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SCENARIO OF WIND ENERGY IN THE STATE OF GUJARAT

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ABSTRACT

A transition to renewable energy has become imperative due to the converting crises of increasing fossil fuel prices, their projected extinction in the next few decades, and climate change. World over, the transition has begun and WIND POWER is leading it. Renewable energy sources, especially wind turbine generator, are considered as important generation alternatives in electrical power system due to their non exhausted nature and benign environmental effects. The purpose of this paper is to understand the economics of wind power and to understand the financial viability of wind power projects for industries as well as utilities. We are re-inventing an old, reliable and green energy source is the run-up to a post-fossil fuel world. That green source is WIND and INDIA now rank 4th in the world in terms of installed capacity derived from wind power, which makes our paper especially timely.

Keywords: *Power output, wind speed, wind pattern*

1. INTRODUCTION

The energy from wind has been harnessed for thousands of years for useful purposes. Wind energy is an indigenous power source which is permanently available in almost every country in the world. However, its utilization as a cost effective renewable energy source for power generation is relatively new.

Renewable energy will cover more than 50% of all the global energy needs by middle of this century and 80% of all the global energy needs by the end of this century. Thus, this century can be called the century for renewable energy with its advantages being now clear cut. Some of which are that its generation-

1) Reduce the impact on environment,
2) Substantially lowers the incidence on public health,
3) Ensures energy security with freedom from the volatile oil market,
4) Creates jobs and
5) Enhances the value of local economics.

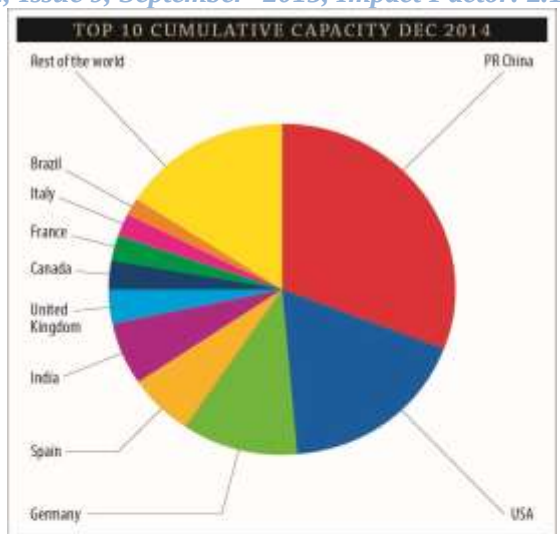
In India high wind speeds are obtainable in coastal areas of saurashtra, Western Rajasthan, Tamilnadu & some parts of central India. India have wind speed range of 8-36 km/hr. India has a potential of 20,000 MW of wind power generation. There may be a much more scope of wind energy production in Gujarat state. This paper find outs hope of wind energy production in Gujarat state to contribute towards the self dependency of power generation.

2. WIND RESOURCES ASSESSMENT

The wind resource Assessment Programme is being implemented in the country through the centre for wind Energy Technology, Chennai.

The wind power potential in the world initially identified as 60,000 MW.

After a slowdown in 2013, the wind industry set a new record for annual installations in 2014. Globally, 51,473 MW of new wind generating capacity was added in 2014 according to the global wind market statistics by the Global Wind Energy Council (GWEC). The record-setting figure represents a 44% increase in the annual market, and is a solid sign of the recovery of the industry after a rough patch in the past few years. Total cumulative installations stand at 369,597 MW at the end of 2014.



Country	MW	% SHARE
PR China	114,609	31.0
USA	65,879	17.8
Germany	39,165	10.6
Spain	22,987	6.2
India	22,465	6.1
United Kingdom	12,440	3.4
Canada	9,694	2.6
France	9,285	2.5
Italy	8,663	2.3
Brazil*	5,939	1.6
Rest of the world	58,473	15.8
Total TOP 10	**311,124**	**84.2**
World Total	**369,597**	**100**

*Projects fully commissioned, grid connection pending in some cases. Source: GWEC

3. WINDMILL & ITS COMPONENTS

Windmill is a machine which works with the help of wind energy to obtain some useful work. The parts of windmill are three blades, generator, computer control system, turbine etc.Wind machines used blades to collect the wind's kinetic energy. There are two types of wind machines used today: horizontal–axis wind machines and vertical-axis wind machines. Most windmills are the horizontal-axis type.

4. HORIZONTAL AXIS

Horizontal-axis wind machines have blades like airplane propellers. A typical horizontal wind machine stands as tall as a 20-story building and has three blades that span 200 feet across. Wind machines stand tall and wide to capture more wind.

5. VERTICAL AXIS

Vertical – axis wind machines have blades that go from top to bottom. The typical vertical wind machine stands 100 feet tall and 50 feet wide. Vertical-axis wind machines make up just five percent of the wind machines used today. Holland is famous for manufacturing of windmills because their windmill have propeller type blades.

