

**MADHYA PRADESH ELECTRICITY REGULATORY COMMISSION
BHOPAL, MADHYA PRADESH**



ORDER

(Passed on 11th June 2004)

In the matter of procurement of wind energy

MADHYA PRADESH ELECTRICITY REGULATORY COMMISSION

Section 86(1)(e) of the Electricity Act of 2003 requires that the Commission shall promote renewable sources of energy through (a) ensuring that Licensees extend the grid suitably to draw power from renewables and (b) ensuring that each Licensee purchases a minimum requirement as a percentage of total consumption in his area of supply.

Section 61(h) mandates that the Appropriate Commission, shall be guided by the promotion of co-generation and generation of electricity from renewable sources of energy while specifying the terms and conditions for determination of tariff.

The Commission accordingly issues the following Order to meet the above requirements of the Electricity Act, 2003.

A1: BACKGROUND

Promoting Energy Generation from Renewables

- 1.1 Non-conventional / renewable energy sources such as wind, solar, mini-hydel, biomass, urban-municipal waste or other such sources as approved by Ministry of Non-conventional Energy Sources (MNES), Government of India (GoI) or Government of Madhya Pradesh (GoMP) and co-generation need to be encouraged in view of the advantages they offer. The MNES at the central level and various agencies at the state level promote the development of non-conventional energy sources in the country as they are renewable in nature and less polluting than conventional sources
- 1.2 According to MNES, in India, the total installed capacity from renewables at the end of 9th plan stood at 3000 MW (3% of the total installed capacity in the country).
- 1.3 Among the various sources of renewable energy, the estimated potential for various types in the state of Madhya Pradesh is as mentioned below:

Table 1: *Estimated capacity for Power Generation from Renewables in MP*

Source	Potential (MW)	Presently installed (MW)	Source
Wind	825	23	MNES
Biomass	200	3.7	www.mprenewable.org , ARR for FY04 and FY05
Solid Waste /Urban	78	NA	Powerline, March 2004

Waste			
Mini / Micro hydel	336	5.45	Powerline, March 2004, ARR for FY04 and FY05
Solar	339 kWp	NA	Powerline, March 2004

Potential of Wind Energy in Madhya Pradesh

- 1.4 The potential in MP is estimated at 5500 MW as gross potential and 825 MW as technical potential, as identified by M.P.Urja Vikas Nigam Ltd.,Bhopal . At a Capacity Utilization Factor (CUF) of 22.5% this technical potential translates to an annual potential of 1626 MU.

Legal Provisions for tariff determination

Provisions of Electricity Act, 2003

- 1.5 The Commission draws its powers to determine tariff through the Electricity Act, 2003 (36 of 2003). The relevant provisions of this Act are as follow:

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

(h) The promotion of co-generation and generation of electricity from renewable sources of energy

Further the Electricity Act, 2003 provides that:

62.(1) The Appropriate Commission shall determine the tariff in accordance with provisions of this Act for –

(a) Supply of electricity by a generating company to a distribution licensee:

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;

Transmission of electricity;

Wheeling of electricity;

Retail sale of electricity.

The Act provides specific reference to promotion of renewable energy sources:

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:

Providing that where open access has been permitted to a category of consumers under section 42, the State Commission shall determine only the wheeling charges and surcharge thereon, if any, for the said category of consumers;

(b) 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;

(c)

(d)

(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 licensee;

Government Incentives to Renewables Energy

Central Government Incentives to Renewables Energy

- 1.6 Development of renewable energy technologies has a long history in India. Commission for Additional Sources of Energy (CASE) was formed in 1981 for the development and promotion of renewables. Since then the sector has undergone various stages of development. Department of Non Conventional Energy Sources (DNES) was set up in 1982, which later became the Ministry of Non-conventional Energy Sources (MNES) in 1992. CASE is now a part of MNES.
- 1.7 Policy development stage included provision of financial and institutional support for renewable energy technologies. MNES, in 1993, prepared policy guidelines for promoting power generation from renewable energy sources which contained important guidelines regarding pricing of renewable energy.
- 1.8 On the financing front, in order to overcome the burden of high initial cost and high financing risk perception of the renewable energy technologies, Indian Renewable Energy Development Agency Limited (IREDA) was established in March 1987 as a public sector enterprise to finance renewable energy projects. Loans for such projects were provided by IREDA at lower interest rates. Depending upon the commercial viability of different renewable technologies, the interest rates were increased gradually for some projects. Today, in many sectors, including wind energy, the interest rates offered by IREDA are at par with market interest rates.
- 1.9 The Government of India, through MNES and the various State Governments has been supporting investment in non-conventional energy through various policy measures to promote the same. These incentives are by way of:
 - Fiscal and financial incentives
 - Permission for wheeling, banking, third party sale and buy-back by SEB's
 - Capital subsidies in some states

- 1.10 The MNES Guidelines suggest charging only 2% as wheeling charges, banking of energy for up to 1 year and also recommend third-party sale at remunerative prices.

Financial and Fiscal Incentives

- 1.11 Some of the key fiscal and financial incentives which have been provide in the past are:

- ✓ Concessional import duty on specified wind turbines
- ✓ Accelerated depreciation up to 80% allowed in the first year¹
- ✓ Sales tax, excise duty reliefs
- ✓ Soft loans from the IREDA
- ✓ Income tax holiday for first five years
- ✓ 5% annual escalation in tariff was recommended to be provided
- ✓ Financial assistance of 60% of the cost of wind turbine equipment, up to a specified limit².
- ✓ Facilitate purchase of private land etc.

