pavan

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EDITORIAL

The installed capacity of wind power in the country during the financial year 2007-08, was 1663 MW. This is slightly lower than the installation during the year 2006-07. The reduction in the capacity addition during the year 2007 has been attributed by many as a signal for the slower growth of wind power in India. But a comparison of the state-wise achievement during the two years of 2006-07 and 2007-08 would reveal that this was due to the slowing down of the growth primarily in the state of Maharashtra. Maharashtra could register a capacity addition of only 55% of what it had achieved during the year 2006-07. The reduction in capacity happened due to reasons other than manufacturing capacity, policy etc. but due to local issues where by installation of turbines and its commissioning were considerably delayed. Thus, the slight reduction in achievement during 2007-08 should not be taken as a bench mark for the growth of wind power during the remaining period of 11th plan.

One of the important services offered by C-WET was to carry out wind resource assessment studies in the country in association with the concerned state nodal departments. Recently, there has been requests from various State Governments to take up more sites for wind resource assessment.

In order to expedite the progress, C-WET has issued revised guidelines for preparation of the proposals by the State Governments and the methodology to be adopted for setting up of masts, carrying out measurements, data collection etc.

Wind solar Hybrid systems have been found to be useful to provide electricity on a decentralized mode, where grid facilities are either not available or the supply of electricity is extremely erratic. Ministry of New & Renewable Energy has been promoting setting up of such systems in the country by providing capital subsidy. Limited manufacturing facility has been established in the country.

Though a number of aero-generators are based on the technology available abroad, they are not tested with respect to its power performance, safety etc. C-WET has set up a testing facility for aero-generators in its Wind Turbine Test Stations at Kayathar. Some of the manufacturers have already offered their model for testing.

There has been keen interest in the country to know the potential of off-shore wind power in India. A review of the work done in the country has been included in this Vol. of Pavan.

In brief, there seems to be a limited potential for off-shore wind farms in the Indian water, as indicated in the measurement carried out along the costal area.

Further detailed measurements of wind, preferably through masts set up in the off-shore stations, the sea bed characteristics etc. would be required to assess the potential more realistically.

C-WET proposes to take a detailed study in this area pooling the expertise available in the country with the other concerned organizations.

K.P. Sukumaran
Executive Director

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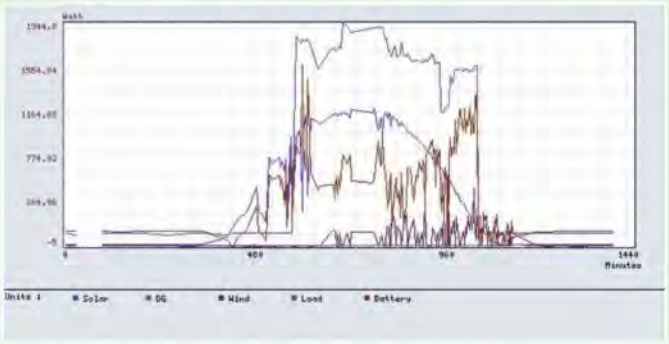
Editorial Board

Developments in R&D UNIT

Wind Solar DG Hybrid system

A 5 kW Wind Solar DG Hybrid system has been installed at C-WET campus as a pilotcum-demonstration project. The system configuration is 1.8 kWp solar photovoltaic panels, 3.2 kW aero generator and a 5 kVA DG set which acts as a back up. Batteries of 48 V, 1200 Ah are connected for storage. The system supplies a load of 2 kW. The system is monitored by a GPRS based remote monitoring system.



Time series of power (watts) of various components of the hybrid system

Testing of Small Wind Turbine

The unit has undertaken testing of a 5 kW small wind turbine manufactured by M/s. Supernova Technologies Private Limited at Wind Turbine Test station, Kayathar. Power Performance Measurements, Duration Test and Safety and Function Tests will be performed on the turbine. This is the first time the Centre has undertaken testing of a Small Wind Turbine.

Aero generator under test in Kayathar

Move on in WRA UNIT

Presently, forty eight wind monitoring stations are operational under various wind monitoring projects like Wind Resource Assessment in Uncovered / New areas, Wind Resource Assessment in North East Region and Consultancy Projects etc.

