Mainstreaming Wind Energy - Key Issues to be addressed

1 INTRODUCTION

Enactments prior to the Electricity Act 2003 had no specific provisions which would promote renewable or non-conventional sources of energy. This caused the policies for renewable sources of energy being left to whims and fancies of the State Governments and Electricity Boards though Ministry of Non-conventional Energy Sources (MNES) attempted to give impetus to sector by way Policy guidelines in 1994-95. These efforts had mixed results. However, the Electricity Act 2003 (EA 2003) has radically changed legal and regulatory framework for the renewable energy sector. The Act provides for policy formulation by the Government of India and mandates State Electricity Regulatory Commissions to take steps to promote renewable and non-conventional sources of energy within their area of jurisdiction. In fact, Section 3 of EA 2003 clearly mandates that formulation of National Electricity Policy, National Tariff Policy and Plan thereof for development of power systems shall be based on optimal utilization of all resources including renewable sources of energy.

While it is true that the Electricity Act 2003 has brought out radical changes to legal and regulatory framework applicable to renewable sector in the country, one should not forget that it was primarily enacted to bring about fundamental changes in the institutional and market structures in the power sector. As a result, currently entire power sector is going through massive transition, during which old institutions like State Electricity Boards have crumbled, new institutions like power pools and exchanges are taking shapes. The Act is helping develop competitive environment in the power sector in India.

2 THE ELECTRICITY ACT 2003

The Electricity Act, 2003 was passed by both Houses of Parliament and made effective from 10th June 2003, making it the single most important piece of legislation for the sector and effectively nullifying all earlier enactments that governed the electricity businesses of the State Electricity Boards, licensees and other sectoral entities. The Act provides for wide ranging reforms in the sector including the restructuring and re-organization of the electricity boards within a given timeframe and the drafting of various regulations by the State Electricity Regulatory Commissions (SERC) to act as a driver to this reform process.

Some of the issues addressed in the Act include captive generation, de-licensing of power generation, open access to transmission and distribution systems, multiple distribution licensees with own infrastructure, and other new areas including electricity trading. These provisions are expected to provide the much needed and long overdue fillip to stimulate private investment in the power sector and enabling competitive framework amongst various segments of electricity business. Specifically the ambitious steps the Act lays down include:

- **De-licensing of power generation**: The Act states that any generating company may establish, own, operate and maintain the generating stations without obtaining any license provided it complies with the grid standards set for the connectivity to the grid.
- **Captive Power Generation**: The Act allows any individual, body corporate, co-operative society or association of persons whether incorporated or not to set up the captive power plant. Further, the captive power plant would be immediately permitted "Open Access".
- **Multiple Distribution Licensees in the Area of Supply**: The Act specifically authorizes the State Commissions to award multiple distribution licenses in the same area of supply. Further, the Act states that license will not be denied to the applicant solely on ground that one distribution licensee already exists.
- **Open Access to Transmission System**: The Act mandates that "Open Access" be provided to the transmission system as soon as it is made effective.
- **Open Access to Distribution System**: The Act also provides for "Open Access" to be implemented in distribution thus enabling customers to choose their electricity supplier. SERCs are expected to introduce "Open Access" in phased manner and subject to other constraints such as cross-subsidies and operational constraints.
- **Trading in electricity permitted**: Trading has been identified as a distinct activity under the new legislation. While traders are required to obtain a licence, distribution licensee does not have to obtain a separate trading license.
- **Unbundling of the State Electricity Boards** including transfer schemes for assets/liabilities and employees within one year of the passage of the Act;
- Establishment of independent State Electricity Regulatory Commissions within six months;

- Notification of the State Transmission Utility within one year including the separation of the trading function;
- Preparation of a National Electricity Policy and a National Tariff Policy in consultation with the State Governments;
- Complete rural electrification and provide for management of rural distribution by Panchayats, Co-operative Societies, non-Government organisations, franchisees, etc.
- Provision for licence free generation and distribution in rural areas;
- Provision for private licensees in transmission and entry in distribution through an independent network;
- Provision for payment of subsidy through budget;
- Metering of all electricity supplied made mandatory;
- Establishment of an Appellate Tribunal to hear appeals against the decisions of the Central Electricity Regulatory Commission (CERC) and SERCs;
- Provisions relating to theft of electricity made more stringent; and
- Establishment of a forum for redressal of grievances of consumers and Ombudsman scheme within six months.

