized that involvement of various stakeholders such as State Electricity Regulatory Commissions, State Utilities, RE developers, etc. in the development and implementation of REC Mechanism was essential. As a result, we have adopted a consultative approach, which is significantly different from the typical desktop study approach usually adopted for such studies. The approach adopted for development of Conceptual Framework for REC Mechanism in India has been elaborated under Chapter-2.

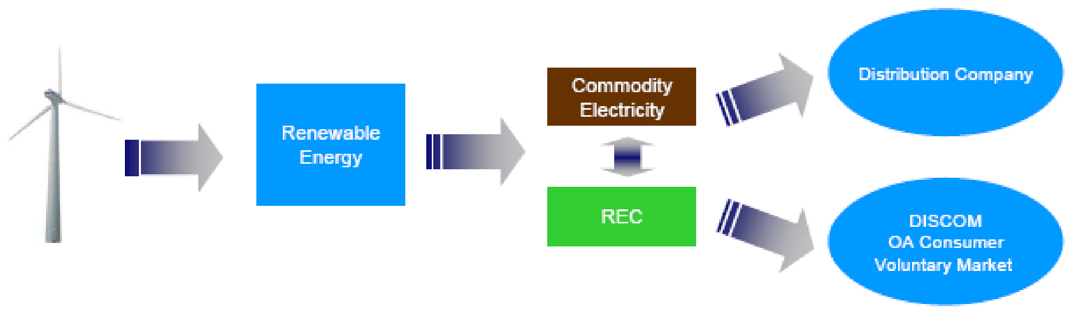
Further, ABPS Infra was invited to make presentation before Forum of Regulators and subsequently before Task Force constituted by FOR on Renewable Energy Certificate Mechanism. The detailed deliberations and suggestions made during FOR meeting held at Chennai on January 30, 2009 and Task Force meeting held at Delhi on March 2, 2009 have also been taken into consideration while finalising the proposed REC mechanism.

1.4 Overview of REC Mechanism

Internationally, purchase of REC is deemed as purchase of power generated from RE sources. It is acknowledged that renewable energy generation entails production of certain environmental attributes apart from electricity generation *per se*. Thus, RE generator can sell two different products on account of renewable energy generation. These products are the electricity and the environmental attributes associated in the form of RE Certificate. It is proposed to adopt the same philosophy for REC mechanism in India.

The schematic in Fig 1.1 presents the concept of REC mechanism and also represents the revenue model for the RE generator in the context of REC mechanism.

Fig. (1.1): Concept of REC mechanism



In the proposed mechanism, one REC will be issued to the RE generator for one MWh electrical energy fed into the grid. The RE generator may sell electricity to the distribution company and associated RECs to the distribution company or any other obligated entity. The RE generator may sell RECs to the entities with RPO target in the State or outside the State. The entities with RPO target, such as distribution companies and other entities which are required to purchase Renewable Energy have been referred to as 'Obligated Entities' in the further discussion. The purchase of RECs will be deemed as a purchase of power generated from renewable sources and accordingly will be allowed for compliance the RPO target. The REC mechanism will enable Obligated Entities in any State to procure RECs generated in any of the States in India and surrender the same to satisfy its RPO target.

Thus, REC mechanism will address the issues of scarcity of RE sources in some of the States which currently have negligible RPO targets in view of the limited RE potential in the State. In addition, in RE rich States, the REC mechanism will reduce the risks for Obligated Entities in continued procurement of renewable power beyond their RPO targets.

1.5 Important features of REC mechanism

1. REC mechanism is ***NOT*** an incentive scheme. Rather it will enable sale and purchase of renewable component across the State boundaries.
2. REC mechanism will coexist with all current incentive based schemes, since most of these schemes are based on certification of generation.

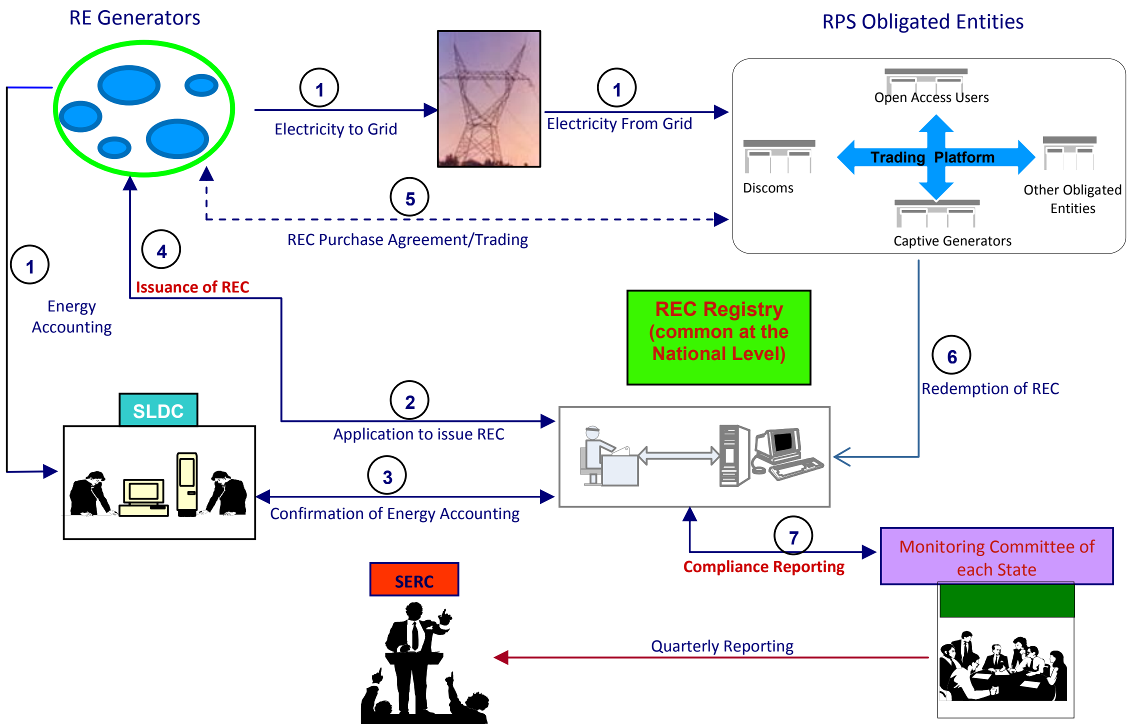
3. RE Certificate will not represent any fiscal attribute such as 'Accelerated Depreciation', hence it will be different than Production Tax Credits.
4. Though REC represent environmental attribute, it will not be related to carbon credits. These two mechanisms will operate independent of each other.

1.6 Overview of Proposed Operational Framework for REC Mechanism

The operational scheme for the Proposed REC Mechanism has been developed taking into consideration experiences of prevalent RE based tradable certificate schemes in countries such as United Kingdom, Australia, etc. Although all the operational frameworks are similar in principle, the countries have customized the operational schemes to comply with the prevalent legal and regulatory framework. The operational framework for India as presented below has also been customized to comply with existing legal and regulatory framework in India.

The schematic in Figure 1.2 represents a flow diagram for various processes involved in the REC mechanism. The numbers indicate the chronological sequence of seven identified key processes.

Fig. (1.2): Schematic of Operational Framework for REC Mechanism



The operational framework depicted above does not envisage any major modification to the existing arrangements for renewable energy procurement. The proposed framework entails appointment of an agency at national level to facilitate the registration of eligible RE generators, issuance of RECs and maintenance of record of procurement of RECs by Obligated Entities.

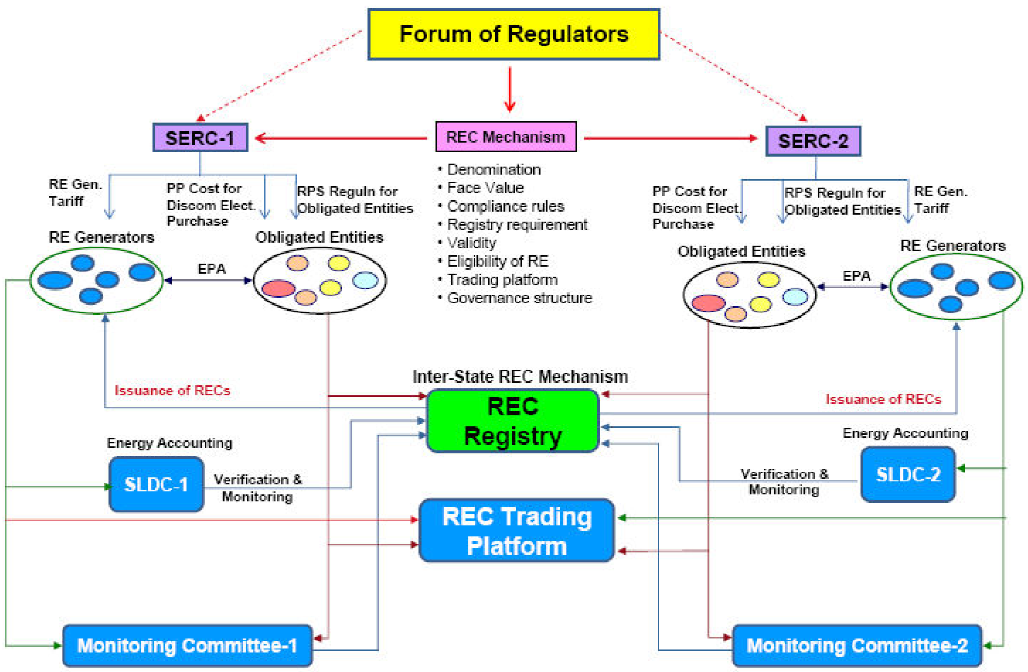
As depicted from the schematic above, the State Load Dispatch Centres (SLDC) and proposed new institutions such as National level REC Registry and State level Monitoring Committees will play the pivotal role in day-to-day operation of REC mechanism. The success of the proposed REC mechanism will depend on adoption of precise definition of the roles and responsibilities of these institutions, adoption of the appropriate governance structures and capacity building to undertake defined roles and responsibilities.

To implement the proposed REC mechanism at the national level, the above mentioned operating framework needs to be put in place in various States. Here, it may be noted that the REC registry and REC Exchange platform will be common at the national level.

1.7 Institutional Framework for the Proposed REC Mechanism

The schematic diagram at Figure 1.3 below presents the institutional framework for implementation of the proposed REC mechanism.

Fig. (1.3): REC Mechanism: Institutional Framework at National Level



For successful implementation of the proposed REC mechanism, regulatory oversight through Forum of Regulators (FOR), various State Electricity Regulatory Commissions (SERCs) and Central Electricity Regulatory Commission (CERC) will play the pivotal role. It is envisaged that Forum of Regulators shall perform an important task of development of harmonized regulations for implementation of REC mechanism at the State level.

1.8 Pricing Options for Electricity and REC components

The REC mechanism entails pricing of two components, namely, electricity component and REC component representing environmental attributes of RE generation. There are multiple options for pricing of 'electricity component' such as market based approach, UI price linked approach, average power purchase cost of utility approach and normative RE feed-in tariff linked approach etc. The merits and de-merits of various approaches have been discussed in detail under Chapter-8.

Further, REC pricing mechanism in India need to address unique situation where electricity market is still governed/regulated to great extent and the preferential feed-in tariff mechanism will have to continue as per provisions under Tariff Policy. Under the circumstances, REC price will have to be determined on notional basis, however, the same could be discovered through market mechanism based on volume and exchange of RECs.

Based on deliberations covered under Chapter-8, most feasible option for RE pricing is to link the electricity component with normative RE tariff and REC component with notional fixed price. Further, it is important to have focus on the basic purpose of introduction of REC mechanism in India which is to facilitate the inter-State exchange/transactions of RE so that all the States will be able to meet the long term RPS target specified under National Action Plan for Climate Change (NAPCC). This purpose distinguishes REC mechanism proposed for India from that in most of the other countries which rather have their REC mechanism as an incentive mechanism. Therefore, the effective electricity component prices shall be net of notional fixed price for REC component.

REC Component Price = Notional Fixed Price
Electricity component Price = Normative RE Tariff – Notional Fixed Price of REC Component

The suggested approach seems to be the most feasible solution in the present electricity market scenario. However, with the progressive development of electricity sector, the pricing methodologies for Electricity component and REC component need to be reviewed at periodic interval. After attaining the maturity by RE technologies, both the prices should reach the level of price discovery through the commercial market for electricity as well as REC prices should be determined using market discovery mechanism. The FOR Task Force on REC has supported the proposed approach for pricing of electricity component and REC component.

1.9 Key Design Parameters for REC Mechanism

Apart from pricing aspect, several other key design parameters as mentioned below have been evaluated for development of REC mechanism in Indian context.

- **Eligible RE sources and technologies**: As MNRE is nodal ministry for all matters related to renewable energy, it would be preferable to include only those RE technologies in the REC mechanism which are approved by MNRE. Further, in order to harmonise RE eligibility criteria across the States, FOR in consultation with MNRE may issue guidelines for eligibility of RE technologies.

- **Eligible RE generator / Project:** Considering the current status of infrastructure availability, it will be appropriate to focus and give priority to grid-interactive RE technologies only and based on the status after a few years the off-grid RE technologies may be included. This will enable the development of grid-interactive RE technologies up to commercial maturity and then such mature technologies can easily be transferred to the off-grid RE projects. Therefore, it is proposed that grid connected RE projects with 250 kW and above shall be eligible. The FOR Task Force has also concurred with this suggestion and has recommended that the grid connected renewable energy generators of at least 250 kW should be allowed to participate in the REC Mechanism. Existing RE projects have already been covered under particular tariff and regulatory regime. Further, the long term contracts for the same are already put in place. Hence, it will not be appropriate to subject existing RE projects to be part of REC mechanism at this stage. Therefore, it is suggested that existing projects may be allowed to participate in REC scheme after the expiry of their existing PPA. It has also been accepted and recommended by the FOR Task Force that the RE Generators already having PPA with the distribution licensees for contracted quantum would not have option to participate in the REC Mechanism till the validity of their PPA. FOR may develop suitable methodology for inclusion of the existing projects into REC mechanism after expiry of their agreements with the utilities. Further, all new grid connected RE projects, to be commissioned after introduction of REC mechanism, should be covered under REC scheme on mandatory basis. During the discussion with FOR, it has emerged that the new RE generators shall have two options i.e. either to sell both the Electricity and REC Component together at preferential tariff determined by the respective State Regulator or sell only the electricity component to the distribution utilities and to sell the REC component through the market mechanism to any of the obligated entities.

- **Obligated Entities:** It is recommended that distribution licensee, captive users and open access consumers should be considered as obligated entities for the purpose of RPO target under REC mechanism, in accordance with provisions of Section 86(1)(e) of EA 2003.

- **Shelf life of REC:** The shelf life of REC means the period during which a REC issued shall remain valid. It is proposed that shelf life of REC should be maximum one year. Keeping shelf life more than one year may result into accumulation of RECs by the stakeholders in the expectation of better price in future which may create artificial shortage of REC. The shelf life of more than one year may threaten the liquidity and viability of REC market in the short term. Therefore, it is proposed that shelf life of REC should also be of one year.

- **REC Issuing Authority:** A national level REC Registry has been proposed to be created and CERC may formulate rules for creation of such national level entity in accordance with the harmonized policies to be developed by FOR for operation of REC mechanism at national level.

- **Compatibility with other incentive scheme:** In the proposed REC mechanism for India, RPO and preferential tariff has already been taken into account while detailing out the conceptual framework for REC. It is also important that REC should be compatible with other financial and fiscal incentive schemes already in existence. The Government has announced accelerated depreciation benefits, tax benefits, generation based incentives and capital subsidy to the renewable energy projects. It shall be responsibility of MNRE to ensure that future incentive schemes are compatible with the REC mechanism as REC mechanism is a long term mechanism with validity of 20 years. Further, CDM benefit is also available to renewable energy projects. At present, all these incentives and benefits have direct or indirect impact on the normative preferential tariff announced by SERCs. In the proposed REC scheme, no change has been suggested in the existing methodology used by SERCs for tariff determination hence there will be no impact of the proposed REC scheme on any of the existing incentive schemes and benefits etc.

- **Creation and redemption of RE Certificate:** In Indian context, it is proposed that RECs will be issued to the RE generator for the electricity injected and metered at the bus-bar of the generating station. In cases, where the licensee has already contracted for electricity and REC procurement with the RE generator, RECs will be issued in the name of RE generator and immediately transferred in the name of licensee which has purchased those RECs. This will avoid creation of multiple RECs for same generation. Other issues can be very well addressed by using the appropriate hardware and software having compatibility to modify the processes, with the gain in operational experience. It is also suggested to issue REC only in 'electronic form' and no 'physical form' of REC has been contemplated to avoid hassles of paperwork and also in view of the fact that the security/verification protocols etc can be easily implemented in case of 'electronic form'.

  RECs shall be redeemed when RECs are presented to REC Registry for redemption by the owner of RECs or when shelf life of the RECs expires. Whether redeemed specifically or expired due to expiry of life, owner of the RECs shall be allowed to account these RECs for compliance of the RPO.

- **Denomination of RE Certificate:** The RECs are proposed to be denominated in energy (MWh) terms in order to be consistent with RPO percentage obligation to be specified in energy terms. With the proposed denomination in energy terms, SERCs can continue to specify the RPO target as a percentage of energy consumption which can easily be converted into the equivalent number of RECs, by applying some conversion factor, required for achieving the RPO target.

- **Period to issue RE Certificate:** In order to avoid oversupply or non-availability of RECs in the market, it is necessary that generators regularly apply for RECs. Therefore, it has been suggested to keep this period three months of the generation within which RE generator must apply for issuance of RE certificate.

- **Control period, operative period and sunset date:** Control period is a period during which the proposed REC Scheme will be in force while operative period is a period in which projects implemented during control period. Sunset date refers to the date on which scheme expires. It is proposed that the Scheme shall come into force on April 1, 2010 and control period shall be five years i.e. March 31, 2015. And the sunset date shall be 25 years from the date on which scheme came into force i.e. March 31, 2035.

- **Form of RE Certificate:** Proposed REC needs to contain all the information such as Unique Certificate Number, Name of the Issuing Body, Generator Identity, Type of Generation Technology, Installed Capacity of the Generator, Location of the Generator, Signature of the Authorized person, in its electronic form. In addition information about date of issuance of certificate and validity of certificate may also be provided on the proposed RE certificate.

(a) **Sale and Purchase of REC:** It is proposed that not only obligated entities but also other persons shall be allowed to buy RECs. REC Exchange Platform is expected to provide the services for sale and purchase of RECs. While any trading platform could be used for exchange of RECs, at this point of time there is no clarity about the volume and liquidity in the market. It is suggested that FOR should undertake the assessment of market, liquidity requirements, costs involved in setting up of the market and necessary fee structure. Further, REC Exchange Platform shall have to be developed and the regulations under Section 66 of EA 2003 will have to be framed to cover such exchange/transfer of REC. The Task Force has agreed with the proposal that one single market shall be created in the country for exchange/transfer of REC. However, the difficulties/reluctance being observed on the parts of the States in creation of all India Electricity market for conventional power should be duly taken into consideration while designing the operating rules for exchange/transfer of RECs.

2. Introduction

This Chapter outlines the scope of the study for development of Conceptual framework for REC Mechanism and also covers the methodology adopted, description of processes and inputs received and considered while devising the Conceptual Framework for introduction of REC mechanism in India.

2.1 Background

At the end of 10th Five Year Plan, renewable energy capacity in country was 13.2 GW. The 11th Five Year (2007-2012) plan envisages addition of renewable energy capacity by 14 GW. While the current efforts to harness renewable energy are targeted to meet State specific objectives, future RE capacity addition will be constrained due to lack appropriate measures to enable inter-State RE transactions. REC mechanism has been widely acknowledged as a potential tool to achieve inter-State RE transactions.

2.2 Purpose of the Study

In the view of NAPCC mandate, Ministry of New and Renewable Energy (MNRE) engaged ABPS Infrastructure Advisory Private Limited (ABPS Infra) to develop suitable conceptual framework for REC mechanism that can facilitate inter-State transactions based on electricity generation from RE sources which will enable the Obligated Entities to fulfill their obligation to purchase power generated from renewable sources.

2.3 Scope of Study

In order to develop Conceptual Framework for REC mechanism, MNRE had outlined following Terms of Reference for the Study.

1. Hurdles faced by RE in India
2. Regulatory developments in India
3. Potential for competitive bidding in RE sector
4. Feasibility of implementation of REC mechanism in India
5. Potential for creating competition among various RE technologies
6. Operational Aspects of REC Mechanism such as:
    - Denomination of RE Certificate
    - Mechanism for stating RPS/RPO in terms of REC
    - Rules for issuance of RE certificate
    - Validity of RE certificate
    - Certificates of Origin

- Registry/Clearing house and rules for the same
- Energy Accounting and Energy Credit Mechanism to recognize REC
- Entities to be covered
- Conformity with other relevant regulations such as Open Access, Grid Code, Scheduling and Dispatch Regulations etc

7. Institutional Mechanisms needed for REC implementation
8. Legal and Regulatory Issues
9. Road map for implementation of RECs

2.4 Approach and Methodology

Renewable Energy Certificate (REC) mechanism is a market-based instrument to promote renewable energy and facilitate renewable energy purchase obligations amongst various stakeholders. RECs have been successfully used in many countries such as Australia, Japan, US, Netherlands, Denmark and UK for promotion of renewable energy. However, these schemes vary in detail and need to be customized for local legislations and market situations. Further federal structure of governance as found in India and electricity being part of the concurrent list poses unique challenges for development of such a scheme in India.

Accordingly, we recognized that involvement of various stakeholders such as State Electricity Regulatory Commissions, State Utilities, RE developers, etc. in the development and implementation of REC Mechanism was essential. As a result, we adopted a consultative approach, which is significantly different from the typical desktop study approach usually adopted for such studies. We have adopted following approach for development of 'Conceptual Framework for REC Mechanism' in India:

i. **Stakeholder consultation and identification of key issues:**
A number of States with significant RE potential and with very little RE potential were identified so as to gather views of various stakeholders involved in inter-State RE transactions in these States. The identified States were Andhra Pradesh, Delhi, Gujarat, Karnataka, Maharashtra, and Rajasthan. The stakeholders considered for consultation process in these States covered SERCs, SLDCs, State Transmission Utilities (STUs), State Nodal Agencies (SNAs), distribution licensees, RE generators and their associations, CERC, Regional Load Despatch Centres and Regional Power

Committees (RPCs). A detailed questionnaire was designed and administered for seeking responses from various stakeholders for identifying existing legal, operational, commercial and regulatory issues involved in undertaking inter-State and intra-State RE transactions.

ii. **Identification of Legal and Regulatory Hurdles in REC development:**
The potential legal and regulatory hurdles for proposed REC mechanism were identified. An exhaustive list of these issues was prepared. Their relevance for the REC mechanism was studied. The outcome of this study was useful while devising a suitable regulatory approach for development of appropriate REC mechanism.

iii. **Analysis of International Experience of REC implementation**
Under this module, we undertook comprehensive review of REC schemes implemented in other countries. The evaluation of the features of the REC schemes was carried out in the context of the legal and regulatory framework prevalent in the electricity sector in that country. Also, interplay of REC mechanism with other policy instruments for promotion of RE sources was also studied. This analysis was applied to Indian context to assess the relevance of a particular feature in Indian context.

iv. **Evaluation of options and recommendations:**
It was desired that the proposed REC mechanism should be compatible with the existing policy and regulatory framework. Further any new mechanism it should cause minimal modifications to the existing institutional and operational requirements. Accordingly, various options for introduction of REC mechanism were evaluated and most suitable option has been selected.

v. **Ascertaining feasibility of the proposed REC mechanism**
The proposed solution was presented to MNRE and FOR and deliberated extensively. ABPS Infra was invited to make presentation before Forum of Regulators on January 30, 2009 at Chennai. The presentation covered in detail the proposed conceptual framework for REC mechanism. The FOR has 'in-principle' accepted the proposed conceptual framework for REC mechanism in India and constituted a Task Force to address further operational issues to ensure speedier implementation of the mechanism. The meeting of FOR Task Force was held at Delhi on March 2, 2009 wherein several implementation aspects were deliberated at length.

The feedback and suggestions of the Task Force have been taken into consideration under this Report on REC mechanism for India.

vi. **Design parameters and Salient features of the proposed REC mechanism**
While designing conceptual framework, we have identified several design parameters such as denomination of REC, eligibility of RE technologies, eligibility of RE generators, pricing of electricity component, pricing of REC component, REC registry, transfer/exchange mechanism, shelf-life, sunset date, etc. We have identified various alternatives for each of the design parameters and have assessed merits/de-merits of each alternative before proposing suitable framework for REC Mechanism in India.

vii. **Institutional Set up and identification of roles and responsibilities**
Energy accounting, issuance of REC and monitoring of RPO compliance are critical processes for successful implementation of the REC mechanism. Understanding of the existing processes is very important while developing any new solution. It is necessary to make maximum use of the existing institutions. Accordingly, we have strived to work with the existing institutional set up such as SLDCs, distribution licensees, RLDCs and RPCs for undertaking inter-State energy transactions. However, new institutions such as REC Registry, Exchange platform at national level and Monitoring Committee structure at State level are essential to operationalise the proposed REC mechanism. We have critically evaluated the roles and responsibility of each agency in the proposed REC mechanism.

2.5 Organization of this Report

This report has been organized through eleven chapters.

Chapter 1 provides an Executive Summary of the report.

Chapter 2 presents the background and purpose of study, scope of study, approach and methodology identified to accomplish the task and outline of the Report.

Chapter 3 presents the status of grid-interactive RE power generation in India. It highlights the commercial developments in the RE sector and potential market for RECs.

Chapter 4 highlights the existing legal and regulatory framework, drivers and objective for REC mechanism, concept of RE Certificate and the issues identified in development and implementation of such inter-State mechanism in India.

Chapter 5 covers the detailed analysis of international REC schemes and identifies the salient features and key design parameters for the purpose of devising REC mechanism in Indian context.

Chapter 6 presents the potential approach for introducing REC mechanism in India including the institutional requirements, regulatory challenges and outlines possible roadmap for regulatory activities to be undertaken prior to introduction of REC mechanism in India.

Chapter 7 presents the detailed conceptual framework for REC. It also elaborated on operational framework with step wise analysis of procedures involved in issuance of REC certificate, role and responsibility of each entity involved in the transaction. Further, the step-wise process map from issuance of REC to its redemption has been laid out under this Chapter.

Chapter 8 elaborates on various pricing aspects of electricity component and REC component under the proposed REC mechanism. Various options available for pricing of electricity component and REC component have been discussed in detail along with their merits/de-merits. A suitable pricing option has been recommended.

Chapter 9 elaborates on various design features and key parameters for proposed REC mechanism in India context. It also evaluates various alternatives alongwith merits/de-merits in respect of each design parameter.

Chapter 10 elaborates the next steps to be taken by various stakeholders for implementation of REC mechanism in India.

3. Overview of Renewable Energy Development in India

This chapter presents the overview of renewable energy development in India. The chapter assesses the RE potential to be harnessed in respect of each RE technology. Further, this Chapter also highlights the status of regulatory measures such as RPO regulations and Feed-in tariffs across various States. Finally, this Chapter estimates the potential for RE transactions through REC mechanism.

3.1 RE Development in India

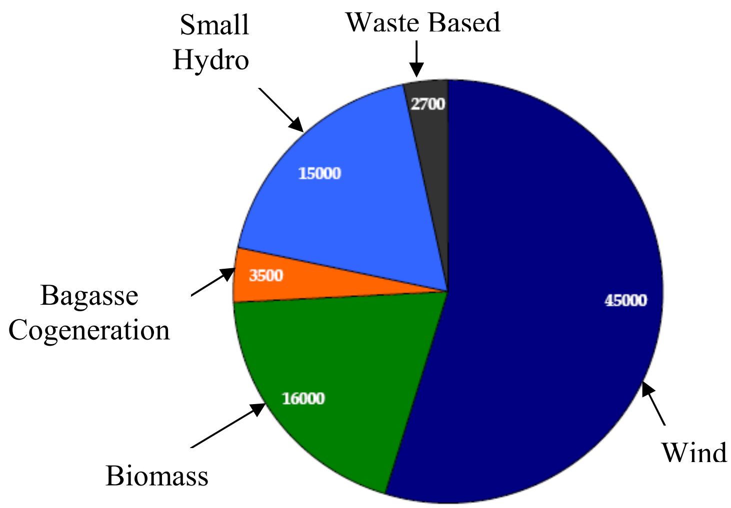
India started its renewable energy program in 1981 with the establishment of Commission for Additional Sources of Energy which was later converted into Ministry of Non-conventional Energy Sources in 1992. In the year 2006 it was renamed as Ministry of New and Renewable Energy (MNRE). Today, MNRE operates one of the world's largest programmes for promotion of RE sources in the country.

This section provides brief information about the technical potential and achievement in terms of cumulative installed generation capacity for each RE source in India. It also highlights the huge gap between India's gross potential and the capacity installed, so as to develop appreciation of the need for development of suitable policy instruments for accelerated development of renewable energy sources in India.

3.2 Technical Potential of Renewable Energy

India has been bestowed with huge RE potential; however it is not distributed uniformly across the country. Solar, wind, biomass and small hydro are the major RE sources in India. India receives solar energy approximately 5000 trillion kWh/year equivalents, which is far more than India's total energy consumption of about 848 billion kWh as projected for FY 2010 by Central Electricity Authority in its 17th Electric Power Survey. The potential of various RE sources excluding solar energy is shown in figure 3.1 below.

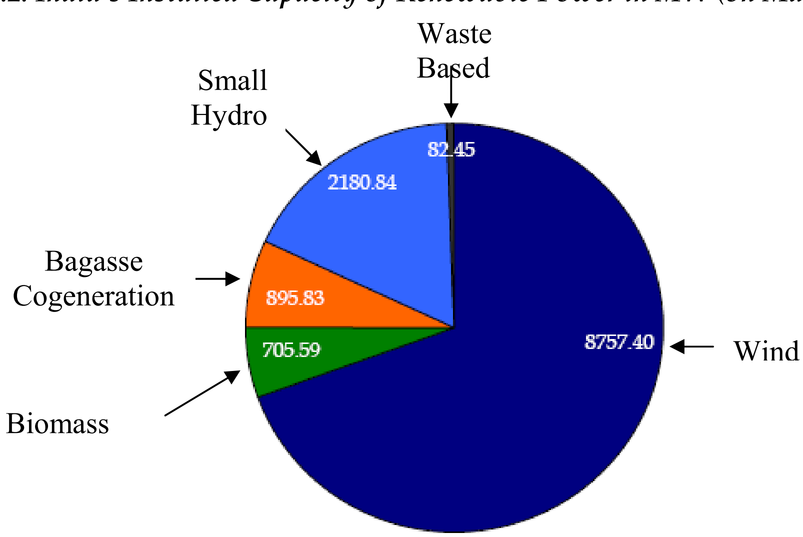
Fig. 3.1: India's Technical Potential of Renewable Power in MW [1]



3.3 Renewable Energy Installed Capacity

As it is evident from figure 3.2, the wind energy constitutes largest commercially exploited RE source in India. Further, as per 11th Plan projections, the dominance of wind energy within overall renewable energy mix is expected to continue.

Fig. 3.2: India's Installed Capacity of Renewable Power in MW (on March 31, 2008)



The status of potential and installed capacity of each RE resource available in India has been presented below in more detail.

[1] http://mnes.nic.in as on January 22, 2009

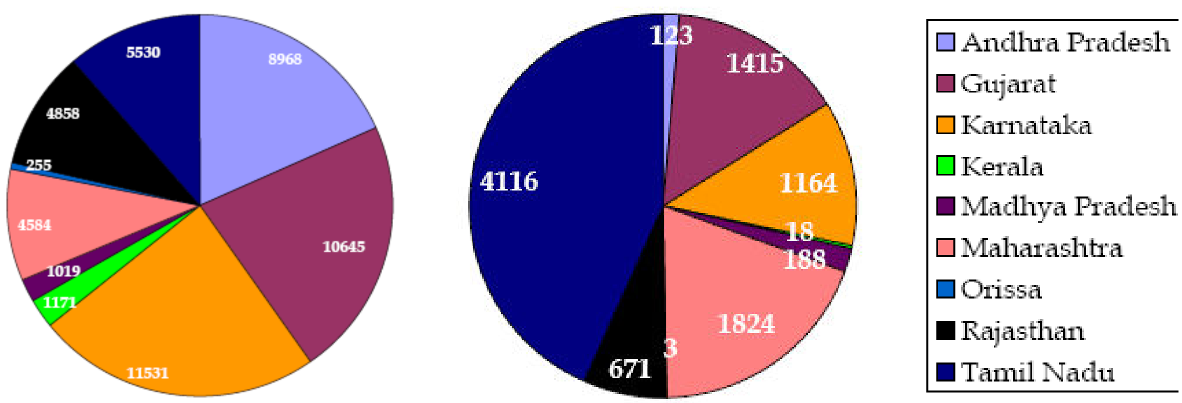
3.3.1 Wind

Wind based generation capacity constitutes about 80% of the total renewable energy based installed generation capacity in the country. Wind energy potential is mainly concentrated in the western and southern part of the country due to the better wind regimes in the coastal areas. . The States of Tamil Nadu, Karnataka, Maharashtra, Gujarat, Rajasthan, and Madhya Pradesh have seen significant investments in wind energy generation by private as well as public sector investors.

The 11th five year plan has outlined a target of 10,500 MW of capacity addition from wind energy projects. The energy generation is expected to increase at an average growth rate of 9% per annum and is expected to reach 7 billion units during FY2011-12.

The potential and installed capacity in the important States in India has been shown in the figure 3.3.

