Preparation of road map for mainstreaming wind energy in India

[Sponsor: Indian Wind Energy Association]

Executive summary

The wind power sector in India has reached a juncture where few strategic impetuses would catapult it into the mainstream of country's power sector. The goals of the study were to revisit the potential market for wind power projects in light of ever-growing power shortages and increased consciousness about the impact of electricity generation; evaluate socio-environmental benefits of wind power vis-à-vis conventional power; develop a better understanding of the current state of the technology; analyse the international initiatives for promoting power from renewables; and to develop a plan for advancing the penetration-levels of wind power technology. Key observations of the study are summarized below.

- **Power situation**

  The magnitude of energy consumption has always been taken as an indicator of development status of an economy. India's projected economic growth rate is pegged at 7.4% in the period 1997–2012. This would necessitate commensurate growth of energy resources, most of which is expected to be from fossil fuels and electricity, in the business as usual scenario. In the Indian scenario, brown outs and black outs had become a way of life due to peaking as well as general energy shortage, especially in non-metro and rural areas. In such a scenario, it is possible to absorb every unit of wind power, irrespective of its quantum and the time of delivery.

- **The environmental impacts**

  Coal is the mainstay of electricity generation in India. Coal is also the dirtiest fossil fuel in terms of harmful emissions and negative impacts on environment, human health, flora, and fauna. If the current expansion of power generation based on coal continues, the Indian power system will pose a serious threat to the environment in the coming years. Even at the 16th EPS estimates of the total energy requirement to reach 975 billion units by 2012, at the current fuel-mix, the total emissions could reach levels of 780 MT (million tones) of CO_2 (carbon dioxide), 4.7 MT of SO_2 (sulphur dioxide), and 1.3 MT of NO_x (oxides of nitrogen). This means that utilization of environmentally sound technologies must increase substantially to counter these negative impacts. Total emissions in 2001/02 from power generation in India were about 415 MT of CO_2, 2.5 MT of SO_2, and 1.3 MT of NO_x. The Mahatrashtra case study

brings out the fact that wind power, through generation of 1505 million units (till August 2003) has saved 1 324 400 MT of CO_2, 7525 MT of SO_2, and 3010 MT of NO_x. Indeed, were all of 45 000 MW (megawatts) of wind power potential in the country to be exploited, then on the basis of MNES (Ministry of Non-conventional Energy Sources) estimates of environmental benefits of wind power, it would result in mitigation of 90 000–128 000 tonnes of SO_2; 45 000–109 000 tonnes of NO_x; 6400–12 800 MT of total suspended particulates; and 22 MT of CO_2 annually.

- **Wind power and energy security**

  Normally, energy security is conceptualized in terms of the risks of fuel supply disruption. However, fuel price volatility probably represents a more important aspect of energy security. At times, price volatility may well have more profound effects on economic well-being than temporary supply disruptions. Wind energy offers a direct mean of dealing with it. Indeed, wind energy represents a form of 'insurance' against high fossil prices. Estimations and planning exercises do not take into account the possible escalation in the prices of coal. The cost of coal could rise abnormally in future on account of following reasons

  (i) Mining has to be undertaken much deeper when all the surface coal is finished
  (ii) New coal fields are situated on thickly populated areas
  (iii) More land for mining is either not available or is forestland

- **Wind power and socio-economic development**

  Wind energy is also a key potential source of sustainable jobs that are created without adding to air pollution, greenhouse gases, or other types of pollution and environmental damage such as mining or oil spills. Indeed, the wind farms, most of which are situated on remote rural locations, have been able to bring about a sea-change in socio-economic conditions of those rural areas. By way of generating income through land sales, through employment generation, and through other economic activities built around wind farms, wind power has contributed significantly to the rural development. The setting up of 338 MW wind park at Satara, Maharashtra, created about 600 jobs at the factory and 2000 indirect jobs at the ancillary units. It is further estimated that Satara wind park has resulted in around 120 million rupees pumped into local economy through personal income. Moreover, the local job creation also helps in minimizing the rural-to-urban migration.

- **Why more wind power in India**

  Apart from the aforementioned points, the rationale for mainstreaming wind power in the country gets further buttressed because of the following reasons.