While these provisions required some immediate action, the broad timeframe for the adoption of distribution open access and other provisions was considered as between three to five years. Given the complexity of the sector and the issues involved timeline was considered as aggressive. Implementation of several of these provisions after three years of enactment is still a challenge.

2.1 Policies related to Renewable Energy

The Act also did one more novel thing. It, for the first time, explicitly stated the requirement of optimal utilization of resources including renewable sources of energy. Section 3 (reproduced below) of the Act requires Central Government to develop National Electricity Policy (NEP) and National Tariff Policy (NTP) to ensure optimal utilization of resources.

> *"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".*

The Act also recognized that to ensure provision of electricity to all, strategy of grid expansion may not always be the best strategy and therefore visualized development of mini-grid and off-grid applications through community participation. The Act gave away with the requirement of license for the notified rural areas. Further, under Section 4 mandated Central Government to develop policies for rural electrification and off-grid applications.

> *"The Central Government shall, after consultation with the State Governments, prepare and notify a national policy, permitting stand alone systems (including those based on renewable sources of energy and non-conventional sources of energy) for rural areas."*

Government of India, after extensive consultation process notified National Electricity Policy on 12th February 2005 and National Tariff Policy on 6th January 2006. Further, the Government has also circulated drafts for Rural Electrification Policy and Policy for stand-alone systems using renewable sources of energy and non-conventional sources of energy, though final policies are to be notified at the time of writing of this chapter.

2.1.1 National Electricity Policy (NEP)

The Clause 5.12 of the National Electricity Policy stipulates several conditions in respect of promotion and harnessing of renewable energy sources. The salient features of the said provisions of NEP are as under:

"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**)*

2.1.2 National Tariff Policy (NTP)

The National Tariff Policy recently notified on 6th January 2006 has further elaborated on the role of regulatory commissions, mechanism for promoting harnessing of renewable energy and timeframe for implementation etc. The Clause 6.4 of the NTP addresses various aspects associated with promotion and harnessing of renewable energy sources. The salient features of the said provisions of NTP are as under:

> *"(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."(**emphasis added**)*

2.2 *Regulatory provisions related to Renewable Energy*

Institution of the independent Electricity Regulatory Commissions is a backbone of the reforms process anticipated under the Electricity Act 2003. The legislatures have incorporated provisions which would enable this important institution of State Electricity Regulatory Commissions (SERCs) to take actions to promote renewable energy within their area of jurisdiction. These provisions are mandatory in nature and therefore put significant responsibility on SERCs.

Section 61 of the Act prescribes the philosophy to be followed by SERCs while determining tariffs while Section 86 prescribes the functions of the SERCs. Both these Sections have very important provisions from the perspectives of the renewable sources of energy.

Section 61 (h):

"*61. The Appropriate Commission shall, subject to the provisions of this Act, specify the terms and conditions for the determination of tariff, and in doing so, shall be guided by the following, namely:-*

(h) the promotion of co-generation and generation of electricity from renewable sources of energy;"

For the first time, promotion of cogeneration and generation of electricity from renewable sources of energy has been made explicit responsibility of the SERCs which are bound to take these considerations into account while drafting their

'Terms and Conditions of Tariff' Regulations. Nearly all SERCs have issued their Tariff Regulations incorporating suitable clauses which will enable SERCs to provide preferential treatment to renewable during tariff determination process.