MNES Guidelines for Non-conventional Energy Tariffs

- 1.12 MNES had prescribed the tariffs for purchase of power from renewable sources of energy.
- 1.13 The MNES guidelines assume 1994-95 as the base year for tariff determination and for that year, the tariff was set at 2.25 rupees / Unit with a provision for escalation of 5% per annum for the first 10 years. From the end of 10th year onwards, the price of power shall be equal to the purchase price in the 10th year. The MNES guidelines also require that the period of PPA must be a minimum of 20 years and can be extended by another 10 years.

¹ As per Ministry of Non-conventional Energy Sources [<http://mnes.nic.in/wp4.htm>]

² 3.5 Crores / MW for determination of CFA. The ceiling in respect of all Special Category States and Islands would be Rs. 4 Crores / MW.

MP State Government Incentives to Renewables

1.14 The Government of MP announced a separate scheme for promotion of renewable energy. This scheme is different from MNES guidelines in some respect.

1.15 The Scheme of Incentives by the Government of MP is provided below. As per the notification dated 14/09/98, the GoMP decided to give the following incentives for development of Non Conventional Energy sources:

1. *any industry, institution, or private agency, desirous of installing a power generating unit based on Non Conventional Energy Sources like mini/micro Hydel, wind energy, Bio energy, solar energy etc. in M. P. shall be welcome to establish such a unit and shall be eligible for these incentives*
2. *the party may set up the unit either by itself or as a joint venture with M.P. Urja Vikas Nigam Ltd.*
3. *Under this scheme the capacity of Small-mini micro Hydel projects shall be limited up to 3 MW. For projects based on other Non conventional Energy Sources, any power project having a capacity of 50 kW (minimum) and above shall be eligible. The party may use the power generated themselves at the point of generation or at any other place or sell it to the MPEB (the Madhya Pradesh State Electricity Board) or to a third party, provided such a third party is a H.T. (High Tension) consumer of the M. P. Electricity Board (MPEB).*
4. *For wheeling of power from the point of generation to any other place for the party's own use or for selling it to third party wheeling through MPEB'S transmission/distribution system will be allowed on payment of 2% wheeling charges. The state government will separately compensate MPEB towards line losses etc. at the rate of 4% of the power wheeled. The wheeling charges will be 2% irrespective of the distance to which the power is wheeled.*
5. *Power generated through Non Conventional Energy Sources will be purchased by MPEB at the rate of Rs. 2.25 per unit. For sale of power to a third party, the rates are to be settled mutually between the generating party and the third party.*
6. *Electricity generated from Non Conventional Energy and sold either to the MPEB, or to a third party, or consumed by the party itself will be exempted from payment of electricity duty 5 years.*
7. *Any industrial unit which is a consumer of MPEB and which establishes a power generating unit from Non Conventional Energy Sources for its own use will be given exemption from the demand cut to the extent of 30% of the installed capacity of the Non Conventional Energy unit.*
8. *Metering equipment for the sale of power will be provided by the party at its cost at points decided by MPEB. The meters will be duly approved and tested by MPEB.*
9. *The transmission / distribution lines and transformers required for transmitting power from a Non Conventional Energy generating unit to the nearest grid /sub station of MPEB and any equipment required for synchronizing, protection etc. will be provided by the party as per the specification of MPEB, alternatively, these can be provided by the MPEB at the cost of the party, however these lines / equipment will be maintained by MPEB, but the party will be required to pay operation and maintenance charges as decided by MPEB.*
10. *Government land (GO MP revenue dept. circular of 16-3/ 93/ seven/2a, Bhopal , dated 25.10.97) if available, will be made available to the party , subject to renewal. For the first five years the land will be given on a token premium / rental of rupee one per annum and thereafter the premium and the annual rent will be decided on terms and conditions prescribed by the government from time to time. The premium and the*

lease rent after the expiry of the five years will be decided based on the market rate of land in sixth year. For [Wind Energy Projects](#) the open land required for free flow of wind (other than the land required for the project) will be provided free of cost on the basis of the proposal from energy department This open land will remain in the possession of the Energy Department.

- 11. In case of non-availability of government land, private land will be acquired by the Government and made available to the party at acquisition cost. No service charges will be payable. Permission for conversion of land use will not be required. The party will only be required to inform the District Collector for use to be made.*
- 12. Power generating units based on Non Conventional Energy Sources will be treated like industry and all the concessions applicable to new industrial units will be applicable to these power-generating units also.*
- 13. The parties desirous of setting up Non Conventional Power Generating Systems will be required to give their application to MANAGING DIRECTOR, M.P. URJA VIKAS NIGAM LTD., BHOPAL with a copy to SECRETARY, M..P. ELECTRICITY BOARD JABALPUR. Approval of projects up to 3 MW will be given by M.P. URJA VIKAS NIGAM (M.P. ELECTRICITY BOARD FOR HYDEL PROJECTS ONLY). Cases for projects of capacity beyond 3 MW will be referred to the state government for approval. After the required approval , the generating unit , and also the user unit will be required to enter in to necessary agreement with M.P. ELECTRICITY BOARD.”*

1.16 Key incentives given by the GoMP to investment in renewables are summarised below:

- (a) Offer of joint venture with MP Urja Vikas Nigam Ltd.
- (b) Wheeling charge of 2% irrespective of distance charged to the generators
- (c) GoMP to compensate MPSEB at the rate of 4% additionally
- (d) MPSEB to purchase at 2.25 rupees per unit.
- (e) 5-year holiday on electricity duty.
- (f) Open land required for free flow of wind will be made available to investor free of cost.

