WORKING PAPER

CURRENT TARIFF OF WIND ENERGY IN PAKISTAN

May 2010

BY

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Renewable Resources (Pvt) Ltd

TITLE

Working Paper
Current Tariff of Wind Energy in Pakistan

CLASSIFICATION

UNCLASSIFIED

SYNOPSIS

This working paper describes the status of current tariff for wind energy in Pakistan.

DATE

May, 2010.

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SECTION 1

EXECUTIVE SUMMARY

1 EXECUTIVE SUMMARY

This main objective of this working paper is to express the current tariff of wind energy for generation companies in Pakistan. The current energy crisis in the country has taught us many lessons and one of the key is to utilize indigenous sources of energy. Our electricity mix is heavily tilted towards thermal and we are making 35% of our total electricity from imported oil. Through this working paper we would like to highlight that wind is a potential resource which can be tapped immediately to overcome this energy crises. We also want to give confidence to the potential investors / organizations to become an Independent Power Producer (IPP) using wind as a resource by describing the current tariffs and trend.

Renewable Resources (Pvt) Ltd is a private consultant specialized in Renewable Energy (RE), Energy Efficiency (EE) and Environment (Env) projects. The company is owned by group of professionals who have remained involved in the renewable energy program of Pakistan and a solid grip on project development, feasibility studies, tariff negotiations, requisite approvals, security documents etc. RE2 is a one stop shop for any investor coming to invest in wind enrgy in Pakistan.