While Section 61 (h) is important from the perspective of the determination of preferential tariffs, probably the most important Section in the Act from renewable perspective is Section 86 (1)(e) which reads as follows:

> *"86. The State Commission shall discharge following functions, namely –*
>
> ……..
>
> *(e) promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of total consumption of electricity in the area of distribution licensee".*

With careful reading, this sub-Section could be easily divided into three parts:

- Suitable measures for Connectivity to the grid
- Sale of electricity to any person
- Specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;

As of date, most SERCs have put significant emphasis on the last part of this important sub-Section i.e. specify percentage of electricity to be procured by the distribution licensees from the renewable sources of energy while virtually ignoring the first two parts. As of date, following SERCs have issued their Orders/ Regulations under this Section of the Act.

State	**Status of RPS Regulation**
Maharashtra	Order issued
MP	Final Regulation
Karnataka	Final Regulation
Kerala	Final Regulation
Orissa	Final Regulation
Gujarat	Final Regulation
Rajasthan	Order issued

State	Status of RPS Regulation
UP	Order issued
AP	Final Regulation
Tamil Nadu	Order issued

As mentioned earlier, all of these Regulations / Orders primarily cover the last part of the Section 86 (1)(e) which deals with specification of percentage of power to be procured through renewable sources. While development of regulations for this part of the section is probably the easiest, it has not been without usual share of conflicting perceptions. SERCs have on several occasions interpreted the provisions of the Act in a different manner. In this Section all such issues have been analyzed in detail.

2.2.1 Total consumption of electricity

The SERCs are required to specify the target which would be percentage of total consumption of electricity in the area of distribution licensee. The issue arises what constitutes 'total consumption of electricity' in the area of distribution licensee. Strictly speaking, total consumption would be sum of energy input at the interface point of the distribution licensee and energy generated and consumed within the area of distribution licensee. Obviously total consumption would include not only consumption by consumers of the utility but also technical and commercial losses and consumption by open access and captive consumers within the area of distribution licensee.

It would be interesting to analyze the interpretations adopted by various regulators while developing regulations under this Section. Most Regulators have placed the obligation as a percentage of the energy input to the distribution licensee. In this manner, SERCs have accounted entire energy purchased by the distribution licensee whether from outside of the area or within the area of distribution licensee. However, this method exempts important category of consumers i.e. open access and captive consumers from obligation of purchase of renewable sources of energy. This is certainly not desirable as with growth of open access market, significant obligation would be borne by the consumers who don't have choice of supplier while the consumers eligible for open access will get away without paying for this obligation.

2.2.2 Percentage Specification

As mentioned in earlier section, most SERCs have specified the percentage for total energy input into the distribution system of licensee. There has been significant variation in target percentage specified by various SERCs. This of-course reflects different potential for renewable sources of energy. TNERC has specified the target of as high as 10% while MPERC has specified target of just 0.5% for distribution utilities in its jurisdiction. This is a direct result of the fact that Tamil Nadu has huge wind potential while MP is not endowed with any renewable resource. However, this uneven development of renewable resources across the country would eventually result in tariff distortions. It is essential to develop policies which will ensure balanced development of renewable across the country.

While most SERCs have specified single target for procurement of renewable energy technologies, some SERCs have specified separate technology specific targets. For e.g. Madhya Pradesh Electricity Regulatory Commission has specified 0.5% target for purchase from wind energy sources. Similarly, APERC has reserved 0.5% for procurement from wind energy sources out of minimum purchase requirement of 5% from renewable energy sources. Following table provides the list of States which have technology specific targets.

State	Status of RPS Regulation
MP	0.5% (Wind)
Orissa	3% (Wind + Hydro)
AP	5% (0.5% for Wind)
Kerala	5% (2% for Wind)

While specifying the target some SERCs have not specified 'year on year' targets but have specified single target for the entire period. In regard, NEP has stated that "*Progressively the **share of electricity from non-conventional sources** would **need to be increased** as prescribed by State Electricity Regulatory Commissions*" implying that the target specified should increase every year.

2.2.3 Sale of RE to any person

As mentioned in earlier paragraphs, Section 86 (1)(e) require SERCs to develop policies which will promote sale of electricity to any person.