A2: PROCEDURAL HISTORY

- 2.1 The Commission had received petitions from MP Windfarms Limited, Bhopal, to determine their tariff. Accordingly, the Commission issued an approach paper on Tariff setting and support to Renewable sources on 27th February, 2004.
- 2.2 This discussion paper expressed the Commission's opinion and sought feedback on the following issues:
- Identify issues that may arise as a result of increasing production from renewable sources.
 - Discuss mechanisms to arrive at a suitable tariff for wind energy, which is a large source of renewable power.
 - Discuss other tariff related issues such as Minimum Purchase Requirements for the Licensees, banking of power, settlement mechanism etc.
- 2.3 In response to the approach paper, the Commission received responses from the following associations/ individuals:

Kalchuri Trading & Investment Co. Ltd., Jabalpur
MP Urja Vikas Nigam Limited, Bhopal
MP Electricity Consumers Society, Indore
Indian Wind Power Association, Mumbai
MPSEB, Jabalpur
M/s Consolidated Energy Consultants Ltd., Bhopal & M/s MP Windfarms Ltd., Bhopal

- 2.4 The Commission conducted a hearing on 31st March 2004 at the Commission's Office at Bhopal, on wind tariff determination. The list of attendees is annexed (Annexure I).

A3: TARIFF DETERMINATION MECHANISM FOR RENEWABLES

3.1 The tariff setting mechanism must meet the following key objectives:

Interests of consumers

3.2 Fairness to consumers is of significant importance, which would lead to consumer welfare. One of the derivatives of this objective is that the retail tariff should not witness a significant upward revision just for the purpose of accommodating green or renewable power. It must also be ensured that the equipment and machinery used are of high efficiency, are cost effective and that investments are made in locations that offer highest CUF and energy generation, etc.

Fairness to Investors

3.3 The tariff must ensure that the investor earns an adequate return on investment. This should be fair and consistent reflecting the risks and opportunity costs. This will provide the necessary signal and incentive to potential investors to invest in green power.

Interests of Licensees

3.4 The power purchase tariff must also be fair to the Licensee(s) and should reflect the costs and benefits on account of the mandatory requirement to purchase power from renewables energy generators. Factors such as reliability and availability (e.g. in firm nature of wind) could be of serious concern in case the quantum of renewables energy is large as compared to the total purchases. Inconvenience to the licensee on account of such factors should be given due consideration.

Tariff Determination Process

3.5 The tariff determination mechanism could be a Cost-plus, Market Driven, Long Run Marginal Costing and Avoided Cost of Generation. The latter two are difficult to estimate accurately and therefore are not being considered.

Market Determined Pricing

3.6 In a free market, where there is perfect competition market determines the price. However, there is a good reason that the market driven pricing mechanism may be difficult to apply in the case of renewables. The same is elaborated below.

3.7 Under market determined prices, the buyer of power would go in for merit-order dispatch and purchase power from the cheapest source. However, wind power is a costlier source as compared to conventional sources of power. Adopting merit order dispatch may lead to wind power not getting dispatched at all.

- 3.8 To illustrate this point in MP context, the costs of power from various sources of MPSEB are given alongside. In FY04, the highest cost of power was 332 P/U from the Kawas Station. Unless any wind energy generator is able to provide power at a rate less than 332 p/u, it would not be able to dispatch its power under merit order dispatch scenario.

Source	Paise/unit	
	FY04	FY05
Korba	87.23	87.65
Vinyachal	130.81	128.13
Vindyachal II	165.07	160.56
Kawas	332.42	336.1
Gandhar	310.82	307.16

- 3.9 The ABT mechanism provides for marginal price determination wherein the marginal price of power depends on the current frequency of the grid. Furthermore, wind power – which is the main renewable in MP – cannot be dispatched depending on the conditions of the grid, since it is heavily dependent on wind flow patterns. These factors make market pricing of wind power difficult to implement.

Cost-Plus Tariff Determination

- 3.10 Market determined pricing is difficult to implement for renewable sources because of their uncertain nature and higher costs of generation. Hence, cost-plus tariff determination is a more practicable method. Some of the reasons which make cost-plus tariff simpler and acceptable are as mentioned below:
- Can be easily designed to provide adequate return to the investor; a surety of return will lead to larger investment in renewables power.
 - Costs of renewables power generation sets are reducing rapidly and since it is difficult to predict this reduction, as the cost falls, the actual cost can be reflected through the cost plus tariff mechanism.
- 3.11 The Commission therefore has decided to determine tariff for wind energy projects based on the Cost Plus approach.

Single Part vs. Two Part Tariff

- 3.12 Two part tariff is applied in order to recover fixed and variable costs through the fixed and variable components of tariff. This is specifically useful in a scenario of merit order dispatch.
- 3.13 All the respondents during the public hearing supported the idea of Single Part tariff for wind power since it is not amenable to merit order dispatch principles because of infirm nature. Also, almost all the costs of wind energy generators are fixed in nature, hence it is appropriate to have a Single Part tariff for wind energy generators.

- 3.14 Considering the above mentioned arguments, the Commission deems it fit to determine and apply Single Part tariff for the purpose of wind power.

Tariff Design

- 3.15 This section on tariff design discusses issues such as project specific tariff or a single tariff applicable to all wind energy projects, the structure of the tariff over the life of the project, the period for which the tariff shall be valid etc. These are important issues that have significant bearing on tariff and consequently on the investment in wind energy projects in the state.

Tariff – Project Specific or Generalized

- 3.16 A Generalized tariff mechanism would provide an incentive to the investors for use of most efficient equipment to maximize returns and for selecting the most efficient site while an individual tariff determination (Project Specific tariff) would provide each investor, irrespective of the machine type and the site selected, the stipulated return on equity which, in effect, would shield the investor from the uncertainties involved in CUF due to machine type and the site location.
- 3.17 The Commission believes that the tariff setting mechanism must promote efficiency in the use of machines, in identification of good sites, and in operational ease. In view of this, the first method of setting up of a single tariff for all renewables projects is a preferable option if computed with due consideration to all factors.
- 3.18 After hearing the representations made by respondents, the Commission is of the opinion that since MP is not well endowed with wind energy; a very careful scrutiny would be required to determine if the site selection as well as the machine type is optimum. This should also prevent the retail consumers from being loaded with inefficient wind tariffs. Thus, in the interest of the retail consumers, it would be appropriate to set up such a tariff structure that incentivises the developers to choose the optimum site and machine type. Thus the Commission deems it fit to adopt a tariff structure where there will be a Generalized tariff for all wind energy projects, based on efficient norms for costs.