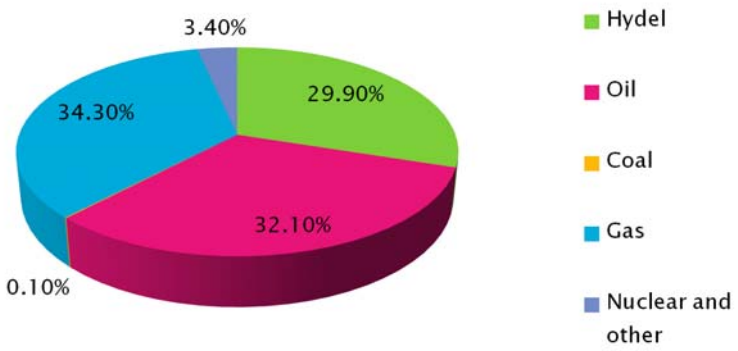
SECTION 2

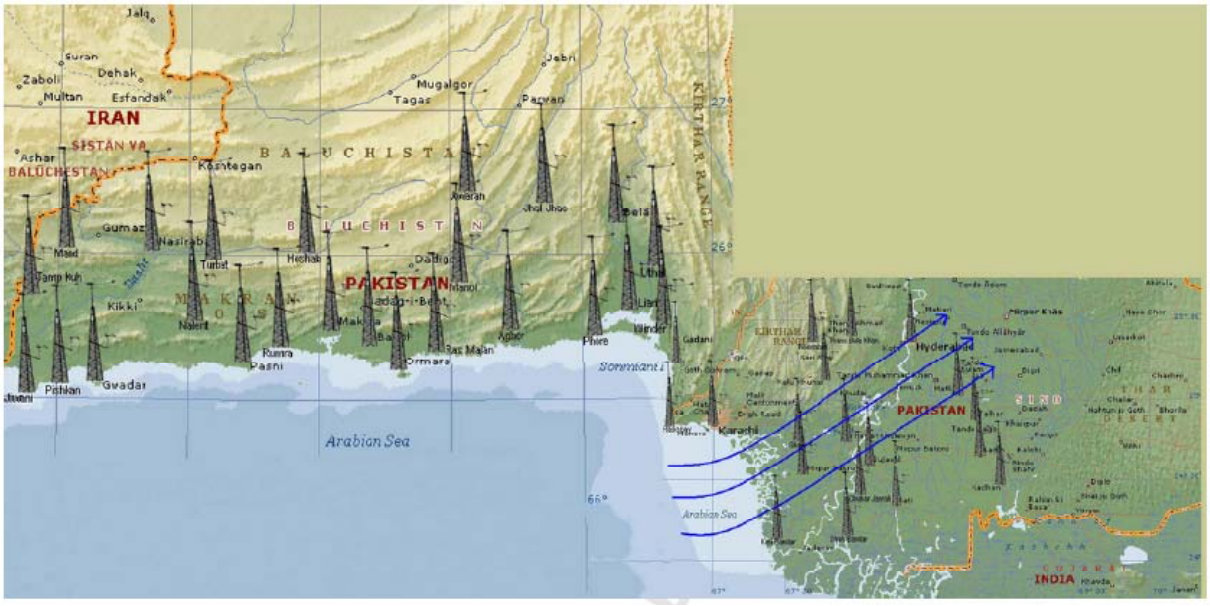
BACKGROUND

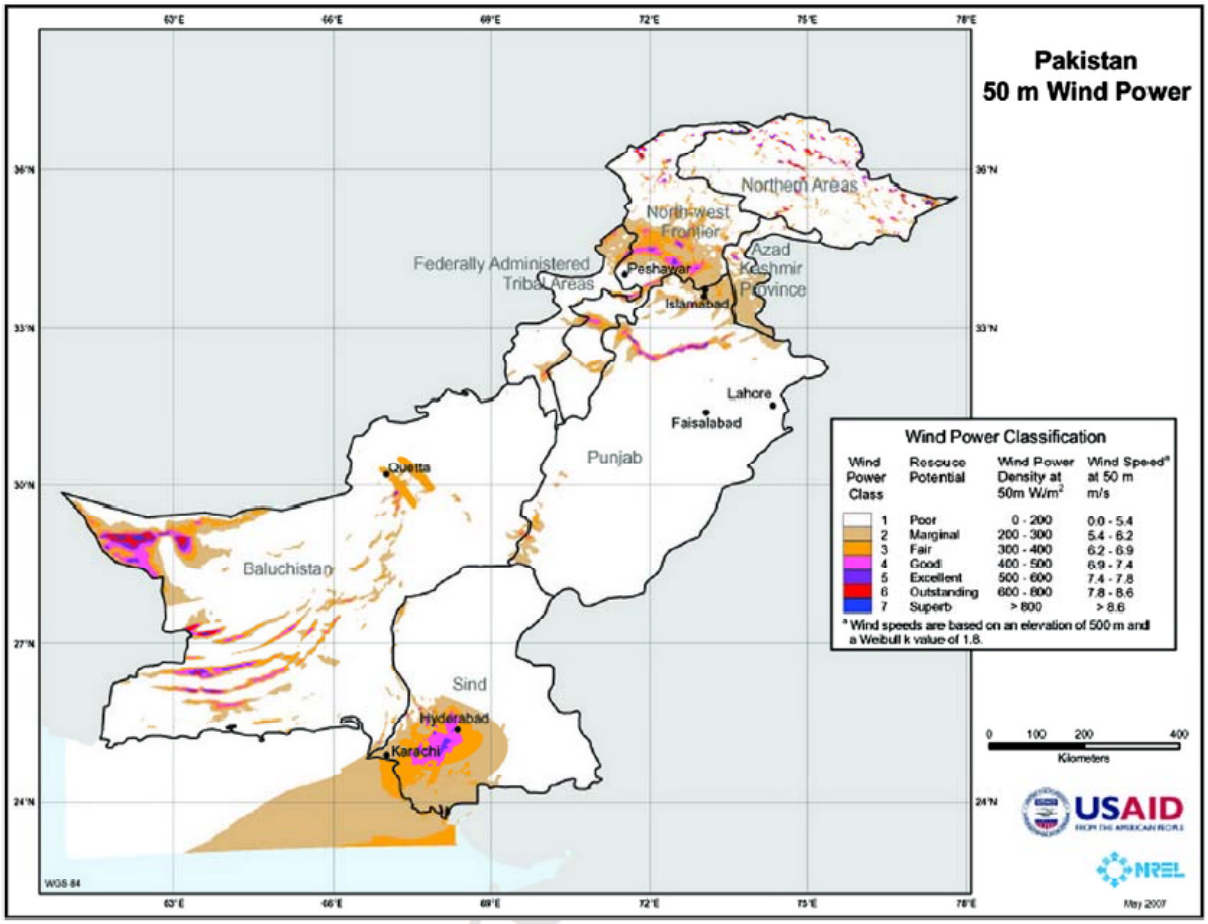
2 BACKGROUND

2.1 Energy Situation of Pakistan

At this juncture, we are encountering the worst electricity crises of the history of Pakistan resulting in extended load shedding to an extent which virtually suspends social life. The situation has further forced Government of Pakistan to decisions like early market shutdown, power cutoff to industry, and two holidays per week thus affecting all business activities. In the short term we put all our eggs in the oil based rental power projects. It is nearly impossible at this time to bear the cost of electricity both by the consumers and the government (circular debt issue) because of the existing oil based projects. I don't know what will happen after rental projects with a little price hike of oil in the international market. We need to have out of the box thinking to utilize our own indigenous resources like wind energy.


3.40%
29.90%
34.30%
32.10%
0.10%
Hydel
Oil
Coal
Gas
Nuclear and other


IRAN
SISTAN VA
BALUCHESTAN
BALUCHISTAN
PAKISTAN
MAKRAN
Arabian Sea
Karachi
Hyderabad
PAKISTAN
INDIA
Gwadar
Pasni
Ormara
Pasni
Turbat
Nasirab
Kikki
Pishan
Tagas
Pasnan
Dalbandin
Khuzdar
Lasbela
Uthal
Piare
Gadani
Thatta
Sonmiani
KIRTHAR RANGE
THAR DESERT
Zaboli
Dehak
Multan
Esfandak
Suran
Jalq
Jebri
Mugalgor
Kasntegan
Ashar
Gumaz
Mand
Tamp Kuh
Zamak
Heshak
Ladgasht
Bazman
Makula
Bahoti
Ormara
Aspar
Ziarat
Sibi
Jhal Jhao
Awaran
Bela
Lasbela
Uthal
Lasbela
Gadani
Thatta
Hyderabad
Tando Allahyar
Jamshoro