In case consumer sources power from persons (generating company, trading company or distribution licensee other than licensee in whose area of supply such consumer is located) under Section 42 of the Act then, energy input by distribution licensee shall be reduced to the extent of consumption outsourced by OA consumer. To that extent quantum renewable energy required to be procured by distribution licensee would reduce in 'absolute terms'. While Section 86(1)(e) of EA2003 provides that such percentage should be applicable on the 'consumption' within area of distribution licensee, the intention is clearly to apply such percentage on entire consumption in the area of distribution licensee irrespective of who is supplying such energy. Accordingly, it may be appropriate that OA consumers should also procure certain percentage of their energy requirement from renewable energy source, to the extent of their outsourcing.

Besides, if RPS obligation is levied only on distribution licensees and if eligible open access consumers are exempted from applicability of RPS then, it will not be fair to non-eligible open access consumers of the distribution licensees as the cost of renewable energy procurement is required to be borne by 'non-eligible open access consumers alone. While it is clear that renewable energy generation within the State 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 consumers are also subjected to RPS regime.

2.2.4 RE purchase from outside the State

Jurisdiction of the State Electricity Regulatory Commissions (SERCs) is limited to the State. Their regulations are applicable to utilities/entities regulated by them in the State where they are incorporated. Further, no institutional mechanism is currently available wherein regulators of two States could cooperate for optimal utilization of the resources within the region. As a result, no State has permitted purchase of renewable energy from outside the State.

However, if percentage specification is made applicable to open access and captive consumers as recommended in earlier, mechanism for inter-state purchase of renewable energy would be required sooner than later. Further, currently renewable

market is fragmented on the basis of state boundaries. If these boundaries are removed, it would help develop healthy competitive market which would help bring down prices of renewable energy.

2.2.5 Connectivity to the grid

This is another very important issue on which no SERC has taken any holistic view. At best one or two SERCs have ordered that connectivity should be provided to renewable energy generators on priority.

In India, eight states have commercially feasible wind potential namely Tamilnadu, Karnataka, Maharashtra, Andhra Pradesh, Madhya Pradesh, Gujarat, Kerala and West Bengal. Mapped Potential at 50 mtrs Hub height is 45,000 MW. With new wind power plants coming up at a rapid pace some issues need to be considered with respect to the same. High level penetration of wind energy leads to address these issues.

- Variability of wind and its forecasting;
- Grid connection standards for wind;
- Impact of wind power on grid stability;
- Transmission planning and evacuation of wind energy;
- Cost of integrating wind into the grid;
- Market integration of wind power.

Grid Interconnection Standards

Since power generated from wind is special, due to its intermittent nature, the interconnection standards as well are special for wind power, as compared to conventional source of generation. In India, no such wind connection standards have yet come up which may be due to low penetration level of wind into grid. But owing to increasing wind generation this intermittent source of generation shall require appropriate grid connection standards in line with those prevalent in other countries world over.

Such technical interconnection standards for wind energy should specifically address following key aspects – a) active power control, b) frequency control, c) voltage control, d) tap changer, e) wind farm protection, f) modeling and communication requirements.

As per Section 73 of EA2003, Central Electricity Authority has been mandated to notify Grid Connectivity Regulations and Grid Standards. While CEA has published

Draft Grid Connectivity Regulations for public consultation, it is yet to notify the same.

Impact of Wind power on Grid Stability

The impact of wind power on the power system depends on the size and inherent flexibility of the power system. It is also related to the penetration level of wind power in the power system.

When examining the impact of intermittency of wind on the grid, it firstly has to be noted that an analysis of individual wind turbines or wind farms in isolation does not capture the essence of the challenge posed. The fragmentation of the market might lead to the idea that each generator should provide individually for balancing reserve. However, this will not necessarily lead to a least cost solution from a systems perspective. Thus, the objective of mitigating intermittency is not to provide a steady output from each renewable generator itself (i.e. individual wind turbines or -parks), but to equal demand and supply at minimised operation costs to the electricity system as a whole.