Tariff Structure

- 3.19 The final tariff determined, in a cost-plus scenario, would depend significantly on the assumptions on investment costs, operating and financing costs and the CUF in a cost-plus scenario. The key drivers of cost are as mentioned below:
- Capital investment
 - Life of plant and salvage value
 - Depreciation rate applicable
 - Operation and maintenance expenses

- Debt-equity ratio
- Interest costs on debt
- Return on equity
- Capacity Utilization Factor

3.20 While setting tariff, it is also important to consider the actual cash flow position so that there is cash surplus at all times for meeting all liabilities.

Capacity Utilization Factor (CUF)

3.21 The CUF is a key factor in the tariff determination process because the projection of quantum of energy generation and the revenue earned depends critically on it. Hence, an accurate estimate of CUF is essential.

3.22 The CUF depends on several factors such as wind regime of the site, the quality and age of machines installed, height of the stub, length of blade etc.

3.23 With regard to CUF, the MP Windfarms Limited provided a list of average CUF in various sites in Madhya Pradesh in Annexure: P7 of its petition³ according to which the average CUF is 19.58%. However, there is a disagreement on the CUF levels, which are claimed differently by various sources. For example, the petition claims the CUF of the Jamgodri Station in Dewas at an average of 17.75% and UVN claims it to be 19.80%. However, the Enercon disputes this and claims a higher CUF of 25% at the same site.

3.24 The difference in the CUF's claimed by different sources is due to the fact that CUF had been measured over different timeframes and for different machines. Factual or computational errors cannot be ruled out either.

Estimates of CUF for Wind Energy Sites in Madhya Pradesh

Site	District	Wind Power Density			CUF		
		MPWF	UVN / MNES	Other	MPWF	UVN	Other (Enercon)
Jamgodrani	Dewas	222	222	-	18%	20%	25%
Kukru	Betul	255	255	-	18%	-	-
Mahuriya	Shajapur	217	217	176	18%	-	-
Mamatkheda	Ratlam	255	255	214	22%	25%	-
Sendhwa	Khargaon	215	215	-	17%	-	-

³ MPWL/MPERC/PETITION No. 231/02/575

Nagda	Dewas	371	371	-	24%	25%	-
Newali / Valyapani	Barwani	-	-	200	-	24%	-
Khera	Dhar	-	-	-	-	20%	-

3.25 The Commission would like to promote investment in efficient equipment at good sites. The Commission would, therefore, like to assume a CUF that will promote investment in such desirable sites. In view of this, and after duly considering the respondents opinion during the public hearing, the Commission has taken a minimum **CUF of 22.5%, without derating**, as a reasonable estimate for ‘modified’⁴ category of machines.

Capital Investment

3.26 The capital investment may be considered on the basis of per unit energy generated. The Commission has taken into account the estimates of investment per MW of installed capacity and the Capacity Utilization Factor (CUF) while arriving at the capital investment figure per unit of energy generated.

3.27 There is a wide variation in the project cost estimated by different agencies / entities for investment in wind power projects. The expected investment ranges from Rs. 3.5 crore to Rs. 5 crore per megawatt.

3.28 During the public hearing, Indian Wind Power Association, Mumbai, favored a CUF of 22%, fixed for entire life of the plant, with a capital investment of Rs. 4.5 Cr./MW for modified category of machines. The representative from Suzlan mentioned that Rs. 4.5 Cr./MW is a reasonable estimate for capital investment. He also suggested that this figure be linked to the steel price index so that cost escalations in steel prices are duly factored in while arriving at the correct estimate.

3.29 Based on these estimates and inputs received from various stakeholders during the public hearing, the Commission has decided that **Rs. 4.5 Cr.** is a reasonable estimate for cost of investment in a 1 MW project.

3.30 As mentioned above, the Commission has taken **22.5% CUF**, without derating, as a reasonable estimate for ‘modified’ category of machines.

⁴ There are 3 categories of machines – orthodox, modified and improved

- 3.31 The respondents, M/s Consolidated Energy Consultants Ltd., Bhopal and M/s M.P. Windfarms Ltd., Bhopal suggested that the rational factor to be considered for determination of capital cost is in terms of energy generated per unit. The Commission finds it appropriate since this measure encompasses both the parameters of cost/MW as well as the CUF of the plant. Based on the above, the Commission deems it fit to fix the capital investment norm at **Rs. 23/kwh of energy generated per year as detailed below :**

Installed Capacity (in MW)	1
CUF	22.5%
Generation (in MU)	1.971
Capital expenditure (Rs.Cr./MW)	4.5
Capital expenditure (Rs./u)	22.83

Life of Plant

- 3.32 Except for the MP Electricity Consumers Society, Indore, which suggested a plant/project life of 30 years, all other respondents proposed 20 years as the life of wind power generation units.
- 3.33 Other states like Andhra Pradesh and Maharashtra, too have assumed the plant life to be as 20 years. International experience also suggests the expected project life for a wind energy project to be 20 years.
- 3.34 Based on these inputs and experiences elsewhere, the Commission considers the plant life as **20 years** for wind power generation units for tariff determination purposes.