Chachro
Diplo
Mithi
Nagarparkar
Badin
Tando Bago
Tando Adam
Sanghar
Khipro
Mirpur Bathoro
Kaloki
Nawabshah
Shahdadpur
Digri
Mirpur Khas
Umerkot
Sujawal
Jati
Shah Bandar
Kharo Chan
Keti Bandar
Hala
Matiari
Tando Muhammad Khan
Hyderabad
Kotri
Jamshoro
Sehwan
Dadu
Khairpur
Kandiaro
Naushahro Feroze
Moro
Kandhkot
Shikarpur
Jacobabad
Kashmore
Ghotki
Sukkur
Rohri
Khairpur
Nara Desert
Rann of Kutch
Gujarat
Kachchh
Jamnagar
Rajkot
Porbandar
Junagadh
Veraval
Diu
Bhuj
Mandvi
Jakhau
Nalia
Lakhpat
Dhrol
Jodiya
Kalavad
Jamkandorna
Gondal
Jetpur
Dhoraji
Upleta
Rajula
Mahuva
Talaja
Bhavnagar
Palitana
Sihor
Gariadhar
Jasdan
Vinchhiya
Rajkot
Morbi
Wankaner
Halvad
Dhrangadhra
Chotila
Limbdi
Wadhwan
Surendranagar
Dhrangadhra
Patdi
Viramgam
Mandal
Dholka
Dhandhuka
Ranpur
Botad
Gadhada
Barwala
Ahmedabad
Sanand
Kalol
Gandhinagar
Mansa
Vijapur
Himatnagar
Idar
Khedbrahma
Vadnagar
Visnagar
Kheralu
Unjha
Mehsana
Kadi
Becharaji
Patan
Sidhpur
Chanasma
Harij
Radhanpur
Tharad
Deesa
Dhanera
Vav
Palanpur
Danta
Ambaji
Abu Road
Mount Abu
Sirohi
Pindwara
Reodar
Jawal
Sumerpur
Bali
Desuri
Rohat
Pali
Marwar Junction
Jaitaran
Sojat
Jodhpur
Phalodi
Osian
Luni
Bilara
Nagaur
Merta
Degana
Makrana
Parbatsar
Nawa
Kuchaman
Ladnun
Sujangarh
Ratangarh
Sardarshahar
Taranagar
Churu
Rajgarh
Sadulpur
Suratgarh
Sri Ganganagar
Karanpur
Hanumangarh
Nohar
Bhadra
Pilibanga
Rawatsar
Hanumangarh
Ganganagar
Anupgarh
Jaisalmer
Pokaran
Fatehgarh
Ramgarh
Sam
Barmer
Sheo
Chohtan
Gudha Malani
Siwana
Gudamalani
Jasol
Sindhari
Balotra
Pachpadra
Gudha
Sanchore
Jalore
Bhinmal
Sayla
Chotan
Raniwara
Sanderao
Sumerpur
Jaitaran
Pali
Marwar Junction