The input to the ANN is the value of exponent of reactive power load-voltage characteristic (n_q) and the output is the desired proportional gain (K_P) and integral gain (K_I) parameters of the SVC. Normalized values of n_q are fed as the input to the ANN the normalized values of outputs are converted into the actual value. The process of determining the weights is called the training of the learning process. Prior to conducting the

6. WIND POWER PRODUCTION

A wind machine can produce 1.5 to 4.0 million kilowatt-hours (kWh) of electricity a year. That is enough electricity for to power 150-400 homes wind machines in the United States generate 17 billion kWh per year of electricity, enough to serve 1.6 million households. This is enough electricity to power a city the size of Chicago, but it is only a small fraction of the nation's total electricity production, about 0.4 percent. Wind machines generate electricity in 30 different states. The states with the most wind production are California, Texas, Minnesota, Iowa, and Wyoming. Most of the wind power plants in the world are located in Europe and in the United States where government programs have helped support wind power development

New technologies have decreased the cost of producing electricity from wind, and growth in wind power has been encouraged by tax breaks for renewable energy and green pricing programs. Many utilities around the country offer green pricing options that allow customers the choice to pay more for electricity that comes from renewable sources.

Windmills work because they slow down the speed of the wind. The wind flows over the airfoil shaped blades causing lift, like the effect on airplane wings, causing them to turn.. The blades are connected to a drive shaft that turns an electric generator to produce electricity.

In India there are following windmill systems are:-

(1) CAZRI Windmill at Jodhpur (Rajasthan).
(2) Central Salt & Marine Chemicals Research Institute at Bhavnagar (Gujarat).
(3) Madurai windmill at Madurai (Tamilnadu).

7. THE WIND ENERGY PROGRAMME IN INDIA:

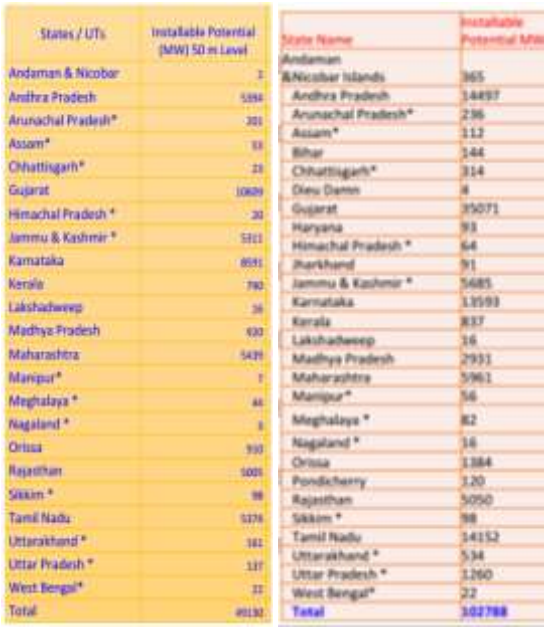
The Wind power Programme in India was initiated towards the end of the Sixth Plan, in 1983-84. A market-oriented strategy was adopted from inception, which has led to the successful commercial development of the technology. The broad based National Programme includes wind resource assessment activities; research and development support; implementation of demonstration projects to create awareness and opening up of new sites; involvement of utilities and industry; development of infrastructure capability and capacity for manufacture, installation, operation and maintenance of wind electric generators; and policy support. The Programme aims at catalyzing commercialization of wind power generation in the country. The Wind Resources Assessment Programme is being implemented through the State Nodal Agencies, Field Research Unit of Indian Institute of Tropical Meteorology (IITM-FRU) and Center for Wind Energy Technology (C-WET).

Wind in India are influenced by the strong south-west summer monsoon, which starts in May-June, when cool, humid air moves towards the land and the weaker north-east winter monsoon, which starts in October, when cool, dry sir moves towards the ocean. During the period march to August, the winds are uniformly strong over the whole Indian Peninsula, except the eastern peninsular coast. Wind speeds during the period November to march are relatively weak, though higher winds are available during a part of the period on the Tamil – Nadu-coastline

State-wise Wind Power Installed Capacity In India

State	Gross Potential (MW)	Total Capacity (MW)	Technical Potential (MW)
Andhra Pradesh	8275	101.3	1750
Gujarat	9675	218.05	1780
Karnataka	6620	274.2	1120
Kerala	875	2.00	605
Madhya Pradesh	5500	26.35	825
Maharashtra	3650	411.15	3020
Rajasthan	5400	212.0	895
Tamil Nadu	3050	1683.6	1750
West Bengal	450	1.10	450
Others	**2990**	**3.1**	**-**
Total (All India)	**45195**	**2884.75**	**12875**