Depreciation Rate

- 3.35 The Income Tax (Twenty Forth Amendment) Rules, 2002 allow accelerated depreciation for wind mills up to a maximum of 80% of the asset value in a year. The Commission considers the same as a guiding factor for tariff determination purposes.
- 3.36 However, for the purpose of tariff determination, the Commission considers it more prudent to take depreciation on a Straight Line Method wherein the asset life is to be depreciated to a residual value of 10% of its initial value over the entire asset life of 20 years. This translates to an SLM depreciation of **4.5%** per annum.

Operation and Maintenance Expenses

- 3.37 O&M expenses are comprised of:

- Manpower expenses
- Insurance expenses

- Spares and repairs
 - Consumables
 - Other expenses (statutory fees etc.)
- 3.38 MPSEB suggested that O&M expenses per MW be fixed by the Commission allowing an increase based on WPI/CPI index. They also suggested that 5 years O&M expense of MP Windfarms Ltd. may be considered for computation of base O&M charges. Other respondents agreed to a figure of 1 to 1.5% of the capital cost of the project for O&M expense.
- 3.39 Considering various suggestions, the Commission has decided that it would be appropriate to charge **1% of the capital cost of the project as O&M expense for the first five years**, and increased thereafter with a simple escalation of 5% per year,

Debt-equity ratio

- 3.40 The debt-equity ratio of a Wind Energy project shall be considered as **70:30**.

Interest Costs on Debt

- 3.41 The Commission agrees with the suggestions made by respondents like Suzlan, M/s Consolidated Energy Consultants, Bhopal & M/s MP Windfarms Ltd. Bhopal that interest rate on debts should be as per the IREDA norms for renewables.
- 3.42 Accordingly, the Commission fixes the interest rate on debt equivalent to the interest rate on IREDA loans for wind energy projects⁵ for tariff determination purposes. This rate is thus being determined as **10.5%**.
- 3.43 The investor is allowed the freedom to take a cheaper loan, and any benefits may be retained.

Term of Loan

- 3.44 Loans are assumed to be available for **10 years with a moratorium of 1 year**. IREDA loans are available with this term structure.
- 3.45 The investor is allowed the freedom to take a longer tenure loan, and any benefits may be retained.

⁵ as specified at www.iredaltd.com/annexure.asp on 15th April 2004

Return on Equity (RoE)

- 3.46 There were various suggestions made by the respondents as per which the RoE should be in the range of 14-16%, considering the nature of projects and risks associated with them.
- 3.47 The Commission feels that the investors perceive a high risk and having a long pay back period in such project and therefore there should be an adequate return to the investor. The Commission therefore accordingly fixes the RoE to be at the rate of **16%, pre-tax**. The payment to the developer is secured as per the payment provisions provided in this order.

Tariff Review Period / Control Period

- 3.48 Indian Wind Power Association (IWPA) has suggested a tariff review period of five years while MPSEB has suggested a tariff review period of three years subject to revision every year if the PLR changes by more than 1%.
- 3.49 In the case of wind power, the primary cost is the cost of debt. With interest rates apparently unstable – though with a clear downward trend in the past few years – setting of the tariff period for a very long time horizon may not be in the interest of the investors or the consumers.
- 3.50 Apart from the interest rates, the cost of investment per unit energy generated is on a downward path.
- 3.51 In view of the above, the Commission considers that a review period of a longer duration (such as five years) might not be desirable as the interest costs, costs of investment etc could change significantly in this period. On the other hand, a short review period of 1 year would cause high uncertainty for the investors with respect to the tariff rates. Accordingly, the Commission has decided that the **control period shall be of three years**. The first control period will start from the date of release of this Order and will close at the end of FY 06-07.
- 3.52 At the end of the control period the tariff determination process may be reviewed. Tariff decided in a particular control period shall apply to all projects that shall come up within that control period. The tariff determined for a project shall remain in effect for the whole project life, which is assumed to be 20 years.
- 3.53 The Commission hereby states that if the PLR changes by more than 2% as compared to the PLR at the start of the control period, the renewables tariff may be reviewed earlier.

A4: MINIMUM PURCHASE REQUIREMENTS

4.1 Section 86 (1) (e) of the Electricity Act of 2003 states that the State Commission must require each Licensee to purchase a certain minimum quantum of energy from renewable sources. The target must be set as a percentage of consumption in the area of supply. This section analyses how such a scheme may be implemented in Madhya Pradesh.

Factors to Consider for Determining Minimum Purchase Requirement

4.2 While determining the minimum purchase requirement for MPSEB and the distribution licensees, the Commission has considered the following factors:

- Total quantum of energy required
- Total potential for renewable energy generation in the State
- Quantum of renewable energy being generated
- Power purchase tariff for renewable energy
- Commercial and technical impact of purchase of renewable power on retail tariffs

4.3 The total consumption including losses of MPSEB in FY03 is 27129 MU. The table shows the equivalent number of units as percentages of total consumption:

Energy purchase as a percentage of Consumption in FY03

As a percentage of FY03 consumption	MU
0.25%	68
0.50%	136
0.75%	203
1.00%	271
2.00%	543
3.00%	814
4.00%	1085
5.00%	1356

4.4 The current wind energy generation capacity in MP is 23 MW approximately, which translates to 45.3 MU at a CUF of 22.5%. Generation from bio-mass is around 0.5 MU and that from Mini hydel has varied between 0.9 to 2.4 MU. (As per ARR for FY 04 and FY05, submitted by MPSEB). Hence, the total renewable generation is equivalent to 0.17% of total consumption in the MPSEB area of supply.