Verification of Procedure of Wind Monitoring at Khanapur in Sangli district, Maharashtra has been taken up for M/s. Enercon India Limited, Mumbai.

Wind Recourse Assessment at Sanai Dongri has been taken up for M/s. Narmada Wind Energy Private Limited, Jabalpur.

Basic & Preliminary Study for Exploring Feasibility has been taken up for Wind Farms at Ottapidaram site in Tuticorin for M/s. U. C. World Online Limited, Chennai.

The unit has completed three Site Validation & Generation Estimate of Proposed 69 MW, 35 MW and 15 MW Wind Farm projects for M/s. Reliance Innoventures Private Limited, Mumbai, M/s. Tata Power Company Limited, Mumbai and M/s. Theolia Wind Power Private Limited, New Delhi, respectively.

The unit has completed two Verification of Procedure of Wind Monitoring for Bhose, Sangli district, Maharashtra and Akal, Jaisalmer district, Rajasthan for M/s. Enercon (India) Limited, Mumbai & M/s. Vestas RRB India Limited, Chennai, respectively.

Steps forward in TESTING UNIT

The measurements for Provisional Type Testing (PTT) of Suzlon S-52 600 kW wind turbine at WTTS, Kayathar were closed and the reporting is under progress.

The measurements for Provisional Type Testing (PTT) of IWPL 250 kW wind turbine and Siva 250 kW wind turbines are expected to be extended to the next windy season 2008 due to inadequate measurements.

The measurements for Provisional Type Testing (PTT) of Suzlon 1500 kW wind turbine at Moti Sindhodi and Enercon 800 kW wind turbine at Jodhpar in Gujarat were closed and the reporting is under progress.

Blade Instrumentation for M/s. Shriram EPC's LIET WIND Model LTW77 1.35 MW at Oothumalai, Tamil Nadu was completed successfully.

The unit has applied for MEASNET (International Network for Recognized and Harmonized measurements in wind energy) in the area of Power performance measurements. The technical audit by MEASNET is under progress.

Marching ahead in S&C UNIT

An agreement has been signed with M/s. Southern Wind Farms Limited for Renewal of Provisional Type Certificate of GWL 225 – 225 kW wind turbine model as per TAPS – 2000 (amended).

The certification projects, taken up as per TAPS – 2000 (amended), are under progress.

The continual improvement and maintaining the Quality Management System are on going.

Highlights from ITCS UNIT

The Unit had successfully organized a Special International Training Course for 20 Cuban scientists on "Wind Turbine Technology and Applications" covering all aspects related to Wind Resource Assessment, System Assembly, Standards, Testing, Certification and Operation & Maintenance of wind energy system during 11th – 24th February 2008. Ministry of New and Renewable Energy (MNRE) mooted the idea of this training course and sponsored the programme and the international travel cost of the participants was supported by Indian Technical & Economical Cooperation (ITEC) being established by TC division of Ministry of External Affairs.

The objective of the training course was to transfer knowledge and special skills needed by the wind energy personnel working in the technical and operational fields and to share the experiences from the lessons learnt over the past two decades. This course has provided invaluable platform for dialogue and open exchange of views and experiences.

The content for the training was a carefully thought out syllabus with specific subject experts giving lectures with case studies. The course was aimed at professionals engaged in wind energy planning and implementation.

The training addressed the following aspects

- Introduction to Wind Resources Assessment & Techniques
- Wind Measurements & Guidelines
- Wind Monitoring Station, Operation, Data Collection and Analysis
- Micro-siting Techniques & Guidelines
- Satellite Information for Wind Resources
- Certification Schemes
- Type Certification as per TAPS - 2000
- Design Requirements – Electrical, Mechanical & Hydraulic systems and Tower
- Wind Turbine Tower & Foundation
- Testing of Wind Turbines
- Testing Instrumentation
- Testing Measurements Techniques
- Power Performance and Quality Measurements
- Erection and Commissioning of Wind Turbines
- Wind Turbine Operation and Maintenance

The total course duration was fourteen days covering tutorial lectures, exercises and manufacturing facilities & wind farms visits to give a complete picture of the know-how and how to go about setting up a coordinated wind energy programme at a national level.