Fig. 3.3: State-wise Gross Potential and Installed Capacity in MW [2]



Gross Potential Capacity in MW

Installed Capacity in MW as on September 30, 2008

3.3.2 Biomass power

The table 3.1 below provides information related to the cumulative capacity addition at the end of 10th plan and gross potential for the resource for the entire country.

[2] Programmes and schemes for Grid Interactive Renewable Power From http://mnes.nic.in/ as on January 22, 2009

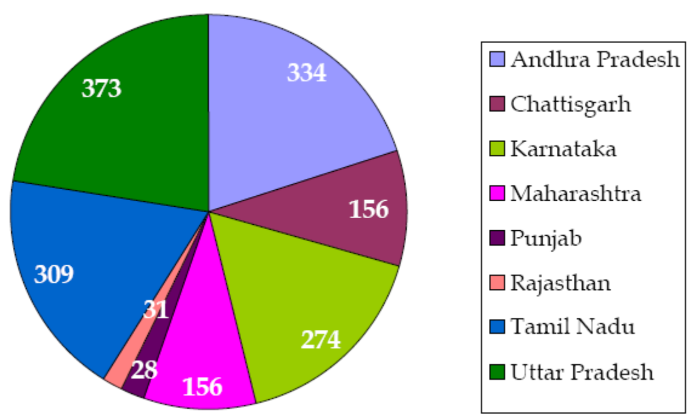
Table (3.1): India's Biomass Power Generation Installed Capacity & Potential (MW) [3]

Sr. No.	Grid interactive Projects	Cumulative Installed Capacity (on March 31, 2007) in MW	Estimated Potential in MW
1	Bio power (agro residues and plantations)	524.80	16881
2	Bagasse Cogeneration	615.83	5000

During 11th Plan period, capacity addition of around 2100 MW from biomass power and bagasse cogeneration projects has been targeted as against capacity addition of 750 MW achieved during 10th Plan.

The State-wise distribution of the installed capacity of biomass and bagasse based cogeneration projects have been shown in the figure 3.4 below.

Figure (3.4): Biomass based installed Capacity across the Important States till end of FY 2009 [4]

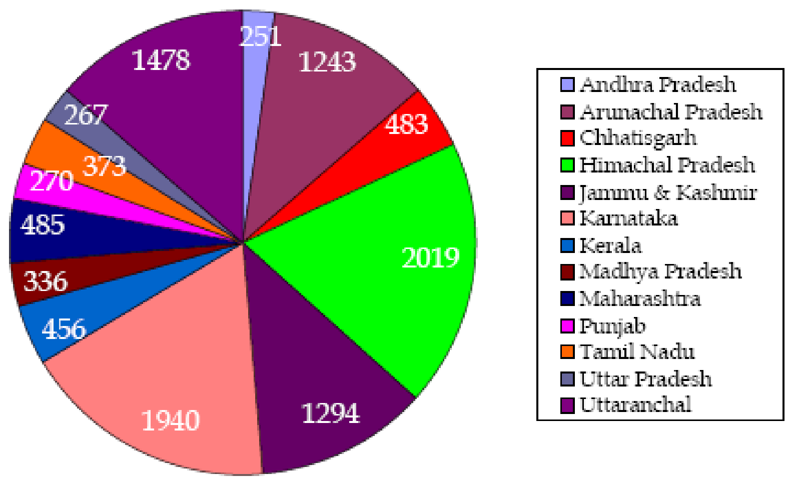


[3] 11th Five Year National Plan
[4] Programmes and schemes for Grid Interactive Renewable Power From http://mnes.nic.in/ as on January 22, 2009

3.3.3 Small Hydro Power

In India, the hydro power plants with installed capacity of less than 25 MW are classified as small hydel power plants and therefore considered as a part of renewable generation. The State-wide installed capacity of small hydro power plants is shown in figure 3.5.

Figure 3.5: Small Hydro based installed Capacity (MW) across the Important States as on June 2007 [5]



3.3.4 Solar Power

Due to geographical location India has many of the abundantly gifted sunny regions of the world. While, the highest annual radiation is received in western Rajasthan, the north-eastern region receives the lowest annual radiation.

Most parts of India receive 4–7 kWh of solar radiation per square meter per day with 250–300 sunny days in a year. India receives solar energy approximately 5000 trillion kWh/year equivalent, which is far more than India's total energy consumption of about 848 billion kWh in FY 2010, as projected by Central Electricity Authority in it's 17th Electric Power Survey. India has Solar Photovoltaic power generation potential of 20 MW per sq. km while Solar Thermal power generation potential of 35 MW per sq. km. The grid connected installed capacity at the end of 10th five year national plan was about 3 MW. It is targeted to add 50 MW during the 11th plan. Table 3.2 summarizes the solar based installation in the country.

[5] Programmes and schemes for Grid Interactive Renewable Power From http://mnes.nic.in/ as on January 22, 2009

Table (3.2): Solar based installation in India (as on March 31, 2008) [6]

Sr. No.	Particular	Unit	Detail
1.	Solar Power	MW	2.12
2.	Solar PV power plants and street lighting	MW_P	7.72
3.	Solar Lantern	Nos.	6,70,059
4.	SPV Pumps	Nos.	7148
5.	Solar water heating-Collector Area	Million sq. m.	2.30
6.	Solar Cookers	Lac units	6.34

3.4 Potential Market for REC in India

In this section, an attempt has been made to estimate the market size for REC Scheme in India. In order to estimate demand for renewable energy, energy requirement as estimated by Central Electricity Authority [7] in its 17th Electric Power Survey has been considered. Further, it has been assumed that India will be able to achieve the target set by NAPCC. Renewable energy generation thus available has been compared with the current scenario (RE capacity addition as planned under 11th Five Year Plan) to quantify incremental RE generation due to target set out in NAPCC.

Table (3.3): REC Potential Market Assessment

NAPCC Target implementation scenario	Unit		2008-09	2009-10	2010-11	2011-12
Energy Requirement	BU			848.39	906.32	968.66
NAPCC Target	%			5%	6%	7%
Renewable Energy	BU			42.42	54.38	67.81
Incemental Renwable Energy	BU				11.96	13.43
Current Scenario		**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**
Renewable Installed Capacity	MW	10250.0	12712.2	15765.9	19553.1	24250.0
CUF 28%	%	28%	28%	28%	28%	28%
Renewable Energy Availability	BU	25.14	31.18	38.67	47.96	59.48
Renewable Energy Availability				4.56%	5.29%	6.14%
Incremental Renewable Energy Availability	BU			7.49	9.29	11.52

6 Renewable Energy Booklets From http://mnes.nic.in/ as on December 20, 2008
7 http://www.cea.nic.in as on January 13, 2009

Based on projected RE capacity addition of 14 GW during 11th Plan, the total renewable energy installed capacity in the country is expected to increase from 10.25 GW (end of 10th Plan) to 24.25 GW (end by 11th Plan). Out of projected RE capacity addition plan of 14 GW, significant quantum of RE capacity addition (around 10.5 GW) is expected to be added from wind energy. Thus, at an estimated CUF of 28% on aggregate basis, total renewable energy generation is expected to increase from 38.67 Bn units (2009-10) to 59.48 Bn units (2011-12) which translate to share of RE quantum in overall energy mix to increase from 4.5% to 6.1%, which is marginally lower than the RPO trajectory outlined under NAPCC. Thus, incremental RE generation varies from 7.5 Bn units to 11.5 Bn units. If RECs are proposed to be introduced for new RE projects, this translates to REC market potential of around 8 to 10 Bn units per annum.

As shown in the above table, the market potential assessment for REC has been carried out taking into consideration (a) targets specified under NAPCC and (b) the capacity addition targets envisaged by MNRE. As regards the capacity addition targets specified by MNRE, those were set at the beginning of 11th plan considering the significant renewable energy capacity addition during the 10th Plan. However, the current economic slowdown has adversely affected the renewable energy capacity addition during the first two years of 11th Plan, especially in the wind energy sector. Therefore, in such conditions, actual renewable energy capacity addition may be lower than the targeted capacity addition as envisaged during the 11th Plan.

Further, based on earlier experience of operationalising RPO regulations, very few States such as Tamil Nadu, Karnataka, Gujarat etc. have exceeded the minimum targets for RE procurement, whereas many States are yet to achieve the minimum targets. NAPCC has set the target of 5% renewable energy purchase for FY 2009-10 against current level of approx 3.5%. Further, NAPCC envisages that such target will increase by 1% for next 10 years. This would mean NAPCC envisages renewable energy to constitute approx 15% of the energy mix of India. This would require quantum jump in deployment of renewable energy across the country. Strong policy measures and proactive regulatory framework and innovative financing instruments would be required, if the desired level of penetration of renewable energy is to be achieved.

Further, at present, none of the SERCs have specified the minimum RPS targets after considering the targets specified under NAPCC, mainly due to the reason that almost all the Orders/Regulations were framed before issuance of NAPCC. However, interestingly, the Consultative Papers issued by the SERCs in the recent past for review of RPS/RPO targets also has no mention of the NAPCC target.

Thus, to meet the targets as envisaged under NAPPC, all States will have to undertake comprehensive review of the RPS/RPO Regulations. However, it is unlikely that all States will develop the mandatory RPO/RPS framework before April, 2010 and the obligated entities will actually be able to meet the targets in the short term. Therefore, as a word of caution, the REC market potential assessment on the basis of above two assumptions may lead to most optimistic scenario for near future. A detailed study on REC market potential assessment needs to be carried out after considering the realistic assumptions and ground realities.

3.5 Implications of REC Implementation

It may be noted that non-availability of mechanism for inter-state sale and purchase of RE is not the only impediment in the path of achievement of higher targets set out in NAPCC. Many other issues such as increased cost of generation, lack of compliance mechanism, etc would have to be resolved. However, it is believed that lack of coordination among States while setting RPO targets and non-uniformity in procedures and norms for determination of tariffs for various RE technologies are the two most important barriers. It is learnt that CERC has already initiated the exercise to develop norms and regulations for determination of tariffs for renewable energy technologies. Once notified by the CERC, such norms would become guiding factors for all SERCs.

While this will take care of the second problem, the first problem is more fundamental as currently RPO Targets are set without any regard to national target. The currently specified RPO targets vary significantly across the States. At one end of the spectrum, Delhi has target of just 0.5% for renewable energy purchase, while at other end, Himanchal Pradesh has target of 20% for distribution utility in the State. This disparity in targets is a reflection of the varying renewable energy potential in different states. Similar disparity is noted in achievement of the targets or actual injection of renewable energy in the State. While States like Tamil Nadu and Karnataka have achieved target of 10% for renewable energy, many other states are not able to meet target of even 1-2% for purchase of renewable energy. While nothing can be done about the varying renewable energy potential in different states, it may be possible to develop an approach which will enable nation as a whole to achieve the target set under NAPCC.

At present, none of the SERCs has specified the minimum RPS targets after considering the targets specified under NAPCC, mainly due to the reason that almost all the Orders/Regulations were framed before issuance of NAPCC. However, interestingly, the Consultative Papers issued by the SERCs in the recent past for review of RPO targets also has no mention of the NAPCC target.

In theory, all State Regulators can set the renewable target which is equal to the national target under NAPCC. However, such an approach would be futile as the States with little/no RE potential will never be able to procure renewable energy as per the national target. Further, most of the SERCs have specified renewable targets from the short term perspective, primarily due to limitation of in-depth study of renewable energy potential in the State and non-availability of appropriate instrument to allow purchase of renewable energy from outside the State. As a result, it will be difficult to achieve the NPACC target unless some appropriate policy / regulatory instruments are developed. While one of the options would be State level targets being determined by the Central Government, given current legal framework, this is not a feasible option. Therefore, consensus among the SERCs is the only feasible option to achieve the national target. It has been recommended and also acknowledged by the Task Force that in depth consultation with SERCs to arrive at consensus in the matters of setting renewable purchase obligations should be crucial for the success of REC Mechanism. Also, it has emerged during discussion with the Task Force that FOR should evolve state-wise targets for RPS after duly taking into consideration recommendations of achieving the target of 5% as a whole at national level and its likely impact on consumer tariff.

In addition, while NAPCC envisages long term trajectory for RPO targets to be set upto 2020, at present, most of the States have specified RPO targets only for period of 3 to 5 years upto 2010. There are very few States, who have RPO targets specified for period beyond 2012. Thus, in order to achieve objectives outlined under NAPCC, long term RPO trajectory should be specified by all States. It is necessary to develop appropriate regulatory and institutional mechanism to ensure that States determine RPO targets in consultations with each other. , Such consultations may be carried out by the Forum of Regulators which has been entrusted with the responsibility of harmonizing regulatory policies in the country.

4. Existing Legal and Regulatory Framework for RE and its Assessment for REC

This Chapter briefly describes the existing legal and regulatory framework in India for promotion of power generation from RE sources. The Chapter will also attempt to present some of the key issues that remain un-addressed.

4.1 Existing Legal and Regulatory Framework for Renewable Energy

This section describes the legal and regulatory provisions relevant for promotion of renewable energy based power generation. The section incorporates provisions from EA 2003, National Electricity Policy (NEP), and National Action Plan for Climate Change, and a brief on RPO orders/regulations notified by SERCs.

4.1.1 The Electricity Act 2003

The *Preamble* to the Electricity Act 2003 records the following,

*"An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, **promotion of efficient and environmentally benign policies**, constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto."*

Further, the EA 2003 has following provisions for promotion and development of Renewable Energy sources in India.

- **Section 86(1)(e):** The State Commission shall 'promote cogeneration and **generation of electricity from renewable sources** of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for **purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee.'**
- **Section 61(h):** The Appropriate Commission shall, subject to the provisions of the Act, specify the terms and conditions for **the determination of tariff**, and in doing so, shall be **guided by the promotion of co-generation and generation of electricity from renewable sources of energy.**

- **Section 86(1)(b):** The **SERCs shall discharge the function to regulate electricity purchase and procurement process of distribution licensees** including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for **purchase of power for distribution and supply within the State.**
- **Section 3(1):** The Central Government shall, from time to time, **prepare the National Electricity Policy and tariff policy**, in consultation with the State Governments and the Authority for development of the power systems **based on optimal utilization of resources such as** coal, natural gas, nuclear substances or materials, hydro and **renewable sources of energy.**
- **Section 3(3): The Central government may**, from time to time in consultation with the State Governments, and the Authority **review or revise, the National Electricity Policy and tariff policy** referred to in section 3(1).
- **Section 79(k):** the Central Electricity Regulatory Commission (CERC) shall discharge the functions assigned under the Act.
- **Section 66:** The **Appropriate Commission** shall endeavour **to promote the development of a market (including trading)** in power in such manner as may be specified and shall be guided by the National Electricity Policy referred in Section 3 in this regard.

4.1.2 National Electricity Policy

National Electricity Policy was notified by Central Government in February 2005 as per provisions of Section 3 of EA 2003. The Clause 5.12 of NEP outlines several conditions in respect of promotion and harnessing of renewable energy sources. The salient features of the said provisions of NEP are as follows.

- "5.12.1 Non-conventional sources of energy being the most environment friendly there is an urgent need to promote generation of electricity based on such sources of energy. For this purpose, **efforts need to be made to reduce the capital cost of projects** based on non-conventional and renewable sources of energy. Cost of energy can also be reduced by promoting competition within such projects. At the same time, **adequate promotional measures would also have to be taken for development of technologies and a sustained growth of these sources**.

- "5.12.2 The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the SERCs by **providing suitable measures for connectivity with grid** and **sale of electricity to any person** and also by **specifying**, for purchase of electricity from such sources, a **percentage of the total consumption** of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made **applicable for the tariffs to be determined by the SERCs at the earliest**. Progressively the **share of electricity from non-conventional sources** would **need to be increased** as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the **Commission may determine an appropriate differential in prices to promote these technologies**.

- 5.12.3 Industries in which both process heat and electricity are needed are well suited for cogeneration of electricity. A significant potential for cogeneration exists in the country, particularly in the sugar industry. **SERCs may promote arrangements between the co-generator and the concerned distribution licensee for purchase of surplus power from such plants.** Cogeneration system also needs to be encouraged in the overall interest of energy efficiency and also grid stability." **(emphasis added)**

4.1.3 Tariff Policy

National Electricity Policy was notified by Central Government during January 2006 as per provisions of Section 3 of EA 2003. Tariff Policy has further elaborated the role of regulatory commissions, mechanism for promoting harnessing of renewable energy and timeframe for implementation etc. The Clause 4 of the TP addresses various aspects associated with promotion and harnessing of renewable energy sources. The salient features of the said provisions of TP are as under:

- Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall **fix a minimum percentage** for purchase of energy from such sources taking **into account availability of such resources in the region** and **its impact on retail tariffs**. Such percentage for purchase of energy should be made applicable for the tariffs to be determined by the **SERCs latest by April 1, 2006**. It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. Therefore, **procurement by distribution companies shall be done at preferential tariffs determined by the Appropriate Commission.**

- Such procurement by Distribution Licensees for future requirements shall be done, **as far as possible**, through **competitive bidding process** under **Section 63** of the Act **within suppliers offering energy from same type of non-conventional sources**. In the long-term, these technologies would need to compete with other sources in terms of full costs.

- The **Central Commission** should lay down guidelines **within three months** for **pricing non-firm power**, especially from non-conventional sources, to be followed in cases where such procurement is not through competitive bidding."

4.2 RPO Orders of various States

Under Section 86(1)(e) of the EA2003, the SERCs are empowered to specify the percentage of electricity to be procured by the obligated entities from the renewable sources of energy. Most SERCs have put significant emphasis on this provision and have issued Orders/Regulations specifying such percentages. This percentage is referred to as 'Renewable Portfolio Standard' (RPS) or Renewable Purchase Specification (RPS) or 'Renewable Purchase Obligation' (RPO). The Working Group on Renewable Energy of Forum of Regulators has recommended usage of 'Renewable Purchase Obligation' (RPO) for this percentage under Section 86(1)(e). Therefore, we have used term RPO throughout this Report.

Accordingly many SERCs have specified the percentage or RPO for area under their jurisdiction by issuing RPO Orders or Regulations. The table 4.1 below presents the percentage obligations levied by various SERCs in their respective jurisdictions. It can be easily noted from the table that obligation under Section 86(1)(E) varies significantly from the State to State.

Table 4.1: Target for RPS obligation [8]

States	Date of the RPS order	Minimum percentage of renewable power in following years							
			2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Andhra Pradesh	September 27, 2005 extended up to July 31, 2008		5%	5%	5%	5%	-	-	-
Chhattisgarh	Regulation dt. July14, 2008	Biomass	-	-	-	5%	5%	5%	-
		Small hydel				3%	3%	3%	
		Others				2%	2%	2%	
Delhi	Feb 23, 2008	NDPL	-	-	1%	1%	1%	1%	-
	23-Feb-08	BYPL	-	-	1%	1%	1%	1%	-
	Feb 23, 2008	BRPL	-	-	1%	1%	1%	1%	-
	7-Mar-08	NDMC	-	-	1%	1%	1%	1%	-
Gujarat	Notification Oct 29, 2005		-	1%	1%	2%	-	-	-
Haryana	January 31, 2007		-	2%	2%	3%	10%	10%	10%
Karnataka	January 23, 2008(Amendment of regulation 2004)	Wind	-	-	2%	2%	2%	-	-
		SHP	-	-	2%	2%	2%	-	-
		Others	-	-	1%	1%	1%	-	-
Kerala	Regulation June 24, 2006	SHP-2%	-	5%	5%	5%	-	-	-
		Wind-2%							
		Others-1%							
Madhya Pradesh	Regulation June 2008	Wind	-	-	-	5%	6%	6%	6%
		Biomass	-	-	-	2%	2%	2%	2%
		Cogeneration and others	-	-	-	3%	2%	2%	2%
Maharashtra	August 16, 2006		-	3%	4%	5%	6%	-	-
Punjab	December 13,2007		-	-	1%	1%	2%	3%	4%
Rajasthan	Proposed Order- March 31, 2006	Wind	-	2%	4%	5%	6%	6.75%	7.5%
	Final RPS order Sept. 29, 2006,	Biomass	-	0.5%	0.88%	1.25%	1.45%	1.75%	2%
	RPS order for OA and CPP - March 7, 2007	CPP and OA	-	-	4.88%	6.25%	7.45%	8.5%	9.5%
Tamil Nadu	May 15,2006		-	10%	10%	10%	-	-	-
Uttarakhand	UERC (Tariff for Electricity from RE)		-	-	5%	5%	8%	9%	10%
West Bengal	Notification dated March 25, 2008	WBSEB	-	1.9%	3.8%	4.8%	6.8%	8.3%	10%
		CESC	-	1.02%	2.03%	4%	6%	8%	10%
		DPL	-	0.72%	1.4%	2.5%	4%	7%	10%
		DPSC	-	0.43%	0.95%	2%	4%	7%	10%

4.2.1 Other critical features of RPO

In case of RPO obligations, percentage is not the only thing which varies significantly. Other parameters such as applicability to OA/ Captive consumers, period of obligation and compliance procedures are few other areas where significant difference of opinion among various SERCs exists. Following table presents views of the different SERCs on few such other critical issues.

[8] RPS Orders and Regulations of various States for respective years

Table 4.2: RPO Implementation in India [9]

State	RPO Declared Till	RE Technology Specific Targets	Applicability to entities other than the Distribution Licensees	Enforcing /Penalty Mechanism	Recognition of Inter-State RE Purchase
Andhra Pradesh	FY 2009	Yes (only for Wind)	OA & Captive Consumers	Yes	No
Chhattisgarh	FY 2011	Yes (Biomass, Small Hydro)	-	No	No
Delhi	FY 2011	No	-	No	No
Gujarat	FY 2010	No	-	No	No
Haryana	FY 2012	No	-	No	No
Himachal Pradesh	FY 2010	No	-	No	No
Karnataka	FY 2010	Yes (Wind, SHP)	-	No	No
Kerala	FY 2009	Yes (Wind, SHP)	-	No	No
Madhya Pradesh	FY 2012	No	-	No	No
Maharashtra	FY 2010	No	OA & Captive Consumers	Yes (Rs. 6/unit)	No
Punjab	FY 2012	No	-	No	No
Rajasthan	FY 2012	Yes (wind, biomass)	OA & Captive Consumers	No	No
Tamil Nadu	FY 2009	No	-	No	No
Uttar Pradesh	FY 2011	No	-	No	No
Uttarakhand	FY 2012	No	-	No	No
West Bengal	FY 2011	No	-	No	No

4.3 RE Tariff

The existing regulatory framework requires the Appropriate Commission to determine the Preferential Tariffs for procurement of RE power by the distribution licensees under RPO regime. It is envisaged that the Commission will determine tariff separately for

[9] Latest RPS Orders and Regulations by SERCs

each type of technology adopted for harnessing any of the renewable energy sources. For instance, it is expected that separate tariffs will ve determined for solar thermal and solar PV applications. Following table (3.4) summarises the tariffs determined for various RE based generation sources across various States. The table also provides vital information about the average power purchase costs in these States.

Table 4.3: Comparison of Tariff for Renewable based power with Average Power purchase of few identified States [10]

State	**Tariff (Rs./kWh)**						**Avg. Power Purchase Cost (Rs./kWh)**
	Wind	**Small Hydro**	**Biomass**	**Bagasse**	**Solar * PV**	**Solar * Thermal**	
Andhra Pradesh	3.37	2.6	2.88	2.75	7	7	1.83
Gujarat	3.37	-	3.1	3			2.46
Karnataka	3.4	2.8	2.85	2.8	3.4+12	3.4+10	3.22
Kerala	3.14	2.44	-	2.8	3.18+12	-	1.74
Madhya Pradesh	3.97	-	3.4	-	-	-	1.97
Maharashtra	3.5	3	3.04	3.05	3 +12	3 +10	2.58
Rajasthan	3.65	-	4.48	-	15.7	-	2.61
Tamil Nadu	2.9	-	3.15	3.15	3.15	3.15	1.78
West Bengal	4	4	4	2.6	11	11	2.04
WBSEB							
CESC							
Durgapur							
DPSC							
Haryana	4.08	3.67	4	3.74	15.96	-	2.68

It is apparent from the above table that in all the States the tariff applicable to any RE technology is higher than the average power purchase cost in that particular States. The high tariff of RE based power in comparison to the average power purchase cost has

[10] Latest Tariff orders for various States
* Generation Based Incentive is shown wherever applicable

been one of the key barriers in large scale deployment of RE power. The distribution licensees have been reluctant to contract RE power beyond their RPO target.

4.4 Drivers for REC Mechanism in India

In this section some of the significant limitations of RPO regulation have been highlighted.

4.4.1 Absence of Legal and Regulatory Framework to Facilitate Purchase of RE from Outside the State

Existing RPO regulations recognize procurement of renewable energy generated in the State by Obligated Entities for fulfilment of RPO. Procurement of renewable energy generated outside the State has not been recognized by any SERC for the purpose of RPO compliance. Besides, renewable energy being site specific resource, guidelines under the Tariff Policy have specified that the SERC shall be guided by the factors such as availability of renewable energy resources within the region and its impact on retail tariff within State while stipulating the percentage for RPO. This has resulted in RPO regulations being viewed only from the State perspective and lack National perspective of harnessing available entire RE potential in the country.

4.4.2 Percentage specification for only short term period

In many States, RPO percentage has been specified for limited period of 2 to 3 years, which does not provide long term perspective for harnessing of renewable energy within the State. Short term targets do not create long term market for technologies and products. Further, most States have specified targets close to their existing purchase levels, which does not kick-start or accelerate development of new RE projects. To provide certainty of market to RE Project developers and equipment manufacturers, it is necessary to demonstrate long term perspective with challenging targets.

4.4.3 No RPO for Open access (OA) and Captive consumers

The Section 86(1)(e) of EA 2003 provides for specification of percentage applicable on the 'consumption' within area of distribution licensee and not to procurement of energy by the distribution licensee alone. Thus, it appears that the intention of the legislature is to apply such percentage on entire consumption in the area of distribution licensee irrespective of who is supplying such energy. However, currently, except few States such as Maharashtra, Rajasthan, and Andhra Pradesh, all the other States do not impose RPO on OA/Captive consumers.

Besides, if RPS obligation is levied only on distribution licensees and if eligible open access consumers are exempted then, it will not be fair to non-eligible open access consumers of the distribution licensees as they will have to bear the complete cost of RE procurement. While it is clear that renewable energy based power generation needs to be promoted, it is equally important that the costs and benefits of such harnessing are equitably distributed amongst all concerned. Accordingly, it would only be appropriate that Open Access and Captive consumers are also subjected to RPO regime.

4.4.4 Weaker Enforcement Methodology

In order to ensure strict compliance with the RPO regulation, it was essential to put an efficient enforcement mechanism in place. However, only few States have included specific provisions for shortfall in RE procurement by Obligated Entities. It has been proved that enforcement mechanism acts as a deterrent and thereby incentivises the Obligated Entities to proactively seek contracts for procurement of renewable energy. However, due to weak enforcement methodology the objective of promotion of renewable energy through RPO regulation may not have been achieved.

4.5 Other Important Developments

In the recent past, several developments have taken place, which emphasize the need of development of Renewable Energy Certificate Mechanism. These developments have been discussed in this section of the Report.

4.5.1 National Action Plan for Climate Change

On June 30, 2008 Hon Prime Minister of India announced National Action Plan for Climate Change which delineated India's strategy to tackle menace of global warming without jeopardising prospects of economic growth. The Technical Document annexed to NAPCC includes following provisions for mainstreaming the RE based resources in India's power sector. In particular the document solicits use of REC mechanism. The provisions listed under section 4.2.2 of NAPCC on Grid Connected Systems, are as follows:

- A Dynamic Minimum Renewable Purchase Standard (DMRPS) may be set, with escalation each year till a pre-defined level is reached, at which time the requirements may be revisited. It is suggested that **starting 2009-10, the national renewables standard** (excluding hydropower with storage capacity in excess of daily peaking capacity, or based on agriculture based renewables sources that are used for human food) **may be set at 5% of total grids purchase, to increase by 1% each year for 10 years, SERCs may set higher percentages than this minimum at each point in time.**

- Central and State Governments may set up a verification mechanism to ensure that the renewables based power is actually procured as per the applicable standard (DMRPS or SERC specified). Appropriate authorities may also issue **certificates that procure renewable based power** in excess of the national standard. Such **certificates may be tradeable, to enable utilities falling short to meet their renewable standard obligations**. In the event of some utilities still falling short, **penalties** as may be allowed under the Electricity Act 2003 and rules there under may be considered.

- Procurement of renewables based power by the State Electricity Boards/other power utilities should, in so far as the applicable renewable standard (DMRPS or SERC specified) is concerned, be based on competitive bidding, without regard to scheduling, or the tariffs of conventional power (however determined).

- Renewables based power may, over and above the applicable renewables standards, be enabled to compete with conventional generation on equal basis (whether bid tariffs or cost-plus tariffs), without regard to scheduling (i.e. renewables based power supply above the renewables standard should be considered as displacing the marginal conventional peaking capacity). All else being equal, in such cases, the renewables based power should be preferred to the competing conventional power.

4.5.2 FOR Working Group Recommendations

Forum of Regulators (FOR) established under Section 166 of the Electricity Act is an association of Chairpersons of all electricity regulators. Chairperson of the Central Electricity Regulatory Commission is ex-officio Chairperson of the FOR. The primary responsibility of the FOR is to harmonize the regulatory policies in the country. The FOR has established various Working Groups to look into different aspects of the electricity sector. FOR had set up Working Group on Renewable Energy which in its Report has stated following.

- Need for inter-State exchange of RE power
  - Inter-State exchange of RE power is desirable from National perspective and the same should be promoted.
  - Mechanism for appropriate treatment for inter-State RE exchange through Regional Energy Account needs to be developed.

- Feasibility of REC mechanism
  - RE Certificate as a tool for promotion of RE sources has been used in some countries. In India REC mechanism can be introduced within existing framework of EA 2003.
  - Co-operation amongst the States is essential and SERCs should recognize procurement of RE generated in other States for purpose of compliance, as RPS by regulated entity in their respective jurisdiction.

4.5.3 Tariff Order of DERC

Delhi Electricity Regulatory Commission (DERC) in its Multi-year tariff orders for the control period of FY 2008-11 for its four distribution licensees, has acknowledged the need for procurement of RE from other States due to the scarcity of RE sources in Delhi. The DERC has put forward its views which are reproduced below.

> *"The Commission is keen to promote the procurement from renewables. However, the scope for such procurement in Delhi is rather limited. It is therefore necessary for States like Delhi to look for procurement from renewables from other States. The matter was also discussed by the Commission in the State Advisory Committee meeting held on 21 January, 2008.The carbon credit trading is being done across continents. The system is very well established over a period of time. The Commission is of the view that it will be a good idea to create an environment in which the* ***renewable energy certificates*** *can* ***also be traded across various States in India****. The Commission earnestly requests the Govt. of India as well as the State Government for evolving an appropriate methodology for trading in renewables certificates so that States like Delhi, which do not have much scope in promoting renewables can at least follow the route of trading in renewables certificates. Any such trading in renewables certificates shall be evolved in such a manner which protects the interest of both the buyers and the sellers of such certificates".*

4.6 Objectives for REC Mechanism in India

From the various issues discussed in this chapter, need of REC mechanism is evident. The significant objectives arising out of discussions in the chapter have been listed below:

4.6.1 Effective implementation of RPO Regulations

REC mechanism will enable obligated entities to procure renewable energy from RE generator outside the State. Thus for obligated entities, several avenues will be available for purchase of REC. This will enable obligated entities to fulfil their RPO obligation.

4.6.2 Increased Flexibility to Participants

REC mechanism will offer increased flexibility to Obligated Entities and the RE generators to sell and purchase renewable energy. The Obligated Entities can procure RECs from RE generator outside the State and RE generator participating in the REC mechanism can sell its RECs and electricity separately to two different entities.

4.6.3 Overcome geographical constraints

As seen in chapter 3, the RE sources are dispersed unevenly across the States in India. Through implementation of REC mechanism, the available potential can be harnessed to promote RE sources based power generation and to some extent meet the unfulfilled demand for electricity. Further, in current regulatory framework, renewable energy looses its green character as soon as it is traded across the State boundaries. The proposed mechanism should help overcome this barrier.

4.6.4 Reduce transaction costs for RE transactions

Currently inter-State RE transactions are subjected to the inter-State open access Regulations. RE transactions are subjected to OA charges as well as balancing market costs in a manner similar to conventional generation. Further, RE generators are required to give schedules just like any other generator. As a result, the costs associated with open access transaction (whether intra-state or inter-state) involving RE are significantly higher than that for conventional generator of the same size.

If implemented, REC mechanism will enable RE generators to sell their electricity to any consumer of their choice and sale RECs generated from quantum of such electricity to any Obligated Entity. Hence, other than procurement of RECs, no other transaction is necessary for obligated entities to meet their RPS target. Thus, for Obligated Entities the cost of fulfilling RPO obligation is expected to go down substantially.

4.6.5 Enforcement or penalty mechanism

The existing RPO Regulations/ Orders do not have strong enforcement provisions in case the obligated entities fail to meet their RPO. This has led to lackadaisical attitude in some of the Obligated Entities towards their RPS obligation. The potential dangers of such scenario are obviously very high. While REC mechanism on its own can not improve compliance, it is necessary to develop and implement suitable enforcement mechanism while developing REC mechanism.

4.6.6 Create competition between different RE technologies

There is a need for promoting the RE technologies which are in nascent stage of their development over those which are already into the mature commercial market. The distinction between the two is important. The REC mechanism can enable such distinction between different RE technologies at different stages of development. The specific RE technology can be provided with more promotional incentives than the other mature RE technologies. Such schemes are being designed in many countries. This is proposed to be done by issuing more than one REC for 1MWh of RE generation. Thus with selective support to some RE technologies competitive market for RE technologies can be brought into place.

4.6.7 Development of all encompassing incentive mechanism

International experience in implementation of REC mechanisms have been discussed in next chapter. If this experience is considered, it cab easily observed that REC mechanism is primarily used as an incentive mechanism for improving the financial viability of the renewable energy projects.