Regarding the power system, the drawbacks of wind power are that wind power production is variable, difficult to predict and cannot be taken as given. However, integration of variable sources like wind is much less complicated if they are connected to large power systems, which can take advantage of the natural diversity of variable sources. A large geographical spreading of wind power will reduce variability, increase predictability and decrease occasions of near zero or peak output. The power system has flexible mechanisms to follow the varying load that cannot always be accurately predicted. As no production unit is 100% reliable, part of the production can come from variable sources, with a similar risk level for the power system.

Power system size, generation capacity mix (inherent flexibility) and load variations have an effect on how intermittent production is assimilated into the system. If the proportion of intermittent power production is small and if wind power production is well dispersed over a large area and correlates with the load then, wind power is easier to integrate into the system.

Thus, for large scale integration of wind into Grid, power system planning should not be confined to State specific boundaries. Wind energy is the site specific resource. Some States have been bestowed with significantly higher wind energy potential

than other States. Power system planning from broader perspective needs to be adopted to facilitate expeditious harnessing of available wind energy resource.

Transmission planning and evacuation of wind energy

One of the most critical issues for the development of wind energy in India has been the transmission capacity of the grid in the areas where the wind farms were built. Similar to many other countries, wind farms are concentrated in remotely located, hilly or coastal regions, where the existing transmission grids are very weak. In addition, in India the new wind farms are being built during a competitively short period of time and are restricted to a few areas, and the reinforcement of the transmission system in these areas has lagged behind the fast development of wind energy.

In fact, in the recent past timely availability of evacuation arrangement and transmission system capacity has severally affected not only the growth of wind energy installations but also posed limitation on despatch of existing wind energy installation due to operational system constraints.

2.2.6 Competitive bidding

Clause 5.12.2 of the NEP stated that "……..*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****."*

Further, 6.4 (2) of the NTP stated that "*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."*

Though none of the provisions of the Act indicated competitive bidding for procurement of renewable energy, both NEP and NTP have specific provisions for procurement of renewable energy under Section 86(1) (e) to be undertaken by the distribution utilities under Section 63 of the Act which provides for competitive bidding process. Further, it is necessary to review experience of competitive bidding in Indian context. On several occasions, bids have been floated for development of

conventional projects on competitive basis. However, barring gas based power project in Andhra Pradesh, it has not been possible to add significant capacity through competitive bidding route.

Currently, biding for 'Ultra Mega Power Projects' (UMPP) is in progress. Also, several utilities have floated tenders for procurement of power under Competitive Bidding Guidelines of the Ministry of Power, Government of India. It would be too early to evaluate the success of the same. It is very difficult to envisage, how competitive bidding for renewable energy could be conducted successfully when it has not been possible to develop thermal projects through this route.

Being well aware of this fact, most of the SERCs have not issued any specific directive to conduct any competitive bidding.

2.2.7 Preferential Tariffs

Section 61 (h) has specifically mandated SERCs to develop tariffs with an objective of promotion of renewable and non-conventional sources of energy. Further, though both NEP and NTP have referred to competitive bidding for procurement of renewable energy, NTP has specific provision favoring determination of promotional tariffs for renewable sources of energy.

Second paragraph of Clause 6.4 reads as follows:

> *"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.*** *" (emphasis added)*

Most SERCs have already issued tariff orders for main technologies operating within their jurisdiction. Following Table provides details of SERCs and technologies for which they have issued Orders.

State	Wind	Small Hydro	Biomass	Cogeneration	MSW	Solar
Maharashtra	√	√	√	√	√	
Andhra Pradesh	√	√	√	√		
Madhya	√					

State	Wind	Small Hydro	Biomass	Cogeneration	MSW	Solar
Pradesh						
Rajasthan						
Gujarat						
Tamil Nadu	√	√	√	√		
Kerala						
Karnataka	√	√	√	√		
Kerala						

Though Orders have been issued by SERCs for various categories of renewable energy, capacity addition in wind and biomass has been significant in the recent past. Obviously, tariffs have played a key role in this development. It would be interesting to analyze how provisions of the Act have been used by SERCs to develop tariffs for wind energy projects. In the next section, theoretical underpinnings for tariffs have been discussed followed by Sections on issues related to tariff design.