The course was attended by 19 participants from Cuba. The course was appreciated by the participants.

Shri. V. Subramanian, I.A.S., Secretary, MNRE inaugurating the training

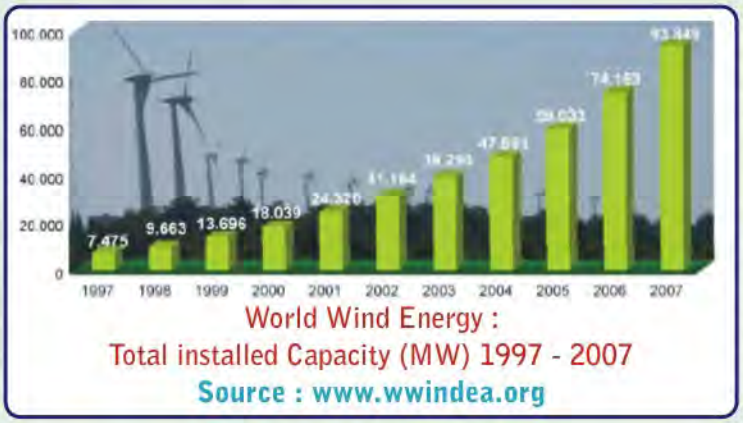
Shri. Vilas Muttemwar, Honorable Mister for State, Independent Charge, MNRE distributing Course Certificate to the participants at the Valedictory function

27 locations in India can harness wind power news

There are 27 locations in the coastal areas of India that have the potential for harnessing wind for power generation.

This was revealed subsequent to wind surveys carried out at 71 locations in the states of Andhra Pradesh, Gujarat, Goa, Karnataka, Kerala, Maharashtra, Orissa, Pondicherry, Tamil Nadu and West Bengal, Lakshadweep, and Andaman & Nicobar Islands.

Minister of state for new and renewable energy, Shri.Vilas Muttemwar, informed the Lok Sabha that wind power capacity of 7844 MW had been installed in the country as of 31 December 2007, including potential coastal areas. He said a target of 10,500 MW of wind power has been planned during the Eleventh Five Year Plan period, including in potential coastal areas.



World Wind Energy :
Total installed Capacity (MW) 1997 - 2007
Source : www.wwindea.org

The minister also told the House that the strategy for promoting wind power projects through private sector investment is being continued during the 11th Plan, by providing various fiscal incentives such as concessional import duty on certain components of wind electric generator, excise duty exemption, ten years' tax holiday on income generated from wind power projects, the benefit of accelerated depreciation, and loans from Indian Renewable Energy Development Agency (IREDA).

Technical support for wind power is provided by the Centre for Wind Energy Technology (C-WET) by way of detailed wind resource assessment to identify further potential sites.

The minister also said that a higher tariff is being provided for wind power in all the potential states.

Source : www.windenergynews.com

India to promote wind power projects

India said it will promote the setting up of commercial wind power projects by providing financial incentives.

Minister for New and Renewable Energy Vilas Muttemwar said Tuesday the government will provide concessional import duty for wind electricity generator subsystems, excise duty exemption and 10-year tax holidays on wind power projects.

Muttemwar said the government also provides benefits of accelerated depreciation, term loans from the Indian Renewable Energy Department Agency and identification of more potential locations by carrying out wind resource assessment studies.

"A wind power installed capacity of 7,844 megawatts has been achieved up to Dec. 31, 2007, in the country, which includes 3,712 MW in Tamil Nadu. Production of power from ocean energy has not been found to be cost effective on a commercial scale," Muttemwar said.

Source : www.windenergynews.com

Wind power urged for computers

The world's computing power should be moved from desktop computers and company servers to remote outposts where renewable energy such as wind and solar power is abundant, according to a Cambridge University computer expert.

With carbon emissions from computing set to rise rapidly in the coming decades, he said his idea could significantly reduce the contribution made by computers to climate change. "There's something very special about computing power which is very different from heating your house," said Prof Andy Hopper. "Computing power can be moved around the world and can be done anywhere in the world where the energy is available."