4.6.8 Reduce risks for local distribution company

Currently under the RPO regulation the Obligated Entity has to locate the RE generator and physically procure the power from to fulfil its RPO obligation. This increases the cost for local distribution company. Further, since most of RE generators are not-schedulable and/or dispatchable, procurement of power from such sources subject local distribution company to balancing market costs. The REC mechanism should reduce the risks being borne by the local distribution company.

4.7 Conclusion

Considering the unique barriers suffered by the renewable energy sector in India, it is felt that following five objectives should take precedence over others.

1. Effective implementation of RPO mechanism
2. Increased flexibility for participants
3. Overcome geographical constraints
4. Reduced transaction costs for RE transactions
5. Enforcement of penalty mechanism

5. Key Legal Issues in the Development of REC Framework

Apart from the key Objectives of the REC mechanism discussed above there are certain legal issues which should be dealt in order to achieve successful implementation of REC Framework in India. The key legal issues in the Development of REC Framework in India are,

5.1.1 Recognition of Inter-State RE Transaction for RPO compliance

In pursuance of section 86(1) (e) of EA 2003 and as mentioned in section (4.6) of NAPCC whether SERC(s) under its RPO regulation or RPO order, can recognise procurement of electricity generated from Renewable Energy sources outside its State, by person/distribution company within its State to fulfil their renewable purchase obligations, particularly in view that SERCs jurisdiction is to promote renewable energy within its State?

The freedom of a person / distribution licensee to procure electricity from any place / location is one of the core objects of the EA 2003. The concepts of electricity trading and open access are the tools for achieving such freedom of procurement of electricity.

Section 86 (1) (e) of EA, 03, relates to the functions of the SERC, provides as follows:

"promote co-generation and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;"

Section 86 (1) (e) do not express any restriction on the State Commission's ability to recognize (or take into account) procurement of electricity generated from renewable energy sources outside the State by a person / distribution licensee within the State, so as to fulfill its statutory renewable purchase obligations.

Next, it needs to be checked if there is any implied restriction – so as to hold that the main object of Section 86 (1) (e) is to promote generation from renewable sources in the State. Therefore, to allow procurement within the distribution area from other States would defeat the very purpose of the said Section. To address this concern, it is necessary to refer to the context in which Section 86 (1) (e) is placed. Section 7 of the EA 2003, states that generation of electricity whether from renewable sources or otherwise, is de-licensed. Further, the SERC have not been vested with regulatory superintendence over generation of electricity, save and except to a limited extent provided in Section 62.

A careful / close scrutiny of Section 86(1) (e) of EA 2003 will reveal that the focus is clearly on consumption of renewable energy within the area of the distribution licensee. In order to ensure such consumption, the SERC has been vested with the power to:

(a) provide suitable measures for connectivity with the Grid, and
(b) specify the minimum purchase obligation

This power will be exercised through the licensees, consistent with the other functions of the SERC. It is necessary to create a distinction between the function of the SERC in section 61 (h) and Section 86 (1) (e) of the Act. In Section 61(h) the mandate is to specify terms and condition of tariff. Under this provision the SERC has the ability to provide promotional tariff for co-generation and generation of electricity from renewable sources. Section 61 (h) has to be read with Section 62, under which section the SERC has the power to determine tariff of a generating plant for supply to a distribution licensee.

The mandate under Section 61 (h) is different from that in Section 86(1) (e). In Section 86 (1) (e), as stated earlier, the focus is on consumption within the distribution area. To promote consumption, the SERC has been vested with two distinct powers. However, Section 61 (h) is towards providing promotional-tariff, which will incentivize creation of generating assets in the State. **If the distinction is appreciated, there will be no difficulty in holding that Section 86(1) (e) operates in a different sphere and is not related to the location of the generator.**

5.1.2 Jurisdiction of Appropriate Commission for Pricing of REC and Electricity component

In view of inter-State nature of REC transactions, the issues to be addressed in the context of regulatory jurisdiction for pricing of REC and electricity component are as under:

(a) If SERC(s) recognise the RE generation outside their State through RPO regulation or RPO order so as to allow their utilities to meet their RPO, who should regulate the Tariff rate for such procurement ?

(b) Will it be concerned the SERC to determine Generation Tariff where RE Generator is located under Section 61(h) or will it be SERC to regulate Rate of Procurement where distribution licensee is situated under Section 86(1)(b) or will it be CERC being inter-State transaction as per Section 79(1)(b)?

(c) Which Appropriate Commission (SERC or CERC) would have governing jurisdiction to regulate such inter-State Power Purchase Agreement/Arrangement?

(d) Will the answers to queries (b) and (c) change, if concerned RE partly sells its RE generation within State and partly sells to entities outside the State?

The EA 2003 does not create any difference in the regime between conventional energy and renewable energy as far as determination of generation tariff is concerned. For procurement of electricity by a distribution licensee, whether from conventional sources or otherwise, the Appropriate Commission will have the ability to determine tariff. In this context, reference can be made to section 62(1) (a) and (b), 79(1) (b) and Section 86 (1) (a) and (b) of EA 03.

Section 62 *(1) The Appropriate Commission shall determine tariff in accordance with the provisions of this Act for –*

(b) <u>supply of electricity by a generating company to a distribution licensee</u>:

Provided that the Appropriate Commission may, in case of shortage of supply of electricity, fix the minimum and maximum ceiling of tariff for sale or purchase of electricity in pursuance of an agreement, entered into between a generating company and a licensee or between licensees, for a period not exceeding one year to ensure reasonable prices of electricity;

……………..”

Section 79 (1) The Central Commission shall discharge the following functions –

……

(c) to regulate the tariff of generating companies other than those owned or controlled by the Central Government specified in clause (a), if such generating companies enter into or otherwise have a composite scheme for generation <u>and</u> sale of electricity in more than one State.

Section 86 (1) The State Commission shall discharge the following functions namely:-

(a) determine the tariff for generation, supply, transmission and wheeling of electricity, wholesale, bulk or retail, as the case may be within the State:

……………

(b) *regulate electricity purchase and procurement process of distribution licensee including the price at which electricity will be procured from the generating companies or licensee or from other sources through agreements for purchase of power for distribution and supply within the State.*

The aforesaid provisions have to be harmoniously construed, so as to ensure that they do not negate. From the aforesaid it is quite clear that only tariff for electricity supplied by a generating company to a distribution licensee is required to be determined by an Appropriate Commission. If the electricity is sold by a generating company to a trading licensee or a consumer, there is no statutory requirement for determining generation tariff. The language of Section 62(1) (a) is clear and unambiguous.

Section 79 (1) (b) comes into operation when a generating company enters into or has a composite scheme for generation and sale of electricity to distribution licensees in more than one State. Hence in order to trigger Section 79 (1) (b) two conditions i.e. generation and sale of electricity in more than one State have to be fulfilled.

Therefore, while approving the power procurement of the distribution licensee, the State Commission will approve / disapprove the power procurement costs of the licensee for procurement of power from a generator, which includes an RE Generator. This conclusion is on the basis of the clear language of Section 61(a) and Section 86(1) (b).

As regards the tariff provided under Section 61(h), this is only relevant when the RE generator is selling the power within the State. If he does so he gets a preapproved rate from the distribution licensee, which will be automatically approved under Section 86(1) (b). It is sufficient to say that Section 79(1)(b) is meant to operate in a different sphere when there is a composite scheme for generation and sale of electricity in more than one State.

Unless the generating company fulfils the above conditions, and also sell electricity in more than one State, 79(1)(b) will not operate.

Hence it is possible that if the preconditions of Section 79(1) (b) are met the CERC will have jurisdiction to "regulate" the tariff of the generating companies. However, the exercise of this power will not prevent the State Commission in exercising its power qua the distribution licensee's procurement process. A harmonious constructions of the two provisions would be that the CERC's jurisdiction to regulate tariff under 79(1) (b) will be in all cases except those under Section 86(1) (b). One can conclude that the CERC has the ability to create a framework to regulate tariff of generating companies having a composite scheme for generation and sale of electricity in more than one State.

At present, the CERC has not taken any steps to define what a composite scheme. It may be necessary to do so in future. As regards inter-state Power Purchase Agreement, those are executed by a distribution licensee and are regulated by the State Commission in which such licensee is located. The CERC does not have any role to play in this regard.

If RE generator is established on the basis of a composite scheme for generation and sale of electricity in more than one State, it is possible that the CERC will have the ability to regulate the tariff of such a generating company. However, this cannot negate the power of the State Commissions to regulate the procurement process of the distribution licensees. The CERC's tariff will only act as guidance. In such circumstances, however, the tariff of the generator which is regulated by CERC will find greater acceptability with a trading licensee or a consumer.

5.1.3 Enforcement Provisions

The mandatory RE procurement target under RPO regulations is unlikely to yield desired results unless adequate enforcement mechanism is introduced. In fact, lack of adequate enforcement mechanism under existing RPO regulations in many States have been one of the reasons for non-compliance or lacklustre performance by various obligated entities in meeting their RPO obligations. The success of REC mechanism is critically dependent on introduction of appropriate mechanism for enforcement. Some States such as Maharashtra, Rajasthan etc. have introduced compensation in the form of per unit enforcement charge or surcharge for shortfall in meeting RE procurement obligations over and above penal provisions as provided under Section 142 for non-compliance.

Thus, there is increasing realization that appropriate penalties for non-fulfillment of RPOs are required to be incorporated by SERCs in their regulations. It is preferred that FOR evolves harmonized approach for this purpose. It was felt that the amount of this penalty has to be higher than what is provided under section 142 of the Electricity Act. However, FOR Task Force opined that the proposition of specifying penalties higher than those provided under section 142 of the Act should be examined from legal angle.

Accordingly, legal scrutiny and findings in the matter are summarised below:
Section 86 of the Electricity Act, 2003 provides the following functions of State Commission:

"86. (1) The State Commission shall discharge the following functions, namely: -
……
(e) promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licence;
……
(k) discharge such other functions as may be assigned to it under this Act."

The State Commission clearly has a positive mandate under the Act to promote cogeneration and generation from renewable sources. This power is strengthened with the ability conferred on the Commission to specify "*for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licence*".

The clear mandate of the statute cannot be implemented unless there is an enforcement charge. In this context, the Hon'ble Supreme Court of India, has passed various judgments where the power to "enforce" has been held to fall with the "regulators" jurisdiction.

Relevant judgments of the Supreme Court of India are as under;

(i) **The Hon'ble Supreme Court of India has held in *U.P. Power Corporation Ltd. vs. National Thermal Power Corporation Ltd. and Ors. JT 2009 (3) SC 46*2** that:

"5. A regulatory Commission not only makes Regulations but in view of its extensive powers but also in-charge of implementation thereof. It furthermore in the event of any dispute or difference arising between several players involved in the framing of tariff for the consumers of electrical energy has also an adjudicatory role to play.

…
29. The Central Commission in terms of the 1998 Act as also the Regulations framed thereunder exercise diverse powers. It exercises legislative power, power of enforcement of the Regulations as

<u>also the adjudicatory power.</u> Each of its functions although are separate and distinct but may be overlapping. The power of the Central Commission is extensive.

…

35. <u>The Central Commission, as indicated hereinbefore, has a plenary power. Its inherent jurisdiction is saved.</u> Having regard to the diverse nature of jurisdiction, it may for one purpose entertain an application so as to correct its own mistake but in relation to another function its jurisdiction may be limited. <u>The provisions of the 1998 Act do not put any restriction on the Central Commission in the matter of exercise of such a jurisdiction. It is empowered to lay down its own procedure</u>."

(ii) In relation to the validity and efficacy of the UI mechanism, the Supreme Court held in *Central Power Distribution Co. and Ors. v. Central Electricity Regulatory Commission AIR 2007 SC 2912*, that:

"22.3 <u>As already noticed, the Central Commission has the power and function to evolve commercial mechanism such as imposition of UI charges to regulate and discipline. It is well settled that a power to regulate includes within it the power to enforce."</u>

The State Commissions have been empowered under the Electricity Act, 2003 to regulate electricity purchase and procurement process of distribution licensees as well as to promote cogeneration and generation of electricity from renewable sources of energy. Thus, levy of enforcement charges through a "commercial mechanism" is held to be well within regulatory powers of the State Commission and is quintessential for ensuring implementation of its orders. Once Supreme Court of India has upheld the UI mechanism, which promote grid discipline through a commercial mechanism, there is a strong case for providing a commercial mechanism to meet the objects provided in Section 86 (1) (e) of the Act. In any event, the jurisdictional issue stands settled and State Commission will certainly have the ability to design a commercial mechanism in the form of enforcement charge.

(iii) In K. Ramanathan v. State of Tamil Nadu AIR 1985 SC 660, the Hon'ble Supreme Court held:

> *"18. The word "regulation" cannot have any rigid or inflexible meaning as to exclude "prohibition". The word "regulate" is difficult to define as having any precise meaning. It is a word of broad import, having a broad meaning, and is very comprehensive in scope.*

There is a diversity of opinion as to its meaning and its application to a particular state of facts, some courts giving to the term a somewhat restricted, and others giving to it a liberal, construction. The different shades of meaning are brought out in Corpus Juris Secundum, Vol. 76 at p. 611:

`Regulate' is variously defined as meaning to adjust; to adjust, order, or govern by rule, method, or established mode; to adjust or control by rule, method, or established mode, or governing principles or laws; to govern; to govern by rule; to govern by, or subject to, certain rules or restrictions; to govern or direct according to rule; to control, govern, or direct by rule or regulations. `Regulate' is also defined as meaning to direct; to direct by rule or restriction; to direct or manage according to certain standards, laws, or rules; to rule; to conduct; to fix or establish; to restrain; to restrict.

See also: Webster's Third New International Dictionary, Vol. II, p. 1913 and Shorter Oxford Dictionary, Vol. II, 3rd Edn., p. 1784."

(iv) **In State of U.P. v. Maharaja Dharmander Prasad Singh AIR1989SC997 the Hon'ble Supreme Court held that** the power to regulate includes all powers incidental and supplemental to it. The relevant paragraph is reproduced as under:

"52. …In this case the grant of permission is part of or incidental to the statutory power to regulate orderly development of the "Development Area" under the Act under Regulatory Laws. The power to regulate with the obligations and functions that go with and are incidental to it, are not spent or exhausted with the grant of permission. The power of regulation which stretches beyond and the mere grant of permission, takes within its sweep the power, in appropriate cases, to revoke or cancel the permission as incidental or supplemental to the power to grant. Otherwise the plenitude of the power to regulate would be whittled down or even frustrated."

(v) In Hotel & Restaurant Assn. and Anr. v. Star India (P) Ltd. and Ors. AIR2007SC1168, in regard to the role of TRAI as a regulator, the Hon'ble Supreme Court said:

"55. <u>TRAI exercises a broad jurisdiction. Its jurisdiction is not only to fix tariff but also laying down terms and conditions for providing services</u>. Prima facie, it can fix norms and the mode and manner in which a consumer would get the services.
56. The role of a regulator may be varied. A regulation may provide for cost, supply of service on non-discriminatory basis, the mode and manner of supply making provisions for fair competition providing for a level playing field, protection of consumers' interest, prevention of monopoly. The services to be provided for through the cable operators are also recognised. While making the regulations, several factors are, thus required to be taken into account. The interest of one of the players in the field would not be taken into consideration throwing the interest of others to the wind."

(vi) The Hon'ble Supreme Court of India in Cellular Operators Association of India & Ors. Vs. Union of India MANU/SC/1368/2002 has held as follows:

"33. <u>The regulatory bodies exercise wide jurisdiction. They lay down the law. They may prosecute. They may punish. Intrinsically, they act like an internal audit. They may fix the price, they may fix the area of operation and so on and so forth. While doing so, they may, as in the present case, interfere with the existing rights of the licensees."</u>

From the aforesaid judgments, one can conclude that the power to levy enforcement charge is available with a regulator. However, the regulator has to act only in terms of the statute under which he is created. In this context, the power to promote renewable energy by fixing minimum purchase obligation is only available to the State Commission under Section 86 (1) (e) of the Act. Hence, one can argue that the only limitation to levy of enforcement charge is that the same can be levied and / or recognised by the State Commissions. The Central Commission does not have the powers equivalent to the ones provided under Section 86 (1) (e).

6. International Experience with Certificate Trading Schemes

As a part of the Assignment, ABPS Infra carried out the study of the 'Certificate Trading Schemes' in operation in different parts of the world. This chapter summarises the key learning from these Certificate Trading Schemes. In particular, the study was carried out of schemes in operation in United Kingdom, Australia, and European Union. The Certificate Trading Schemes discussed in this Chapter are well recognized for their success with their respective primary objectives.

In this chapter, the focus of study is to understand the operating framework of the mechanism and its features, legal and regulatory framework, certificate design, life of the scheme, scope of technologies and the roles and responsibilities of various stakeholders.

6.1 Framework of REC Mechanism in International Case studies

Internationally, the RECs are issued to RE generators, typically for every MWh of electricity fed into the grid by an eligible RE generator or equivalent amount of electricity displaced using a RE source. Revenue from sale of REC is treated as an additional source of revenue for an eligible RE generator. While all schemes include all grid-interactive RE technologies, some schemes also include off-grid RE technologies.

The involvement of the Regulatory Institution varies significantly from scheme to scheme. While in UK, Office of Gas & Electricity Markets (OFGEM) administers the ROCS scheme; in Australia, separate institution called Office of Renewable Energy Regulation (ORER) has been created. The typical life cycle of REC can be described through following three phases.

1. Issue of REC:

For every MWh of electricity generated by an eligible renewable source a certificate (physical or electronic) is issued to the generator by the registry appointed under the scheme which also tracks movement/ transfer of the certificate.

2. Ownership (Transfer/Trade):

RECs so issued are owned by a single party at any point during its life. The RECs may be owned by the generator, or a trader, or an obligated entity or any other kind of buyer permitted under the scheme.

3. Redemption:

Upon receipt of the request from the certificate owner (typically an obligated entity) to redeem its REC; the registry transfers the certificate to a redemption account and then informs the owner by means of a written declaration that its certificate has been redeemed. Such redeemed certificate can no longer be transferred or traded. This record is further used as a proof by the obligated entity to demonstrate compliance of RPO.

Typically the certificate issued to the RE generator contains information about its unique identification number, generator, nature of source i.e. wind, solar, etc, period of generation date, and validity period.

In this chapter two different REC mechanisms have been discussed. Salient features such as declared life of certificate scheme, key stakeholders and their role, supporting legal framework, success of the mechanism, etc for each scheme have been provided separately in the following sections.

6.2 ROC mechanism in United Kingdom

The tradable RE certificate in United Kingdom (UK) is called as Renewable Obligation Certificate (ROC). The 'Renewables Obligation' (RO) in UK, the 'Renewables Obligation Scotland' and the 'Northern Ireland Renewables Obligation' are designed to incentivise renewable generation into the electricity generation market. These schemes were introduced by the Department of Trade and Industry, the Scottish Executive and the Department of Enterprise, Trade and Investment respectively and are administered by the Gas and Electricity Markets Authority of Great Britain.

'Buy out' mechanism is an unique feature of the UK – ROCS. Under this mechanism, liable entities which are not able to purchase ROCs pay 'buy out' price to the administrator of the scheme for shortfall in ROCS. The money thus received in 'buy out fund' is redistributed to the liable entities to the extent they surrender ROCS to meet their obligation. This mechanism assists in improving the viability of the scheme.

A) <u>Key Features:</u>

- Implemented in UK in April, 2002
- Prior declaration of sunset date of ROC Scheme (March 2037)
- Increased proportion of renewable electricity over a period
- Liable entities can fulfil RO by:

- Acquiring ROCs
- Paying a buy-out price
- A combination of ROCs and paying a buy-out price.

- Buy-out and penalty fund is paid back to liable parties on a pro-rata basis of their surrendered ROCs.

B) Institutional Stakeholders:

The Gas and Electricity Market Authority, the regulator in UK is responsible for administering the ROC mechanism. The Office of Gas and Electricity Markets maintains ROC Registry.

C) Supporting Legal Framework:

- In UK, Renewable Obligation (RO) was introduced through Renewables Obligation Order (ROO) in April 2002 and was enforced under the terms of Section 32 of the Electricity Act, 1989.
- RO has been made the main support scheme for renewable electricity in the UK.
- Through ROO 2002, the targets for RO were defined for period upto March 31, 2011
- However, during the review of RO in 2009 target for FY 2020 was revised to 15 % and the ROC mechanism was extended to year 2037 from earlier 2027.

D) Latest Developments on UK ROCS

- By way of Renewable Obligations Order 2009 (ROO 2009), UK has implemented the proposal of Energy Banding under which less mature RE technologies, as shown in table (5.1) will be promoted over other mature renewable technologies.
- Preferential treatment is given to Wave/tidal, Solar PV, advanced gasification/ pyrolysis/digestion
- No preferential treatment for Hydro (>50kW) and wind power being fairly mature RE technologies
- Under Energy Banding proposal, the less mature technologies will be offered more ROCs for each MWhe of generation as specified in table below.

Table (5.1): Energy Banding Approved in UK [11]

RE Type	ROC/MWhe
Hydro	1
Wind	1
Solar PV	2
Wave, Tidal, Geothermal	2
Dedicated Biomass with CHP	2
Standard Gasification	1

6.3 REC Mechanism in Australia

The Government of Australia enacted The Renewable Energy (Electricity) Act 2000 for the establishment and administration of a scheme to encourage additional electricity generation from renewable energy sources. The objectives of this Act are:

(a) to encourage the additional generation of electricity from renewable sources;

(b) to reduce emissions of greenhouse gases; and

(c) to ensure that renewable energy sources are ecologically sustainable.

This is done through the issuing of certificates for the generation of electricity using eligible renewable energy sources and requiring certain purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire during a year. Where a liable entity does not have enough certificates to surrender, the liable entity will have to pay renewable energy shortfall charge.

Key Features:

- Implemented in the year 2001
- Prior declaration of sunset date of REC Scheme (March 2020)
- Liable entities also include large buyers of electricity
- The Act sets renewable energy to be procured in absolute terms i.e. GWh
- Quantum of RE to be procured by the liable entities in percentage terms is set annually as a percentage of the sum of the relevant acquisitions of electricity.

[11] UK Renewables Obligation Order 2009

- Liable entities are required to discharge their liability by surrendering RECs to the Regulator or pay a shortfall charge, which is significantly higher than the average price of REC.
- In addition to the large RE generators, small generators with following capacity are also eligible for creation of REC
  - Hydro with installed capacity less than 6.4 kW & 25 RECs annually
  - Wind: with installed capacity less than 10 kW & 25 RECs annually
  - PV: with installed capacity less than 100kW & 250 RECs annually
- Solar water heating (using heaters complying with specified standard) is also eligible to create RECs.

Institutional Stakeholders:

Office of the Renewable Energy Regulator (ORER) oversees the processes of registration and issue, validation and surrender of RECs. However it does not control or monitor the price of RECs.

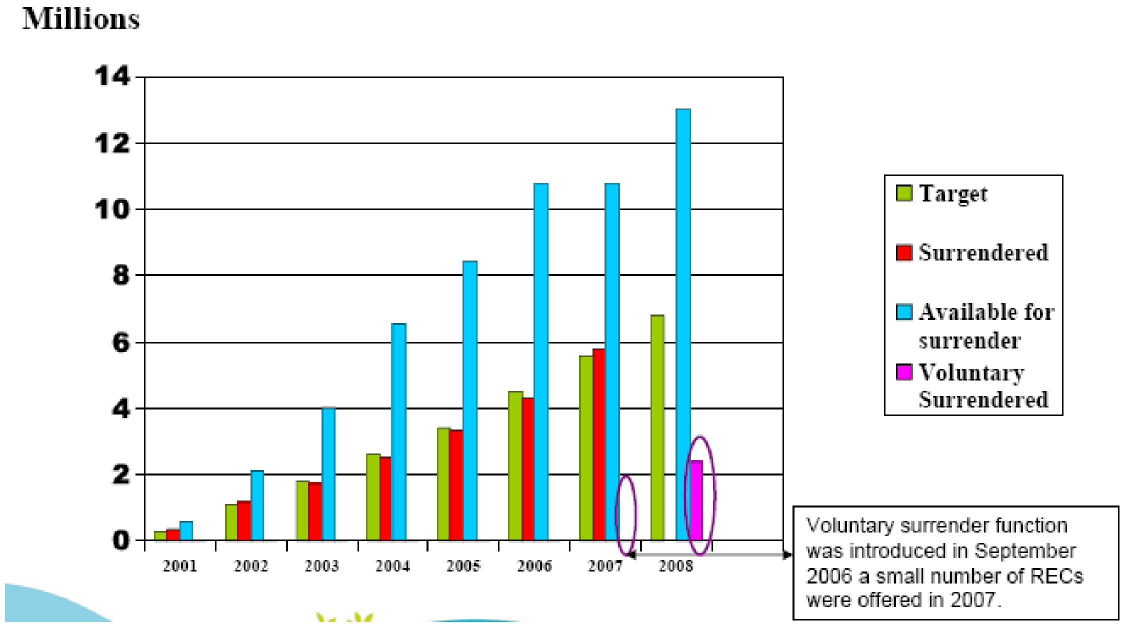
Supporting Legal Framework:

The necessary legal framework was established by creating a new act dedicated for RE development. The Renewable Energy (Electricity) Act 2000 is supported with The Renewable Energy (Electricity) (Charge) Act 2000. The act has been amended on need basis, so far 4 times, twice in year 2006 and 2008.

Success of REC Mechanism

Figure 5.3 shows that although the RPS target was increased year after year the REC mechanism has been successful enough to attract the investments for capacity addition of RE based power projects, which is apparent from trend of the number of RECs available for redemption.

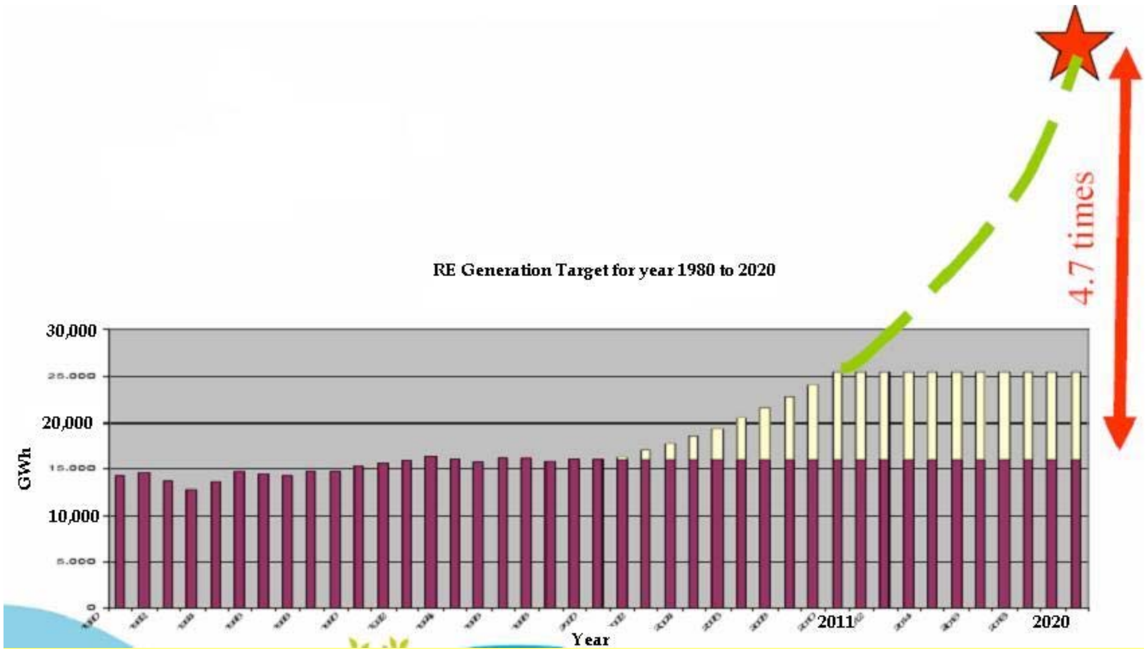
Fig.(5.3): Comparison of Year on Year Target with Actually Generated and Surrendered RECs [12]



Further, considering the repeating trend of accomplished target, year on year, the ORER has decided to increase its RE based power generation target uniformly over a period of 10 years till year 2020, to 4.7 times of the earlier target as shown in figure (5.4) i.e. to 45,000,000 MWh.

[12] www.orer.gov.au as on January 10, 2009

Figure (5.4): Increased year on year target till year 2020 [13]



Latest Amendments:

The ORER is working on a regulation for energy banding to selectively promote less mature RE technologies.

6.4 Comparative Analysis of International Case Studies

Table (5.3): Sources which qualify as RE sources [14]

Parameter	UK ROC	Australia REC
Certificate denomination	1 MWhe	1 MWhe
Tradability feature	Yes	Yes
Implemented in	2002	2001
Sunset date	Yes (March 2037)	Yes (March 2037)
Prior declaration of RPS Target till Sunset	Yes	Yes
Dynamic RPS Target (rising year after year)	Yes	Yes

[13] www.orer.gov.au as on January 10, 2009

[14] RE based Certificate mechanisms of countries considered

Approximate Price of Certificate ($/MWhe)	57	19
Approximate Penalty against non compliance ($/MWhe)	Yes (buyout price)	Yes (RE Shortfall Charge)
Obligated Entities	Electricity Supplier	Whole sale purchaser of electricity
Whether participation is mandatory RE generators?	Yes	Yes
Extension in Sunset date	Yes (from Yr 2027 to 2037)	No
Increase in previously declared RPS target	Yes	Yes
Incentives to obligated entities for fulfilling RPS target	Some part of buy-out fund	Some part of buy-out fund
Banking of RECs	Yes (1 year)	Yes (no limit of duration)
Energy Banding	Design process completed and about to be implemented	Most likely to get implemented in near future
Legal Framework for REC mechanism	Section 32 of the 1989 Electricity Act	RE Act 2000, and its amendments
Legal/Regulatory tools used for revisions	Renewable Obligation Order	Regulations
Monitored by	Office for gas and electricity market	Office of RE Regulator
Role of Regulator	Administers the REC Mechanism but does not regulate the price	Making policies and regulations but does not regulate the price

6.5 Lessons Learnt from International Case Studies

This section summarizes the features of REC mechanisms from the case studies undertaken and identified potential challenges for REC mechanism to be implemented in India.

1. Prior declaration of long-term targets for Renewable Power Purchase Obligation has provide certainty to private investors in a regulated RE power market. In most of the countries, the sunset date of the scheme and final Renewable obligation target under REC mechanism has been declared at least 15 years in advance. The RE purchase targets for initial few years or for every year till sunset date are also declared at the time of introduction of REC mechanism. This strategy has reduced the risk perceived by private investors about off-take arrangements for RE projects.
2. Trading feature for REC ensures liquid market. This way issue of development of the least cost option for renewable energy is taken care of by the market for RECs.
3. Banding among the eligible RE technologies is a useful tool to improve competition among various RE technologies.
4. The regulatory framework, role of institutions and interplay with other regulatory instruments should be clearly specified.
5. No attempt should be made to regulate price of REC. Instead review of the REC market may be carried out to:
    - Identify key influencing factors for RE development
    - Evaluate trend in REC price movement & key drivers for price movement
    - Forecast likely composition of RE sources for fulfilling the RE obligation of obligated entities

   This information may be used to tweak the targets without getting involved into direct price control.
6. It is important to ensure the liquidity, stability for long-term confidence of the private investors in REC market.
7. Prices of Tradable RECs reflect dynamic nature of market. It reacts to the changes in the generation costs, electricity prices and emissions allowance prices. However, some measures may be required to avoid the risk of excessive supply and collapse of REC prices.
8. The Government may be required to continue to support more expensive RE technologies.
9. Banding of RE technologies can be challenging if the generation cost difference between technologies is large.

7. Approach to introduce REC Mechanism in India

In Chapter 4, we identified the possible objectives for the proposed REC Mechanism in India. These objectives are reproduced below:

a) Effective implementation of RPO mechanism
b) Increased flexibility for participants
c) Overcome geographical constraints
d) Reduced transaction costs for RE transactions
e) Enforcement of penalty mechanism
f) Create competition amongst different RE technologies
g) Development of all encompassing incentive mechanism
h) Reduce risks for local distribution licensees

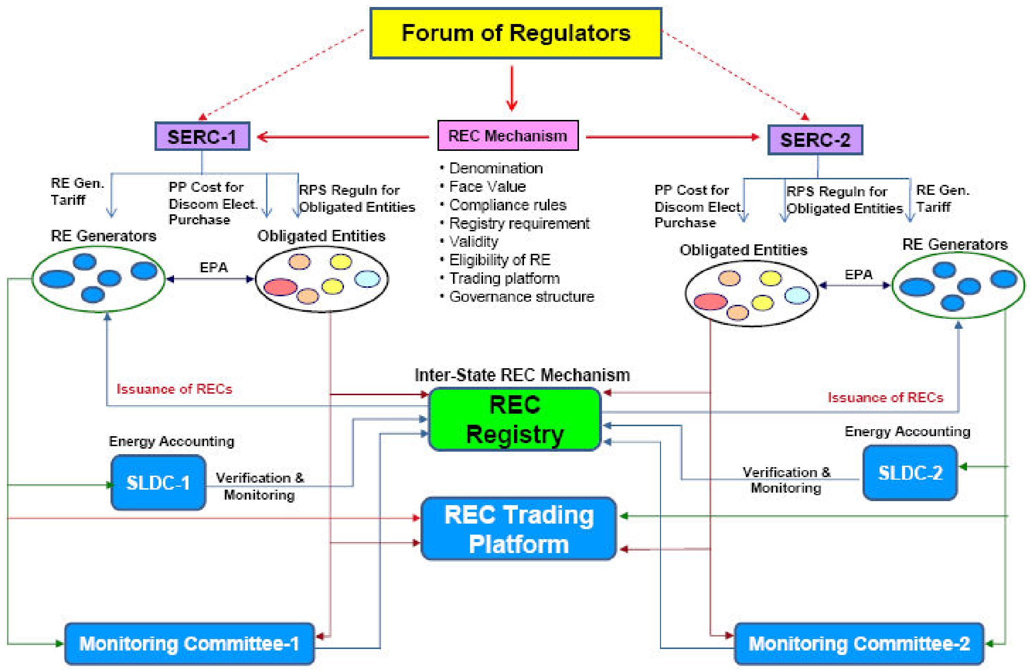
As mentioned in Chapter 4, it is felt that objectives 'a' to 'e' should take precedence over other objectives. In this chapter, an approach for introducing REC mechanism to address the above objectives within existing legal framework in India has been presented.