3 OTHER KEY REGULATORY CONCERNS

Over the past three years, many SERCs have issued Orders pertaining to tariff determination for wind energy projects and other related issues

Sr. No.	State	Date of the Order
1	Maharashtra	24th November 2003
2	Madhya Pradesh	11th June2004
3	Karnataka	18th January 2005
4	Andhra Pradesh	20th March 2004
5	Tamil Nadu	15th May 2006

However, some of the key issues that remain to be addressed and pose as major regulatory concern from industry perspective are highlighted in the following paragraphs.

3.1 Integration with the balancing market

National Electricity Policy as well as National Tariff Policy requires States to implement Availability Based Tariff Mechanism, one of the balancing market methodologies, at the intra-State level. Though NTP require implementation of ABT to be completed by 1st April 2006, no State could follow this deadline as

implementation of balancing market whether ABT or any other type requires significant efforts. Several SERCs have published discussion papers and are in the process of finalizing their methodologies for implementation of balancing markets.

Typically, any competitive market mechanism requires generators to give schedules for their generation some time ahead of actual period of generation. It is very difficult, rather impossible in Indian context, for wind generators to provide schedule for generation on 'day ahead' basis. Therefore, it is necessary to exempt wind generators from participating in balancing market.
Recently,

Recently, Karnataka (KERC), Gujarat (GERC) and Rajasthan (RERC) Electricity Regulatory Commissions have exempted wind energy generators from applicability of Intra-State ABT.

3.2 Reactive power charges

Reactive power is essential part of the power system and appropriate reactive power compensation is required to ensure voltage profile of the power system. Most generators supply to grid reactive power alongwith active power. However, wind generators are unique in this regard in that wind generators being induction generators consume reactive power rather than supply the same. Given that the reactive energy is an essential component of power system, it is reasonable that the wind generators pay for the reactive energy consumed from the grid.

Wind generator can install capacitor banks to meet its own reactive power requirement as well as to supply reactive power to the grid. However, if wind generator opts to draw reactive power from the grid, it has to pay for its consumption of reactive power. Various methods such as power factor penalty, kVARh billing, etc are available to penalize the reactive power consumer. However, most SERCs have opted for cost per unit of reactive power purchase as a method of billing for the reactive energy. This method is very simple to implement and administer. Further, necessary metering is usually part of the existing infrastructure.

MERC has specified charge of 25 paise per kVArh with 5% annual escalation for the quantum of reactive energy consumed upto 10% of active energy delivered. TNERC has also opted for the same reactive power tariff for reactive power drawn upto 10% of active energy delivered to the grid. However, for generators drawing more than 10% of net active energy, the TNERC has fixed a charge of 50 paise per kVArh for the

total reactive drawal. While MPERC has determined rate of 27 paise /kVArh (as revised from time to time) for purchase of reactive energy from the grid, it has not put any limit on drawal of reactive power from the grid.

3.3 Evacuation Facilities

Wind generation is largely dependent on geography. Typically, wind generators are installed in hilly terrain. Further, though individual wind generators are small in capacity, large number of such small generators are located at one place. This require good transmission infrastructure. According to EA 2003, it is the responsibility of the State Transmission Utilities to provide necessary infrastructure. However, given cash strapped situation of the STUs, it is often not in a position to invest necessary capital and this has been hindering the development of wind power projects. In some instances in Tamil Nadu and Karnataka, wind generators were asked to back down during windy periods due to transmission capacity constraints. SERCs have adopted various formulations to tackle this problem.

MERC has directed the developer to bear the cost of project switchyard and interconnection facilities at the project site upto the point of energy metering and utilities to bear the cost of transmission lines and associated facilities beyond the point of energy metering for the evacuation of power. However, given the poor cash position of the MSEB (now reorganized into various companies), direct the Developers to provide an interest free advance to the MSEB equivalent to an amount of 50% of the cost of works to be carried out by the utilities for power evacuation purposes. The MSEB is required to refund this interest free advance to the Developers, in five equal installments, spread over the period of five years, commencing from one year after the date of commissioning of the respective projects. TNERC, in its Order has directed STU in the State to create necessary infrastructure on war footing. TNERC has further directed STU to prepare the contingency plan and submit the same to the Commission within 45 days of the Order.