According to UK government figures, business computing is responsible for 2.8m tonnes of CO2 emissions a year. The UK's total emissions are just over 554.5m tonnes. Office equipment (of which computers make up about a third) is responsible for 15% of the emissions from a typical office.

Moving energy via the national grid entails significant losses. Hopper's scheme would work by shifting computer operations to servers close to wind farms that are working at full tilt. On a global scale a network of energy producers could be called upon depending on where energy was most abundant at any time.

"I think it is very interesting to contemplate a world with a smallish number of server farms, huge ones, which are deployed in places where the energy is produced," he told a conference at the Royal Society in London yesterday. "The whole point is that we are using energy that would otherwise be lost. It is more efficient, more appropriate, cheaper to use it in situ."

Source : www.windenergynews.com

Power generation from waste and wind

31 waste-to-energy based power projects aggregating to 68.62 MW capacity in eight States and 36 demonstration wind power projects aggregating to 70.9 MW capacity in nine States have been set up with Central Financial Assistance from Ministry of New and Renewable Energy. Moreover, commercial wind power projects of about 7844 MW capacity have been installed in the country through private investment.

Resource Assessments are being carried out for power generation from wind and biomass resources in the country, including the backward and rural areas. Wind-solar hybrid systems and biomass gasifiers are being installed for meeting the energy requirements in various States, including the backward and rural areas.

The Ministry is also implementing a programme for electrification of remote unelectrified census villages and un-electrified hamlets of electrified census villages through various new and renewable energy sources including biomass resources such as crop residues and agro-industrial wastes.

Central Financial Assistance of Rs. 10.03 crore for waste-to-power projects and Rs. 1.90 crore for demonstration wind power projects has been provided by the Ministry to various States during the last two years.

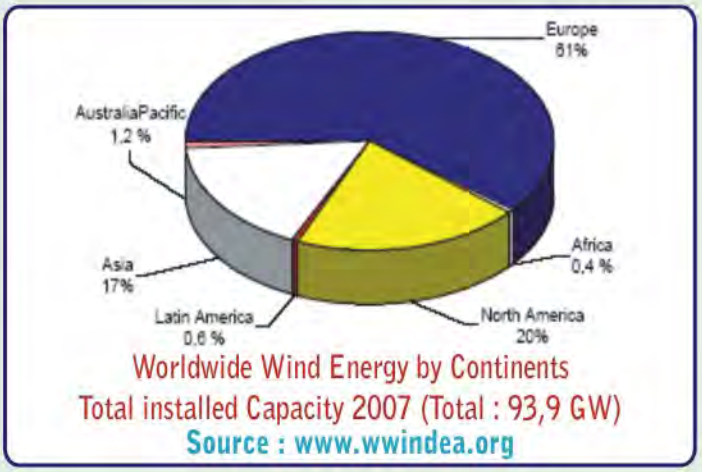
This information was given by the Minister of State for New And Renewable Energy, Shri Vilas Muttemwar, in a written reply to a question by Shri Jai Parkash Aggarwal in the Rajya Sabha today.

Sources : http://pib.nic.in

India ranks fourth in wind energy map

Wind power is becoming a mainstream energy source. Over 20,000 mw of wind turbines were installed in 2007 bringing world- wide capacity to 94,112 mw, up 27% from 2006. The top five countries in terms of installed capacity are Germany (22, 300 mw), the US (16,800 mw), Spain (15,100 mw) India (8000 mw) and China (6,100 mw). In terms of economic value, the global wind market in 2007 was worth about $36 billion, according to Global Wind Energy Council (GWEC). In capacity addition, the US was in the lead in 2007, followed by China and Spain.

According to the GWEC data, the US installed 5,244 mw of wind turbines in 2007, more than double the 2006 figure. It accounted for 30% of the country's new power producing capacity in 2007. Overall the US wind power generating capacity grew 45% in 2007 with total installed capacity at 16,800 mw. Spain added 3515 mw of new capacity in 2007. Total capacity now stands at 15,000 mw.