7.1 Proposed Approach

From analysis of international case studies and regulatory & legal framework in India and keeping in mind the most desirable objectives for the REC mechanism, it is obvious that uniform framework at national level is utmost desirable in order to derive maximize benefits from the proposed REC mechanism. However, promotion of renewable energy development is an important function within jurisdiction of the State Electricity Regulatory Commissions. The compatibility of framework amongst different States becomes critical if inter-State RE transactions are involved. Further, other regulatory instruments for promotion of renewable energy such as feed-in tariff mechanism are also expected to continue. While consistency in development of feed-in tariffs as well as development of obligations under Section 86(1)(e) is expected to evolve, it is necessary that any new mechanism is compatible and consistent with the existing regulatory framework and incentive structure for RE investors in India.

Accordingly, a detailed institutional framework has been designed to adopt the concept of REC mechanism in India. The proposed approach is presented in this section with its potential advantages. The prime focus while designing this approach has been to explore the legally tenable and most practical REC mechanism for India. The Approach proposed in this Report can be better understood by the schematic shown in fig. (6.1).

Fig. (6.1): Proposed Approach for Conceptual Framework of REC



7.2 Description of the Proposed Approach

Under Section 166 of the Electricity Act 2003, the Forum of Regulators has been established. Further, Government of India has issued Rules, namely, Forum of Regulators Rules, 2005 notified on February 15, 2005 vide GSR no. 75(E), which mandate FOR to ensure harmonisation of regulation in power sector. In the proposed approach, it is envisaged that Forum of Regulators will develop the harmonized policy for implementation Renewable Energy Certificate Mechanism across India. The Policy shall be adopted by the State Electricity Regulatory Commissions in their respective States. RECs issued in the States which adopt the harmonized policy of the FOR shall be allowed in those States for compliance of Renewable Purchase Obligation under Section 86(1)(e).

Under Section 79 of the Electricity Act 2003, the Central Electricity Regulatory Commission is responsible for regulation of inter-state transmission and trading. Since proposed REC Mechanism is primarily envisaged for inter-state sales, common institutional framework such as REC Registry and REC Exchange Platform shall be developed by the CERC. The same institutional structure may be used by the States for exchange of RECs among various players in the State. This will help avoid duplication of infrastructure required for implementation of REC mechanism.

RECs may be purchased by any person and not necessarily only by obligated entities.
REC sell and purchase transactions may take place either on exchange platform or through bilateral contracts.

7.3 Roles and Responsibilities of Institutions

The above approach envisages additional role for various existing institutions as well as creation of new institutions. The proposed approach proposed creation of following new institutions:

- Monitoring Committees for each State participating in REC Mechanism
- REC Registry common for all States
- REC Exchange Platform common for all States

In the following paragraphs, roles and responsibilities of each institution have been discussed in detail:

7.3.1 Ministry of New and Renewable Energy (MNRE)

MNRE, being the nodal agency for promotion of renewable energy in the country is primarily expected to facilitate the development of REC mechanism in India. Some of the activities which MNRE is expected to perform are listed below:

- To facilitate development of REC mechanism
- To provide support as desired by Forum of Regulators
- To approve technologies eligible for participation in REC Mechanism
- To assist SERCs in implementation of generation accreditation process
- To ensure that any future incentive mechanism for promotion of RE is compatible with the REC Mechanism

7.3.2 Forum of Regulators (FOR)

Forum of Regulators is expected to play crucial role in design, development and coordination of implementation in various States participating in the REC Mechanism. In particular, FOR is expected to evolve consensus on following issues: viz.

Operating framework for REC Mechanism

- Standard Regulations under Section 86(1)(e) incorporating REC covering:
  - Institutional structure for REC Mechanism
  - Operating Framework for REC Mechanism
  - Methodology for pricing of electricity component
  - Methodology for pricing of REC component
  - Enforcement Principles for non-compliance of RPO
  - Generation accreditation process
  - Structure & Rules of the Monitoring Committee
- Development of standard methodology for energy accounting process
- Assessment of market for REC
- Review and comment on the Regulations developed by the CERC for REC Registry and REC Exchange Platform
- Periodic review of the development and implementation of REC mechanism
- Seek inputs from time to time from the MNRE and other stakeholders
- Resolve any issue which may crop up during implementation in any State

7.3.3 Central Electricity Regulatory Commission (CERC)

Under Section 79 of the Electricity Act 2003, CERC is responsible for inter-state transactions. Since, the proposed REC mechanism is expected to provide suitable platform for inter-state transaction in renewable energy, CERC is expected to develop appropriate institutional & Regulatory framework. In particular, CERC is expected to develop and implement:

- Institutional and Regulatory Mechanism for REC Registry
- Regulation for REC Exchange Platform
- Principles for determination of tariff for RE Technologies which may be used by SERCs for determination of pricing of RE in the State
- Develop criteria for eligibility of RE technologies for inclusion in REC mechanism in consultation with MNRE and FOR
- Approve RE technologies for inclusion in REC mechanism, in consultation with MNRE

7.3.4 State Electricity Regulatory Commissions (SERCs)

The Electricity Act 2003 mandates SERCs with the responsibility of promotion of renewable energy. While FOR may develop standard regulations, the SERCs are expected to play a crucial role in implementation of the REC mechanism. In particular, SERCs will carry out following activities:

- Adopt Standard Regulation developed by FOR after taking into account state specific issues
- Determination of RE Technology specific tariffs
- Determine the Tariff Rate for procurement of electricity component of RE
- Specify the RPS percentage and eligibility for RE procurement
- Specify enforcement mechanism for different Stakeholders for non-compliance
- Amend State Grid code to enable SLDC to take up energy accounting
- Amend Regulations under Section 86(1)(b) to account for acquisition of RECs
- Adopt with suitable modifications, regulations for monitoring committees
- Design Contractual framework between SLDC/ Distribution Company, RE Generator and Monitoring Committee for energy accounting
- Design Contractual framework between SLDC/ Distribution Company, Obligated entities and Monitoring Committee for energy accounting

7.3.5 State Load Dispatch Centres (SLDC)

Energy Accounting would be the backbone of the proposed REC mechanism and the mandate for this important task under the Act is with SLDC. The procedure for energy accounting is usually governed by the State Grid Code. It is expected that SERCs will modify the State Grid Codes to enable SLDCs to undertake following functions:

- Accounting of renewable energy fed into the grid (electricity generated)
- Accounting of renewable energy procurement by the Obligated Entities
- Issuance of power generation certificate to REC registry
- Accounting of total energy procurement by all obligated entities

7.3.6 Monitoring Committee

Monitoring Committee is one of the three new institutions proposed under this Conceptual Framework. The Primary Responsibility of the Monitoring Committee would be to monitor the compliance of the RPO by all obligated entities. This institution is expected to bridge the link between Central REC Registry and SERC. It is envisaged that Central REC Registry will notify the Monitoring Committee about the RECs redeemed by various entities in the State. However, it is possible that Obligated Entities are using renewable energy by way of:

- Procurement from the generators under contracts prior to the implementation of REC mechanism
- Procurement from the generators which are renewable but not eligible for RECs
- Off – site captive generation
- On site captive generation

In such cases, information about renewable energy will not be available with REC Registry. Some of the above mentioned information; particularly on-site captive generation may not be available even with SLDC. However, this generation will have to be accounted for monitoring compliance of the RPO. Monitoring Committee may have to evolve processes for collection of this data. Apart from this, the Monitoring Committee is expected to undertake following activities:

- Accreditation of eligible RE generators in the State
- Act as a repository of all information pertaining to renewable energy in the State
- Maintain database of Obligated Entities in the State
- Monitoring the compliance of Market rules by all stakeholders
- Reporting of non-compliance, breach of rules to the concerned SERC
- Enter into tripartite agreement with SLDC/ Distribution Company & RE Generator for energy accounting
- Enter into tripartite agreement with SLDC/ Distribution Company, Obligated entities for energy accounting

While this Study has identified the need of institution to undertake the abovementioned tasks, it is not clear whether any of the existing institutions can take up the responsibility to act as a Monitoring Committee.

7.3.7 REC Registry

While Monitoring Committees will be formed in each State, REC Registry and REC Exchange Platform are proposed to be central institutions. The primary responsibility of REC Registry will be to issue Renewable Energy Certificates to eligible RE generators. The processes for energy accounting and REC issuance have been discussed in the next chapter. The REC Registry will also have to perform following tasks:

- Registration of eligible RE generators
- Registration of REC buyers which could be any person, obligated entity, trader or individual buyer who wishes to buy RECs to be carbon neutral
- Issuance of RECs to RE generators
- Redemption of RECs on receipt of redemption request
- Track transactions involving sell and purchase of RECs
- Provide requisite information to Monitoring Committee of each State on redemption of RECs by buyers
- Automatically redeem RECs if the life of the RECs is over

As in case of Monitoring Committee, this Report identifies the need for institutions to act as REC Registry and REC Exchange Platform. However, we have not identified any particular institution which may be able to perform the responsibilities of REC Registry or REC Exchange Platform.

REC Registry would be allowed to collect operating fees and charges as approved by the CERC from time to time. These operating fees and charges would be dependent on costs incurred on provision of hardware and software and to facilitate registration of entities, transactions, information exchange, and fulfilling its obligations towards reporting requirements. At this point of time, it is not clear how many States would join the proposed REC Mechanism and therefore it is difficult to estimate resultant volume for REC Registry.

7.3.8 REC Exchange Platform

REC Exchange Platform is expected to provide REC buyers and sellers a fair and transparent platform for sell and purchase of RECs. This platform will also help in finding out fair price of RECs in given circumstances. REC Exchange Platform is expected to undertake the following tasks:

- Development of hardware and software in accordance with CERC Regulations
- Facilitate exchange of RECs amongst interested parties in accordance with CERC Regulations
- Periodic reporting to the CERC regarding REC trades
- Recovery of costs from participants on the Platform

The platform would collect operating fees and charges as approved by the CERC from time to time. These operating fees and charges would be dependent on costs incurred on provision of hardware and software and to facilitate volume of transactions on the REC Exchange Platform. At this point of time, it is not clear how many States would join the proposed REC Mechanism and therefore it is difficult to estimate resultant volume. Further, it may be noted that several methods such as block bids, pay-as-you bid, of sell and purchase on Exchange Platform are possible. Further, periodicity of operation of exchange will have to be decided as REC market may not be liquid enough to operate on daily basis. It is necessary that method most suitable to meet the requirement is identified. Considering that this Report's primary purpose is to identify 'Conceptual Framework for REC Mechanism', we have not analysed this issue in detail. It is suggested that appropriate study may be undertaken to identify most suitable method for Exchange Platform and to estimate the volume and cost associated with operationalisation of the Platform.

7.3.9 REC Buyers

Worldwide awareness about the global warming and climate issues is increasing. As a result, many corporate as well as individuals prefer to purchase clean/ green energy. If such buyers are allowed to purchase RECs, market for renewable energy may increase significantly. Therefore, it is proposed that any person may be allowed purchase and redeem RECs. As the buyers purchasing RECs to satisfy RPO have been referred to as Obligated Entities, buyers without RPO may be called voluntary buyers.

All buyers whether Obligated Entities or Voluntary Buyers will have to be registered with the REC Registry. REC Registry will report redemption by Obligated Entities to the Monitoring Committee of the State where the entity is located. In case of Voluntary Buyers, their redemptions will be disclosed to the Regulator under Reporting Requirements to be specified by the CERC in its Regulations. Further, Voluntary Buyers will not have to register with the Monitoring Committee.

Apart from disclosure, both types of REC buyers will enjoy same rights with the REC Registry. Further, both Obligated Entities as well as Voluntary Buyers may carryout transactions through either bilateral contract mechanism or Exchange Platform.

7.3.10 Obligated Entities

As mentioned earlier, Obligated Entities are a subset of REC Buyers. Unlike Voluntary Buyers, Obligated Entities must purchase defined quantum of renewable energy or REC to meet its obligation under RPO. Failure to meet RPO would attract enforcement charges. Obligated Entities can meet their obligation using any of the five methods discussed in section on 'Monitoring Committee'. Following shall be the responsibilities of the Obligated Entities.

- Register itself with Monitoring Committee and REC Registry
- Enter into contract with Generators for purchase of renewable energy and/or REC certificate for RPO compliance
- Redeem RECs at an appropriate time
- Furnish periodic reports to Monitoring Committee about their individual RPO compliance

- In case of shortfall in compliance of RPO, pay enforcement charge, as applicable and provide adequate payment security, as may be necessary.
- Enter into tripartite agreement with SLDC/ Distribution Company, Monitoring Committee for energy accounting and provide requisite information to Monitoring Committee from time to time.

7.3.11 RE Generators

Upon implementation of the REC Scheme, RE generators would be of two types; eligible RE generators and non-eligible RE generators. Only those generators which employ technology approved by the CERC in consultation with MNRE would be eligible to participate in the REC scheme. All other generators, even if renewable will not be allowed to participate in the REC Scheme. It will not be mandatory for eligible RE generators to participate in the REC Scheme and the eligible RE generators will be allowed to sell renewable energy in any of the following combinations:

1. **Sale of electricity and REC to the local distribution company**: The RE generator may sell both electricity and REC component to the local distribution company under 'feed-in tariff' determined the Regulator. In such case, the REC Registry will issue RECs to the distribution company which may use the same to demonstrate the compliance of RPO or to sell in the market.

2. **Sale of electricity to local distribution company and RECs to any other entity**: In this option, the electricity will be procured by the local distribution company. Such procurement will be governed by 86(1)(b) of the Electricity Act. RECs shall be issued to the RE Generator which it may sell in the market.

3. **Sale of electricity to any entity other than local distribution company and REC to any entity**: The RE Generator may decide to sell electricity to any person subject to provisions of applicable Open Access Regulations and payment of relevant Open Access charges. The Open Access Regulations applicable in this case are the same as those applicable to any conventional generator. In this case, RECs will be issued to the generator which may be sold in the market.

Irrespective of the mode for sale of power adopted by the RE generator, it will have to perform following specific tasks:

- Register with SLDC, Monitoring Committee and REC Registry
- Enter into contract for sale of electricity and REC
- Enter into tripartite agreement with SLDC/ Distribution Company, Monitoring Committee for energy accounting and provide requisite information to Monitoring Committee from time to time.
- Notify Monitoring Committee about the nature of the contract
- Sell RECs during its life time

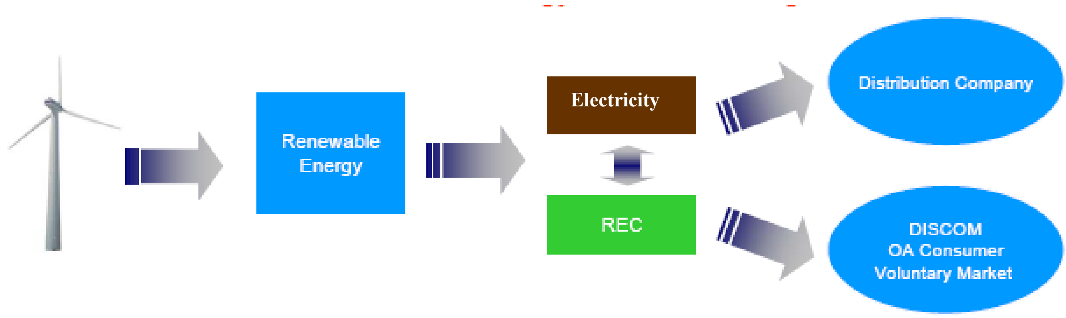
8. Conceptual Framework for REC Mechanism

Across the world, the core objective behind introducing REC mechanism is to promote generation of electricity from renewable energy sources. However, the guiding factors in designing the REC framework vary significantly across the countries. In Indian context, the objective of REC mechanism is to overcome the hurdles in harnessing the renewable energy spread non-uniformly across the States. With such specific requirement, it is necessary to discuss in detail the conceptual framework for REC mechanism in India.

8.1 Origination of REC concept

Renewable sources of energy are characterized as clean fuel or environmental friendly fuel because the electricity generated from renewable sources of energy does not degrade the environment. Therefore, electricity generated from RE sources can be divided into two components; electricity component and environmental component. The electricity component of RE can be considered comparable with the electricity generated from any other conventional energy source like coal, natural gas etc. However, the other component i.e. environmental component distinguishes the electricity generated from renewable sources from that of conventional sources. The environmental component associated with renewable energy can be carved out as a separate component and used for the purpose of REC mechanism while the electricity component can be transacted like transaction of electricity generated from conventional energy sources.

Figure 7.1: Schematic of REC Origination



The separation of REC component would make it governing factor in ensuring the RPO compliance by the obligated entities. As REC is only notional aspect or only a commercial mechanism for RPO compliance, it would not require creating any physical infrastructure for transaction of REC from one place to another. No inter-state or inter-regional transaction cost would mean that RE generator can sell its REC to any obligated entity located in any part of country with no additional cost. Similarly, obligated entities shall have freedom to procure REC from the place of their choice.

Further, quantification of REC is foremost issue that needs to be addressed at conceptual level itself. There exist various options for quantification of RECs such as denomination in equivalent generation terms or in capacity terms or in currency terms. REC as a concept itself is linked with the generation of electricity therefore quantification also needs to be done in energy (MWh) terms. One REC will be issued for every MWh of electricity fed to the grid and metered at the bus-bar of the RE generator.

8.2 Schematic of the Proposed REC Mechanism

Over a period of time, the electricity sector has developed a well established institutional and operational structure at central level as well as state level for generation, transmission and distribution of electricity. However, REC mechanism is totally a new concept in electricity sector therefore the institutional as well as operational structure would need to be defined. Further, the structure should be such that it is compatible and could be operationalized in harmony with the existing framework. After due consideration of all these aspects, the schematic of operational framework for the proposed REC mechanism is shown in figure 7.2 and elaborated in the subsequent paragraphs:

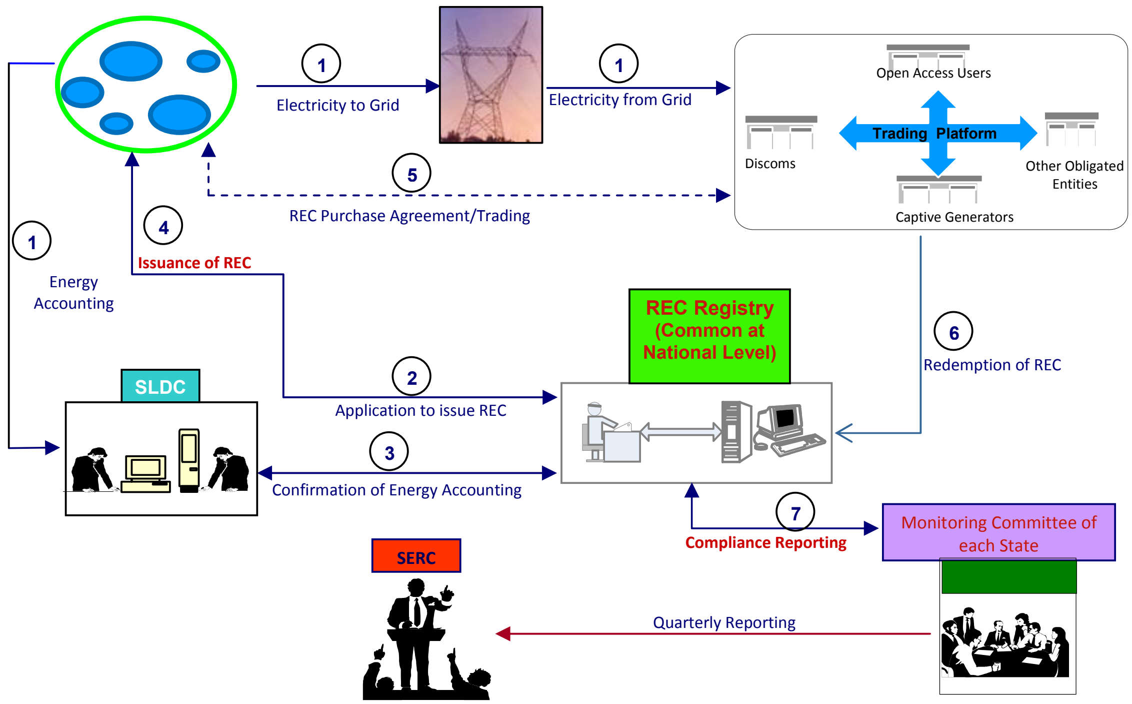
Step 1: Electricity Generation and Feeding to the Grid

The electricity generated in RE project is injected into the grid. This electricity is consumed in real time by load prevalent in the system, which in turn is accounted against the consumption by the entities which had contract with that particular RE project. The metering of quantum of electricity injected into the grid and energy accounting will be done by the State Load Despatch Centre (SLDC).

Step 2: Request for issuance of REC

The RE Generator will send a request to the REC Issuance Registry to issue the RE certificates equivalent to the amount of electricity injected into the grid and as certified by the SLDC.

Figure 7.2: Operational Framework of the Proposed REC Scheme



Step 3: Confirmation of Electricity Generation

The REC Registry and SLDC shall establish procedure for exchange of information about actual electricity generated by registered RE projects on monthly basis. The SLDC shall submit the report for the energy accounts of RE projects to the REC Registry, as per established procedures on regular basis.

Step 4: Creation and Issuance of RECs

Referring to the generation report submitted by SLDC, the REC Registry will create and issue appropriate number of RECs to the concerned RE Generator.

Further, in case, obligated entities have entered into long term contract with a RE generating station for purchase of both the electricity as well as REC, REC may be directly issued to the obligated entities on the basis of energy generation certificate and contract for such REC procurement submitted by the obligated entities.

Step 5: REC Sale by RE Generator

Once the RECs are issued to the RE Generator, it can be sold to any buyer either by way of a bilateral agreement or through an aggregator. Further, sale/purchase of RECs amongst various RE Generators / Obligated entities / Voluntary Buyers can be undertaken through REC Exchange Platform to be established in accordance with the Regulations to be formulated by CERC for this purpose.

Step 6: Surrender/Redeeming of RECs

The obligated entities can procure the RECs directly from the RE generator or from the market and need to surrender the RECs to the REC Registry to meet their RPS obligation. This will facilitate convenient and effective mechanism for ensuring the RPO compliance by the obligated entities. REC Registry shall maintain record of RECs issued and RECs received for redemption on regular basis.

Step 7: Compliance Reporting

REC registry will prepare a state specific and Obligated Entity Specific REC Procurement report on the basis of the RECs redeemed by each of the obligated entities and send it to the State level Monitoring Committee. In addition, the report will also provide the details of RECs issued to each of the RE generators in that State. Further, state level Monitoring Committee will verify the information provided in the REC Procurement report and provide the summary of status of RPS compliance of individual obligated entities in its State to the SERC on quarterly basis.

The above framework can be operationalized well within existing institutional and operational framework. It needs only two additional institutions i.e. REC registry at national level for issuance of RECs and Monitoring Committee at State level for monitoring the compliance of obligated entities.

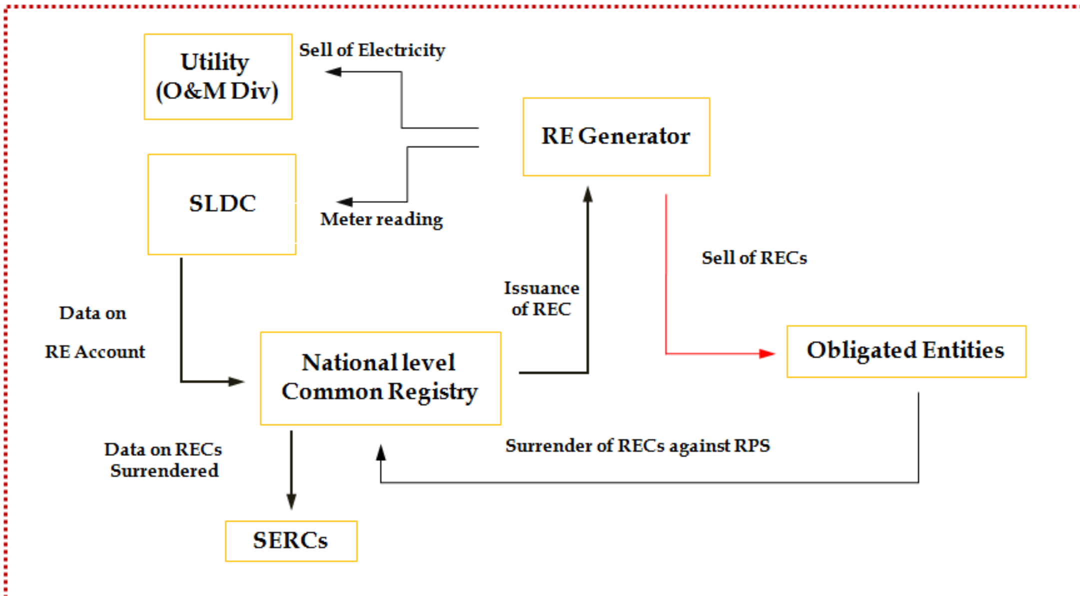
8.3 Operational Framework for the Proposed REC Mechanism

Having discussed the schematic of REC mechanism, it is equally important to understand the procedural framework for operationalisation of REC mechanism.

The operational framework can be broadly divided into four aspects:

- Energy accounting of RE generator
- Issuance of RECs to RE generator
- Procurement and surrender of RECs by Obligated entity
- Notification to the respective SERC about fulfilment of RPO of Obligated Entity

Figure 7.3: Operational framework of REC mechanism



8.3.1 Energy Accounting Mechanism to Create REC

Energy accounting for the proposed REC mechanism will not call for major modifications in the existing arrangement or creation of any new institution for energy accounting purpose. The existing framework can very well be used for accounting of electricity generated from renewable energy projects.

Currently, most of the renewable energy projects especially based on wind energy are directly connected with the state grid while some projects are connected at embedded level, local distribution licensee's network such as biomass power and SHP projects. However, most of the RE projects are not visible to system operator i.e. state load dispatch centre as these projects are not required to furnish the day-ahead generation schedule at individual project level. The energy accounting of RE projects is done by transmission/distribution licensee on the basis of joint meter reading taken by the representatives of transmission/distribution licensee and project developer.

The success of REC mechanism to a great extent will depend upon accurate metering and accounting of electricity generated by the renewable energy projects.

The SLDC, on monthly basis, will generate a report for energy injected by the RE Generator. The energy accounting report shall be prepared on monthly basis providing details of net energy injected into the system. The monthly energy accounting report prepared by SLDC shall work as generation certificate for the purpose for issuance of renewable energy certificate.

8.3.2 Procedures for Issuance of RE Certificates

Once the energy generation certificate is issued, the RE generator would have to approach the REC registry for issuance of renewable energy certificates within the stipulated timeframe. The process at REC registry shall be completed in the following stages:

- Registration
- Request submission
- Verification
- Data recording
- Issuance of RE certificate

Stage 1- Registration:

For participating in REC mechanism, the RE generator must be registered with REC registry with separate registration for each RE project. Such registration would enable creation of a permanent account for purpose of keeping record of REC transaction by a particular RE generator separately for each of its RE project. The RE generator may need to provide the following details such as contact address, location, metering details, fuel sources, technology, installed capacity, start-up date. In turn the registry will issue a unique registration number to the individual generator. To control the volume of registered accounts, REC Registry may specify the validity period for such registered account. Further, the RE generator may register the different RE generation projects, for each RE generator of which energy accounting is separately done by SLDC, in a single account.

Stage 2- Request submission:

The registered RE generator would submit the request for issuance of REC on the basis of energy generation certificate issued by the state load dispatch centre.

Box 7.1: Similarity of REC Registry with a Commercial Bank

In the nature of operation, REC registry shall work very much similar to the work executed by any commercial bank. The customers willing to make transaction using the bank facility needs to open an account that hold the records of all transactions made by a particular customer. The account opening is done on the basis of criteria specified by the bank.

The specific requests made by the customers (like cheque clearance) are first verified by the bank and then, the request is processed by the bank. At the end, the bank debits/credits the customer's account accordingly.

Stage 3- Verification:

The REC registry will verify the request on the aspects of eligibility of RE technology, and period of issuance of generation certificate. REC Registry may decline such request if any of the criteria is not met.

Stage 4- Data recording:

REC registry shall maintain a database keeping record of all relevant information related to the RE generator identity, its project location, type of RE source, technology used, and date of electricity generation etc.

Stage 5- Issuance of RE certificate:

A unique number will be generated for a particular RE Certificate. RE certificate in electronic form shall be given to the RE generator. The same shall be updated in the account of RE generator.

8.3.3 Procurement and surrender of RECs by Obligated entity

The Obligated Entities that need to comply with RPO targets can procure REC issued to the RE generator either through the bilateral contract or through some market mechanisms. However, only procurement of such REC certificate shall not suffice for RPO compliance. The Obligated Entities shall be required to surrender the procured REC to the registry. The process of redemption of REC certificate is very much similar to the process of issuance of RE certificate. The process of REC redemption shall be completed in the following stages:

- Registration

- Request submission
- Verification
- Data recording
- Issuance of RE certificate

Stage 1- Registration:

For participating in REC mechanism, the Obligated Entities must be registered with REC registry. Such registration would enable a permanent account for purpose of keeping record of REC redemption by a particular Obligated Entity. The Obligated Entity may need to provide the following details such as contact address, location, nature of business etc. In turn, the registry will issue a unique registration number to the individual obligated entity. To control the volume of registered accounts, REC Registry may specify the validity period for such registered account.

Stage 2- Request submission:

The registered obligated entity shall submit the request for surrender of REC along with other related details.

Stage 3- Verification:

The REC registry will verify the request on the basis of period of issuance of RE certificate. REC Registry may decline such request if any of the criteria is not met.

Stage 4- Data recording:

REC registry will record all the relevant information related to the REC unique number, type of RE source, and technology used, date of RE surrender etc. in its database.

Stage 5- Redemption of RE certificate:

After verification and data recording, REC registry will credit the obligated entity's account with the equivalent amount of RE certificate redeemed by it.

8.3.4 Notification towards fulfilment of RPO Obligation

For ensuring the RPO compliance, the information related to issuance and redemption of RECs must be submitted to Monitoring Committees at State level. Therefore, REC Registry needs to submit such information in consolidated form giving details of quantum of REC redeemed by the Obligated Entities. For close monitoring of RPO compliance, the REC registry shall submit such report on quarterly basis. Upon scrutiny and verification the report, Monitoring Committees may upload it on its website.

8.4 Participating Rules and Compliance Monitoring Process

The success of REC mechanism will depend upon RPO compliance by entities, co-ordination among the agencies involved, prevention of any unfair practices etc. All such issues can be addressed by framing the rules on various aspects related to REC mechanism. At conceptual level, broad rules and principles can be formulated at FOR level while the rules for State-specific aspects of RPO compliance to be monitored by Monitoring Committee can be developed over a period during the operation period as and when need arises. Some of the broad aspects which can be covered at conceptual level are discussed below:

8.4.1 Generator Accreditation

Prior to issuing the RE certificates, it is necessary to certify that the electricity is generated from a renewable energy source. The definition of renewable energy source is different from one scheme to another. Technologies such as Wind, Biomass and Bagasse, Small Hydro, Solar, Geothermal, Tidal are recognised to be renewable in nature across all the schemes. However, few States also recognise electricity generation from fossil fuel based cogeneration for the purpose of RPO compliance.

With Ministry of New and Renewable Energy (MNRE) being the nodal ministry for dealing with all matters related to renewable energy sources, the renewable energy technologies as approved by MNRE will have to be included in the accreditation process. Therefore, the energy generation from RE sources as approved by MNRE will be eligible for the participating in REC mechanism.

The Monitoring Committee will set out the accreditation criteria for RE generators. All rights to review and amend the accreditation process will be with the Monitoring Committee. The monitoring committee will notify for any proposed changes and amendments to the accreditation process, as and when required. The said changes and amendments will be finalised in consultation with the RE Generators. The RE Generators will be given reasonable time to adapt to the requirement modifications.

A RE generator is only eligible to qualify under the renewable energy certificate scheme, as long as it complies with the terms and conditions set by the Monitoring Committee. In case of any changes, the RE generator must notify to the Monitoring Committee for the changes made or intention to make changes in the operation e.g. change in fuel source or capacity addition to the existing plant and submit the relevant documents to the Monitoring Committee for their verification and certification.

On a pre defined time interval, an independent auditor as approved by the Monitoring Committee may perform a technical audit of each of the eligible RE Generator to ensure continual compliance with the accreditation criteria set out by the Monitoring Committee.

8.4.2 Reporting of Non-Compliance with the RPS

The REC procurement report as submitted by REC Registry on quarterly basis shall form basis of RPO compliance report to be prepared by Monitoring Committees at each State level. Further, as outlined under Section 6.3.6, it is possible that Obligated Entities can meet their RPO obligation by way of REC purchase as well as renewable energy procurement from RE generators not eligible for REC, on-site/off-site captive generation etc. In such cases, information about renewable energy will not be available with REC Registry. Some of the above mentioned information; particularly on-site captive generation may not be available even with SLDC. However, this generation will have to be accounted for monitoring compliance of the RPO. Monitoring Committee may have to evolve processes for collection of this data.