Formulation adopted by the MPERC is very similar to the one adopted by the MERC. MPERC has ruled hat 100 % of the cost of transmission lines and associated facilities beyond the point of energy metering for the evacuation of power will be borne by the developer. Out of this total cost, 50% is to be treated as interest free loan to the utility which would be refunded in five equal installments spread over a period of five years, commencing from one year after the date of commissioning of the respective projects. In this case, wind developers are responsible for transmission network even

beyond the metering point. This is likely to affect development of wind power in the State.

Even in cases, where developer has undertaken development of evacuation infrastructure, the STU/concerned Utilities have been demanding supervision charges to the extent of 15% of cost of works (including capital cost of equipment and systems) carried out. This poses significant cost burden on capital cost of wind energy project. Some SERC have acknowledged this anomaly and are in the process of addressing the same. MERC has stipulated that supervision charges of 15% shall be levied only on cost of labour component involved in execution of works and shall exclude cost of equipment and material.

4 ISSUES ASSOCIATED WITH OPEN ACCESS TRANSACTIONS

MNES as well as various State Government policies permitted wind power generators to use power generated for captive purposes. These policies also permitted wind generators to sell power to third parties. This was possible primarily due to two reasons i) inability of utilities to pay for wind power and ii) skewed tariff structure provided incentive to industries to procure power from wind generators than purchasing the same from the local distribution utility. As a result, in initial years, in most States, wind power picked up mainly for self consumption and sale to third party purposes.

However, during the last few years several changes have taken place in the power sector. Since the establishment of State Electricity Regulatory Commissions under Electricity Regulatory Commissions Act 1998, systematic efforts have been taken to rationalize the tariffs of the utilities. Also greater emphasis on improvement in efficiencies has resulted in lower losses and has improved cash flows of the utilities.

With the enactment of the Electricity Act 2003, significant efforts are being taken to develop competitive market in a structured manner. National level policies have tried to bring in more uniformity in application various principles of utility regulation and market development. Under new Act, open access has been permitted in a phased manner with target of providing open access to all consumers with more than 1MW load by January 2009. While third party sales under earlier legal framework was by exception, under new Act it is a rule and obviously SERCs as well as utilities are developing rules and regulations applicable to all such transactions. SERCs are required to determine the charges for transmission and wheeling along with methodology for loss compensation. Several SERCs have already issued orders

for transmission and wheeling charges. Further, the Act requires all OA consumers to compensate the incumbent utilities for loss cross-subsidy.

During last two years, prices of fossil fuel have nearly doubled resulting in increase in cost of generation from liquid fuel based power stations. Variable cost of generation from liquid fuel based power stations such as Kawas and Gandhar has increased to more than Rs.7 per unit. As a result, today utilities are more willing to procure power from renewable sources than earlier.

These developments can be summarized from the point of view of the wind generation as follows:

i) Levy of transmission and wheeling charges on OA transactions
ii) Requirement of transmission and wheeling loss compensation
iii) Reduction in incentive to sell to third part consumers
iv) Improved cash flows of utilities
v) Applicability of surcharges for OA transactions.
vi) Mandatory purchase under Section 86(1)(e)

As a result, sell of power to utilities has become the main driver for growth of wind power industry in the recent years. Nevertheless, open access transactions exist and therefore, it is essential to analyze critical regulatory and tariff issues affecting these open access transactions. In this section, such issues have been analyzed.

4.1 Applicability of OA Regulations

Under MNES policy as well as various State Government Policies, wind generators were allowed to sell power to third parties. These same 'third party sales' transactions are now referred to as 'Open Access' transactions under Electricity Act 2003 and these have been saved under Section 172of the Act.