Worldwide Wind Energy by Continents
Total installed Capacity 2007 (Total : 93,9 GW)
Source : www.wwindea.org

In Europe the capacity of new wind turbines in 2007 reached 8,662 mw and the total capacity reached 57,135 mw. It would avoid about 90 million tonnes of carbon emissions. GWEC quoted the European Wind Energy Association chief executive, Christian Kjaer, as saying that "it is positive that wind energy is now increasing more than any other power technology in Europe making up 40% of total new power installations".

China is making rapid strides in wind power generation. In 2007 it added 3,449 mw of wind energy capacity, a growth of 156%. China is ranked fifth in installed wind energy capacity with over 6000 mw at the end of 2007. Based on current growth rates, the Chinese Renewable Energy Industry Association (CREIA) forecast a capacity of around 50,000 mw by 2015.

The growth in wind power market has encouraged domestic production of wind turbines and there are over 40 manufacturing Companies. It is estimated that by 2010 the domestic manufacturing capacity in China would go up to 10,000-12,000 mw from the present 5000 mw.

With 8000 mw of installed capacity, India is ranked fourth in the world in total wind power capacity. About 1730 mw new capacity was added up to December-end 2007.

While Europe, North America and Asia continue to see the most important additions to their wind energy capacity, West Asia-North African region increased the wind power installations by 42%, reaching 534mw at the end of 2007. New Capacity was added in Egypt, Morocco, Iran and Tunisia. ...

Sources : "The Financial Express"

Offshore prospects in India

1.0 Introduction

In recent years, utilizing the wind energy offshore, that is to say siting wind turbines at sea off the coasts, has evolved from a vision into a reality. In this area too, the utilization of wind energy is progressing rapidly. India which has a total installed capacity of 8000 MW of onshore wind energy is also exploring offshore prospects.

Wind Turbines installed into the sea for power generation are generally known as offshore wind farms. The depth of water can be few meters up to 20/30 meters. There would be financial constraints to have wind turbines installed in deeper water than this depth. Offshore wind development zones are generally considered to be a few kilometers from land. The surfaces of seas are generally smooth thus the roughness of the seascape is very low at constant wind speeds. Thereby, winds available on the sea are less turbulent and possess higher density when compared to land, as such the turbines located at sea are expected to have higher generation as well as longer life than land based turbines (Fig-1). Capacity factors (utilization rates) are considerably higher than for onshore and near-shore locations. Siting wind turbines at sea promotes the tendency to "size". The wind turbines suitable for offshore wind energy are of megawatt size thus making it possible to have wind farms of magnitude similar to large power stations. Offshore wind turbines are less obtrusive than turbines on land, as their apparent size and noise can be mitigated by distance.

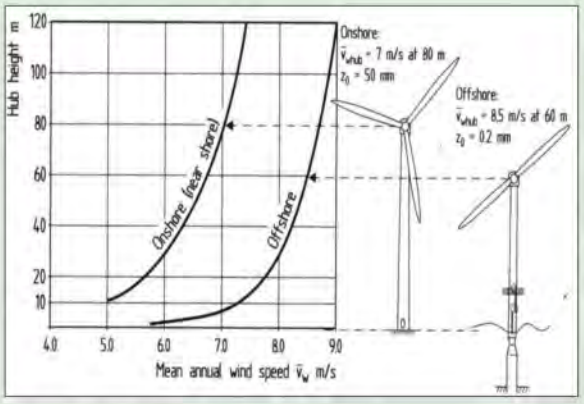


Fig-1 : Logarithmic profiles indicating increasing wind speeds with height for typical onshore and offshore wind turbines
Source: Wind Turbines: Fundamental, Technologies, Applications and Economics – Erich Hau

2.0 Technology

The first prerequisite for utilizing wind energy successfully offshore is a suitable design and the technical equipment of the wind turbines themselves. Existing wind turbines were designed for siting on land. A wind turbine located at sea is typically subjected to different external conditions that must be taken into consideration in the design.

To make use of high wind speeds, the towers of wind turbines sited offshore do not need to be as high as those on inland sites. The wind speed profile has more of a bulge so that lower tower heights are sufficient for attaining the optimum economic value. The tower height is also determined by the oceanographic conditions in relation to the rotor diameter. Factors to be taken into consideration are the normal water depth above sea bottom, the tidal range, the maximum wave height to be expected and sufficient clearance to the rotor. Fig-2 shows the proposed minimum height for a large wind turbine with a rotor diameter of 100 m for an assumed water depth of 20 m and the water level conditions of the sea.