Monitoring Committees will prepare consolidated statement of RPO compliance for each Obligated Entity on quarterly basis and also on annual basis at the end of each financial year. After verification by Monitoring Committee, the report shall be submitted to respective SERCs. The SERCs shall publish this report on its website along with giving the details of quantum of enforcement charge on each of the Obligated Entities for non-compliance with the RPO target.

8.4.3 Preparation of Standard Documents

In order to have a dispute free scheme in place, it is necessary that it should be governed by the strong contractual framework. Under the leadership of Forum of Regulators, the Monitoring Committee will facilitate the development of basic rules and minimum standards for contractual agreements to be followed by the Generators, Obligated Entities, Energy Accounting Agencies, and REC Registry.

9. Pricing Options in REC Mechanism

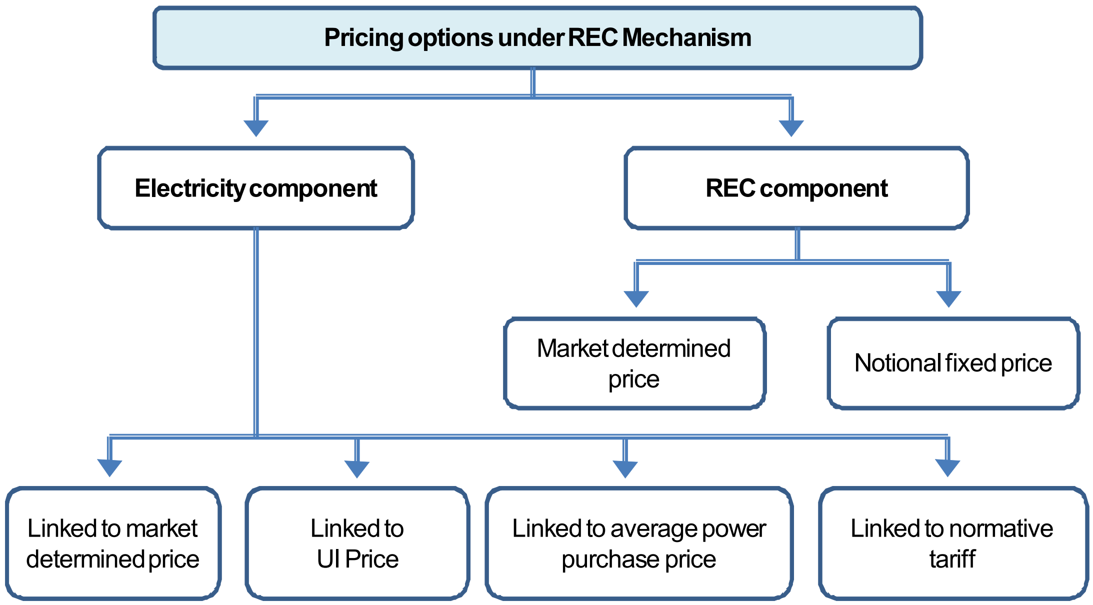
Pricing is one of the most important factors which influence the economics of operation of any commodity. Presently, prices for electricity generated by central sector generating stations, state sector generating stations are regulated by the Appropriate Regulatory Commissions through cost-plus approach. The tariff for power procurement by distribution licensee from renewable energy sources are also determined by the SERCs on the basis of preferential 'cost-plus' tariff approach.

With the introduction of REC mechanism, the renewable energy based generating sources would have two distinct products; electricity and REC. The suitable pricing mechanism for each of the component needs to be devised and it should also be compatible with the existing regulatory and policy framework. On the basis of this aspect, various alternatives for pricing of electricity and REC component has been shown in figure 8.1 which has further been elaborated in the subsequent paragraphs.

As shown in the figure (4.1), the energy generated from RE sources can be divided into two components; electricity component and environmental or 'Green' component. The electricity component of RE can be considered comparable with the electricity generated from any other conventional sources. However, the other component i.e. environmental component is the only factor which distinguishes the electricity generated from renewable sources from that of the conventional sources. Hence, it would not be unfair to allow a RE generator to sell these two as different products and have an additional source of revenue from RE project. Hence, it becomes necessary to identify the feasible methodologies for pricing each of these two components. This section covers the four different methodologies identified for pricing of the two components. Also, the feasible methodology has been recommended at the end.

Figure 8.1: Options for pricing of Electricity and REC Component

Identified Options for REC Pricing



9.1 Options for Pricing of Electricity Component

As shown in figure (8.1), pricing of electricity component could be linked to following four options:

1. Market prices for electricity
2. UI Price
3. Average power purchase price of the distribution licensee
4. Normative or feed-in tariff for particular renewable technology

In the following sub-sections, these options and their merits and demerits have been discussed in detail.

9.1.1 Linked to Market Price

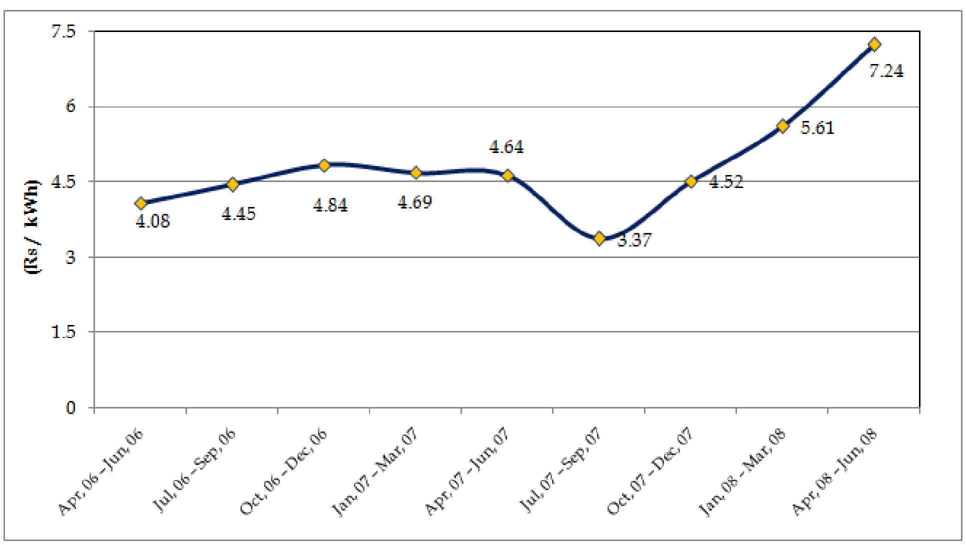
In a truly competitive power market, the prices of electricity are discovered through dynamics of the market operations. With regard to electricity, market price discovery has been done through the following two mechanisms:

- Competitive Bidding Process
- Power Exchange

The price discovery through competitive bidding process reflects market price for electricity procurement under long term contract whereas price discovery through power exchange reflects market price for electricity procurement under short term contracts (on a day-ahead basis). The price discovery through competitive bidding process has two components viz. capacity charge and energy charge. Further, energy charge component is subjected to fuel cost adjustments with due escalation factors from time to time. Besides, due to case specific nature of competitive bidding projects, the price discovery reflects wide variation in tariff range. Considering the nature of electricity generation from renewable sources of energy, which is amenable to single part tariff component, the price discovery through power exchange will be more appropriate option.

The power exchange provides such platform for price discovery by matching demand and sale price, quoted by the buyers and sellers respectively. In India, two power exchanges have started their operations in recent past. The volume of electricity exchanged is very miniscule as compared to total electricity generation in the country. The average price variation in the power exchange on quarterly basis, for last two years, has been shown in the figure (8.2).

Figure 8.2: Weighted Average Sale Price of Traded Electricity (Rs/kWh) [15]



[15] **Source:** CERC Staff Paper on "Measures for restraining the prices of Electricity in short-term sale/trading" dated September 01, 2008

Merits

- Adopting the philosophy of the power exchanges for determining price of electricity component would be appropriate as it represents short term marginal cost of electricity procurement in the market. Its usefulness has been successfully demonstrated for transactions of the conventional electricity in India.
- It will enable different RE sources and technologies to compete among themselves and with other conventional energy technologies.

Demerits

- Significant demand-supply gap prevalent in the country poses restriction in true price discovery. The price discovered through power exchange in India which corresponds to < 0.5% of electricity generation in the country may not truly reflect the market price of electricity.
- The market discovered prices are reasonably higher than the cost of generation in case of most of the RE technologies and this would lead to artificial increase in power purchase cost of utilities for their RPS target which will ultimately burden the end consumers.
- Currently, the tariff for electricity generated from conventional as well as RE sources is determined through the regulated 'cost-plus approach' adopted by the appropriate Regulatory Commissions. Linking the energy price with market price does not fit into 'preferential cost –plus' structure specified by the SERCs for RE technologies.
- CERC has also expressed a concern over the steep increase in power exchange price without corresponding increase in commodity prices for fuel/oil/coal and inflation indices for equipment etc. Thus, pricing methodology based on exchange discovered price for pricing of electricity component from RE generation may be less acceptable by Commissions.

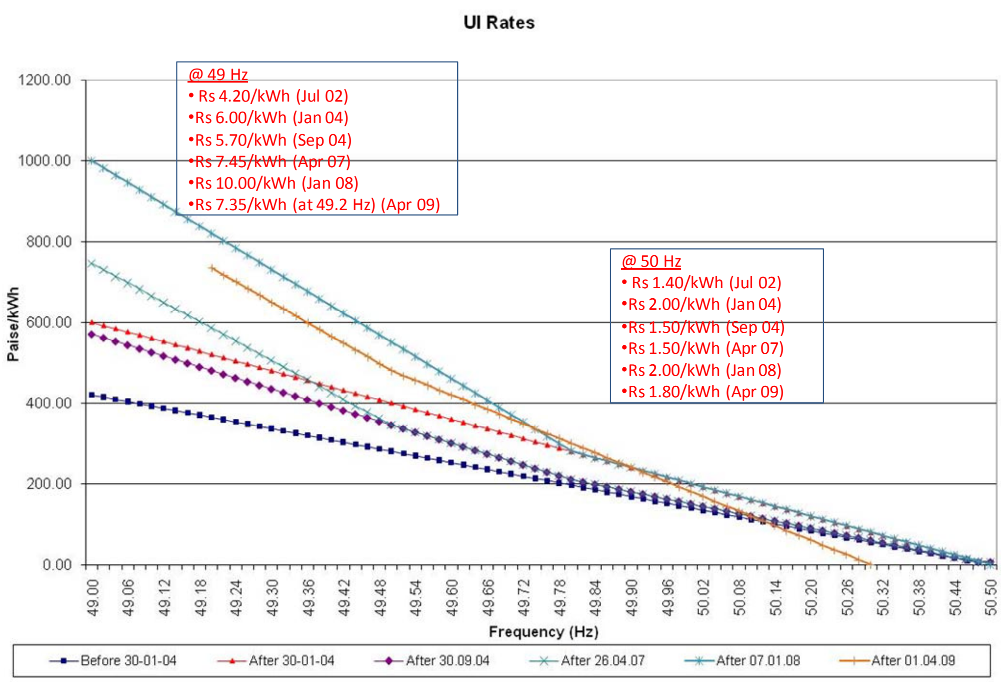
On the basis of above considerations, it would not be appropriate to link the electricity component price with market determined price in present scenario. However, with the development of market and maturity of RE technologies, this option can be explored.

9.1.2 Linked to Unscheduled Interchange (UI) price at 50 Hz

In the present power system operations, the generators and beneficiaries/buyers are required to generate and draw electricity as per generation and drawal schedule finalised by the appropriate load despatch centre. The deviation from the scheduled generation and drawal is governed through the UI mechanism under which rate of electricity has been linked with the prevailing grid frequency. The UI rates for inter-State operations are specified by CERC.

The electricity generation of RE sources predominantly represents non-firm nature of power therefore prices based on un-scheduled interchange may be considered one of the options for pricing of electricity. The UI price vector, as specified by CERC from time to time, is shown in the figure 8.3.

Figure (8.3): Unscheduled Interchange Price Vector [16]



__Merits__

- Due to prevalent shortfall and nature of grid operations, average UI rates are very high than the rate for power procurement under any other power purchase mechanisms. If the electricity corresponding to REC is made to procure at UI rates, the revenue for the RE project is likely to be higher although it would be

[16]UI Prices has been notified by CERC, time to time, through 'Terms and Conditions of Tariff, Regulations' including amendments thereto. However, CERC has recently published the separate Regulations for UI charges. The new Regulations have been made effective from April 01, 2009.

uncertain. Alternately, the rate for procurement can be fixed at UI rate prevalent at 50 Hz.

Demerits

- UI Rate is essentially used as mechanism for grid balancing purposes and grid discipline purposes. CERC under its recent UI regulations have referred that UI mechanism should not be used as 'trading' mechanism. Hence, using it as a price settlement mechanism for electricity from RE sources may not be appropriate.
- Wide variation in UI volume and corresponding variation in the UI rate, may lead to additional un-certainty on revenue stream for the RE generators.
- The higher cost paid in power purchase will ultimately burden the end consumers.

UI price vector with its philosophy has been designed to undertake commercial settlement for deviation from the scheduled generation or drawal. Therefore, this mechanism can't be used for electricity component pricing of renewable energy.

9.1.3 Linked to Average Power Purchase Price

Under the current regulatory regime, the SERCs are required to regulate all sources of power purchase and procurement process of distribution licensee including the price of such power procurement.[17] Under regulated regime, the power purchase expenses are part of Aggregate Revenue Requirement (ARR) which SERCs approve before determination of retail supply tariff for a given financial year. The average power purchase cost based on recent Tariff Orders by concerned SERCs in respect of few distribution utilities in various States has been shown in figure 8.4

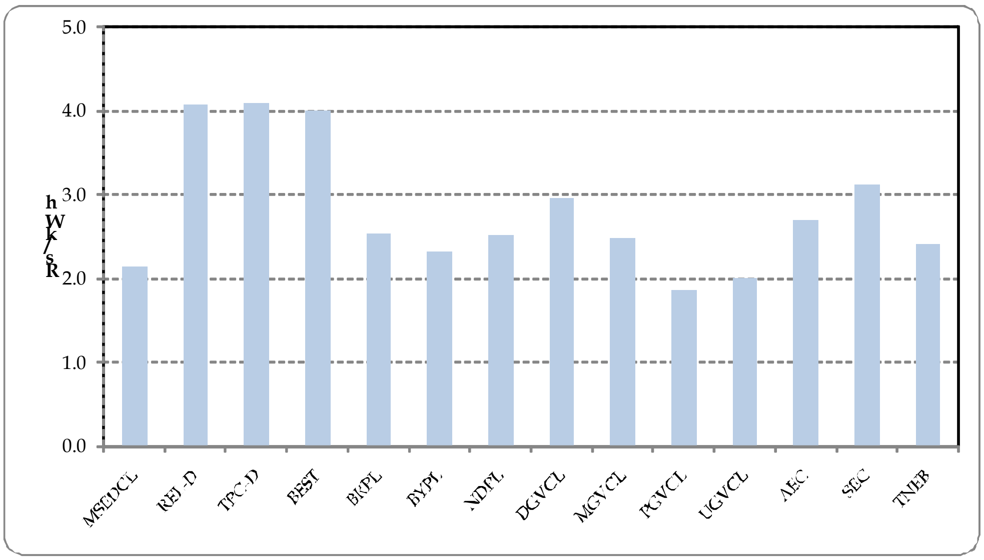
Merits

- The average power purchase cost reflects the pooled price of electricity purchased from all sources hence this methodology would be more appropriate as a benchmark for pricing of electricity component. This methodology will not unnecessarily burden the end consumers.

[17] Section 86(1)(b) of Electricity Act, 2003

- The average power purchase information is available well before the commencement of Control Period therefore it will provide certainty to the project developer as well as distribution utility about the price of electricity component of renewable energy during ensuring year.

Figure (8.4): Average Power Purchase Cost (Rs / kWh)[18]



Demerits

- It has been noticed that, while approving the power purchase expenses of a distribution licensee, some of the SERCs do not account their power purchase cost from short term sources, like traders and UI pool. In such situation, if a distribution licensee purchases significant amount of power from traders and UI pool, the actual average power purchase cost of a distribution licensee will be higher than their approved average power purchase cost approved by their

[18] The average power purchase cost for utilities, except TNEB, has been computed on the basis of power purchase expense and energy requirement approved by the SERCs in the ARR and Tariff Order for FY 2008-09. For TNEB, average power purchase cost has been calculated on the basis of data available in the book ‘Statistics at a Glance’ published by TNEB for FY 2007-08.
MSEDCL, REL-D, TPC-D and BSET are distribution utilities in Maharashtra. DGVCL, MGVCL, PGVCL, UGVCL, SEC and AEC are distribution utilities in Gujarat. Average power purchase cost data for AEC and SEC have been taken from MYT Order for Torrent Power Limited (TPL). BRPL, BYPL and NDPL are distribution utilities in Delhi.

SERC. Hence in that case this methodology will not truly represent the appropriate benchmark for pricing of electricity component.

- Further, as evident from figure 8.4, the average power purchase expense varies considerably across the utilities within the State. e.g. within the State of Maharashtra and Gujarat, the average power purchase cost is significantly different across the utilities.

This Average power purchase approach may lead to a situation where RE project developer may trade-off better generation sites with the higher energy price, resulting into un-coordinated development of RE resources. Further, average power purchase cost is a dynamic figure, varies on the basis of power purchase mix. With these limitations, this mechanism may not be adopted for pricing of electricity component.

9.1.4 Linked to Normative RE tariff

As per the principles outlined under Tariff Policy, the SERCs are required to specify the preferential tariff for power procurement by distribution licensees from RE sources. Due to small unit size and large number of RE generators, most of the SERCs, on the basis of representative sample study, have specified the normative tariff parameters and tariff thereof on the basis of representative sample study. In most of the cases, the tariff has been determined through cost-plus approach under which the SERCs have made assumptions for underlying tariff parameters like capital cost, plant load factor, O&M expense etc. The RE tariff across the selected States under study for different RE technologies have been summarized in the table (8.1).

Table (8.1): Renewable Energy Tariff across the States (Rs / kWh)[19]

S. No.	Technology	Delhi	Maharashtra	Gujarat	Tamil Nadu
1.	Wind		3.50	3.37	2.90
2.	Biomass		3.11	3.08	3.14
3.	Bagasse		3.05	3.00	3.16
4.	Small Hydro		3.00		
5.	Solar (GBI Scheme)			3.37	
6.	Municipal Solid Waste	3.53[20]			

[19] Renewable Energy Tariff Orders of respective SERCs

Merits

- Linking the electricity component with normative RE tariff is most suitable approach from legal, institutional and operational perspective. It would lead to no change in the current tariff determination approach except for harmonization of some of the tariff principles across the States for providing the level playing field for various RE technologies.
- It will provide necessary certainty about the electricity price to the utilities as well as to the RE developers at the beginning of the Control Period itself.

Demerits

- Currently, in all the States except Rajasthan, the RE tariff remains constant for the duration of Control Period, specified under the Tariff Order/Regulations notified in this regard. There is no review mechanism for review of normative tariff due to variation in underlying tariff parameters like capital cost, interest rate etc. Therefore, the normative tariff without in-built review mechanism may not necessarily reflect the actual cost and return specified under the Order/Regulations.
- For some of the technologies like solar and small hydro, the normative tariff has been specified after considering the subsidies/incentives announced by the Government. With the withdrawal of such subsidies/incentives, the actual cost of generation for these technologies would go up in comparison with their normative tariff.

9.2 Options for pricing of RECs

The REC pricing mechanism in India need to address unique situation where electricity market is still governed/regulated to great extent and the preferential feed-in tariff mechanism will have to continue as per provisions under Tariff Policy. Under the circumstances, REC price will have to be determined on notional basis, however, the same could be discovered through market mechanism based on volume and exchange of RECs. An analogy can be drawn in terms of pricing of equity shares during their initial public offer and afterwards their daily price discovery in stock exchanges. However, equity share pricing represents a price of commodity as going concern basis and their life corresponds to the life of the company which is not the case with the renewable energy certificate. At international level, the REC as a concept is used as incentive mechanism

[20] DERC Order dated December 26, 2006 in the matter of Timarpur Waste Management Company (Pvt.) Limited

and cannot be relevant for pricing of REC in Indian context. In the present circumstances, any of the following two mechanisms can be explored for pricing of REC component:

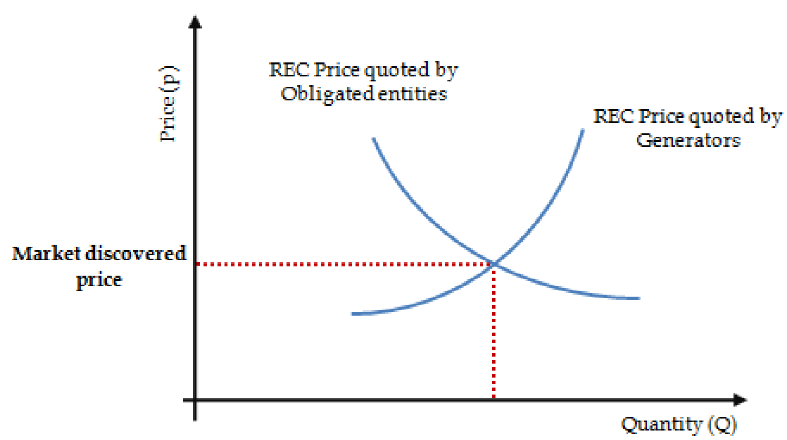
Similar to pricing mechanisms for electricity components, yet there is no established mechanism for pricing of environmental or 'green' component in the form of REC. For environmental component pricing, following two methods can be explored:

- Market discovered price
- Notional Fixed Price

9.2.1 Market Discovered Price

This approach is based on basic principles of Economics, price discovery through the market clearing price based on demand and supply curve. The balancing point of price quoted by RE generators and obligated utilities will decide the price of REC as shown in figure (8.6).

Figure 8.6: REC Price Discovery through market mechanism



<u>Merits</u>

- Price discovery through the demand-supply principles is an ideal situation for long term sustainability of any market. Such mechanism is already being used for price discovery of electricity in power exchange.

Demerits

- As REC market is yet at concept stage/nascent stage of development, without adequate regulatory oversight and intervention measures, the pricing based on market may not be the best way to introduce REC mechanism.
- The primary issues such as minimum base price, suitable platform, minimum denomination etc will need to be addressed for market price discovery to emerge, which could be ideally addressed only after first few years of successful operation of REC mechanism in a closely monitored environment.

9.2.2 Notional Fixed Price

Under this approach, some notional value can be assigned to REC component derived from its associated electricity. The REC component price can be specified in MWh terms which would mean that 1 REC will be issued for every one MWh of electricity generated from RE source and fed to the grid. It may become the most preferred option for introduction of REC mechanism in a tightly regulated market of India.

Merits

- Sustainable methodology to introduce a completely new REC mechanism in India.
- Fair methodology to the generators and buyers because of which the end consumers will not get unnecessarily burdened due to high cost of power purchase for obligated purchase of renewable power.
- No apparent hurdles in switching over to a completely new methodology, if required, after REC market becomes more mature.

Demerits

- This methodology leverages the exiting considerations used for deciding RE tariff and has no apparent demerit.

9.3 Recommended Methodology

From the discussion in previous section about various approaches for pricing of energy component in the form of electricity, and environmental component in the form of REC, it can be concluded that the most feasible option for RE pricing is to link the electricity component with normative RE tariff and REC component with notional fixed price. Further, it is important to have focus on the basic purpose of introduction of REC mechanism in India which is to facilitate the inter-State exchange/transactions of RE so that all the States will be able to meet the long term RPS target specified under National Action Plan for Climate Change (NAPCC). This purpose distinguishes REC mechanism proposed for India from that in most of the other countries which rather have their REC mechanism as an incentive mechanism. Therefore, the effective electricity component prices shall be net of notional fixed price for REC component.

REC Component Price	**=**	**Notional Fixed Price**
Electricity component Price	**=**	**Normative RE Tariff – Notional Fixed Price of REC Component**

The suggested approach seems to be the most feasible solution in the present electricity market scenario. However, with the progressive development of electricity sector, the pricing methodologies for Electricity component and REC component need to be be reviewed at periodic interval. After attaining the maturity by RE technologies, both the prices should reach the level of price discovery through the commercial market for electricity as well as REC prices should be determined using market discovery mechanism.

The FOR Task Force on REC has supported the proposed approach for pricing of electricity component and REC component. However, it is has also been suggested to ensure that the price of electricity component and REC component should be kept at reasonable level. The Task Force has further suggested that the concept of cost of generation has its relevance till such time the procurement of non-firm renewable energy is through competitive bidding. Hence due consideration should be given while devising the methodology for pricing the electricity component in the REC Mechanism.

In addition to the pricing, there are some more significant parameters to be taken care of while design of REC scheme. Various key design parameters have been identified and discussed in the next chapter.

10.Key Design Parameters of the Proposed REC Mechanism

Having discussed the basic framework for introduction of REC mechanism, it is equally important to discuss the parameters which would play important role while designing the detailed REC implementation roadmap. Though, at conceptual stage, it may not be appropriate to discuss all these parameters in detail but providing the basic concept for all these parameters would be of great help during later stage.

The following aspects related to REC mechanism have been discussed in this chapter:

- Eligible RE sources and technologies
- Eligible RE generator / Project
- Obligated Entities
- Banking period and Shelf life of REC
- REC Issuing Authority
- Compatibility with other incentive scheme
- Creation and retirement of RE Certificate
- Denomination of RE Certificate
- Period to issue RE Certificate
- Form of RE Certificate
- Trading mechanism for REC

10.1 Eligible RE Sources and Technologies

The term 'renewable energy' carries a broad meaning, and in general, it covers all sources of energy which could be replenished over a period of time. There has been difference of opinion among the various stakeholders for the energy sources that should be covered under the definition of 'renewable energy'.

The study of international practice reveals that sources such as Wind, Solar, Biomass, Landfill Gas, Municipal Solid Waste, Low Impact Hydro, bagasse cogeneration have been qualified as RE sources. Table 9.1 shows various sources which qualify as RE sources in selected countries.

Table 9.1: Eligible RE Sources in Selected Countries[21]

	Denmark	Texas	UK	Sweden	Norway	Netherlands	Australia
Biomass	√	√	√	√	√	√	√
Solar PV	√	√	√	√	√	√	√
Solar Thermal	√	x	x	√	√	x	√
Wind	√	√	√	√	√	√	√
Geothermal	√	√	x	√	√	x	√
Tidal	√	√	√	x	√	x	√
Wave	√	√	√	√	√	x	√
Oceam Thermal	√	x	x	x	√	x	√
Small Hydro	√	√	√	√	√	<15 MW	√
Large Hydro	x	√	√	√	√	x	√

Further, there are varieties of technologies which can harness these RE sources and generate electricity. The vision of various countries differ on this aspect considering the availability of that resource and short term and long term impacts of leveraging that particular resource. For example, advanced gasification technology is preferred to co-firing while harnessing Biomass resource. Further, eligibility of small hydro technology is subjected to project capacity. For example, in Netherlands small hydro is considered up to project capacity of 15 MW, where as in ROC scheme of U.K. it is up to 20 MW, however in India the limit is up to 25 MW. REC scheme of Australia includes the domestic solar water heating also as an eligible RE technology but other countries do not.

In India, the wind, hydro projects up to 25 MW, biomass, bagasse cogeneration, MSW, solar PV and solar thermal etc have been described as renewable energy sources. The coverage of all these sources is based on the guidelines specified by the Ministry of New and Renewable Energy from time to time.

As MNRE is nodal ministry for all matters related to renewable energy, it would be preferable to include all the RE technologies as approved by MNRE under the REC mechanism. Further, in order to harmonise RE eligibility criteria across the States, FOR in consultation with MNRE may issue guidelines for eligibility of RE technologies.

In this regard, the Task Force has suggested that the electricity generated from schedulable RE sources may be excluded from the REC Mechanism and such generators should be free to sell electricity like any other generator. However, procurement of

[21] Final Report, Tradable Renewable Energy Certificate, Department of Minerals and Energy Pretoria

electricity from such sources would be acknowledged towards fulfilment of RPO. Though, ABPS Infra appreciates the logic behind such recommendations, we would not recommend such decision at this stage. It may be noted that REC Mechanism once established will be in place for 25 years. During this period, such issues are likely to come up. It is necessary to establish institutional process to resolve such issues as and when they arise. Therefore, we suggest that issue may be resolved by FOR in consultation with MNRE during operational phase..

10.2 Eligible Renewable Energy Generator/Project

In India, nature of operation of renewable energy projects varies across the technologies. Almost all the wind and small hydro based RE projects are grid connected, either directly or through the distribution licensee's network. While in some cases, the biomass and bagasse based projects operates on off-grid mode. Further, most of the solar projects currently installed in the country are off-grid projects, although recent initiatives by MNRE and significant developer interest is likely to see Grid connected Solar Power to be developed in big way. In the matter of specifying eligibility criteria for RE generators, three issues need to be addressed:

- Whether REC scheme should cover the only new projects, commissioned after the introduction of REC mechanism or existing projects should also be covered under this scheme?
- Whether grid connected or off-grid projects both should be covered under REC scheme?
- Whether participation in REC scheme should be made mandatory or it should be on voluntary basis?

In countries like U.K. and Australia, the date of commissioning of the project is used as a primary eligibility criterion. In addition, installed capacity of the project is the next immediate criterion which is used to assess the eligibility of a given RE project. Depending upon the RE resource and technology the threshold values of these two criteria differ.

ROC scheme of United Kingdom

- All the RE projects, except hydro and co-firing, commissioned after January 1, 1990 are considered to be eligible RE projects. The consideration seems to have been given by the regulator to protect the long term interest and faith of private investors of those RE projects, into U.K's ROC market.

- In case of hydro, project with installed capacity more than 20 MW is eligible as a RE generator, if it is commissioned after date of their first Renewable Order i.e. April, 2002, otherwise the hydro projects with installed capacity up to 20 MW are eligible RE projects
- Further, though U.K.'s ROC scheme will be operational up to year 2037, biomass based co-firing projects generating electricity will be eligible RE projects only up to March 31, 2011.

REC scheme of Australia

- All the RE projects generating electricity above the baseline as their power generation in year 1997.
- Power Plant Accreditation process for assessing the suitability of a given RE project has been detailed out which is used for yearly verification for eligibility of RE project.
- Domestic solar water heating systems installed after March 31, 2001 with capacity up to 10 kW, displacing electricity up to 25 MWh per year are eligible RE projects. However, these instillations need comply with the standards released by the regulator.

In the international context it has been observed that all the new RE projects are eligible for their respective RE certificate market. Further, as shown in table 9.2, almost every country has mandated the new RE projects to participate in RE certificate market.

Table 9.2: Inclusion of New RE projects in RE Certificate Scheme [22]

	Denmark	Texas	UK	Sweden	Norway	Netherlands	Australia
Mandatory or Voluntary	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Voluntary	Mandatory

In India, extending the REC scheme to off-grid projects or to the small scale grid connected projects at this stage is not a feasible due to the following reasons:

[22] Renewable Energy Certificate Mechanisms of Respective Countries

- Challenges in energy accounting of the generated electricity due to lack of visibility to the SLDC. In such case, an independent metering arrangement will have to be put in place and a detailed verification system for such power generation will have to be institutionalized. At international level, net-metering facility was provided to account the energy generated by the small scale renewable energy projects.
- Otherwise it is challenging to quantify the quantum of electricity generated or displaced by off-grid technologies.

Considering the current status of infrastructure availability, it will be appropriate to focus and give priority to grid-interactive RE technologies only and based on the status after a few years the off-grid RE technologies may be included. This will enable the development of grid-interactive RE technologies up to commercial maturity and then such mature technologies can easily be transferred to the off-grid RE projects. Therefore, it is proposed that grid connected RE projects with 250 kW and above shall be considered eligible for inclusion in REC mechanism. The FOR Task Force has concurred with suggestion and recommended that the grid connected renewable energy generators of at least 250 kW should be allowed to participate in the REC mechanism.

Existing RE projects have already been covered under particular tariff and regulatory regime. Further, the long term contracts for the same are already put in place. Hence, it will not be appropriate to subject existing RE projects to be part of REC mechanism at this stage. During the deliberation with the FOR it has been agreed upon that the RE Generators already having PPA with the distribution licensee would not have option to participate in this proposed REC scheme till such time their PPA are valid. However, the new RE Generators which come into existence after the notification of this scheme by competent authority shall be eligible to participate in this scheme. The New RE generators shall have two options i.e. to sell both, the electricity component and REC component together at preferential tariffs determined by the respective SERC or to sell only the electricity component to distribution utilities and to sell the REC component through market mechanism to any of the obligated entities. Further, it is suggested that, if deemed appropriate, FOR may develop suitable methodology for inclusion of existing projects in REC mechanism after the expiry of their existing PPA. Further, all new grid connected RE projects, to be commissioned after introduction of REC mechanism, should be covered under REC scheme on mandatory basis.

10.3 Obligated Entities

Obligated entities in context of REC would mean the entities who would be subjected to the mandatory RPO specified by the Regulatory Commissions. The RPO has been an effective tool in ensuring the purchase of electricity generated from renewable energy sources but the entities that are covered under RPO target differ across the countries.

In the international context, two markets operate for purchase of RE certificate namely, 'Compliance' and 'Voluntary' Market. Under the compliance market, the energy supplying utilities are obligated to purchase the RECs. For Example, the UK ROCs places an obligation on all licensed suppliers to purchase a proportion of their electricity supply from renewable sources. However, under the voluntary market, consumers, primarily domestic and non-residential, purchase renewable certificates to offset the emissions contributed by them. The obligated entities variation in different countries have been summarised in the table 9.3.