Pakistan
50 m Wind Power
Northern Areas
North-west Frontier
Federally Administered Tribal Areas
Peshawar
Azad Kashmir
Province
Islamabad
Lahore
Faisalabad
Punjab
Quetta
Baluchistan
Sind
Hyderabad
Karachi
Wind Power Classification
Wind Power Class
Resource Potential
Wind Power Density at 50m W/m²
Wind Speed* at 50 m m/s
1 Poor 0 - 200 0.0 - 5.4
2 Marginal 200 - 300 5.4 - 6.2
3 Fair 300 - 400 6.2 - 6.9
4 Good 400 - 500 6.9 - 7.4
5 Excellent 500 - 600 7.4 - 7.8
6 Outstanding 600 - 800 7.8 - 8.6
7 Superb > 800 > 8.6
* Wind speeds are based on an elevation of 500 m and a Weibull k value of 1.8.
0 100 200 400
Kilometers
USAID
NREL
WGS 84
May 2007

To facilitate the projects in Gharo ~ Keti Bandar Corridor of Sindh Government of Pakistan has established benchmark wind speeds for each month at different heights. Below benchmarks suggests that there is a huge potential of wind energy development in the above mentioned corridor in Sindh Province.

Month	Monthly Benchmark Wind Speeds (meter/sec)					
	30 m height	50 m height	60 m height	67 m height	80 m height	85 m height
January	4.7	5.1	5.2	5.3	5.4	5.5
February	5.1	5.4	5.5	5.6	5.7	5.8
March	5.3	5.7	5.8	5.9	5.9	6
April	7	7.3	7.4	7.6	7.6	7.7
May	8.9	9.4	9.6	9.7	9.8	9.9
June	10.3	10.9	11.1	11.2	11.3	11.4
July	8.4	8.9	9	9.2	9.2	9.3
August	9.3	9.8	10	10.2	10.3	10.4
September	7.6	8.1	8.2	8.3	8.4	8.5
October	4.3	4.6	4.7	4.7	4.8	4.9
November	3.8	4.1	4.2	4.3	4.4	4.5
December	4.6	4.9	5.1	5.2	5.3	5.4
Annual Average	**6.6**	**7**	**7.1**	**7.2**	**7.3**	**7.4**

Table 1: Monthly Benchmark Wind Speeds for Gharo

SECTION 4

POLICY FRAMEWORK

4 POLICY FRAMEWORK

With the introduction of the Policy for Development of Renewable Energy for Power Generation 2006, by Government of Pakistan, a guideline was provided for the development of wind energy sector.

Under the policy, RE projects can be setup in the following models:

4.1 Power Generation as an IPP

The IPP can be established through solicited as well as unsolicited proposals. For the solicited proposals, the competent authorities can invite proposals from IPPs for competitive bidding.

The process of unsolicited proposals is more adapted at this moment. It starts with submission of unsolicited proposal to Government for issuance of an LOI to IPP, who then has to prepare a feasibility study, develop complete project and pursue all requisite approvals.

The process flow chart for developing the project is attached as Annex 'A'.