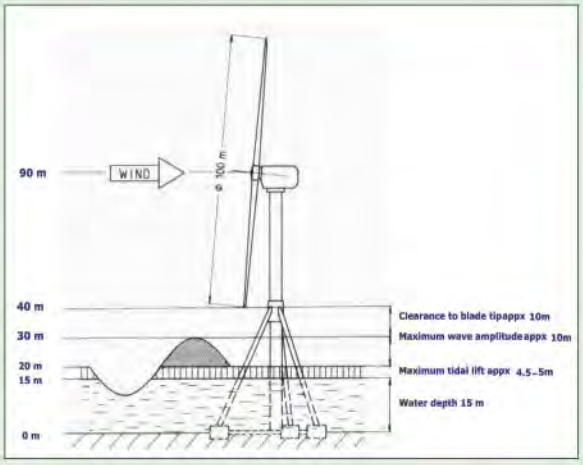


Fig-2: Typical view indicating water levels in the sea w.r.t. tower height of turbine
Source: Wind Turbines: Fundamental, Technologies, Applications and Economics – Erich Hau

While designing Wind Turbines for offshore applications, it is important to note several other additional factors. The foremost is of course the sea state and marine conditions. Other equally important aspect is the evacuation arrangements and the O&M aspects. As use of sub marine cables is unavoidable, the cable damage due to near shore activities, natural oscillations caused by sea would be quite detrimental. As a consequence of such damages, the machine may be kept under brake condition for extended periods of time. This has serious consequences on the gear boxes and other systems. Corrosion and scour are other serious issues that need to be taken into account while designing the turbine. Machines of modern design prevent outside air from entering into the turbine. With reliability at serious stake in offshore environment, on line condition monitoring is imperative and is part of the system design. Over the years, the initial stall regulated simplistic designs have given way to gear less variable speed technologies.

3.0 Economics of Offshore Wind Power

Unlike the on shore projects, the cost of wind turbine itself forms only about 45 to 50% of the project cost (Fig-3). The evacuation facilities will range between 20 to 25% depending on the distance from the shore and as to whether on AC or DC bus is employed. DC link is expected to be cheaper when the distances to the shore are larger. High voltage DC transmission can be considered as an alternative for transmitting power for distances more than 50 kms from the shore. Foundations again are expected to cost less on a per kW basis for larger wind turbines as the water depth goes up. Foundation costs will be in the range of 15 to 25% of the project cost. Project management and other expenditure will be at about 5%.

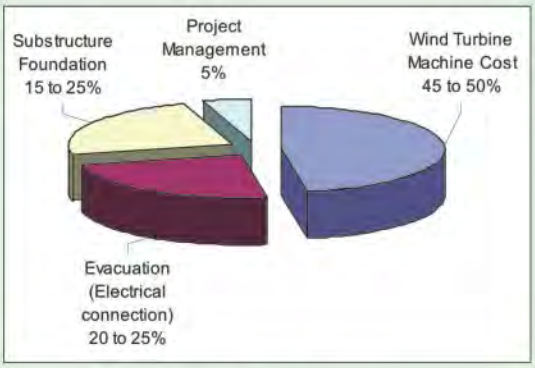


Fig- 3: Economics of offshore wind power

4.0 International Scene

Offshore wind capacity accounts for almost 1,165 megawatts worldwide up to December 2007 (Table-1) Denmark maintains its leadership, with 426 megawatts of installed offshore wind power capacity, followed by the United Kingdom, Sweden, the Netherlands, and Finland.