Table 9.3: Stakeholders with Renewable Power Purchase Obligation [23]

	Denmark	Texas	UK	Sweden	Norway	Netherlands	Australia
Obligation on Whom?	End User	Supplier	Supplier (Passed to Suppliers)	End Users < 10 MW	n.a.	n.a.	Wholesale Purchaser

In Indian context, the RPO targets are governed by the framework provided under Section 86(1)(e) of Electricity Act 2003 under which the SERCs are required to specify the RPO target as a percentage of total electricity consumption in the area of distribution licensee. However, the interpretation of this clause has created ambiguity over the applicability of RPO targets to different entities. Most of the State Electricity Regulatory Commissions have made RPO targets applicable to distribution licensees while some SERCs have extended it to open access and captive users as well.

If RPO is levied only on distribution licensees and if eligible open access consumers are exempted, this may not be fair to non-eligible open access consumers of the distribution licensees due to the cost of RE procurement being borne by non-eligible open access consumers alone. The SERCs in Maharashtra and Rajasthan have applied the obligation to RE on open access and captive consumers to the extent of their outsourcing. The

[23] Renewable Energy Certificate Schemes in various countries

physical purchase of electricity from renewable energy sources by open access and captive users may be cumbersome due to the small quantity of RE purchase. With the implementation of REC mechanism, such entities can easily meet their RPO target just by purchasing the REC certificate.

In view of above aspects, it is recommended that distribution licensee, captive users and open access consumers should be considered as obligated entities for the purpose of RPO target under REC mechanism.

10.4 REC Issuing Authority

The prevailing regulatory framework for renewable energy emanates under the provisions of Section 86(1)(e) of Electricity Act 2003 which empowers SERCs to take all suitable measures for promotion of renewable energy. Due to state specific provisions, the development of renewable energy is limited within the state boundaries. However, the RE transactions, in the form of unique REC, will involve stakeholders in different States and the existing established institutional framework may be found challenging to be leveraged to carry out the large number of tasks involved. Hence, for operationalising REC scheme, a national level entity needs to be created.

It has become apparent form the case studies discussed in chapter 5, that the single common body is convenient and cost-effective to closely monitor the REC issuance and redemption. The countries like Australia and U.K. have dedicated institutions such as ORER (Office of Renewable Energy Regulator) and OFGEM (Office for Gas and Electricity Market) respectively with an electronic tracking system, which avoids duplication in issuance of RECs. These case studies have been demonstrating the convenience and cost-effectiveness of single monitoring agency for issuance and redemption of RE Certificates, for a period of about a decade.

It is envisaged that India need to have a REC scheme common at national level. Further, for such common scheme, it will be convenient and cost-effective to monitor the life cycle of every REC, from its issuance to redemption, by a single institution common at national level. Following are the important aspects of such single institution.

- Single institution will avoid duplications and its other consequences such as disputes and significant resource occupation. In addition, the administrative cost component of REC will be less in case of a single institution in comparison with that of with involvement of many inter-State institutions.

- Such unique institution can be termed as a 'REC registry' as mentioned in the chapter 6. Further, for more effective operations, REC Registry can be provided with an electronic tracking system to maintain and update the central database and will contain the record of issuance and retirement of REC.
- The registry will have following three primary functions.
  - Issue Certificates
  - Record Certificate Transactions and
  - Remove/Redeem/Retire certificates from the market at the request of or surrender by consumers

The REC Registry can be prescribed and appointed by the CERC under FOR guidelines/rules.

10.5 Shelf life of REC

The shelf life of REC means the period during which a REC issued shall remain valid. It is proposed that shelf life of REC should be maximum one year. Keeping shelf life more than one year may result into accumulation of RECs by the stakeholders in the expectation of better price in future which may create artificial shortage of REC. The shelf life of more than one year may threaten the liquidity and viability of REC market in the short term. Therefore, it is proposed that shelf life of REC should also be of one year.

10.6 Denomination of Renewable Energy Certificate

In almost, all the existing RE Certificate schemes in different countries, the RECs are issued for a pre-defined quantum of electricity displaced or generated and fed to the grid. Typically this quantum has been denominated as one MWh. In certain schemes, where the voluntary market for REC exists, the RECs are issued in lower energy terms as well. Table 9.4 shows the denomination of RECs followed in various countries. In Netherlands, the RE certificates are issued with higher orders of magnitude such as 10 MWh, 100 MWh, and 1000 MWh.

Table 9.4: International Denomination of RE Certificate[24]

	Denmark	Texas	UK	Sweden	Norway	Netherlands	Australia
Certificate Size (MWh)	1	1	1	1	1	1, 10, 100, 1000, 10000	1

In almost all these countries renewable obligation is also defined by the regulator in terms of certificates to be purchased. Further as mentioned in chapter 5, many of these countries are about to go for 'energy banding', which will revise the REC denomination to some extent. As mentioned, less number of RECs will be issued per MWh of electricity generated/displaced using pre-declared mature RE technologies. 'Energy Banding' has not been proposed for India.

With the proposed denomination in energy terms, SERCs can continue to specify the RPO target as a percentage of energy consumption which can easily be converted into the equivalent number of RECs, by applying some conversion factor, required for achieving the RPO target.

10.7 Enforcement Charge for Non–Compliance

As mentioned in section 4.2 in chapter 4, the RE development in India has been limited by the fact that most of the SERCs have not provided for enforcement mechanisms against non-compliance of RPO target. Further, in cases where enforcement charge has been introduced, it is yet to be implemented. In doing so, the consideration has been given to the scarcity of the RE sources and supporting infrastructure. However, with new inter-State REC mechanism in place, the regional scarcity of RE will not limit the fulfilment of RPO target. Hence, then it would not be unfair to implement an effective enforcement mechanism across all the States for non-compliance of RPO target. However, during the discussion with the Task Force it has been recognised that, in depth consultation with SERCs to arrive at consensus in the matters of setting renewable purchase obligations and appropriate penalty for non-fulfillment of these obligations will be crucial for success of REC Mechanism. The Forum of Regulators should evolve state-wise targets for renewable purchase obligations after duly taking into account its recommendation of achieving the target of 5% RPO as a whole at national level and also the likely impact on consumer tariffs.

[24] Renewable Energy Certificate mechanisms in respective countries

Most of the international RE Certificate Schemes have strict penal provisions and penalty specified for non compliance of the renewable purchase target. From table 9.5, range of magnitudes of difference between average certificate price and the penalty price can be seen across the different countries.

Table 9.5: RPO Non-compliance Penalty [25]

(Prices are in US Dollar terms)

	Denmark	Texas	UK	Sweden	Norway	Netherlands	Australia
Penalty/Buy-Out $/MWh	n.a	50	65	16	n.a.	n.a.	27
Typical Price $/MWh	n.a	~ 10 - 15	57	7	n.a.	n.a.	19

It has been observed that in markets where the certificate supplies are tight, RECs are traded for prices close to non compliance penalty. The penalty for failure to achieve sufficient purchase of renewable energy is essentially mandatory and simultaneously set the upper level for the price of a unit of renewable energy generated.

Considering the abundance of RE resources available in India, it would not be unfair to specify strong, transparent and non transferable penal provisions for non-compliance with RPS target. The quantum of penalty should be specified after validating the pros and cons of each option. If penalty is too small in comparison with REC price, the obligated entities would obviously opt to pay the penalty, instead of procuring RECs from the market. This scenario will make the RE development efforts futile. Further, if the penalty price is kept much higher than the REC price, the obligated entities will be vulnerable to the unfair practices in the trading market by RE generators. Hence it is necessary to decide the penalty such that it meets the objective of RPS compliance as well as protect the interest of obligated entities.

Further, it may be noted that since enforcement charge will have influence of the prices of REC, it is necessary that all States adopt same principles for determination of enforcement charge. Otherwise, depending upon the State and time of the year, the market will throw skewed prices for RECs.

[25] Renewable Energy Certificate mechanisms in respective countries

Considering all these aspects, it is proposed that Forum of Regulators can take up the task to develop the regulations under the provisions of Section 86(1)(e), Section 142 and Section 146 of the Electricity Act, 2003 to specify the enforcement charge for non-compliance of the RPO target.

The Task Force is in agreement with recommendations proposed by ABPS Infra in this subject matter and have suggested that appropriate penalties for non-fulfilment of RPOs are required to be incorporated by SERCs in their regulations and it is envisaged that FOR shall evolve harmonized approach for this purpose. The Task Force has also agreed on the recommendation that in order to have harmonised approach across the States, draft regulations under Section 86 (1) (e) of the EA 2003 shall be developed for adoption of the SERCs. It was also felt that amount of the penalty/non-compliance should be in addition to that provided under Section 142 (Punishment of Non-Compliance of directions by Appropriate Commission) of the EA 2003. However, it has also been suggested that the proposition of specifying the enforcement mechanism higher than that provided under Section 142 should be legally examined, separately.

10.8 Sunset Date of REC Scheme

The nature of promotional measures keeps on changing with the change in external and internal environment. In case of wind energy, the capital subsidy as announced by the Government during its early development stage has been withdrawn in a phased manner. The other scheme like RPO and preferential tariff may also be withdrawn after RE technologies attains maturity level. As any other scheme, the RE certificate scheme also need to have a sunset date to end the applicability of scheme.

The successful RE certificate schemes across the world have the feature of ex-ante declaration of sunset date of the scheme:

- The Australian REC scheme was announced in 2001 with its sunset date of March 31, 2021. In addition, approximate year on year target has also been announced a priory and revised on need basis.
- In case of UK ROC scheme was announced in 2002 with its sunset date of March 31, 2027. Further, through an order in 2009 this sunset date has been revised to March 31, 2037.
- In case of EU REC scheme the target of 20% has been declared to be achieved by year 2020.

India should also announced the sunset date of REC mechanism while its introduction. Considering the benefits of priory declaration of target and sunset date, the tightly regulated RE sector in India will be able to attract more private investments. Thus, it will stipulate the RE development. The REC sunset period should be specified after duly considering the following two aspects:

- Control Period
- Operative Period

The Control Period refers to the period during which underlying factors for the REC scheme shall remain valid. After the end of one control period, other control period having different REC design framework may be specified. The Control Period should be specified after taking care of gestation period of different RE technologies (varies from 1 year to 3 year). Therefore, the first control period may be of three years. At the end of 2nd year in first control period, the REC scheme should be reviewed to on the aspects of its effectiveness, change in economic conditions etc. Accordingly, necessary changes may be incorporated while specifying REC mechanism for next Control Period. Further reviews in the next control period may be taken up on need basis.

The operative period refers to the period during which REC scheme specified under a particular Control Period shall remain applicable to the projects commissioned during that period. The long operative period will provide certainty to the investors. The operative period may be linked to life of the RE projects which, in most of the cases, is approximately 20 years.

The consideration of sunset period at this stage should be on the basis that it should at least cover one Control Period and one operative period. Therefore, it is proposed that sunset period for REC mechanism should be of 25 years.

10.9 Compatibility with other Incentive Schemes

To a certain extent, the incentives and other benefits announced by the Government through various policy measures has been an important factor in ensuring the growth of renewable energy across the world. Almost every country, having some share of renewable energy, has provided incentives in the form of financial and fiscal benefits, preferential tariff, RPO etc.

At international level, almost every country has undertaken the analysis of interaction of the REC scheme with its other prevailing RE schemes. For example, to understand the complexities and compatibility, the European Commission Directorate has undertaken analysis of how the green and white certificates will impact the EU Emission Trading Scheme before allowing them to party the Emissions Trading Scheme.

In the proposed REC mechanism for India, RPO and preferential tariff has already been taken into account while detailing out the conceptual framework for REC. It is also important that REC should be compatible with other financial and fiscal incentive schemes already in existence or to be announced by the Government in near future. The Government has announced accelerated depreciation benefits, tax benefits, generation based incentives and capital subsidy to the renewable energy projects. Further, CDM benefit is also available to renewable energy projects. At present, all these incentives and benefits have direct or indirect impact on the normative preferential tariff announced by SERCs.

In the proposed REC scheme, no change has been suggested in the existing methodology used by SERCs for tariff determination hence there will be no impact of the proposed REC scheme on any of the existing incentive schemes and benefits etc.

10.10 Creation and Redemption of RE Certificate

Surrender/redemption of REC certificate completes the journey of REC certificate which started with its creation. Through, creation and redemption are two end events, but the process of creation and redemption of REC is almost same which has already been discussed in the earlier sections. However, there are certain issues which could arise due to unfair practices and therefore, should be taken care of during the process of creation and redemption of REC.

- Generation of multiple REC with one energy generation certificate to different parties
- Duplication of REC certificate
- Expiry of REC after retirement

In the international practices, the energy accounting institution communicates the certificate issuing registry about the metered power generation from every RE project connected through its network. The issuing body creates number of certificates equivalent to the quantum reported to it and issues those certificates to the concerned RE project owner. When any entity wants to retire or surrender its certificate, the issuing body captures that transaction and annotates the certificate from their tracking system.

In case of India, the RE generators are either directly connected to the grid or through the network of distribution licensee. The energy generation certificate is to be issued to the REC generator therefore, it will be convenient to issue the REC directly to the concerned RE generator, and not to the host licensee except in cases where the licensee has already contracted for electricity and REC procurement with concerned RE generator. It will avoid creation of multiple numbers of RECs with one energy generation certificate.

Other issues can be very well addressed by using the appropriate hardware and software having compatibility to modify the processes, with the gain in operational experience. It is also suggested to issue REC only in 'electronic form' and no 'physical form' of REC has been contemplated to avoid hastles of paperwork and also in view of the fact that the security/verification protocols etc can be easily implemented in case of 'electronic form'.

10.11 Period to Issue REC Certificate

It refers to period within which the RE generator needs to apply for issuance of REC after getting the energy generation certificate from SLDC. There may be two options for specifying the period of issuance of REC:

- Monthly basis linked to energy generation certificate period
- At RE generator's choice within one financial year

As one option, the RE generator should apply immediately after receiving the energy generation certificate. It will ensure periodic generation of REC and in turn, better availability of RECs in the market. However, this process may be cumbersome if the quantum of energy generation is small as it will be adversely impact the working of REC registry and RE generator both.

As an alternative option, the RE generator may be given choice for availing RECs within one financial year. In such case, the RE generator will apply for REC once he has enough energy generation certificates. However, it will create uncertainty towards availability of REC in the market and in such case, the possibility of price rigging by the RE generators or by any other person having significant quantum of RECs can't be overlooked.

In order to avoid oversupply or non-availability of RECs in the market, it is necessary that generators regularly apply for RECs. Therefore, it has been suggested to keep this period three months of the generation within which RE generator must apply for issuance of RE certificate.

10.12 Form of RE Certificate

RE certificate could be issued either in electronic form or in paper form (physical form). The electronic form of REC makes issuance and tracing of REC quite easier. Internationally, RE Certificates are issued electronically in almost every RE certificate scheme. However, few schemes also have the provision to issue the certificates in printed form when desired. Both the physical or electronic form of REC contains following information:

- Unique Certificate Number
- Name of the Issuing Body
- Generator Identity
- Born date of the Certificate
- Type of Generation Technology
- Installed Capacity of the Generator
- Location of the Generator
- Signature of the Authorized person

For India, electronic system is recommended for monitoring the life cycle of RECs. The electronic system has become a standard solution to maintain and retrieve a huge database and is a mature technology now. Due to the developments over past decade, such system will not involve very high initial investment and operation cost.

Proposed REC needs to contain all the information as mentioned in case of international RE certificate, in its electronic form. In addition following information may also be provided on the proposed RE certificate:

- Date of issues of the Certificate
- Validity of the Certificate

10.13 Sale and Purchase for REC

Underlying theme behind the REC Mechanism is to crate market for renewable energy by breaking the existing barriers of state boundaries. With removal of geographical constraints, it should be possible to sell and purchase RECs in any State of the country. While large number of RECs will sold and purchased through bilateral contracts, liquid market for RECs will help in identifying the most competitive sources of RE. In other countries like UK, Australia etc, the renewable energy certificates have trading feature.

It is proposed that not only obligated entities but also other persons shall be allowed to buy RECs. While redemption of RECs by obligated entities shall be reported to monitoring committees, redemption by voluntary buyers will be reported to only Central Regulator. REC Exchange Platform is expected to provide the services for sell and purchase of RECs. While any trading platform could be used for exchange of RECs, at this point of time there is no clarity about the volume and liquidity in the market. It is suggested that FOR should undertake the assessment of market, liquidity requirements, costs involved in setting up of the market and necessary fee structure.

Further, REC Exchange Platform shall have to be developed and the regulations under Section 66 of EA 2003 will have to be framed to cover such exchange/transfer of RECs. These regulations should cover various aspects of REC mechanism such as registration of participants, operational rules, market monitoring, and to ensure the fair practices by the participants.

The Task Force has agreed with the proposal that 'one single market' shall be created in the country for exchange/transfer of REC. However, the difficulties/reluctance being observed on the parts of the States in creation of all India Electricity market for conventional power should be duly taken into consideration while designing the operating rules for exchange/transfer of RECs.

11.Way Forward

In this Chapter, we have presented the activities for implementation of REC Mechanism in India. It may be noted that these are primary activities and several secondary activities especially related to regulatory process may have to be undertaken at CERC and SERC level. These activities will vary depending upon the regulatory process followed by by CERC and SERC in each State.

Sr. No.	Activity	Responsibility
1	Standard Regulations for RPO under Section 86(1)(e)	FOR to prepare and respective SERC to adopt
2	Guidelines for determination of tariffs for renewable energy	CERC is in the process of developing tariff regulations for RE. As per S 61(a) SERC will be guided by these factors.
3	Standard Regulations for enforcement charge for non-compliance of RPO	FOR to prepare and respective SERC to adopt
4	Discussion Paper for REC Registry	FOR to prepare and CERC to adopt
5	Discussion Paper on REC Exchange Platform, REC Market Assessment, and fee structure	FOR to prepare and CERC to adopt
6	Regulations for REC Registry	CERC to prepare and adopt
7	Regulations for REC Exchange Platform	CERC to prepare and adopt
8	Discussion Paper on structure, role and rules of the Monitoring Committees	FOR to prepare and CERC to adopt
9	Development of process for approval of eligible RE technology	FOR to develop in consultation with MNRE
10	Development of Generation Accreditation Process	FOR to prepare and respective SERC to adopt
11	Appointment of REC Registry	CERC to prepare and adopt
12	Appointment of REC Exchange Platform	CERC to prepare and adopt
13	Approval of rules / bye-laws of REC Registry	CERC

14	Approval of rules and bye-laws of REC Exchange Platform	FOR/CERC
15	Discussion Paper and Standard Amendments to existing Grid Code to enable energy accounting	FOR to prepare and respective SERC to adopt
16	Appointment of Monitoring Committee	SERC to appoint Monitoring Committee in its State.

Further, several other activities such as development of hardware and software by REC Registry and REC Exchange Platform. The Regulator may have to approve the specifications as well as audit the system. Similarly, Monitoring Committee will have to develop database of all renewable energy installations in the State. This Activity would require significant upfront effort. Such preparatory activities have not been considered in the above activity table.

Similarly, significant capacity building activity will have to be undertaken at the State and Central level. These capacity building activities have not been considered.

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Statewise RPO Targets as on 22.08.2019

	State		Type		2010-201	2011-201	2012-201	2013-201	2014-201	2015-201	2016-201	2017-20
1	Andhra Pradesh		Solar				0.25%	0.25%	0.25%	0.25%	0.25%	3.00%
			Non-Solar				4.75%	4.75%	4.75%	4.75%	4.75%	6.00%
			Total				5.00%	5.00%	5.00%	5.00%	5.00%	9.00%
2	Arunachal Pradesh		Solar				0.10%	0.15%	0.20%	0.20%	2.75%	4.75%
			Non-Solar				4.10%	5.45%	6.80%	6.80%	8.75%	9.50%
			Total				4.20%	5.60%	7.00%	7.00%	11.50%	14.25
3	Assam		Solar		0.05%	0.10%	0.15%	0.20%	0.25%	0.25%	1.00%	4.00%
			Non-Solar		1.35%	2.70%	4.05%	5.40%	6.75%	6.75%	3.00%	5.00%
			Total		1.40%	2.80%	4.20%	5.60%	7.00%	7.00%	4.00%	9.00%
4	Bihar		Solar		0.25%	0.50%	0.25%	0.50%	0.75%	1.00%	1.50%	2.25%
			Non-Solar		1.25%	2.00%	3.25%	4.00%	4.25%	4.50%	5.00%	5.50%
			Total		1.50%	2.50%	4.00%	4.50%	5.00%	5.50%	6.50%	7.75%
5	Chhattisgarh		Solar		0.25%	0.25%	0.50%	0.50%	0.75%	1.00%	1.50%	2.00%
			Non-Solar	Biomass/r	3.75%	3.75%	3.75%	3.75%	3.75%	3.75%		
				Other Non	1.00%	1.25%	1.50%	2.00%	2.25%	2.50%	6.50%	7.00%
				Total Non-	4.75%	5.00%	5.25%	5.75%	6.00%	6.00%		
			Total		5.00%	5.25%	5.75%	6.25%	6.75%	7.25%	8.00%	9.00%
6	Delhi		Solar				0.15%	0.20%	0.25%	0.30%	0.35%	2.75%
			Non-Solar				3.25%	4.60%	5.95%	7.30%	8.65%	8.75%
			Total				3.40%	4.80%	6.20%	7.60%	9.00%	11.50
7	Goa		Solar		0.25%	0.30%	0.40%	0.40%	0.60%	0.85%	1.65%	2.50%
			Non-Solar		0.75%	1.70%	2.60%	2.60%	2.70%	2.70%	3.20%	4.20%
			Total		1.00%	2.00%	3.00%	3.00%	3.30%	3.55%	4.85%	6.70
8	Gujarat		Solar		0.25%	0.50%	1.00%	1.00%	1.25%	1.50%	1.75%	1.75
			Non-Solar	Wind	4.50%	5.00%	5.50%	5.50%	6.25%	7.00%	7.75%	7.75
				Other Non	0.25%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50
				Total Non-	4.75%	5.50%	6.00%	6.00%	6.75%	7.50%	8.25%	8.25
			Total		5.00%	6.00%	7.00%	7.00%	8.00%	9.00%	10.00%	10.00
9	Haryana		Solar		0.00%	0.00%	0.05%	0.10%	0.25%	0.75%	1.00%	2.50
			Non-Solar		1.50%	2.00%	2.95%	2.90%	3.00%	2.75%	2.75%	2.75
			Total		1.50%	2.00%	3.00%	3.00%	3.25%	3.50%	3.75%	5.25
10	Himachal Pradesh		Solar		10.00%	10.00%	10.00%	10.00%	10.00%	11.00%	2.50%	4.75
			Non-Solar		0.00%	0.01%	0.25%	0.25%	0.25%	0.25%	9.50%	9.50
			Total		10.00%	10.01%	10.25%	10.25%	10.25%	11.25%	12.00%	14.25
11	Jammu & Kashmir		Solar		0.02%	0.10%	0.25%	0.25%	0.75%	0.75%	1.00%	1.25
			Non-Solar		0.98%	2.90%	4.75%	4.75%	5.25%	5.75%	6.50%	7.25
			Total		1.00%	3.00%	5.00%	5.00%	6.00%	6.50%	7.50%	8.50
12	Jharkhand		Solar		0.25%	0.50%	1.00%	1.00%	1.00%	1.00%	1.80%	3.75

			Non-Solar		1.75%	2.50%	3.00%	3.00%	3.00%	3.00%	3.50%	4.00%
			Total		2.00%	3.00%	4.00%	4.00%	4.00%	4.00%	5.30%	7.75%
13	Karnataka	BESCOM	Solar			0.25%	0.25%	0.25%	0.25%	0.25%	0.75%	2.75%
			Non-Solar			10.00%	10.00%	10.00%	10.00%	10.00%	11.00%	12.00%
			Total			10.25%	10.25%	10.25%	10.25%	10.25%	11.75%	14.75%
		MESCOM	Solar			0.25%	0.25%	0.25%	0.25%	0.25%	0.75%	2.75%
			Non-Solar			10.00%	10.00%	10.00%	10.00%	10.00%	11.00%	12.00%
			Total			10.25%	10.25%	10.25%	10.25%	10.25%	11.75%	14.75%
		CESC	Solar			0.25%	0.25%	0.25%	0.25%	0.25%	0.75%	2.75%
			Non-Solar			10.00%	10.00%	10.00%	10.00%	10.00%	11.00%	11.00%
			Total			10.25%	10.25%	10.25%	10.25%	10.25%	11.75%	13.75%
		HESCOM	Solar			0.25%	0.25%	0.25%	0.25%	0.25%	0.75%	2.75%
			Non-Solar			7.00%	7.00%	7.00%	7.00%	7.00%	7.50%	8.50%
			Total			7.25%	7.25%	7.25%	7.25%	7.25%	8.25%	11.25%
		GESCOM	Solar			0.25%	0.25%	0.25%	0.25%	0.25%	0.75%	2.75%
			Non-Solar			7.00%	7.00%	7.00%	7.00%	5.00%	5.50%	6.00%
			Total			7.25%	7.25%	7.25%	7.25%	5.25%	6.25%	8.75%
		HRECS	Solar			0.25%	0.25%	0.25%	0.25%	0.25%	0.75%	2.75%
			Non-Solar			7.00%	7.00%	7.00%	7.00%	7.00%	7.50%	8.50%
			Total			7.25%	7.25%	7.25%	7.25%	7.25%	8.25%	11.25%
		Applicable	Solar			0.00%	0.00%	0.00%	0.00%	0.00%	0.75%	2.75%
			Non-Solar			5.00%	5.00%	5.00%	5.00%	5.00%	5.50%	6.00%
			Total			5.00%	5.00%	5.00%	5.00%	5.00%	6.25%	8.75%
14	Kerala***		Solar		0.25%	0.25%	0.25%	0.25%	0.25%	0.50%	0.50%	1.50%
			Non-Solar		2.75%	2.78%	2.81%	2.84%	2.87%	4.50%	4.50%	6.00%
			Total		3.00%	3.03%	3.06%	3.09%	3.12%	5.00%	5.00%	7.50%
15	Madhya Pradesh		Solar		0.00%	0.40%	0.60%	0.80%	1.00%	1.00%	1.25%	1.50%
			Non-Solar		0.80%	2.10%	3.40%	4.70%	6.00%	6.00%	6.50%	7.00%
			Total		0.80%	2.50%	4.00%	5.50%	7.00%	7.00%	7.75%	8.50%
16	Maharashtra		Solar		0.25%	0.25%	0.25%	0.50%	0.50%	0.50%	1.00%	2.00%
			Non-Solar	Mini Hydro	0.10%	0.10%	0.10%	0.20%	0.20%	0.20%	0.20%	0.20%
				Other Non-	5.65%	6.65%	7.65%	8.30%	8.30%	8.30%	9.80%	10.30%
				Total Non-	5.75%	6.75%	7.75%	8.50%	8.50%	8.50%	10.00%	10.50%
			Total		6.00%	7.00%	8.00%	9.00%	9.00%	9.00%	11.00%	12.50%
17	Manipur		Solar		0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	5.50%
			Non-Solar		1.75%	2.75%	4.75%	4.75%	4.75%	4.75%	4.75%	2.00%
			Total		2.00%	3.00%	5.00%	5.00%	5.00%	5.00%	5.00%	7.50%
18	Meghalaya		Solar		0.20%	0.30%	0.40%			0.41%	0.42%	0.43%
			Non-Solar	Wind	0.10%	0.15%	0.20%					
				Other Non-	0.20%	0.30%	0.40%			1.09%	1.58%	2.07%
				Total Non-	0.30%	0.45%	0.60%					

			Total		0.50%	0.75%	1.00%			1.50%	2.00%	2.50%
19	Mizoram		Solar		0.25%	0.25%	0.25%	0.25%			0.30%	5.50%
			Non-Solar		4.75%	5.75%	6.75%	14.75%			9.70%	9.00%
			Total		5.00%	6.00%	7.00%	15.00%			10.00%	14.50%
20	Nagaland		Solar		0.25%	0.25%	0.25%				0.25%	1.00%
			Non-Solar		5.75%	6.75%	7.75%				5.00%	6.00%
			Total		6.00%	7.00%	8.00%				5.25%	7.00%
21	Odisha		Solar		0.00%	0.10%	0.15%	0.20%	0.25%	0.50%	1.50%	3.00%
			Non-Solar		1.00%	1.20%	1.40%	1.60%	1.80%	2.50%	3.00%	4.50%
			Cogeneration		3.50%	3.70%	3.95%	4.20%	4.45%	0.00%	0.00%	0.00%
			Total		4.50%	5.00%	5.50%	6.00%	6.50%	3.00%	4.50%	7.50%
22	Punjab		Solar			0.03%	0.07%	0.13%	0.19%	1.00%	1.30%	1.80%
			Non-Solar			2.37%	2.83%	3.37%	3.81%	3.90%	4.10%	4.20%
			Total			2.40%	2.40%	3.50%	4.00%	4.90%	5.40%	6.00%
23	Rajasthan		Solar			0.50%	0.75%	1.00%	1.50%	2.00%	2.50%	4.75%
			Non-Solar	Wind		4.50%	5.10%	5.70%	7.50%	8.20%	8.90%	8.20%
				Biomass		1.00%	1.25%	1.50%				1.30%
				Total Non-Solar		5.50%	6.35%	7.20%				9.50%
			Total			6.00%	7.10%	8.20%	9.00%	10.20%	11.40%	14.25%
24	Sikkim		Solar					0.25%	0.50%	0.75%	0.75%	4.75%
			Non-Solar					2.75%	3.50%	4.25%	4.25%	9.50%
			Total					3.00%	4.00%	5.00%	5.00%	14.25%
25	Tamil Nadu		Solar			0.05%	0.05%	0.05%	0.05%	0.50%	2.50%	5.00%
			Non-Solar			8.95%	8.95%	8.95%	8.95%	9.00%	9.00%	9.00%
			Total			9.00%	9.00%	9.00%	9.00%	9.50%	11.50%	14.00%
26	Telangana		Solar									
			Non-Solar									
			Total									
27	Tripura		Solar							5.00%	6.00%	7.00%
			Non-Solar							6.00%	6.00%	6.00%
			Total							11.00%	12.00%	13.00%
28	Uttar Pradesh		Solar		0.25%	0.50%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
			Non-Solar	Hydro Purc								
				Other Non	3.75%	4.50%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
				Total Non-								
			Total		4.00%	5.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
29	Uttarakhand		Solar					0.05%	0.08%	0.10%	1.50%	4.75%
			Non-Solar					6.00%	7.00%	8.00%	8.00%	9.50%
			Total					6.05%	7.08%	8.10%	9.50%	14.25
30	West Bengal****		Solar					0.10%	0.15%	0.20%	0.25%	0.30%
			Non-Solar					3.90%	4.35%	4.80%	5.25%	5.70%

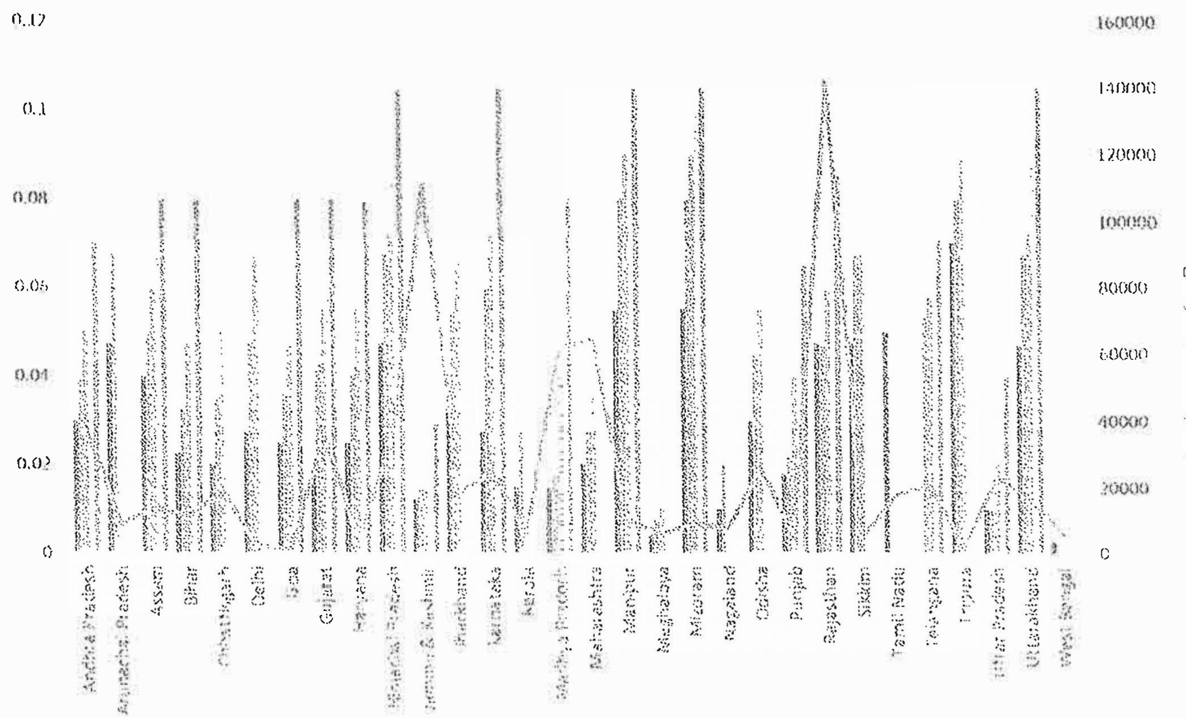
			Total					4.00%	4.50%	5.00%	5.50%	6.00%
31	Ministry of Power		Solar								2.75%	4.75%
			Non-Solar								8.75%	9.50%
			Total								**11.50%**	**14.25**

*Note: If Obligated Entity portion is left blank then it implies that the targets apply to all concerned obligated entities of that state

**Note: RPO Target for Deemed Licensee in Karnataka shall be same as that of the DISCOM where the Deemed Licensee is situat

***Note: For the year 2016-17, the non-solar and solar RPO targets in Kerala are inclusive of the hydrogeneration

"****Note: For subsequent years (from 2018 - 2019 onwards) the increase shall be 1%
each year till the Ultimate Target is reached by the distribution licensee(s). From 2018-19 onwards the annual
target of solar RPO will be increased by 0.1% till it reaches 0.5%. 'Ultimate Target' means the RPO target of 10% of the total con
area of supply, of licensee(s) or some higher percentage of the total consumption as may be
fixed by the Commission to be met by the licensee(s)."