The major incentives in the policy for IPP are as below:

- Wind Risk taken by GoP.
- 100% Power Evacuation / Purchase Guaranteed.
- Grid Access on the doorstep.
- Land Facilitation by GoP.
- Fiscal Incentives like tax rebates, asset depreciation etc.
- 18% ROE in dollar terms
- Repatriation of money is allowed to foreign investors

Some of the key policy features for RE based IPPs are given below:

4.1.1 RE Resource Variability Risk

In the case of grid-connected RE IPPs, the risk of variability in wind speeds is borne by the power purchaser. 'Benchmark' electricity production levels based on mean availability of wind or for the month shall be determined for each project location on the basis of independently monitored data. The IPP shall ensure production corresponding to this benchmark level, even if the resource availability temporarily falls below this benchmark, provided that the reduced electricity production is not due to fault of the IPP itself.

4.1.2 Production Incentive

For grid tied IPPs, all power produced above than the benchmark level, a production bonus payment is allowed to the IPP at a rate of 10% of the approved tariff for the project.

SECTION 5

CURRENT STATUS OF PROJECTS IN PAKISTAN

5 CURRENT STATUS

The wind energy sector of Pakistan has ***matured in the last couple of years***. The major impediments delaying the development of wind power projects have been removed. Wind data of more than 5 years is available for two locations, i.e. Gharo and Jhampir. All the stakeholders are now at the same frequency and are fully motivated to facilitate the development of wind power in the country.

Initially very few suppliers would like to come to new market like Pakistan. But now most of the suppliers are again giving proposal for the Pakistani market because of excessive supplies available in the world due to economic crises. Now GE, Nordex, Siemens and some Chinese companies are aggressively pursuing this Pakistani market. They are also in discussion with Elsewedy, an Egyptian based supplier.

The present status of wind projects with respect to achieving different milestones is as below:

5.1 Letter of Intent (LOI)

Forty Eight (48) national and international private investors currently posses LOI for wind power projects issued by Alternative Energy Development Board (AEDB).

5.2 Land Allocation / Acquisition

AEDB has so far allocated land to eighteen (18) wind IPPs for wind power generation projects of 50 MW each. The details of the land distribution are shown in the table below;

No.	COMPANY	Location of Land
1	New Park Energy Ltd	Gharo
2	Tenaga Generasi Ltd.	Kuttikun
3	Green Power (Pvt) Ltd,	Kuttikun
4	Dawood Power Ltd.	Bhambore
5	Master Wind Energy Ltd,	Jhimpir
6	Zephyr Power Ltd	Bhambore
7	Beacon Energy Ltd.,	Kuttikun
8	HOM Energy (Private) Ltd,	Jhimpir
9	Sachal Energy Development Pvt Ltd,	Jhimpir
10	Fauji Fertilizer Company Ltd.	Jhimpir
11	Arabian Sea Wind Energy Pvt. Ltd.	Lakha
12	Lucky Energy (Pvt) Ltd	Jhimpir
13	Metro Power Co. (Pvt)	Jhimpir
14	Gul Ahmed Energy Ltd,	Jhimpir
15	Zorlu Enerji,	Jhimpir
16	Wind Eagle Ltd. (Technology Plc Ltd),	Jhimpir
17	Sapphire Wind Power Company (Pvt) Ltd,	Jhimpir
18	CWE	Jhimpir

Two IPPs are also in process of purchasing their own land in the wind corridor for the implementation of their 50 MW wind power projects each, namely;

- Makwind Power (Pvt.) Ltd.
- Zeni Wind Power (Pvt.) Ltd.

5.3 Feasibility Study

– Feasibility studies for 50 MW wind power projects completed by twelve (12) IPPs namely;
  - Green Power Pvt. Ltd.
  - Beacon Energy Ltd.
  - New Park Energy Ltd.
  - Tenaga Generasi Ltd.

- Zephyr Power Pvt. Ltd.
- Dawood Power Ltd.
- Zorlu Enerji Pakistan Ltd.
- Fauji Fertilizer Company Ltd.
- Arabian Sea Wind Energy Pvt. Ltd.
- Makwind Pvt. Ltd.
- Master Wind Energy (Pvt.) Ltd.
- Lucky Energy Pvt. Ltd.