Table -1

Cumulative Installed Offshore Wind Power Capacity Country-wise (Dec. 2007)

Country	Cumulative Installed Capacity
Denmark	426
United Kingdom	404
Sweden	133
Netherlands	127
Finland	30
Ireland	25
Spain	10
Germany	7
China	2
Japan	1
World Total	1,165

Source: Compiled by Earth Policy Institute from Wind Service Holland, Offshore Wind Energy, electronic database, at http://home.wxs.nl/~windsh/offshore.html, updated

5.0 Wind Resource along Indian Coastline

India is blessed with a coastline of about 7,600 km. Under a National wind monitoring programme, winds have been measured at 54 locations on the coastline. The western coastline has modest potential at sea level. Measurements along the coastal Kerala and Karnataka have shown marginal sites indicating that winds are rather poor in the first hundred meters. Elevated hills of Goa also exhibit similar trends. As one moves up northwards there is some improvement but it is not some thing that will attract offshore wind farming. Coastline around Gujarat has reasonable potential but is prone to cyclonic conditions that can be very severe. East coast also has a modest potential but is prone to cyclonic conditions, which is again not very comfortable situation.

The southern tip of India starting from Kanyakumari up to Rameshwaram has shown some promising values. Rameshwaram indicates WPD of 603 W/m2 at 50 m agl, and Kanyakumari has shown wind power density in the range of 370 Watts/m2 at 30 m agl (Table-2). But this needs to be rechecked through fresh long term measurements at both the locations.

Table 2: Wind Characteristics at Kanyakumari

Month	Level magl		Level magl	
	10 m		30 m	
	WS (m/s)	WPD (W/m2)	WS (m/s)	WPD (W/m2)
January	5.07	187.0	8.06	473.1
February	4.60	174.4	6.73	289.1
March	4.93	169.1	6.05	237.9
April	4.89	135.0	5.57	193.3
May	6.63	248.6	7.71	383.8
June	7.16	281.3	8.37	447.8
July	7.78	336.7	8.98	515.1
August	7.92	357.4	9.18	558.4
September	6.02	297.1	6.90	443.1
October	4.93	188.1	6.48	343.1
November	3.23	33.4	6.17	212.7
December	1.85	69.9	3.44	380.4
Annual	5.42	206.5	6.97	373.1

Based on Jan-04 to Dec-04
* Based on 26 Days data

6.0 Summary data from Rameshwaram

Rameshwaram wind monitoring station was installed near end of the island. It is a narrow strip of land jutting towards Sri Lanka and about 200 m wide. But for some casurina hedges, the location probes into both monsoons and can be taken as nearly

offshore location. The sea is also rather shallow. The only limitations are the present access by bridge and evacuation facility available at the site. However, it should be noted that in case an experimental off shore wind farm is to be established, this could be one of the locations.

The site, while possessing moderate good potential does not have too high extreme wind conditions. There were a couple of episodes of cyclones playing havoc in the sixties and seventies, but that could be a consequence of unpreparedness as it happens with earth quake damages or the annually featured evacuation that takes place in coastal Andhra Pradesh. While going by the available data, the wind resource available even here is to be considered as modest. It should also be noted that more data needs to be collected at offshore locations using sufficiently tall masts. There can be a stage when even 300 - 500 W/m2 sites become economically viable.

7.0 Conclusions

Preliminary resource investigation at Rameshwaram and Kanyakumari indicates modest wind along the coastal line. However, it was found that whatever offshore data collected was not continuous and lot of uncertainty was involved as most of it was extrapolated. As such further investigations are required for validation of data collected with an objective to examine the feasibility for setting up of demonstration offshore wind farm. To begin with C-WET is exploring possibility of conducting offshore measurements at Koodangulam about one kilometer into to the sea. The same will be carried out as a coordinated programme among various organizations and shall be first of its kind in India.

Table 3 : Summary of Wind Data at Rameshwaram

Month	Wind speed at 20 m a.g.l kmpl	Wind speed density at 20 m a.g.l. W/m2	Peak wind speed kmph	Lull hours (wind speed less than 10) kmph	Prevailing direction
January	26.11	293.0	83.67	22	NE
February	20.67	161.8	57.12	58	NE
March	17.29	107.0	54.71	125	NE
April	17.87	137.8	99.76	131	S/SW
May	26.98	358.6	77.23	46	S/SW
June	31.82	546.3	74.01	31	SW
July	27.04	367.2	80.45	53	SW
August	24.11	256.4	65.16	43	S/SW
September	24.35	288.7	70.80	67	S/SW
October	19.85	177.2	78.04	110	S/SW
November	23.40	234.1	77.23	56	NE
December	27.19	325.7	69.19	22	NE

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