No. 30/04/2018-R&R
Government of India
Ministry of Power
***

Shram Shakti Bhawan, Rafi Marg,
New Delhi, 1st October, 2019

To

1. Chairperson, CEA, Sewa Bhawan, R.K. Puram, New Delhi.
2. Secretary (Energy/Power), All State Govts/UTs.
3. Secretary, CERC/FOR, Chanderlok Building, Janpath, New Delhi.
4. Secretary, All SERCs
5. CMD, All CPSUs under the administrative control of Ministry of Power.
6. President, FICCI, Tansen Marg, New Delhi.
7. President, ASSOCHAM, New Delhi
8. Indian Captive Power Producers Association
9. DG, APP, New Delhi.

Subject: Clarification on Orders related to Renewable Purchase Obligation.

Sir,

I am directed to refer to the Ministry of Power's Order of even number dated 22nd July, 2016 and 14th June, 2018 regarding long term growth trajectory of Renewable Purchase Obligation (RPO) for Solar and Non-solar for the period 2016-19 and 2019-22 respectively.

2. A clarification was issued by Ministry of Power vide letter dated 1st February, 2019 regarding capping of RPO for Captive Power Plants (CPP) (copy enclosed).

3. Based on the concern raised by various stakeholders and after due consultation with MNRE, CEA and CERC it is further clarified that:

i) For CPPs commissioned before 1.04.2016, RPO should be at the level as mandated by the appropriate Commission for the year 2015-16. For CPPs commissioned from 1.04.2016 onwards, the RPO level as mandated by the appropriate Commission or Ministry of Power, whichever is higher, for the year of commissioning of the CPP shall be applicable.
ii) In case of any augmentation in the capacity, the RPO for augmented capacity shall be the RPO applicable for the year in which the CPP has been augmented.
iii) In case, for meeting the RPO obligation, CPP has surplus power than its consumption requirement, such a CPP may sell its surplus power to the DISCOMs under the prevailing arrangements or in the power exchange.

4. This issues with the approval of Hon'ble MoS(I/C) for Power and NRE.

Yours faithfully,

Encl: As above

(D. Chattopadhyay)
Under Secretary to the Govt. of India
Tel: 2373 0265

Copy to: Shri P.C. Maithani, Adviser, MNRE, New Delhi.

No. 30/04/2018-R&R
Government of India
Ministry of Power
***

Shram Shakti Bhawan, Rafi Marg,
New Delhi, 1st February, 2019

To

1. Chairperson, CEA, Sewa Bhawan, R.K. Puram, New Delhi.
2. Secretary (Energy/Power), All State Govts/UTs.
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Subject: Clarification on Orders related to Renewable Purchase Obligation .

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I am directed to refer to the Ministry of Power's Order of even number dated 22nd July, 2016 and 14th June, 2018 regarding long term growth trajectory of Renewable Purchase Obligation (RPO) for Solar and Non-solar for the period 2016-19 and 2019-22 respectively.

2. The request of various stakeholders regarding capping of RPO for Captive Power Plants (CPP) has been examined in consultation with Ministry of New and Renewable Energy and it is clarified that RPO of the CPP may be pegged at the RPO level applicable in the year in which the CPP was commissioned. As and when the company adds to the capacity of the CPP, it will have to provide for additional RPO as obligated in the year in which new capacity is commissioned. There should not be an increase in RPO of CPP without any additional fossil fuel capacity being added.

3. This issues with the approval of Hon'ble MoS(I/C) for Power and NRE.

Yours faithfully,

(D. Chattopadhyay)
Under Secretary to the Govt. of India
Tel: 2373 0265

Copy to: Shri P.C. Maithani, Adviser, MNRE, New Delhi.

THE GAZETTE OF INDIA : EXTRAORDINARY [PART I—SEC. 1]

MINISTRY OF POWER

RESOLUTION

New Delhi, the 28th January, 2016

TARIFF POLICY

No. 23/2/2005-R&R (Vol-IX).—1.0 INTRODUCTION

1.1 In compliance with section 3 of the Electricity Act 2003, the Central Government notified the Tariff Policy on 6 th January, 2006. Further amendments to the Tariff Policy were notified on 31st March, 2008, 20th January, 2011 and 8th July, 2011. In exercise of powers conferred under section 3(3) of Electricity Act, 2003, the Central Government hereby notifies the revised Tariff Policy to be effective from the date of publication of this resolution in the Gazette of India.

Notwithstanding anything done or any action taken or purported to have been done or taken under the provisions of the Tariff Policy notified on 6th January, 2006 and amendments made thereunder, shall, in so far as it is not inconsistent with this Policy, be deemed to have been done or taken under provisions of this revised policy.

1.2 The National Electricity Policy has set the goal of adding new generation capacity and enhancing per capita availability of electricity per year and to not only eliminate energy and peaking shortages but to also have a spinning reserve as specified by the Central Electricity Authority. Development of the power sector has also to meet the challenge of providing access for affordable electricity to all households in next five years.

1.3 It is therefore essential to attract adequate investments in the power sector by providing appropriate return on investment as budgetary resources of the Central and State Governments are incapable of providing the requisite funds. It is equally necessary to ensure availability of electricity to different categories of consumers at reasonable rates for achieving the objectives of rapid economic development of the country and improvement in the living standards of the people.

1.4 Balancing the requirement of attracting adequate investments to the sector and that of ensuring reasonability of user charges for the consumers is the critical challenge for the regulatory process. Accelerated development of the power sector and its ability to attract necessary investments calls for, inter alia, consistent regulatory approach across the country. Consistency in approach becomes all the more necessary considering the large number of States and the diversities involved.

2.0 LEGAL POSITION

2.1 Section 3 (1) of the Electricity Act, 2003 empowers the Central Government to formulate the tariff policy. Section 3(3) of the Act enables the Central Government to review or revise the tariff policy from time to time.

2.2 Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERCs) shall be guided by the tariff policy in discharging their functions including framing the regulations.

2.3 Regulatory Commissions shall be guided by the principles and methodologies specified by the Central Commission for determination of tariff applicable to generating companies and transmission licensees.

2.4 The Forum of Regulators has been constituted by the Central Government under the provisions of the Act which would, inter alia, facilitate consistency in approach specially in the area of distribution.

3.0 EVOLUTION OF THE POLICY
The tariff policy has been evolved in consultation with the State Governments, the Central Electricity Authority (CEA), the Central Electricity Regulatory Commission and various stakeholders.

4.0 OBJECTIVES OF THE POLICY
The objectives of this tariff policy are to:

(a) Ensure availability of electricity to consumers at reasonable and competitive rates;

(b) Ensure financial viability of the sector and attract investments;

(c) Promote transparency, consistency and predictability in regulatory approaches across jurisdictions and minimise perceptions of regulatory risks;

(d) Promote competition, efficiency in operations and improvement in quality of supply;

(e) Promote generation of electricity from Renewable sources;

(f) Promote Hydroelectric Power generation including Pumped Storage Projects (PSP) to provide adequate peaking reserves, reliable grid operation and integration of variable renewable energy sources;

(g) Evolve a dynamic and robust electricity infrastructure for better consumer services;

(h) Facilitate supply of adequate and uninterrupted power to all categories of consumers;

(i) Ensure creation of adequate capacity including reserves in generation, transmission and distribution in advance, for reliability of supply of electricity to consumers.

5.0 GENERAL APPROACH TO TARIFF

5.1 Introducing competition in different segments of the electricity industry is one of the key features of the Electricity Act, 2003. Competition will lead to significant benefits to consumers through reduction in capital costs and also efficiency of operations. It will also facilitate the price to be determined competitively. The Central Government has already issued detailed guidelines for tariff based bidding process for procurement of electricity by distribution licensees.

5.2 All future requirement of power should continue to be procured competitively by distribution licensees except in cases of expansion of existing projects or where there is a company owned or controlled by the State Government as an identified developer and where regulators will need to resort to tariff determination based on norms provided that expansion of generating capacity by private developers for this purpose would be restricted to one time addition of not more than 100% of the existing capacity.

Provided further that the Appropriate Commission, as defined in the Electricity Act, 2003, shall ensure that in case of expansion of such projects, the benefit of sharing of infrastructure of existing project and efficiency of new technology is passed on to consumers through tariff.

Provided also that the State Government can notify a policy to encourage investment in the State by allowing setting up of generating plants, including from renewable energy sources out of which a maximum of 35% of the installed capacity can be procured by the Distribution Licensees of that State for which the tariff may be determined under Section 62 of the Electricity Act, 2003.

Provided that notwithstanding the provision contained in para 5.11(j) of the policy, the tariff for such 35% of the installed capacity shall be determined by SERC.

However, the 15% of power outside long term PPAs allowed under para 5.7.1 of National Electricity Policy shall not be included in 35% allowed to be procured by Distribution Licensees of the State.

5.3 The tariff of all new generation and transmission projects of company owned or controlled by the Central Government shall continue to be determined on the basis of competitive bidding as per the Tariff Policy notified on 6 th January, 2006 unless otherwise specified by the Central Government on case to case basis.

Further, intra-state transmission projects shall be developed by State Government through competitive bidding process for projects costing above a threshold limit which shall be decided by the SERCs.

5.4 The Central Electricity Regulatory Commission in consultation with Central Electricity Authority and other stakeholders shall frame within six months, regulations for determination of tariff for generation of electricity from projects using coal washery rejects. These regulations shall also be followed by State Electricity Regulatory Commissions.

Provided that procurement of power from coal washery rejects based projects developed by Central/State PSUs, Joint Venture between Government Company and Company other than Government Company in which shareholding of company other than Government Company either directly or through any of its subsidiary company or associate company shall not be more than 26% of the paid up share capital, can be done under Section 62 of the Act.

5.5 The developer of a hydroelectric project, including Pumped Storage Plant (PSP), would have the option of getting the tariff determined by the Appropriate Commission for the power to be sold through long term Power Purchase Agreements (PPAs) on the basis of performance based cost of service regulations if the following conditions are fulfilled:

(a) The Appropriate Commission is satisfied that the project site has been allotted to the developer by the concerned State Government after following a transparent two stage process. The first stage should be for prequalification on the basis of criteria of financial strength, past experience of developing infrastructure projects of similar size, past track record of developing projects on time and within estimated costs, turnover and ability to meet performance guarantee etc. In the second stage, bids are to be called on the basis of only one single quantifiable parameter, such as, additional free power in excess of percentage of free power, as notified by the Central Government, equity participation offered to the State Government, or any other parameter to be notified by the Central Government from time to time.

(b) Concurrence of CEA (if required under Section 8 of the Act), financial closure, award of work and long term Power Purchase Agreement (PPA) (of the duration of 35 years or more) of the capacity specified in (c) below with distribution licensees are completed by 15.08.2022.

(c) Long term PPA is firmed up for 60% or more of the total saleable design energy, balance being allowed for merchant sale.

Provided that distribution licensees can extend the duration of long term PPA beyond 35 years for a further period of 15 years at the existing terms and conditions subject to the approval of Appropriate Commission.

Provided further that nothing contained in this clause shall apply to Pumped Storage Plants (PSP).

(d) The time period for commissioning of all the units of the project shall be fixed at four years from the date of approval of the commissioning schedule by the Appropriate Commission. However, the

Appropriate Commission may, after recording reasons in writing, fix longer time period for hydro electric projects (reservoir as well as run-of- river projects) of more than 100 MW capacity. Agreed timelines to achieve the fixed commissioning schedule alongwith penalty for delay shall be decided by the Appropriate Commission in consultation with the Central Electricity Authority. The Appropriate Commission shall allow pass through the Interest During Construction (IDC) and Financing Cost (FC) only upto the period of delay not attributable to the developer, as approved by the CEA.

(e) Award of contracts for supply of equipment and construction of the project, either through a turnkey or through well defined packages, are done on the basis of international competitive bidding.

5.6 Notwithstanding anything contained in Para 5.5 above, the developers of hydro electric projects of more than 100 MW design capacity for which sites have been awarded earlier by following a transparent process and on the basis of pre-determined set of criteria would have the option of getting the tariff determined by the Appropriate Commission for the power to be sold through long term PPA on the basis of cost plus under Section 62 of the Act.

5.7 In case of projects covered under Para 5.5 and 5.6, the Appropriate Commission shall determine tariff ensuring the following:

(i) Any expenditure incurred or committed to be incurred by the project developer for getting project site allotted (except free power as notified) would neither be included in the project cost, nor any such expenditure shall be passed through in tariff.

(ii) The project cost shall include the cost of the approved R&R plan of the Project which shall be in conformity with the following:

(a) the National Rehabilitation & Resettlement Policy currently in force;

(b) the R&R package as enclosed at appendix.

(iii) Annual fixed charges shall be taken pro-rata to the saleable design energy tied up on the basis of long term PPAs with respect to total saleable design energy. The total saleable design energy shall be arrived at by deducting the following from the design energy at the bus bar:

a) Free power as notified by the Central Government from time to time for the host State and the riparian State and percentage for contribution towards Local Area Development Fund as constituted by the State Government. This free power may be suitably staggered as decided by the State Government.

b) Energy corresponding to 100 units of electricity to be provided free of cost every month to every Project Affected Family notified by the State Government to be offered through the concerned distribution licensee in the designated resettlement area/projects area for a period of ten years from the date of commissioning.

5.8 The Appropriate Commission shall provide for suitable regulatory framework for incentivizing the developers of Hydro Electric Projects (HEPs) for using long-term financial instruments in order to reduce the tariff burden in the initial years.

5.9 The real benefits of competition would be available only with the emergence of appropriate market conditions. Shortages of power supply will need to be overcome. Multiple players will enhance the quality of service through competition. All efforts will need to be made to bring power industry to this situation as early as possible in the overall interests of consumers. Transmission and distribution, i.e. the wires business is internationally recognized as having the characteristics of a natural monopoly where there are inherent difficulties in going beyond regulated returns on the basis of scrutiny of costs.

5.10 Consumer interest is best served in ensuring viability and sustainability of the entire value chain viz., generation, transmission and distribution of electricity, while at the same time facilitating power supply at reasonable rate to consumers. The financial turnaround/restructuring plans are approved by the Appropriate Government from time to time to achieve this objective. The Appropriate Government as well as the Appropriate Commission while implementing such plans shall ensure viability of the generation, transmission and distribution in terms of recovery of all prudent costs.

5.11Tariff policy lays down the following framework for performance based cost of service regulation in respect of aspects common to generation, transmission as well as distribution. These shall not apply to competitively bid projects as referred to in para 6.1 and para 7.1 (6). Sector specific aspects are dealt with in subsequent sections.

a) Return on Investment
Balance needs to be maintained between the interests of consumers and the need for investments while laying down rate of return. Return should attract investments at par with, if not in preference to, other sectors so that the electricity sector is able to create adequate capacity. The rate of return should be such that it allows generation of reasonable surplus for growth of the sector.

The Central Commission would notify, from time to time, the rate of return on equity for generation and transmission projects keeping in view the assessment of overall risk and the prevalent cost of capital which shall be followed by the SERCs also. The rate of return notified by CERC for transmission may be adopted by the SERCs for distribution with appropriate modification taking into view the risks involved. For uniform approach in this matter, it would be desirable to arrive at a consensus through the Forum of Regulators.

While allowing the total capital cost of the project, the Appropriate Commission would ensure that these are reasonable and to achieve this objective, requisite benchmarks on capital costs should be evolved by the Regulatory Commissions. The Central Commission may adopt either Return on Equity or Return on Capital approach whichever is considered better in the interest of the consumers. The State Commission may consider 'distribution and supply margin' as basis for allowing returns in distribution business at an appropriate time.

The State Commission may also consider price cap regulation based on comprehensive study. The Forum of Regulators should evolve a comprehensive approach in this regard. The considerations while preparing such an approach would, inter-alia, include issues such as reduction in Aggregate Technical and Commercial losses, improving the standards of performance and reduction in cost of supply.

b) Equity Norms
For financing of future capital cost of projects, a Debt: Equity ratio of 70:30 should be adopted. Promoters would be free to have higher quantum of equity investments. The equity in excess of this norm should be treated as loans advanced at the weighted average rate of interest and for a weighted average tenor of the long term debt component of the project after ascertaining the reasonableness of the interest rates and taking into account the effect of debt restructuring done, if any. In case of equity below the normative level, the actual equity would be used for determination of Return on Equity in tariff computations.

c) Depreciation
The Central Commission may notify the rates of depreciation in respect of generation and transmission assets. The depreciation rates so notified would also be applicable for distribution assets with appropriate modification as may be evolved by the Forum of Regulators.

Provided that the Appropriate Commission shall specify, for the purpose of tariff determination, a upper ceiling of the rate of depreciation to be applicable during the useful life of the project and the developer shall have the option of indicating, while seeking approval for tariff, lower rate of depreciation subject to the aforesaid ceiling.

The rates of depreciation so notified would be applicable for the purpose of tariffs as well as accounting.

There should be no need for any advance against depreciation.

Benefit of reduced tariff after the assets have been fully depreciated should remain available to the consumers.

Notwithstanding the above, power from those plants of a generating company, where either whose PPAs have expired or plants have completed their useful life, may be bundled with power from renewable generating plants to be set up through the process of bidding or for which the equipment for setting up such plant is procured through competitive bidding. In such cases, power from such plants can be reallocated to beneficiaries purchasing power from renewable energy generating plants on the principles to be decided by Appropriate Government. The Obligated Entities which finally buy such power shall account towards their renewable purchase obligation to the extent of power bought from renewable energy generating plants.

The scheduling and despatch of such conventional and renewable generating plants shall be done separately.

d) Cost of Debt
Structuring of debt, including its tenure, with a view to reducing the tariff should be encouraged. Savings in costs on account of subsequent restructuring of debt should be suitably incentivised by the Regulatory Commissions keeping in view the interests of the consumers.

e) Cost of Management of Foreign Exchange Risk
Foreign exchange variation risk shall not be a pass through. However, appropriate costs of hedging and swapping to take care of foreign exchange variations should be allowed for debt obtained in foreign currencies. This provision would be relevant only for the projects where tariff has not been determined on the basis of competitive bids.

f) Operating Norms
Suitable performance norms of operations together with incentives and disincentives would need to be evolved along with appropriate arrangement for sharing the gains of efficient operations with the consumers. Except for the cases referred to in para 5.11(h)(2), the operating parameters in tariffs should be at “normative levels” only and not at “lower of normative and actuals”. This is essential to encourage better operating performance. The norms should be efficient, relatable to past performance, capable of achievement and progressively reflecting increased efficiencies and may also take into consideration the latest technological advancements, fuel, vintage of equipments, nature of operations, level of service to be provided to consumers etc. Continued and proven inefficiency must be controlled and penalized.

The Central Commission would, in consultation with the Central Electricity Authority, notify operating norms from time to time for generation and transmission. The SERC would adopt these norms. In cases where operations have been much below the norms for many previous years, the SERCs may fix relaxed norms suitably and draw a transition path over the time for achieving the norms notified by the Central Commission, or phase them out in accordance with the norms specified by the Authority in this regard.

Operating norms for distribution networks would be notified by the concerned SERCs. For uniformity, the Forum of Regulators should evolve model guidelines taking into consideration the state specific distinctive features.

g) Renovation and Modernization
Renovation and modernization of generation plants (including repowering of wind generating plants) need to be encouraged for higher efficiency levels even though they may have not completed their useful life. This shall not include periodic overhauls. A Multi-Year Tariff (MYT) framework may be prescribed which should also cover capital investments necessary for renovation and modernization and an incentive framework to share the benefits of efficiency improvement between the utilities and the beneficiaries with reference to revised and specific performance norms to be fixed by the Appropriate Commission. Appropriate capital costs required for predetermined efficiency gains and/or for sustenance of high level performance would need to be assessed by the Appropriate Commission.

h) Multi Year Tariff
1) Section 61 of the Act states that the Appropriate Commission for determining the terms and conditions for the determination of tariff shall be guided, inter-alia, by Multi-Year Tariff (MYT) principles. The framework should feature a five-year control period. The initial control period may, however, be of 3 year duration for transmission and distribution if deemed necessary by the Regulatory Commission on account of data uncertainties and other practical considerations. In cases of lack of reliable data, the Appropriate Commission may state assumptions in MYT for first control period and a fresh control period may be started as and when more reliable data becomes available.

2) In cases where operations have been much below the norms for many previous years, the initial starting point in determining the revenue requirement and the improvement trajectories should be recognized at “relaxed” levels and not the “desired” levels. Suitable benchmarking studies may be conducted to establish the “desired” performance standards. Separate studies may be required for each utility to assess the capital expenditure necessary to meet the minimum service standards.

3) Once the revenue requirements are established at the beginning of the control period, the Regulatory Commission should focus on regulation of outputs and not the input cost elements. At the end of the control period, a comprehensive review of performance may be undertaken.

4) Uncontrollable costs should be recovered speedily to ensure that future consumers are not burdened with past costs. Uncontrollable costs would include (but not limited to) fuel costs, costs on account of inflation, taxes and cess, variations in power purchase unit costs including on account of adverse natural events.

5) Clear guidelines and regulations on information disclosure may be developed by the Regulatory Commissions. Section 62 (2) of the Act empowers the Appropriate Commission to require licensees to

furnish separate details, as may be specified in respect of generation, transmission and distribution for determination of tariff.

(i) Benefits under Clean Development Mechanism (CDM)
Tariff fixation for all electricity projects (generation, transmission and distribution) that result in lower Green House Gas (GHG) emissions than the relevant base line should take into account the benefits obtained from the Clean Development Mechanism (CDM) into consideration, in a manner so as to provide adequate incentive to the project developers.

(j) Composite Scheme
Sub-section (b) of Section 79(1) of the Act provides that Central Commission shall regulate the tariff of generating company, if such generating company enters into or otherwise have a composite scheme for generation and sale of electricity in more than one State.

Explanation: The composite scheme as specified under section 79(1) of the Act shall mean a scheme by a generating company for generation and sale of electricity in more than one State, having signed long-term or medium-term PPA prior to the date of commercial operation of the project (the COD of the last unit of the project will be deemed to be the date of commercial operation of the project) for sale of atleast 10% of the capacity of the project to a distribution licensee outside the State in which such project is located.

5.12 While it is recognized that the State Governments have the right to impose duties, taxes, cess on sale or consumption of electricity, these could potentially distort competition and optimal use of resources especially if such levies are used selectively and on a non-uniform basis.

In some cases, the duties etc. on consumption of electricity is linked to sources of generation (like captive generation) and the level of duties levied is much higher as compared to that being levied on the same category of consumers who draw power from grid. Such a distinction is invidious and inappropriate. The sole purpose of freely allowing captive generation is to enable industries to access reliable, quality and cost effective power. Particularly, the provisions relating to captive power plants which can be set up by group of consumers has been brought in recognition of the fact that efficient expansion of small and medium industries across the country will lead to faster economic growth and creation of larger employment opportunities.

For realizing the goal of making available electricity to consumers at reasonable and competitive prices, it is necessary that such duties are kept at reasonable level.

5.13 The Act provides for introduction of open access for consumers of one megawatt and above in a time bound manner. The Regulatory Commissions shall introduce open access for different categories of consumers as per the provisions of the Act.

6.0 GENERATION

Accelerated growth of the generation capacity sector is essential to meet the estimated growth in demand. Adequacy of generation is also essential for efficient functioning of power markets. At the same time, it is to be ensured that new capacity addition should deliver electricity at most efficient rates to protect the interests of consumers. This policy stipulates the following for meeting these objectives.

6.1 Procurement of power

As stipulated in para 5.1, power procurement for future requirements should be through a transparent competitive bidding mechanism using the guidelines issued by the Central Government from time to time. These guidelines provide for procurement of electricity separately for base load requirements and for peak load requirements. This would facilitate setting up of generation capacities specifically for meeting such requirements.

However, some of the competitively bid projects as per the guidelines dated 19th January, 2005 have experienced difficulties in getting the required quantity of coal from Coal India Limited (CIL). In case of reduced quantity of domestic coal supplied by CIL, vis-à-vis the assured quantity or quantity indicated in Letter of Assurance/FSA the cost of imported/market based e-auction coal procured for making up the shortfall, shall be considered for being made a pass through by Appropriate Commission on a case to case basis, as per advisory issued by Ministry of Power vide OM No. FU-12/2011-IPC (Vol-III) dated 31.7.2013.

6.2 Tariff structuring and associated issues

(1) A two-part tariff structure should be adopted for all long-term and medium-term contracts to facilitate Merit Order dispatch. According to National Electricity Policy, the Availability Based Tariff (ABT) is also to be introduced at State level. This framework would be extended to generating stations (including grid connected captive plants of capacities as determined by the SERC). The Appropriate Commission shall introduce differential rates of fixed charges for peak and off peak hours for better management of load within a period of two years.

Power stations are required to be available and ready to dispatch at all times. Notwithstanding any provision contained in the Power Purchase Agreement (PPA), in order to ensure better utilization of un-requisitioned generating capacity of generating stations, based on regulated tariff under Section 62 of the Electricity Act 2003, the procurer shall communicate, at least twenty four hours before 00.00 hours of the day when the power and quantum thereof is not requisitioned by it enabling the generating stations to sell the same in the market in consonance with laid down policy of Central Government in this regard. The developer and the procurers signing the PPA would share the gains realized from sale, if any, of such un-requisitioned power in market in the ratio of 50:50, if not already provided in the PPA. Such gain will be calculated as the difference between selling price of such power and fuel charge. It should, however, be ensured that such merchant sale does not result in adverse impact on the original beneficiary(ies) including in the form of higher average energy charge vis-à-vis the energy charge payable without the merchant sale. For the projects under section 63 of the Act, the methodology for such sale may be decided by the Appropriate Commission on mutually agreed terms between procurer and generator or unless already specified in the PPA

(2) Power Purchase Agreement should ensure adequate and bankable payment security arrangements to the Generating companies. In case of persisting default on payment of agreed tariff as per PPA in spite of the available payment security mechanisms like letter of credit, escrow of cash flows etc. the generating companies may sell such power to other buyers.

(3) In case of coal based generating stations, the cost of project will also include reasonable cost of setting up coal washeries, coal beneficiation system and dry ash handling & disposal system. (4) After the award of bids, if there is any change in domestic duties, levies, cess and taxes imposed by Central Government, State Governments/Union Territories or by any Government instrumentality leading to corresponding changes in the cost, the same may be treated as “Change in Law” and may unless provided otherwise in the PPA, be allowed as pass through subject to approval of Appropriate Commission.

(5) The thermal power plant(s) including the existing plants located within 50 km radius of sewage treatment plant of Municipality/local bodies/similar organization shall in the order of their closeness to the sewage treatment plant, mandatorily use treated sewage water produced by these bodies and the associated cost on this account be allowed as a pass through in the tariff. Such thermal plants may also ensure back-up source of water to meet their requirement in the event of shortage of supply by the sewage treatment plant. The associated cost on this account shall be factored into the fixed cost so as not to disturb the merit order of such thermal plant. The shutdown of the sewage treatment plant will be taken in consultation with the developer of the power plant.

6.3 Harnessing captive generation
Captive generation is an important means to making competitive power available. Appropriate Commission should create an enabling environment that encourages captive power plants to be connected to the grid.

Such captive plants could supply surplus power through grid subject to the same regulation as applicable to generating companies. Firm supplies may be bought from captive plants by distribution licensees using the guidelines issued by the Central Government under section 63 of the Act taking into account second proviso of para 5.2 of this Policy.

The prices should be differentiated for peak and off-peak supply and the tariff should include variable cost of generation at actual levels and reasonable compensation for capacity charges.

Wheeling charges and other terms and conditions for implementation should be determined in advance by the respective State Commission, duly ensuring that the charges are reasonable and fair.

Grid connected captive plants could also supply power to non-captive users connected to the grid through available transmission facilities based on negotiated tariffs. Such sale of electricity would be subject to relevant regulations for open access including compliance of relevant provisions of rule 3 of the Electricity Rules, 2005.

6.4 Renewable sources of energy generation including Co-generation from renewable energy sources:
(1) Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall fix a minimum percentage of the total consumption of electricity in the area of a distribution licensee for purchase of energy from renewable energy sources, taking into account availability of such resources and its impact on retail tariffs. Cost of purchase of renewable energy shall be taken into account while determining tariff by SERCs. Long term growth trajectory of Renewable Purchase Obligations (RPOs) will be prescribed by the Ministry of Power in consultation with MNRE.

Provided that cogeneration from sources other than renewable sources shall not be excluded from the applicability of RPOs.

(i) Within the percentage so made applicable, to start with, the SERCs shall also reserve a minimum percentage for purchase of solar energy from the date of notification of this policy which shall be such that it reaches 8% of total consumption of energy, excluding Hydro Power, by March 2022 or as notified by the Central Government from time to time.

(ii) Distribution Licensee(s) shall compulsorily procure 100% power produced from all the Waste-to-Energy plants in the State, in the ratio of their procurement of power from all sources including their own, at the tariff determined by the Appropriate Commission under Section 62 of the Act.

(iii) It is desirable that purchase of energy from renewable sources of energy takes place more or less in the same proportion in different States. To achieve this objective in the current scenario of large availability of such resources only in certain parts of the country, an appropriate mechanism such as Renewable Energy Certificate (REC) would need to be promoted. Through such a mechanism, the renewable energy based generation companies can sell the electricity to local distribution licensee at the rates for conventional power and can recover the balance cost by selling certificates to other distribution companies and obligated entities enabling the latter to meet their renewable power purchase obligations. The REC mechanism should also have a solar specific REC.

(iv) Appropriate Commission may also provide for a suitable regulatory framework for encouraging such other emerging renewable energy technologies by prescribing separate technology based REC multiplier (i.e. granting higher or lower number of RECs to such emerging technologies for the same level of generation). Similarly, considering the change in prices of renewable energy technologies with passage of time, the Appropriate Commission may prescribe vintage based REC multiplier (i.e.

granting higher or lower number of RECs for the same level of generation based on year of commissioning of plant).

(2) States shall endeavor to procure power from renewable energy sources through competitive bidding to keep the tariff low, except from the waste to energy plants. Procurement of power by Distribution Licensee from renewable energy sources from projects above the notified capacity, shall be done through competitive bidding process, from the date to be notified by the Central Government.

However, till such notification, any such procurement of power from renewable energy sources projects, may be done under Section 62 of the Electricity Act, 2003. While determining the tariff from such sources, the Appropriate Commission shall take into account the solar radiation and wind intensity which may differ from area to area to ensure that the benefits are passed on to the consumers.

(3) The Central Commission should lay down guidelines for pricing intermittent power, especially from renewable energy sources, where such procurement is not through competitive bidding. The tariff stipulated by CERC shall act as a ceiling for that category. (4) In order to incentivize the Distribution Companies to procure power from renewable sources of energy, the Central Government may notify, from time to time, an appropriate bid-based tariff framework for renewable energy, allowing the tariff to be increased progressively in a back-loaded or any other manner in the public interest during the period of PPA, over the life cycle of such a generating plant. Correspondingly, the procurer of such bid-based renewable energy shall comply with the obligations for payment of tariff so determined.

(5) In order to promote renewable energy sources, any generating company proposing to establish a coal/lignite based thermal generating station after a specified date shall be required to establish such renewable energy generating capacity or procure and supply renewable energy equivalent to such capacity, as may be prescribed by the Central Government from time to time after due consultation with stakeholders. The renewable energy produced by each generator may be bundled with its thermal generation for the purpose of sale. In case an obligated entity procures this renewable power, then the SERCs will consider the obligated entity to have met the Renewable Purchase Obligation (RPO) to the extent of power bought from such renewable energy generating stations.

Provided further that in case any existing coal and lignite based thermal power generating station, with the concurrence of power procurers under the existing Power Purchase Agreements, chooses to set up additional renewable energy generating capacity, the power from such plant shall be allowed to be bundled and tariff of such renewable energy shall be allowed to be pass through by the Appropriate Commission. The Obligated Entities who finally buy such power shall account towards their renewable purchase obligations.

Provided also that scheduling and despatch of such conventional and renewable generating plants shall be done separately.

(6) In order to further encourage renewable sources of energy, no inter-State transmission charges and losses may be levied till such period as may be notified by the Central Government on transmission of the electricity generated from solar and wind sources of energy through the inter-state transmission system for sale.

(7) Appropriate Commission may provide regulatory framework to facilitate generation and sale of electricity from renewable energy sources particularly from roof-top solar system by any entity including local authority, Panchayat Institution, user institution, cooperative society, Non-Governmental Organization, franchisee or by Renewable Energy Service Company. The Appropriate Government may also provide complementary policy support for this purpose.

Explanation: “Renewable Energy Service Company” means an energy service company which provides renewable energy to the consumers in the form of electricity.

7.0 TRANSMISSION

The transmission system in the country consists of the regional networks, the inter-regional connections that carry electricity across the five regions and the State networks. Development of the State networks has not been uniform and capacity in such networks needs to be augmented. These networks will play an important role in intra-State power flows and also in the regional and national flows. The tariff policy, in so far as transmission is concerned, seeks to achieve the following objectives:

1. Ensuring optimal development of the transmission network ahead of generation with adequate margin for reliability and to promote efficient utilization of generation and transmission assets in the country;

2. Attracting the required investments in the transmission sector and providing adequate returns.

7.1 Transmission pricing

(1) A suitable transmission tariff framework for all inter-State transmission, including transmission of electricity across the territory of an intervening State as well as conveyance within the State which is incidental to such interstate transmission, has been implemented with the objective of promoting effective utilization of all assets across the country and accelerated development of new transmission capacities that are required.