5.4 Generation License

– Nine (09) IPPs have applied for Generation License to NEPRA, namely;
- Green Power Pvt. Ltd.
- Beacon Energy Ltd.
- New Park Energy Ltd.
- Tenaga Generasi Ltd.
- Zephyr Power Pvt. Ltd.
- Dawood Power Ltd.
- Zorlu Enerji Pakistan Ltd.
- Arabian Sea Wind Energy Pvt. Ltd.
- Milergo Pakistan Ltd.

– NEPRA has so far issued Generation License to eight (8) IPPs.
- Green Power Pvt. Ltd.
- New Park Energy Ltd.
- Tenaga Generasi Ltd.
- Zephyr Power Pvt Ltd.
- Dawood Power Ltd.
- Zorlu Enerji Pakistan Ltd.
- Arabian Sea Wind Energy Pvt Ltd
- Milergo Pakistan Ltd.

5.5 Tariff Approval

– NEPRA has so far announced tariff determinations for **Four (4)** IPPs

- *M/s Green Power awarded a levelized tariff of US Cents 10.2852 per kWh after three review petitions
- M/s Dawood Power Ltd. awarded a levelized tariff of US Cents 11.87 per kWh after two review petitions
- M/s Zorlu Enerji Pakistan given a levelized tariff of US cents 12.1057 per kWh,
- M/s Arabian Sea given a levelized tariff of US cents 11.9201 per kWh

*M/S Green Power join hands with Fauji Foundation and most probably will re-apply for the tariff.

– Tariff petitions of **One (1)** IPPs are under process by NEPRA, namely;

- Fauji Fertilizer Company Ltd

5.6 Energy Purchase agreement (EPA)

The standard draft EPA has been negotiated and finalized by M/s Green Power with NTDC, which now will serve as the standard EPA for all other upcoming projects.

– M/s Zorlu Enerji Pakistan Ltd, M/s Beacon Energy ltd. and M/s Fauji Fertilize Company Ltd. are also in final round of negotiations with NTDC for EPA of their 50 MW projects each.
– M/s Zorlu Enerji Pakistan Ltd. has signed an EPA for its 06 MW Phase-1 of the 50 MW wind power project.

5.7 Implementation Agreement (IA)

– M/s Green Power has negotiated and finalized an IA document with AEDB.
– M/s Beacon Energy, M/s Zorlu Enerji Pakistan and M/s Fauji Fertilizer Company Ltd. are also in final round of negotiations with AEDB for the finalization of their IA.

5.8 Highlights of Leading Projects

5.8.1 ZORLU Project

The first phase of 6 MW of Zorlu project is now installed. Four out of the five 1.2 MW turbines are now up and running. The Financial Close for the full 50 MW is in process. Zorlu has faced

issues with the turbine supplier. The turbines were purchased from Vensys Czech Republic, which announce Bankruptcy during the project. So there are some issues beyond the hands of Government of Pakistan and Zorlu.

5.8.2 Green Power Project

Green Power has made the feasibility study and done significant project development. The EPC options, lender negotiations and EPA discussions have all reached at final stage. More importantly, Green Power has remained the trend setter in approvals process.

However, Green Power has join hands with Fauji Foundation who is actually interested to take up wind projects on a fast track basis.

5.8.3 Becon Project

Becon was always following Green Power in all milestones and strategies. The project status is same. Market news is that Becon has sold its full equity to Fauji Foundation.

On these grounds, it is now expected out of Fauji Foundation to make further quick progress in their 2 X 50MW Projects.

5.8.4 FFC Project

FFC has completed the feasibility study after taking a long time. However, it has been established in the market that feasibility of FFC is most updated and meets the international standards.

The tariff petition has been filed. FFC tried to defend USD 112 Million EPC cost leading to a levelized tariff of Rs. 15.2 per kWh with local financing. This translates to approx. USD cents 13.2 with LIBOR financing.