However, the framework governing these transactions has undergone complete change. Earlier no specific regulations existed for these transactions and usually these transactions were settled on monthly basis. However, under new legal framework, where open access has been permitted to large number of consumers, SERCs are required to develop 'Open Access Regulations' under Section 181 to regulate such transactions. Issue which is frequently raised is, whether new Regulations would be applicable to old third party sales transactions. Many SERCs have not yet tackled this issue, however it is likely that SERCs will find it necessary to apply Open Access Regulations to these transactions.

4.2 *Wheeling charges*

MNES guidelines stipulated 2% wheeling charges for captive and third party sales transactions. Such low charges were primarily attributed to the promotional nature of policies. In reality, costs involved in wheeling of energy are certainly much more than this. With implementation of Electricity Act 2003 and various measures to create competitive environment in the Sector, it has become necessary to develop wheeling charges in more transparent manner.

Several SERCs have determined wheeling charges for captive and third party transactions. TNERC, in its recent Order has specified transmission and wheeling charges of 5% on captive and third party sales transactions.

4.3 *Surcharges*

As stated earlier, all Open Access transactions existing on the date of effectiveness of the Act have been saved under Section 172 of the Act, though these transactions would be governed by new set of provisions, rules and regulations. One such provision relates to payment of cross-subsidy surcharge under Section 42 of the Act. SERCs are faced with the question of whether cross-subsidy surcharge should now be applied to existing OA transactions. If applied, it could entirely change the economic viability of the transaction.

It was expected that National Electricity Policy (NEP) as well as National Tariff Policy (NTP), when announced would clarify these issues. Section 8.5.2 of the NTP clarifies that surcharge shall not be applicable if power is being supplied by a generating company under Section 43(A)(1)(c) of the Electricity Supply 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. NTP has specifically exempted these two categories of transactions from payment of cross-subsidy surcharge. However, State Governments permitted large number of third party sales transactions under Section 28 of the Indian Electricity Act 1910 which have not been exempted from the levy of the surcharge. SERCs will have to take into acc

TNERC has stipulated that Third party sale transactions would be governed by the Open Access Regulations and cross subsidy surcharge as determined by the Commission on the petition filed by the TNEB would be payable. TNERC has

MERC in its recent order on the 'Cross-subsidy surcharge related issues' has exempted open access transactions using renewable sources of energy. MERC has also exempted all existing OA transactions from levy of cross-subsidy surcharge.

4.4 Banking of energy for captive and third party sales

Under MNES policy as well as various State Government policies prior to enactment of Electricity Act 2003, banking of energy was permitted freely. However, since enactment of EA 2003 and drive to implement balancing market mechanism at the State level, banking of energy has become difficult as it exposes distribution licensee to imbalance risks. Further, banking has not been defined as a service to be provided by the distribution companies.

Nevertheless some SERCs have permitted banking of energy, albeit with lots of restrictions. For e.g. TNERC in its recent Order dated 15th May 2006 has permitted banking for a period of upto one year. However, this banking is to be carried out on TOD basis and any energy not utilized at the end of the year will be purchased by the utility at 75% of the rate applicable for that slot. Further, it has also imposed 5% charges for banking of energy. Similarly, APERC has allowed banking of energy with 2% banking charges.

The KERC has formulated a very complex mechanism, wherein KERC has allowed banking facility in respect of wind and mini-hydel projects subject to payment of difference of UI charges between the time of injection and time drawal of the power from these sources and also payment of banking charges @ 2% of the input energy.

4.5 Transmission and distribution loss compensation

MNES guidelines provided for transmission and wheeling charges though did not explicitly provide for compensating for loss incurred on network. However, with unbundling of network and services and associated costs, significant transparency has come in pricing of these services. Transmission and distribution losses which were earlier combined together in single loss number are now segregated and are required to be compensated separately depending on incidence of the transaction. This issue assumes importance only in case of open access and wheeling charges.

MERC in its Order, has ordered levy of transmission losses of 5% for third party sales as well as captive transactions till such time realistic level of loss compensation is arrived at through scientific study which the Commission intended to take up.