(2) The National Electricity Policy mandates that the national tariff framework implemented should be sensitive to distance, direction and related to quantum of power flow. This has been developed by CERC taking into consideration the advice of the CEA. Sharing of transmission charges shall be done

in accordance with such tariff mechanism as amended from time to time. (3) Transmission charges, under this framework, can be determined on MW per circuit kilometer basis, zonal postage stamp basis, or some other pragmatic variant, the ultimate objective being to get the transmission system users to share the total transmission cost in proportion to their respective utilization of the transmission system. The 'utilization' factor should duly capture the advantage of reliability reaped by all. The spread between minimum and maximum transmission rates should be such as not to inhibit planned development/augmentation of the transmission system but should discourage non-optimal transmission investment.

(4) In view of the approach laid down by the NEP, prior agreement with the beneficiaries would not be a precondition for network expansion. CTU/STU should undertake network expansion after identifying the requirements in consonance with the National Electricity Plan and in consultation with stakeholders and taking up the execution after due regulatory approvals. For smooth operation of the grid, efforts should be made to develop transmission system ahead of generation.

(5) The Central Commission has specified norms for capital and operating costs and laid down Standards of Performance for inter-State transmission licensees. Tariff determination and adherence to Standards of Performance shall be carried out in accordance with these norms, as amended from time to time.

(6) Investment by transmission developer including CTU/STUs would be invited through competitive bids in accordance with the guidelines issued by the Central Government from time to time.

(7) While all future inter-state transmission projects shall, ordinarily, be developed through competitive bidding process, the Central Government may give exemption from competitive bidding for (a) specific category of projects of strategic importance, technical upgradation etc. or (b) works required to be done to cater to an urgent situation on a case to case basis.

(8) CERC has specified Regulation on framework for the inter-State transmission. A similar approach should be implemented by SERCs for the intra-State transmission, duly considering factors like voltage, distance, direction and quantum of flow.

(9) Metering compatible with the requirements of the proposed transmission tariff framework should be established on priority basis. The metering should be compatible with ABT requirements, which would also facilitate implementation of Time of Day (ToD) tariffs.

7.2 Transmission loss allocation
(1) Transactions are being charged on the basis of average losses arrived at after appropriately considering the distance and directional sensitivity, as applicable to relevant voltage level, on the transmission system. Based on the methodology laid down by the CERC in this regard for inter-state transmission, the SERCs may evolve a similar framework for intra-state transmission.

The loss framework should ensure that the loss compensation is reasonable and linked to applicable technical loss benchmarks. The benchmarks may be determined by the Appropriate Commission after considering advice of CEA.

(2) It would be desirable to move to a system of loss compensation based on incremental losses as present deficiencies in transmission capacities are overcome through network expansion. The Appropriate Commission may require necessary studies to be conducted to establish the allowable level of system loss for the network configuration and the capital expenditure required to augment the transmission system and reduce system losses. Since additional flows above a level of line loading lead to significantly higher losses, CTU/STU should ensure upgrading of transmission systems to avoid the situations of overloading. The Appropriate Commission should permit adequate capital investments in new assets for upgrading the transmission system.

7.3 Other issues in transmission

(1) Financial incentives and disincentives should be implemented for the CTU and the STU around the Key Performance Indicators (KPI) for these organisations. Such KPIs would include efficient network construction, system availability and loss reduction.

(2) All available information should be shared with intending users by the CTU/STU and the load dispatch centers, particularly information on available transmission capacity and load flow studies.

(3) In extraordinary circumstances including threat to security to the State, public order or natural calamity, if the Central Government allocates power out of the unallocated share of the Central Generating Stations or otherwise, such allocation of power will have priority over short-term, medium-term and long-term access in this order.

7.4 Ancillary Services

(1) The Central Commission may introduce the norms and framework for ancillary services, including the method of sharing the charges, necessary to support the power system or grid operation for maintaining power quality, reliability and security of the grid.

(2) The Central Commission shall also consult the Central Electricity Authority, SERCs/JERCs, CTUs/STUs and NLDC/RLDC/SLDCs while specifying the norms for ancillary services.

(3) The State Commission shall also adopt the norms and framework for ancillary services as specified by the Central Commission.

8.0 DISTRIBUTION

Supply of reliable and quality power of specified standards in an efficient manner and at reasonable rates is one of the main objectives of the National Electricity Policy. The State Commission should determine and notify the standards of performance of licensees with respect to quality, continuity and reliability of service for all consumers. It is desirable that the Forum of Regulators determines the basic framework on service standards. A suitable transition framework could be provided for the licensees to reach the desired levels of service as quickly as possible. Penalties may be imposed on licensees in accordance with section 57 of the Act for failure to meet the standards.

Making the distribution segment of the industry efficient and solvent is the key to success of power sector reforms and provision of services of specified standards. Therefore, the Regulatory Commissions need to strike the right balance between the requirements of the commercial viability of distribution licensees and consumer interests. Loss making utilities need to be transformed into profitable ventures which can raise necessary resources from the capital markets to provide services of international standards to enable India to achieve its full growth potential. Efficiency in operations should be encouraged. Gains of efficient operations with reference to normative parameters should be appropriately shared between consumers and licensees.

Appropriate Commission should mandate Distribution Licensee to undertake load forecasting every year and to publish and submit to the Commission their short, medium and long-term power procurement plans to meet the load.

The State Regulatory Commission will devise a specific trajectory so that 24 hours supply of adequate and uninterrupted power can be ensured to all categories of consumers by 2021-22 or earlier depending upon the prevailing situation in the State.

Micro-grids supplying renewable energy are being set up in such areas where the grid has not reached or where adequate power is not available in the grid. Investment involved in setting up of such microgrids is substantial. One of the risks of investment is grid reaching the area before the completion of the project life and thereby making power from micro grids costly and unviable. In order to mitigate such risk and incentivize investment in microgrids, there is a need to put in place an appropriate regulatory framework to mandate compulsory purchase of power into the grid from such micro grids at a tariff to be determined under section 62 of the Act considering depreciated cost of investments and keeping in view industry benchmark and with a cap if necessary, as approved by the Appropriate Commission. The Appropriate Commission shall notify necessary regulations in this regard within six months

8.1 Implementation of Multi-Year Tariff (MYT) framework
1) MYT framework would minimise risks for utilities and consumers, promote efficiency and appropriate reduction of system losses and attract investments. It would also bring greater predictability to consumer tariffs on the whole by restricting tariff adjustments to known indicators of power purchase prices and inflation indices. The framework should be applied for both public and private utilities.

2) The State Commissions should introduce mechanisms for sharing of excess profits and losses with the consumers as part of the overall MYT framework. In the first control period the incentives for the utilities may be asymmetric with the percentage of the excess profits being retained by the utility set at higher levels than the percentage of losses to be borne by the utility. This is necessary to accelerate performance improvement and reduction in losses and will be in the long term interest of consumers by way of lower tariffs.

3) As indicated in para 5.11(h), the MYT framework implemented in the initial control period should have adequate flexibility to accommodate changes in the baselines consequent to metering being completed.

4) Licensees may have the flexibility of charging lower tariffs than approved by the State Commission if competitive conditions require so without having a claim on additional revenue requirement on this account in accordance with Section 62 of the Act.

5) At the beginning of the control period when the "actual" costs form the basis for future projections, there may be a large uncovered gap between required tariffs and the tariffs that are presently applicable. This gap should be fully met through tariff charges and through alternative means that could inter-alia include financial restructuring and transition financing.

6) Incumbent licensees should have the option of filing for separate revenue requirements and tariffs for an area where the State Commission has issued multiple distribution licenses, pursuant to the provisions of Section 14 of the Act read with para 5.4.7 of the National Electricity Policy.

7) Appropriate Commissions should initiate tariff determination and regulatory scrutiny on a suo moto basis in case the licensee does not initiate filings in time. It is desirable that requisite tariff changes come into effect from the date of commencement of each financial year and any gap on account of delay in filing should be on account of licensee.

8.2 Framework for revenue requirements and costs
8.2.1 The following aspects would need to be considered in determining tariffs:

(1) All power purchase costs need to be considered legitimate unless it is established that the merit order principle has been violated or power has been purchased at unreasonable rates. The reduction of Aggregate Technical & Commercial (AT&C) losses needs to be brought about but not by denying revenues required for power purchase for 24 hours supply and necessary and reasonable O&M and investment for system upgradation. Consumers, particularly those who are ready to pay a tariff which reflects efficient costs have the right to get uninterrupted 24 hours supply of quality power. Actual level of retail sales should be grossed up by normative level of T&D losses as indicated in MYT trajectory for allowing power purchase cost subject to justifiable power purchase mix variation (for

example, more energy may be purchased from thermal generation in the event of poor rainfall) and fuel surcharge adjustment as per regulations of the SERC.

(2) AT&C loss reduction should be incentivised by linking returns in a MYT framework to an achievable trajectory. Greater transparency and nurturing of consumer groups would be efficacious. For government owned utilities improving governance to achieve AT&C loss reduction is a more difficult and complex challenge for the SERCs. Prescription of a MYT dispensation with different levels of consumer tariffs in succeeding years linked to different AT&C loss levels aimed at covering full costs could generate the requisite political will for effective action to reduce theft as the alternative would be stiffer tariff increases. Third party verification of energy audit results for different areas/localities could be used to impose area/locality specific surcharge for greater AT&C loss levels and this in turn could generate local consensus for effective action for better governance. The SERCs may also encourage suitable local area based incentive and disincentive scheme for the staff of the utilities linked to reduction in losses.

The SERC shall undertake independent assessment of baseline data for various parameters for every distribution circle of the licensee.

The SERC shall also institute a system of independent scrutiny of financial and technical data submitted by the licensees.

As the metering is completed up to appropriate level in the distribution network, it should be possible to segregate technical losses. Accordingly technical loss reduction under MYT framework should then be treated as distinct from commercial loss reduction which requires a different approach.

(3) Section 65 of the Act provides that no direction of the State Government regarding grant of subsidy to consumers in the tariff determined by the State Commission shall be operative if the payment on account of subsidy as decided by the State Commission is not made to the utilities and the tariff fixed by the State Commission shall be applicable from the date of issue of orders by the Commission in this regard. The State Commissions should ensure compliance of this provision of law to ensure financial viability of the utilities. To ensure implementation of the provision of the law, the State Commission should determine the tariff initially, without considering the subsidy commitment by the State Government and subsidised tariff shall be arrived at thereafter considering the subsidy by the State Government for the respective categories of consumers.

(4) Working capital should be allowed duly recognising the transition issues faced by the utilities such as progressive improvement in recovery of bills. Bad debts should be recognised as per policies developed and subject to the approval of the State Commission.

(5) Pass through of past losses or profits should be allowed to the extent caused by uncontrollable factors. During the transition period controllable factors should be to the account of utilities and consumers in proportions determined under the MYT framework.

(6) The contingency reserves should be drawn upon with prior approval of the State Commission only in the event of contingency conditions specified through regulations by the State Commission. The existing practice of providing for development reserves and tariff and dividend control reserves should be discontinued.

(7) Section 61 of the Act mandates that the Appropriate Commission, while determining tariff, shall not only ensure safeguarding of consumer's interests but also the recovery of the cost of electricity in a reasonable manner. Section 62 of the Act further provides for periodic tariff adjustment during a year to take care of the variation in fuel price, as may be specified.

Therefore, the Appropriate Commission shall specify an appropriate price adjustment formula for recovery of the costs, arising on account of the variation in the price of fuel, power purchase etc. on monthly/quarterly basis for recovery of all prudent costs of the generating company and the licensee.

8.2.2 The facility of a regulatory asset has been adopted by some Regulatory Commissions in the past to limit tariff impact in a particular year. This should be done only as a very rare exception in case of natural calamity or force majeure conditions and subject to the following:

a. Under business as usual conditions, no creation of Regulatory Assets shall be allowed;

b. Recovery of outstanding Regulatory Assets along with carrying cost of Regulatory Assets should be time bound and within a period not exceeding seven years. The State Commission may specify the trajectory for the same.

8.3 Tariff design: Linkage of tariffs to cost of service
It has been widely recognised that rational and economic pricing of electricity can be one of the major tools for energy conservation and sustainable use of ground water resources.

In terms of the Section 61(g) of the Act, the Appropriate Commission shall be guided by the objective that the tariff progressively reflects the efficient and prudent cost of supply of electricity.

The State Governments can give subsidy to the extent they consider appropriate as per the provisions of section 65 of the Act. Direct subsidy is a better way to support the poorer categories of consumers than the mechanism of crosssubsidizing the tariff across the board. Subsidies should be targeted effectively and in transparent manner. As a substitute of cross subsidies, the State Government has the option of raising resources through mechanism of electricity duty and giving direct subsidies to only needy consumers. This is a better way of targeting subsidies effectively.

Accordingly, the following principles would be adopted:

1. Consumers below poverty line who consume below a specified level, as prescribed in the National Electricity Policy may receive a special support through cross subsidy. Tariffs for such designated group of consumers will be at least 50% of the average cost of supply.

2. For achieving the objective that the tariff progressively reflects the cost of supply of electricity, the Appropriate Commission would notify a roadmap such that tariffs are brought within ±20% of the average cost of supply. The road map would also have intermediate milestones, based on the approach of a gradual reduction in cross subsidy.

3. While fixing tariff for agricultural use, the imperatives of the need of using ground water resources in a sustainable manner would also need to be kept in mind in addition to the average cost of supply. Tariff for agricultural use may be set at different levels for different parts of a state depending on the condition of the ground water table to prevent excessive depletion of ground water. Section 62 (3) of the Act provides that geographical position of any area could be one of the criteria for tariff differentiation. A higher level of subsidy could be considered to support poorer farmers of the region where adverse ground water table condition requires larger quantity of electricity for irrigation purposes subject to suitable restrictions to ensure maintenance of ground water levels and sustainable ground water usage.

4. Extent of subsidy for different categories of consumers can be decided by the State Government keeping in view various relevant aspects. But provision of free electricity is not desirable as it encourages wasteful consumption of electricity. Besides in most cases, lowering of water table in turn creating avoidable problem of water shortage for irrigation and drinking water for later generations. It is also likely to lead to rapid rise in demand of electricity putting severe strain on the distribution network thus adversely affecting the quality of supply of power. Therefore, it is necessary that reasonable level of user charges is levied. The subsidized rates of electricity should be permitted only up to a pre-identified level of consumption beyond which tariffs reflecting efficient cost of service should be charged from consumers. If the State Government wants to reimburse even part of this cost of electricity to poor category of consumers the amount can be paid in cash or any other suitable way. Use of prepaid meters can also facilitate this transfer of subsidy to such consumers.

5. Metering of supply to agricultural/rural consumers can be achieved in a consumer friendly way and in effective manner by management of local distribution in rural areas through commercial arrangement with franchisees with involvement of panchayat institutions, user associations, cooperative societies etc. Use of smart meters may be encouraged as a cost effective option for metering in cases of “limited use consumers” who are eligible for subsidized electricity.

8.4 Definition of tariff components and their applicability

1. Two-part tariffs featuring separate fixed and variable charges and time differentiated tariff shall be introduced on priority for large consumers (say, consumers with demand exceeding 1 MW) within one year and subsequently for all consumers within a period of five years or such period as may be specified. This would also help in flattening the peak and implementing various energy conservation measures.

2. The National Electricity Policy states that existing PPAs with the generating companies would need to be suitably assigned to the successor distribution companies. The State Governments may make such assignments taking care of different load profiles of the distribution companies so that retail tariffs are uniform in the State for different categories of consumers. Thereafter, the retail tariffs would reflect the relative efficiency of distribution companies in procuring power at competitive costs, controlling theft and reducing other distribution losses.

3. The Appropriate Commission may provide incentives to encourage metering and billing based on metered tariffs, particularly for consumer categories that are presently unmetered to a large extent. The metered tariffs and the incentives should be given wide publicity. Smart meters have the advantages of remote metering and billing, implementation of peak and off-peak tariff and demand side management through demand response. These would become essential in future for load-generation balancing due to increasing penetration of intermittent type of generation like wind and solar power.

Appropriate Commission shall, therefore, mandate smart meters for:

(a) Consumers with monthly consumption of 500 units and more at the earliest but not later than 31.12.2017;

(b) Consumers with monthly consumption above 200 units by 31.12.2019.

Further, two way smart meters shall be provided to all prosumers, who also sell back electricity to the grid as and when they require.

In order to enable energy audit in the distribution system, all distribution companies shall ensure smart meters in their electricity system throughout the chain from transformers at 132kV level right down to distribution transformer level at 11kV and further down to each consumer. Further, in order to reduce theft of power, the distribution companies should have enabling feature like distribution SCADA with distribution management system and energy audit functions. SERCs shall mandate these to be in place within two years.

4. The SERCs may also suitably regulate connection charges to be recovered by the distribution licensee to ensure that second distribution licensee does not resort to cherry picking by demanding

unreasonable connection charges. The connection charges of the second licensee should not be more than those payable to the incumbent licensee.

8.5 Cross-subsidy surcharge and additional surcharge for open access
8.5.1 National Electricity Policy lays down that the amount of cross-subsidy surcharge and the additional surcharge to be levied from consumers who are permitted open access should not be so onerous that it eliminates competition which is intended to be fostered in generation and supply of power directly to the consumers through open access.

A consumer who is permitted open access will have to make payment to the generator, the transmission licensee whose transmission systems are used, distribution utility for the wheeling charges and, in addition, the cross subsidy surcharge. The computation of cross subsidy surcharge, therefore, needs to be done in a manner that while it compensates the distribution licensee, it does not constrain introduction of competition through open access. A consumer would avail of open access only if the payment of all the charges leads to a benefit to him. While the interest of distribution licensee needs to be protected it would be essential that this provision of the Act, which requires the open access to be introduced in a time-bound manner, is used to bring about competition in the larger interest of consumers.

SERCs may calculate the cost of supply of electricity by the distribution licensee to consumers of the applicable class as aggregate of (a) per unit weighted average cost of power purchase including meeting the Renewable Purchase Obligation; (b) transmission and distribution losses applicable to the relevant voltage level and commercial losses allowed by the SERC; (c) transmission, distribution and wheeling charges up to the relevant voltage level; and (d) per unit cost of carrying regulatory assets, if applicable.

Surcharge formula:
$S = T – [C/ (1-L/100) + D + R]$

Where S is the surcharge

T is the tariff payable by the relevant category of consumers, including reflecting the Renewable Purchase Obligation

C is the per unit weighted average cost of power purchase by the Licensee, including meeting the Renewable Purchase Obligation

D is the aggregate of transmission, distribution and wheeling charge applicable to the relevant voltage level.

L is the aggregate of transmission, distribution and commercial losses, expressed as a percentage applicable to the relevant voltage level.

R is the per unit cost of carrying regulatory assets.

Above formula may not work for all distribution licensees, particularly for those having power deficit, the State Regulatory Commissions, while keeping the overall objectives of the Electricity Act in view, may review and vary the same taking into consideration the different circumstances prevailing in the area of distribution licensee.

Provided that the surcharge shall not exceed 20% of the tariff applicable to the category of the consumers seeking open access.

Provided further that the Appropriate Commission, in consultation with the Appropriate Government, shall exempt levy of cross subsidy charge on the Railways, as defined in Indian Railways Act, 1989 being a deemed licensee, on electricity purchased for its own consumption.

8.5.2 No surcharge would be required to be paid in terms of sub-section (2) of Section 42 of the Act on the electricity being sold by the generating companies with consent of the competent government under Section 43(A)(1)(c) of the Electricity Act, 1948 (now repealed) and on the electricity being supplied by the distribution licensee on the authorisation by the State Government under Section 27 of the Indian Electricity Act, 1910 (now repealed), till the current validity of such consent or authorisation.

8.5.3 The surcharge may be collected either by the distribution licensee, the transmission licensee, the STU or the CTU, depending on whose facilities are used by the consumer for availing electricity supplies. In all cases the amounts collected from a particular consumer should be given to the distribution licensee in whose area the consumer is located. In case of two licensees supplying in the same area, the licensee from whom the consumer was availing supply shall be paid the amounts collected.

8.5.4 The additional surcharge for obligation to supply as per section 42(4) of the Act should become applicable only if it is conclusively demonstrated that the obligation of a licensee, in terms of existing power purchase commitments, has been and continues to be stranded, or there is an unavoidable obligation and incidence to bear fixed costs consequent to such a contract. The fixed costs related to network assets would be recovered through wheeling charges.

8.5.5 Wheeling charges should be determined on the basis of same principles as laid down for intra-state transmission charges and in addition would include average loss compensation of the relevant voltage level.

8.5.6 In case of outages of generator supplying to a consumer on open access, standby arrangements should be provided by the licensee on the payment of tariff for temporary connection to that consumer category as specified by the Appropriate Commission. Provided that such charges shall not be more than 125 percent of the normal tariff of that category.

9.0 Trading Margin
The Act provides that the Appropriate Commission may fix the trading margin, if considered necessary. Though there is a need to promote trading in electricity for making the markets competitive, the Appropriate Commission should monitor the trading transactions continuously and ensure that the electricity traders do not indulge in profiteering in situation of power shortages. Fixing of trading margin should be resorted to for achieving this objective.

JYOTI ARORA, Jt. Secy

APPENDIX
SALIENT FEATURES OF THE APPROVED R&R PROVISIONS FOR HYDRO POWER PROJECTS
1. SCOPE OF COVERAGE
The following provisions shall be applicable even if one family is affected by the development of a Hydro Power Project.

2. DEFINITION OF PROJECT AFFECTED FAMILIES (PAFs)
A Project Affected Family (PAF) shall mean a family whose place of residence or other property or source of livelihood has been affected by the development of a hydro project and who have been residing in the affected zone for two years preceding the date of declaration of notification under Section-11 of the LARR Act. The affected family would also include squatters.

3. DEFINITION OF AGRICULTURAL LABOURER
A person normally residing in the affected zone for two years preceding the date of declaration of the affected zone and earns his/her livelihood principally by manual labour on agricultural land.

4. DEFINITION OF NON-AGRICULTURAL LABOURER
A person normally residing in the affected zone for two years preceding the date of declaration of the affected zone and who does not hold any land in the affected zone but earns his/her livelihood principally by manual labour or as rural artisan or a service provider to the community.

5. DEFINITION OF SQUATTERS
A family occupying Government land in the affected zone without a legal title, at least for 5 years prior to the date of declaration of notification under Section-11 of LARR Act.

6. REHABILITATION/RESETTLEMENT COLONIES

This policy aims to provide built up houses to Project Affected Families (PAFs) who get displaced due to the development of hydro projects to the extent possible. However, wherever opted for, liberal House Construction Allowance would be given in lieu.

7. TRAINING AND CAPACITY BUILDING

This policy also emphasizes the need to provide training to the Project Affected Families as well as to the local population for a sustained livelihood. Special training programmes from ITIs aimed at providing the required skills to the local population would be undertaken by the Project developers at least six months prior to commencement of construction. This is expected to boost the employability of the PAFs and other people residing in the vicinity of the project.

8. ADDITIONAL PROVISIONS

This policy envisages additional provisions for Project Affected Families such as:

o scholarships for meritorious students,

o extension of medical facilities,

o marriage grants,

o subsistence grants,

o support for income generation schemes for cooperative and self-help groups,

o seed, pesticides and fertilizer subsidies, and irrigation support.

Besides the additional provisions mentioned above, the normally applicable provisions of the National Policy on Rehabilitation and resettlement, currently in force, would be applicable.

16/1/2018 - EFM
Ministry of New and Renewable Energy

Block 14 CGO Complex,
Lodhi Road New Delhi-110003
26 April 2019

Office Memorandum

Subject: Clarification Order of the Ministry of Power related to Renewable Purchase Obligation (RPO)- reg

This refers to this Ministry's OM of even number dated 26 December 2018 and the Ministry of Power's Clarification Order no 30/04/2018-R&R dated 1 February 2019 on the subject cited above.

2. On further examination and interaction with various stakeholders, including State Nodal Agencies for Renewable Energy, it has been observed that about 25 GW capacity Captive Power Plants (CPPs) out of the total CPPs of around 45 GW capacity have been set up prior to 2007-08 when most of the States had no RPOs. The Ministry of Power's Clarification Order of 1 February 2019, in effect, exempts all these CPPs from RPOs.

3. It may further be mentioned that CPPs have been importing/exporting electricity from/to the grid, as per the requirement and cost-competitive considerations. Under RPO, the CPPs will have to either buy or generate renewable power according to the RPO for the particular year. Increasing RPO trajectory will necessitate either increasing power export to the grid, cutting down import from grid. As such, under the prevailing renewables costs and trends thereof, increasing RPO trajectory may not put CPPs in financially disadvantageous position across the CPP landscape. However, increasing RPO may be disadvantageous to certain categories of CPPs (say CPPs in Aluminum industry) on technical grounds.

4. In view of the above, it is suggested that the Ministry of Power may consider issuing Clarification Order in supersession to the order referred to in paragraph 1.0 above of 1 February 2019. The Clarification Order may propose that while considering RPOs for CPPs, the SERCs may permit deviation from the RPO trajectory as notified by the Ministry Power only in the cases where:- i) achieving RPO trajectory will put the industry deploying CPP in a financially disadvantageous position; or ii) increasing renewable power consumption is not technically feasible for operations of the industry deploying CPPs. The above may act as guiding principle for SERCs in determining applicability of RPOs for CPPs.

(Tarun Singh)
Scientist-C

The Chief Engineer (R&R)
Ministry of Power
Rafi Marg, Shram Shakti Bhawan
New Delhi-110001

29/4/19

Dir (RR)

28/4/19

US (RR) : Pl put up

1.5.19

SO (RK)

VAKALATNAMA

BEFORE THE GUJARAT ELECTRICITY REGULATORY COMMISSION, AHMEDABAD

FILING NO.________________

CASE NO.__________________

M/s HINDALCO INDUSTRIES LIMITED **...PETITIONER**

VERSUS

GUJARAT ENERGY DEVELOPMENT AGENCY **...RESPONDENT**

I/We the undersigned do hereby appoint and retain **Shri SAURIN A. MEHTA & MR. KRISHAL H. PATEL, ADVOCATES** to act, appear and plead for me/us in the above matter and in all matters/proceedings that may be taken in respect of any Appeal or Application connected with the same or any Application for Review, to file, obtain and return documents, to accept the process of Court and to deposit and/or receive money on my/our behalf in the said matter and in the applications including that for Review and to Compromise, settle and/or withdraw or to agree to the withdrawal of the said matter or any proceeding arising there in to represent me/us and to take all necessary steps on my/our behalf in the above matter, to ask another Advocate to hold this brief and to appear and plead on my/our behalf if required and to do all things incidental to such acting for me/us. I/we agree to ratify all acts done by the aforenamed ADVOCATES in pursuance of this authority.

Dated this the 9th day of December 2020.

ACCEPTED

ADVOCATE FOR PETITIONER

X__________________

Hindalco Industries Ltd. (Birla Copper) Dahej.

SAURIN A. MEHTA
Advocate
Enrolment No. G/513/1987
Code No. 470

KRISHAL H. PATEL
Advocate
Enrolment No. G/2121/2017
Code No. 9644

THE BAR COUNCIL OF GUJARAT — ADVOCATE WELFARE FUND STAMP Rs.10 — 2132780

OFFICE ADDRESS :
501, 5th Floor, "ClaywAlls",
Zydus Hospital Road, Thaltej,
Ahmedabad, Gujarat - 380059
M- 98792-00265 & 7069634602

COURT FEE 2 रु. Rs.2 भारत INDIA दो रुपये TWO RUPEES

COURT FEE 2 रु. Rs.2 भारत INDIA दो रुपये TWO RUPEES

ADITYA BIRLA

HINDALCO

AUTHORITY LETTER

Hindalco Industries Limited, a Company incorporated and registered under the Companies Act, 1956 (hereinafter referred to as the "Company") and having its Registered Office at Ahura Centre, B – Wing, 1st Floor, Mahakali Caves Road, Andheri (East), Mumbai 400 093, has vide Power of Attorney dated 2nd September' 2017 nominated and appointed Mr. V R Shankar, S/o Late Mr. V J Ranganathan, as the true and lawful attorney of the Company and has further authorized him to commence, prosecute, enforce, defend, answer, oppose or appear or appeal in all actions and other legal proceedings and demands whether civil, criminal, political, administrative or revenue, or proceedings relating to the litigations, legal matters or otherwise and to retain, appoint, engage any advocates and to sign Vakalatnama and other necessary authorities for defending/representing in relation to above actions, on behalf of the Company.

Whereas for better and more effectively doing, effectuating, executing and performing his responsibility vide the same power of Attorney Mr. V R Shankar has been authorized to delegate any of the powers and authorities as specified in the above paragraph to any other person.

1. Accordingly, in exercise of the said power Mr. V R Shankar hereby authorizes Major Tejus Patel (Retd) S/o Major Mahesh Patel (Retd) to sign, to execute, file and institute applications, affidavits, petitions, suits, appeal, written statements, rejoinder and all other necessary pleadings, sign Vakalatnama as may be required, in the proceedings to be initiated by/on behalf of the Company before Gujarat Electricity Regulatory Commission (GERC) at Gandhinagar.
2. Any action done or taken by Major Tejus Patel (Retd) pursuant to this authority shall be deemed to have been ratified by the Company and authorized to do all necessary or incidental acts, deeds, things and matters while representing the Company.
3. Unless earlier revoked, this authorization shall be valid up to 31st March' 2021.

Name: V R Shankar
President – Legal & Duly Constituted Attorney
August 6, 2020

HINDALCO LEGAL DEPARTMENT INDUSTRIES LTD.

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7th Floor, Birla Centurion,
Pandurang Budhkar Road,Worli, Mumbai : 400030
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REGISTERED OFFICE
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Telephone +91 22 6691 7000
Fax +91 22 6691 7001

Website www.hindalco.com, www.adityabirla.com
E mail hindalco@adityabirla.com
Corporate Identity No. L27020MH1958PLC011238

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M - 98792-00265

KRISHAL H. PATEL
Advocate
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M - 7069634602

Office at : 501, 5th Floor, "ClaywAlls", Zydus Hospital Road, Thaltej, Ahmedabad, Gujarat – 380059.
M- 98792-00265 & 7069634602

To,

Date: 10.12.2020

The Secretary,

Gujarat Electricity Regulatory Commission

6th Floor, GIFT ONE, Road 5C, Zone 5, GIFT City, Gandhinagar

Re: Demand Draft for Petition under section under section 86 (1)(e) (4) and 181 of the Electricity Act, 2003 seeking implementation of Notification dated 1/2/2019 and 1/10/2019 issued by Ministry of Power

Dear Sir,

We act on behalf of M/s Hindalco Industries Limited, the Petitioner herein. The captioned Petition is being filed under section 86 (1)(e), (4) and 181 of the Electricity Act, 2003 read with Clause 12.1 of the GERC (Procurement of Energy from Renewable Sources) Regulations, 2010 and Article 6.4 of the National Tariff Policy 2016, seeking implementation of Notification dated 1/2/2019 and 1/10/2019 issued by Ministry of Power.

Through the present Petition, the Petitioner is seeking amendment of the aforesaid RPO obligations in terms of the mandate/ intent of the aforesaid notification

We humbly request the Accounts Department of this Hon'ble Commission to kindly acknowledge the filing of the Demand Draft and proceed accordingly. The above is for your information and record.

Thanking You
With regards

Krishal

KRISHAL H. PATEL

(Advocate for Petitioner)

FORM- I

S. No.	Particulars	Details
1.	Name of the Petitioner / Applicant	M/s Hindalco Industries Limited
2.	Address of the Petitioner / Applicant	Ahura Centre, 15th Floor, B Wing, Mahakali Caves Road, Andheri (East), Mumbai – 400093.
3.	Petition No., If any.	-
4.	Subject Matter	Application under section 86 (1)(e) (4) and 181 of the Electricity Act, 2003 read with Clause 12.1 of the GERC (Procurement of Energy from Renewable Sources) Regulation, 2010 and Article 6.4 of the National Tariff Policy 2016, seeking implementation of Notification dated 1/2/2019 and 1/10/2019 issued by Ministry of Power
5.	Details of fee remitted (a) UTR / DD / Cheque No. (b) Date of remittance (c) Amount remitted (d) Bank name & Branch	Demand Draft - No. 351030 Date of Remittance : 09.12.2020 Amount Remitted : Rs. 5000/- Issuing Bank : State Bank of India Issuing Branch : Corporate Road Branch

Date: 10.12.2020

Place: Ahmedabad

Krishal

Counsel for the Petitioner

(M/s Hindalco Industries Limited)

भारतीय स्टेट बैंक
State Bank of India
जारी करने वाली शाखा Branch:CORPORATE ROAD BRANCH
कोड क्र. /CODE No: 13925
Tel No. 079-76000387

PAYEE'S A/C. ONLY

मांगड्राफ्ट
DEMAND DRAFT

Key: TIMJAQ
Sr. No: 626675

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मांगे जानेपर GUJARAT ELECTRICITY REGULATORY COMMISSION******************** या उनके आदेश पर

ON DEMAND PAY OR ORDER

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IOI 000486351030
Name of Applicant

Key: TIMJAQ Sr. No: 626675
HARSHAD SOLANKI

AMOUNT BELOW 5001(5/4)

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भारतीय स्टेट बैंक
STATE BANK OF INDIA
अदाकर्ता शाखा / DRAWEE BRANCH:GANDHINAGAR
कोड क्र. /CODE No: 01355

प्राधिकृत हस्ताक्षरकर्ता
AUTHORISED SIGNATORY

शाखा प्रबंधक
BRANCH MANAGER
N. J. Parmar
PF 2095

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