SECTION 6

DETAILS OF LATEST APPROVED TARIFF BY NEPRA

6 ARABIAN SEA WIND ENERGY

Government of Pakistan is cognizant of the fact that they need to develop indigenous sources of energy to overcome the current energy crises. The leaders of the pack are coal and wind energy. Nepra has recently announced a wind tariff of 49.5 MW project of Arabian Sea Wind Energy (Pvt) Ltd. The key features of the approved tariff are as follows:

- 33 Nordex 1.5 MW S 77 wind turbines are proposed at 80 m hub height are proposed by Arabian Sea.
- Annual Energy Yield at benchmark wind speeds @P 50 accepted by AEDB is 141.3 GWh.
- Following key technical parameters / losses accepted by AEDB while approval of production numbers are:
    - Availability 97%
    - Power Curve Density Correction 5%
    - Electrical Losses 2.5%
    - Auxilary consumption 1%
    - Air Density 1.225 kgm^{-3}
- Overall Approved Project Cost is US Dollars 126.735
    - Approved EPC cost by NEPRA is 115.166 Million US dollars
    - Non-EPC Cost is accepted as US Dollars 11.569. Non EPC Costs include
        - Interest during Construction
        - Financial Charges. This includes debt arrangement fee, commitment fee by the bank, bank's consultant fee, bank's processing fee and other financial charges
        - Insurance cost during construction
        - Operating fixed assets like land, motor vehicles etc
        - Licenses and other legal fees
        - Cost of Consultants
        - Administration during construction
        - Other project costs

- Petitioner proposes 80 – 20 Debt Equity Structure
- Loan Period is 10 years with one year grace period
- Rate proposed is LIBOR (2.88) plus 3.15% with quarterly payments.
- 17% return on equity has been given by NEPRA to Arabian Sea for the life of the project i.e. 20 years
- WPI and CPI indices are also given for O and M

Below is the reference tariff sheet of Arabian Sea, approved by NEPRA:

ARABIAN SEA WIND ENERGY (PVT) LIMITED
REFERENCE TARIFF

Year	Variable O&M Local	Variable O&M Foreign	Fixed O&M Local	Fixed O&M Foreign	Insurance	Return on Equity	Withholding Tax @7.5%	Loan Repayment	Interest Charges	Total Rs/kWh
	Rs. / kWh	Rs. / kWh	Rs. / kWh	Rs. / kWh	Rs. / kWh	Rs. / kWh	Rs. / kWh	Rs. / kWh	Rs. / kWh	Rs. / kWh
1	0.0147	0.0478	0.4485	0.3125	0.5135	2.5616	0.1921	4.5369	3.5332	12.1608
2	0.0147	0.0478	0.4485	0.3125	0.5135	2.5616	0.1921	4.8167	3.2533	12.1608
3	0.0147	0.0478	0.4485	0.3125	0.5135	2.5616	0.1921	5.1138	2.9563	12.1608
4	0.0147	0.0478	0.4485	0.3125	0.5135	2.5616	0.1921	5.4292	2.6408	12.1608
5	0.0147	0.0478	0.4485	0.3125	0.5135	2.5616	0.1921	5.7641	2.3060	12.1608
6	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	6.1196	1.9505	12.3369
7	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	6.4970	1.5730	12.3369
8	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	6.8978	1.1723	12.3369
9	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	7.3232	0.7469	12.3369
10	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	7.7749	0.2952	12.3369
11	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
12	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
13	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
14	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
15	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
16	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
17	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
18	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
19	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
20	0.0147	0.0715	0.4485	0.4649	0.5135	2.5616	0.1921	-	-	4.2668
Levelized Tariff	**0.0147**	**0.0610**	**0.4485**	**0.3970**	**0.5135**	**2.5616**	**0.1921**	**4.1515**	**1.6730**	**10.0129**

Exchange Rate Used= 1 US$ = Rupees 84.00, Levelized tariff discounted at 10% per annum works out to be US cents 11.9201/kWh.

* ***The above rate is limited to an annual energy production up to 141.300 GWh. Any generated energy beyond 141.300 GWh in a year will be charged at 10% of the Reference Tariff for that year.***