A notable feature of the Indian Programme has been the interest among private investors/developers in setting up of commercial wind power projects. The gross potential is 45,000 MW (source MNES) and a total of about 1869 MW of commercial projects have been established until March 2003. About 8.8 billion units of electricity have been fed to various State grids from wind power projects. The break-up of projects implemented in prominent wind potential states is as given below:



States / UTs	Installable Potential (MW) 50 m Level
Andaman & Nicobar	2
Andhra Pradesh	5394
Arunachal Pradesh*	201
Assam*	53
Chhattisgarh*	23
Gujarat	10609
Himachal Pradesh *	20
Jammu & Kashmir *	5311
Karnataka	8591
Kerala	790
Lakshadweep	26
Madhya Pradesh	920
Maharashtra	5439
Manipur*	7
Meghalaya *	44
Nagaland *	3
Orissa	910
Rajasthan	5005
Sikkim *	98
Tamil Nadu	5374
Uttarakhand *	161
Uttar Pradesh *	137
West Bengal*	22
Total	49130

State Name	Installable Potential MW
Andaman &Nicobar Islands	365
Andhra Pradesh	14497
Arunachal Pradesh*	236
Assam*	112
Bihar	144
Chhattisgarh*	314
Dieu Damn	4
Gujarat	35071
Haryana	93
Himachal Pradesh *	64
Jharkhand	91
Jammu & Kashmir *	5685
Karnataka	13593
Kerala	837
Lakshadweep	16
Madhya Pradesh	2931
Maharashtra	5961
Manipur*	56
Meghalaya *	82
Nagaland *	16
Orissa	1384
Pondicherry	120
Rajasthan	5050
Sikkim *	98
Tamil Nadu	14152
Uttarakhand *	534
Uttar Pradesh *	1260
West Bengal*	22
Total	102788

8. THE SCOPE OF WIND ENERGY PRODUCTION IN GUJARAT STATE

There may be a much more scope of wind energy production in Gujarat state. Possibility can be extracted out at some of the regions of Gujarat states like, Lamba, Okha and Mandavi etc.
Gujarat government is also interested for production of wind energy. GEDA (Gujarat Energy Development Agency) is doing the work progressively for wind energy production authorized by the government.

Sr. No.	Location of Wind Farm, Village, District	Installed Capacity as on 31.03.07
1	**Lamba,** Jamnagar	36.30
2	**Gandhvi**, Jamnagar	17.20
3	**Navadra**, Jamnagar	35.88
4	**Bhogat,** Jamnagar	24.85
5	**Okhamadhi**, Jamnagar	2.00
6	**Patelka**, Jamnagar	13.73
7	**Dhank**, Rajkot	32.94
8	**Mervadar**, Rajkot	21.26
9	**Ukahrala**, Bhavnagar	13.20
10	**Okha**, Jamnagar	0.28
11	**Bamnasa/Kuranga/Satapar/Jodhpar/Okhamadhi,** Jamnagar	89.60
12	**Sadodar**, Jamnagar	92.00
13	**Shikarpur**, Kutch	26.30
14	**Changdai**, Kutch	25.00
15	**Vanku**, Kutch	41.45
16	**Suththri**, Kutch	97.80
17	**Tuna,** Kutch	0.70
		570.47

We observed that from the readings of WHEATHER FORECASTING maximum surface wind speed is10.9 Km /Hr at Saurashtra region. According to GEDA there are two companies (SUZLON & C-WET)are involved for monitoring wind speed in Gujarat.

Large turbines of up to 750kw are made in India, which will have better efficiency in increasing wind. To encourage energy production, GEDA offers an interest rate about 0.5%. Wind energy has been successfully tapped in Tami nadu (Coimbatore, Kanyakumari, and Tuticorn) Pondhicery, Rajasthan. Danish international development authorities (DANIDA), Swiss development corporation (SDC) are helping GEDA to tap the wind energy in various parts of the country.

During last three decades, the assessment of potential of the sustainable eco-friendly alternative sources and refinement in technology has taken place to a stage so that economical and reliable power can be produced. Different renewable sources are available at different geographical locations close to loads, therefore, the latest trend is to have distributed or dispersed power system. Examples of such systems are wind-diesel, wind-diesel-micro-hydro-system with or without multiplicity of generation to meet the load demand. These systems are known as hybrid power systems. To have automatic reactive load voltage control SVC device have been considered. The multi-layer feed-forward ANN toolbox of MATLAB 6.5 with the error back-propagation training method is employed.

9. CONCLUSION

So from above discussion there may be a much more scope of wind energy production in Gujarat state. By observing the above wind speed readings maximum wind energy can be produced in Gujarat state .Thus this paper find outs hope of wind energy production in Gujarat state to contribute towards the self dependency of power generation

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