- 4.5 MP Urja Vikas Nigam Limited (MPUVNL) has proposed a minimum purchase requirement of 500 MW. MPSEB has proposed the minimum purchase requirement to be 30 MW and has suggested that minimum purchase requirement be prescribed only for the western Discom as windmills are located there.
- 4.6 The Commission fixes a target of **0.5% of total annual consumption (including third party sales) in the area of supply for all licensees, subject to availability**, as the minimum purchase requirement from wind power every year, for MPSEB/distribution companies which will operate in future. **This will be subject to the licensee receiving offer(s) from the wind energy generator(s) (WEGs)**. The total consumption would mean the energy input to the area of supply of the licensee. This minimum purchase requirement shall be valid for the entire control period of 3 years and may be reviewed thereafter. However, existing PPAs will not be affected.
- As and when developers of other renewable sources of energy install plants for generation of power, the Commission would appropriately allocate this percentage among wind and other renewable sources. The Commission may then revise the percentage figure itself.
- 4.7 If the licensee fulfills the minimum purchase requirements and still has offers from WEGs, then either the licensee or the WEG can approach the Commission for approval of such procurement offers. The Commission is presently not prescribing the maximum limit as it does not foresee that in the first control period there would be offers from WEGs exceeding the prescribed minimum limit.

A5: THIRD-PARTY SALE

- 5.1 With the Electricity Act 2003 coming into force, Licensees are free to purchase power from any source of their choice. Further, the Act also requires phasing of open access whereby end-consumers may also purchase power from a generator, trader or Licensee of their choice. In view of this, discussion on whether third-party sale should be permitted or not is uncalled for since Open Access inherently means that third-party sale is permitted.
- 5.2 Third Party sales under Open access regime would be guided by the Open Access regulations framed under Electricity Act 2003. These regulations are currently being framed by the Commission. Charges such as transmission, wheeling surcharge etc. to be paid for such sale would be determined and presented in these regulations.

A6: OTHER ISSUES

Banking

- 6.1 The Commission realizes that provision of banking of energy generated from renewables may give rise to gaming possibilities for the developer as well as the licensees. Also, since cost plus pricing mechanism is already being adopted the Commission does not deem it fit to allow banking of energy generated from renewable resources.
- 6.2 Banking is also considered unnecessary since there is a provision for the sale of entire generation to licensees. In case of third party sales, it will be governed by Open Access Regulations, which are being framed by the Commission.

Peak-off peak rates

- 6.3 There will not be any differential rates based on peak or off-peak usage of renewable energy as the tariff determination follows the mechanism of cost plus approach. The rates determined herein by the Commission would be uniformly applicable.

Wheeling Charges

- 6.4 There will be no wheeling charges for usage of the licensees' transmission/distribution system.

Metering and Billing

- 6.5 The energy delivered to the grid will be metered in accordance with the provisions of the relevant codes.
- 6.6 Billing of the metered energy will be carried out on a monthly basis.
- 6.7 Energy accounting for energy delivered to the grid will be carried out at the point of metering.

Settlement Mechanism and Payment Security

- 6.8 Wind energy being infirm in nature, situations will arise where the actual generation is different from contracted generation. On account of this expected variation, modalities of sale of wind energy in terms of settlement of bills need to be determined clearly.
- 6.9 The Commission prescribes that a settlement period of 30 days should be followed stringently in order to ensure that the developer has an assurance of cash inflow for the energy, which he delivers to the grid.

6.10 To reduce this incidence of default, the Commission hereby provides two options to the developers :

- (i) Utility at the cost of, and option of the developer, shall open a Revolving Irrevocable Letter of Credit in favor of the Developer for an amount equivalent to the average monthly bill, computed at the end of each previous financial year. For the first year of operation, such bills would be assessed based on the parameters defined in this Order.
- (ii) To provide the compensation in case of delay beyond the 30 day payment period, the utility will pay penal interest on outstanding amount at the rate of 2% above the short term lending rate of the State Bank of India.

Prerequisites for commercial agreements

6.11 The Wind Energy Generators (WEGs)/ distribution companies/ other parties that are willing to sign commercial agreements, for a period of at least 20 years, for supply/purchase of wind power shall, prior to finalizing any commercial agreement, send a copy of the draft agreement to the Commission for vetting, along with the fees determined by the Commission from time to time. The Commission shall approve the terms and conditions of the agreement after due scrutiny. Only an agreement, duly vetted by the Commission, shall hold legal validity.

Model PPA

6.12 The Commission directs MPSEB/all distribution companies to frame and file a model PPA. This should include a clause for penalty in case the developer winds up its operation before the 20 year power purchase agreement period.

Additional benefits / incentives if any

6.13 The Commission directs WEGs/MPSEB/all distribution companies to notify and appropriately include any benefits/incentives in tariff which they may receive from time to time from State Govt. and which may have any implication on tariff determination

Evacuation Infrastructure

6.14 Project cost not only includes cost of the plant and machinery but also includes other costs such as cost of infrastructure development such as access roads, cost of establishment and improvement in the EHV/HV system for power evacuation etc.

- 6.15 The Commission directs that the developer shall bear the cost of project switchyard and interconnection facilities at the project site up to the point of energy metering. Initially, 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% will be treated as interest free loan to the utility. The utility shall refund the interest free loan to the developer(s) in five equal installments spread over a period of five years, commencing from one year after the date of commissioning of the respective projects.
- 6.16 In case there is more than one Developer sharing the transmission line/evacuation facilities to be set up by the utilities the loan amount shall be shared amongst the Developer(s) in proportion of MW generated.

Reactive energy charges

- 6.17 The Commission determines that charges for kVArh consumption from the grid shall be **27 paise/unit** i.e. the rate which is already prevalent in the state, which may be revised from time to time.
- 6.18 Reactive energy charges shall be recovered from the bill of the developer for energy sold to Utility. In case of self-use, these charges shall be added to the monthly electricity bill of the developer; incase of sale to third party, these charges shall be added to the monthly electricity bill of the consumer (third party purchaser to whose premises energy is wheeled).