- Wind power is one of those renewables-based power generation technologies that have demonstrated sufficiently low risk to gain the attention of the financial community and independent power developers for near-term projects.
- Significant technology advances have occurred since the first wind power plant was installed in the country in early 1980s.
- Industrial learning curve theory suggests that costs decrease by about 20% each time the number of units produced doubles. Thus, the costs of wind turbines could be brought down by increasing the market volume.
- Insofar as impacts on the power systems are concerned, it is an established fact that addition of wind power results in (a) reduction in technical losses and (b) strengthening of voltage levels.
- In case of Maharashtra, 70% of the total wind electricity generation is during high-demand slots and 30% of total wind generation takes place during morning and evening peak hours, in both, high wind and low wind seasons. As such, wind electricity could be awarded premium in line with those prescribed under ToD (Time of Day) tariff structure of Maharashtra State Electricity Board.
- The detailed analysis shows that the levelized annual cost of wind power is less than that of a new thermal power station. Comparing the costs, it has to be noted that while the cost of energy from a thermal power station is initially low, it continues to increase with increases in the cost of fuel. On the other hand, the cost of wind energy is initially high and reduces as loans are repaid, as no variable cost is involved.

These points, in essence, create a backdrop that underscores the rationale for promoting accelerated exploitation of wind resources in India for power generation.

Plan of action

The plan articulated below is devised to address those issues and aspects that are pivotal to accelerated growth of wind power sector in the country. The plan, therefore, suggests concrete steps that allow wind power to mature to the point where it can compete directly with conventional power in the regions, rich in wind energy resources. These steps include the following.

1. *Technical assistance for SERC* Detailed studies on the matters such as grid absorption capacity; intermittency issue of wind power; reactive power; scheduling of conventional power plants; fluctuations; time of day tariff; and hybridization of available resources should be commissioned by the MNES and state nodal agencies.

2. *RPS (Renewable Portfolio Standards)* On the basis of detailed assessment of renewable energy resources in the state, the SERC should come out with RPS, outlining share of each mature/near commercialization renewable energy technology. This should also include framework for trading of green power/certificates.

3. *Preferential tariff* Considering the fact that cost of externalities is not included in the electricity tariff in the country, a preferential tariff needs to be awarded to the wind power in view of its environmental and societal benefits. The higher tariff is also justified in view of the perceived risks associated with financing of new technologies like wind energy in the country. Thus, the tariff should be firm and long-term so that it sends positive signals to the investors and developers. The tariff could be higher during the initial years when loan has to be repaid. Thereafter, it can be reduced in phased manner. Any 'tradable emission credits' or 'tradable renewable energy certificates' resulting from wind power projects getting any financial/fiscal benefits will be the property of the project developer.

4. *Competitive bidding* The competitive bidding should be introduced to bring about a steady convergence between the price paid for wind power in successive years and the market price of the conventional electricity.

5. *The climate change levy or carbon tax* The climate change levy or carbon tax should be levied on the fossil fuels and conventional electricity to create a fund for (i) meeting incremental portion of tariff for wind power, (ii) technology upgradation and up-scaling of manufacturing facilities, and (iii) easy financing of infrastructural requirements.

6. *Wind power bonds* To finance the wind power development, tax-free wind power bonds may be issued by the designated institution with full guarantee from the Government of India.

7. *Grid mapping and strengthening* In order to facilitate large wind farms, EHV grid master plans for the potential areas should be prepared along with strengthening of the grid network, in step with identification of potential sites for wind installations.

8. *Sensitization of the decision/policy makers* To cater to the need expressed at various fora by the policy-makers, regulators, and the utility managers about getting to know the nuances of wind power development and its characteristics, sensitization workshops should be organized in the resource-rich states.

9. *Awareness creation* The exercise of awareness creation has to be carried out at different levels, comprising school children; parliamentarians and legislators; the potential investors and/or developers; and financiers.

10. *Media strategy* It is important to put forward wind power sector's views and needs to potential users, law makers, as well as public at large in an effective manner. Essentially, the aim should be to focus on strategic mainstream groups rather than the renewable energy community. For this a variety of information tools, such as

regular publications, news releases, briefing documents, statistics and market data, and presentations could be used.