Competitive Bidding

- 6.19 The Commission, in future, intends to adopt a tariff based on competitive bidding among the WEGs in accordance with Section 63 of the Electricity Act which states that:

Notwithstanding anything contained in section 62, the Appropriate Commission shall adopt the tariff if such tariff has been determined through transparent process of bidding in accordance with the guidelines issued by the Central Government.

- 6.20 The bidding may be initiated by MPSEB/distribution companies as and when there are sufficient number of WEGs so that the competition may lead to the buyer getting the best possible price. The bidding process will not affect the existing PPAs.
- 6.21 The Commission however clarifies that the bidding should take place **only** among the WEGs, the conventional sources of power should not participate in this bid and that the process should be in accordance with the guidelines issued by the Central Govt. and the Commission from time to time.

A7: TARIFFS FOR NEW WIND ENERGY PROJECTS

- 7.1 New Wind Energy Projects are defined as those, which have the date of purchase and commissioning of new machines after the date on which the current order comes into effect.
- 7.2 The Commission sets the tariff for generation from a 1 MW new wind energy project for its project life of 20 years in the manner shown below: (details on Annexure-II)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Tariff (Rs./unit)	3.97	3.80	3.63	3.46	3.30	3.14	2.98	2.83	2.67	2.52
	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Tariff (Rs./unit)	2.43	2.44	2.46	2.48	2.50	2.51	2.53	2.55	2.58	2.60

- 7.3 The tariff has been determined on the Cost Plus basis. This tariff rate shall be applicable for purchase of wind energy by MPSEB/successor entities from the wind energy generators. This tariff for the licensee is inclusive of all charges (tax liabilities included).
- 7.4 The tariff determination has taken into account the directions with respect to various key drivers of cost, which have been listed under “Tariff Structure” (Section 3).
- 7.5 However, to take care of the concern in this method, viz. the generators winding up the project before the agreed period of 20 years, the Commission directs that an amount equivalent to 4% of RoE shall be deducted in two equal installments from the monthly bill of September and March of each financial year for the first five years. This amount will be deposited in a bank account in the joint names of the developer and the utility. The interest accrued on the deposited amount shall be allowed to be paid to the developer on a yearly basis.
- 7.6 The developer will be able to withdraw this amount only at the end of 10th year based on the clearance of the utility. In case the developer winds up his project / disposes of the business before the completion of the ten year period, the amount of deposit will revert back to the utility.

A8: TARIFFS FOR EXISTING WIND ENERGY PROJECTS

- 8.1 Existing projects are those, which have their date of commissioning before the date on which this current order comes into effect. These projects were set up under the guidelines existing at the time of such investments.
- 8.1 The price payable to this group of projects shall be the average price of 20 years payable to the new projects as determined in Sl. No. 7.2 of this order.
- 8.2 Thus the rate payable per unit for this group of projects will be **Rs. 2.87 / unit**. However, the wheeling charges as determined by the Commission from time to time will be applicable to such sale.

A9: POWER TO AMEND

9.1 The Commission may, at any time add, vary, alter, modify or amend any provision of this Order.

A10: FORCE MAJURE CONDITIONS

10.1 The condition of minimum purchase requirement for the licensee shall not be applicable under Force Majure Conditions such as war, strike, lock out , riots, act of God or natural calamity etc.

Ordered accordingly.

Sd/-

(R. Natarajan)
Member (Econ.)

Sd/-

(D. Roybardhan)
Member (Engg.)

Sd/-

(P.K. Mehrotra)
Chairman

Annexure- I
List of the Persons who were present in the Public Hearing Reg. – Approach Paper on
Tariff Setting and Support to Renewable Energy Sources on 31.03.2004.

S. No.	Name	Designation	Organisation	Tel.No.
1.	Mr. R. Shukla	Engineer & Consultant	G.I. Power Corporation Ltd., 267, Shanker Shah Nagar, Rampur Jabalpur. Pin Code- 482008	Mob-9425152465
2.	Mr. B. K. Dubey	Member	Organisation for Non Conventional Energy Sector (ONES) 11, Tukoganj, Main Road, Indore. Pin Code-452001	Mob-9425063769
3.	Mr. Sanjay S. Chaturvedi	AGM-Business Development Suzlon Energy Ltd.	1207, Raheja Center, Nariman Point, Mumbai. Pin Code-400021	
4.	Mr. K.C. Baishakhia	Member	NCHSE; D-23 Rishikulp, Kalpana Nagar, By pass Road-Bhopal. Pin Code - 462021	Office-0755-2628219
5.	Mr. J. C. Bhola	S.E.	MPSEB S.E. (Commercial) of Chief Engineer (Commercial), MPSEB, Shakti Bhawan, Jabalpur Pin Code-482008	
6.	Mr. R. K. Ghosh	Addl. S. E.	MPSEB O/o CE, (Commercial) MPSEB, Shakti Bhawan, Rampur, Jabalpur Pin Code-482008	
7.	Mr. P.L. Nene	President	M.P. Electricity Consumers Society, 328, Indrapuri Colony, Indore Pin Code - 452017	Mob-6893061624
8.	Mr. R. Ramanujam	Advisor	M.P. Windfarms Ltd., No. 162 M. P. Nagar, Zone-II, Bhopal. – 462016	
9.	Mr. D. K. Chawda	Addl. E. E.	MPSEB, O/o CE, Commercial, MPSEB, Jabalpur. Pin Code-482002	

10.	Mr. A.V. Raghavan	Chartered Accountant	Indian Wind Power Association, Near Harikala Building, VI Floor, Nint Road, fort, Mumbai. Pin Code-400001	Mob-9820045724
11.	Mr. S. K. Gupta	DGM, Finance & Projects	Finance & Projects, Kalchuri Trading & Inv. Co. Ltd. (A unit of K. Malpani Group), 634, Wright Town, Jabalpur. Pin Code-482001	07613121125-(O)
12.	Mr. M. K. Deb	Managing Director	M.P. Windfarms Ltd., Consolidated Energy Consultants Ltd. 162, M.P. Nagar, Bhopal. Pin Code-462011	Mob-9826225401
13.	Col. G.K.Pande (Retd.)	President	Vapari Mahe Sangh, M.P. State Auto, M.P. Nagar, Jagriti Samiti. Zone-II, M.P. Nagar Pin Code-462011	
14.	Mr. S. C. Goyal	S. E.	O/o CMD, (C.Z), M.P.S.E.B, Govindpura, Bhopal. Pin code-462023	Mob-9826229225
15.	Mr. Sanjay Verma	Add. Ex. Engineer	M.P. Urja Vikas Nigam, Urja Bhawan, Shivaji Nagar, Bhopal	
16.	Mr. V.S. Krishna	Vice Chairman	National Centre for Human Settlements & Environment, Girish Kunj, E-5/A, Arera Colony Bhopal. (M.P.). Pin Code - 462023.	2465306, 2463731
17.	Mr. U.R. Singh	Adg. Director (R&T)	EPCO, Environmental Planning & Coordination Organisation, Paryavaran Parisar, Bhopal Pin Code-462016	
18.	Mr. Vipin Kumar Jain	Secretary General	M.P. Laghu Udyog Sangh, E-2/30, Mahavir Nagar, Arera Colony, Bhopal. Pin Code – 462016	R-2466689 O-2467714
19.	Mr. Abhaya Swarup	Director (ECC)	MPUVN, Urja Bhawan, Shivaji Nagar, Bhopal. Pin Code-462016	Mob-9826054609
20.	Mr. Jitendra Sharma	Chief Engineer	MPUVN, Urja Bhawan, Shivaji	Mob - 3132517

			Nagar, Bhopal. Pin Code-462016	
21.	Mr. Ramanand Shukla	MD	MPUVN, Urja Bhawan, Shivaji Nagar, Bhopal. Pin Code-462016	Mob-9425140500
22.	Mr. Chintan Shah	General Manager	Suzlon Energy, 5 th Floor, Godrej Millennium 9, Koregaon Park Road, Pune. Pin Code-411001	Mob-9822323817
23.	Mr. Ramesh Chandra Salhan	Ex. Chief Engineer (E/S) & Chief Elec. Inspector, Retired Public Man	190, Tilak Nagar, Indore, (M.P.) Pin Code-452018	Mob-9826286455
24.	Mr. Rakesh Jangalwa	Director	CAS Management P. Ltd. M-205, Vijay Stambh, M.P. Nagar, Zone-I, Bhopal. Pin Code-462011	Mob-9425011303
25.	Mr. C. K. Dikshit	Add. S.E.,	O/o SE, (O&M), MPSEB, Dewas Pin Code-455001	Mob-9425049833
26.	Mr. Bhuvnesh Kumar Patel	Suptd. Engineer	MPUVN, Urja Bhawan, Shivaji Nagar, Bhopal. Pin Code-462016	Mob-9425008000
27.	Mr. Ambresh Mishra	Sr. Correspondent	Hindustan Times, C-38, Nehru Nagar, Bhopal. Pin Code-462003	Mob-9826029413
28.	Mr. M.Z. Siddiqui	Director	Bhopal Environmental Projects Pvt. Ltd., E-5/102, Arera Colony, Bhopal. Pin Code-462016	Mob-9826023086
29.	Mr. A. K. Pandey	G.M.	Suzlan Energy, Ltd., FF-22, Soh 54, Vijay Nagar, Indore Pin Code-452010	Mob-9826024787
30.	Mr. R. Sankara Narayana	Engg. Faculty	NCHSE, (National Centre For Human Settlement and Environment), Girish Kunj, Arera Colony, Bhopal Pin Code-462016	2463731 (O)
31.	Mr. Ravi Shanker Sonkar	S. E. (L.M)	O/o CMD, M.P.M.K.V.V. Co. Govindpura, Bhopal.	Mob-9893079926
32.		Chief Engineer	Environment Consultants & Engineers, C-8, Chanakyapuri, Chunabhatti, Kolar Road, Bhopal Pin Code-462016	0731-3220778(O)

ANNEXURE II: TARIFF DETERMINATION WORKSHEET FOR 1 MW WIND ENERGY PROJECT

Particulars	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year Ending		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Generation (Mus)		1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971
Transmission Loss (Mus)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Net units Available for Wheeling (Mus)		1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971	1.971
Expenses (Rs Lakhs)																					
Interest on Term Loan		31.83	28.53	25.22	21.91	18.60	15.30	11.99	8.68	5.37	2.07	-	-	-	-	-	-	-	-	-	-
O & M Expenses		4.50	4.50	4.50	4.50	4.50	4.73	4.96	5.21	5.47	5.74	6.03	6.33	6.65	6.98	7.33	7.70	8.08	8.49	8.91	9.36
Depreciation		20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25
Total Expenses before tax and RoE		56.58	53.28	49.97	46.66	43.35	40.27	37.20	34.14	31.09	28.06	26.28	26.58	26.90	27.23	27.58	27.95	28.33	28.74	29.16	29.61
RoE		21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6
Total expenses before tax (including RoE)		78.18	74.88	71.57	68.26	64.95	61.87	58.80	55.74	52.69	49.66	47.88	48.18	48.50	48.83	49.18	49.55	49.93	50.34	50.76	51.21
Tariff Schedule on cost plus basis (Rs./unit)																					
Total expenses before tax (including RoE) / Net units available for wheeling		3.97	3.80	3.63	3.46	3.30	3.14	2.98	2.83	2.67	2.52	2.43	2.44	2.46	2.48	2.50	2.51	2.53	2.55	2.58	2.60