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Prospects of Wind Energy in Western Rajasthan

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ABSTRACT: Wind generation is currently the leading form of new renewable generation. The power generation through wind energy totally dependent on the flow of the wind due to uncertainty and randomness of wind flow, the generation of power is quite fluctuating in nature and large-scale wind farms may cause significant impact to the stability and power system safety. This paper presents a case study of Western Rajasthan which become high wind power penetration zone. Which includes the requirements of the reactive power mitigating device, the analysis of voltage, active and reactive power flow under condition of sudden increase of wind power and effect of reactive power compensating device Static Var Compensator if it is placed at major GSS of Western Rajasthan. To analyze the situation Mi-Power software is used. It is concluded that for Rajasthan power system the installation of suitable capacity SVC is must, preferably at the main wind bus.

The Jaisalmer Wind Park is India's second largest and globally the fourth-largest operational onshore wind farm.^[1] This project is located in Jaisalmer district, Rajasthan, Western India. The project was initiated in August 2001 by developed by Suzlon Energy and comprises Suzlon's entire wind portfolio – ranging from the earliest 350 kW model to the latest S9X – 2.1 MW series.^[2] Its installed capacity is 1,064 MW, which makes it one of the world's largest operational onshore wind farms.^[3] By April 2012, its combined installed capacity crossed 1000 MW i.e., 1 GW.^[4] At 1064 MW, the wind park became the largest of its kind in India,^[4] and one of the largest wind farms in the world.^[5] In 2015, 24 wind turbine generator of 2.1 MW each were installed at Tejuva, taking the overall production to 1300 MW.^[6]

KEYWORDS: wind energy, western Rajasthan, farms, software, park, Jaisalmer, wind turbine generator

I. INTRODUCTION

As part of efforts to strengthen the renewable energy sector, a green energy corridor is being developed for the first time in western Rajasthan to combine the solar and wind power production. The new intra-State transmission infrastructure, comprising a network of grid sub-stations, is expected to generate 6,311 MW green energy.[1]

The grid sub-stations will be linked with the load centres as well as the national transmission network in order to harness the potential of solar and wind energy in the vast desert areas of Jodhpur, Barmer and Jaisalmer districts. The connection with the transmission network is expected to resolve the issue of distance of load centres from the production sites.

The proposed investment program supported the development of facilities to transmit renewable energy from western Rajasthan to the state and national grids, consistent with the road map for renewable energy development in Rajasthan. The program was planned to be implemented in three tranches. The proposed investment program supported the development of facilities to transmit renewable energy from western Rajasthan to the state and national grids, consistent with the road map for renewable energy development in Rajasthan. The program was planned to be implemented in three tranches. It also supported capacity-building activities to improve the operational integration of the solar and wind power generation in the grid.

As on 31.03.2021, cumulative capacity of 103.4 MW windmill power plants have already been commissioned over IR. Wind based power plant of 10.5 MW (for non-Traction) and 10.5 MW (for Traction) capacity in Tamil Nadu, 26 MW (for traction) capacity in Rajasthan, 6 MW (for non-traction) and 50.4 MW (for traction) capacity in Maharashtra has been installed. This green energy project of Indian Railways assumes great importance in the wake of the growing concern of environmental pollution and global warming issues on one hand and the depletion of fossil fuels on the other hand and also shortage in energy demand and hence is in complete agreement to the “2014 Paris Agreement of Climate Change”. [2,3]



This green energy project of Indian Railways assumes great importance in the wake of the growing concern of environmental pollution and global warming issues on one hand and the depletion of fossil fuels on the other hand and also shortage in energy demand and hence is in complete agreement to the “Go-Green” slogan propagated internationally.

Indian Railways first ever Wind Mill Project of capacity of 10.5 MW was commissioned on 30.03.2009 in Triunelveli Distt. Tamilnadu for meeting energy demand of Integral Coach Factory (ICF), Chennai. These wind turbines have generated about 100 million units so far. The project has also been registered with United Nations frameworks Convention on Climate Change (UNFCCC) which will earn carbon credits of 20000 CERs per annum.

The Project being the first of its kind in Indian Railways and by any other Government of India Organization. This green energy project of Indian Railways assumes great importance in the wake of the growing concern of environmental pollution and global warming issues on one hand and the depletion of fossil fuels on the other hand and also shortage in energy demand and hence is in complete agreement to the “Go-Green” slogan propagated internationally.[4,5]

Objectives:-

Harnessing Green energy for sustainable development.

└ Power will be used for captive consumption.

└ Wind Mill Capacity adequate for meeting ICF’s requirement which is about 23 million units per year. The proposed wind power plant is expected to generate 23.1 million units per year.

└ Being green energy it will reduce carbon emission which will in-turn reduce the ill effects like global warming etc.[6,7]

Power Generated from Wind Mills is used for captive consumption. Expected Annual Generation from Wind Mills is 25.9 million units(28% PLF) and this will meet ICF’s Energy demand. Excess energy generated from Wind mills will be sold to TNEB. Project qualifies for CDM benefits and annual revenue of Rs.2.0 crores is expected from carbon credits. Project serves as a corporate responsibility towards green energy, taking care of the sustainable development aspect. Since being green energy it will reduce carbon emission which will in turn reduce the global warming etc. Daily Generation Report is available on ICF Railnet Website(Electrical Dept link).[8,9]

II. DISCUSSION

India in great future in producing Electricity through wind power .India is in 4th position in among all the countries in term of wind source. Asia biggest and tallest wind turbine was built in India in 2004. That shows the capacity of India in power generation through wind. Although Tamilnadu has highest source of wind energy but Rajasthan state is also in 5th position in terms of wind energy across India. According to data Rajasthan have total installed capacity of 21.833 MW at the end of 2018 and it covers about 20% of wind sector in India. Currently the wind power generation capacity of Rajasthan is 4315 and talking about Total wind energy potential which is near to 21,833 MW.The wind energy covers about 17.6% of total energy production of the state . The Rajasthan government taken many step with MNRE to promote wind energy and Identified location of wind power Devghar (chittorghar) , Harshnath (sakar) , Jaisalmer khodal (Barmer) , phtodi (jaipur) .The western part of Rajasthan has large amount of wind energy . The Thar Desert is one a good location for wind farm in western part. There is very little rainfall. There are various wind parks in Rajasthan but jaisalmer wind parks is one of most important wind park. Jaisalmer wind park in India is 2nd largest on shore farm. This project is in Jaisalmer district of Rajasthan. It has Name plate capacity of 10,64 MW that makes it one of largest on shore wind farm

For Wind Energy: 1. The main problem is the stability of grid and also conductivity of wind projects to the grids. Due to high penetration level of Wind generated electricity it’s not possible for grid to absorb electricity. 2. There is also a challenge of Initial Investment on the projects of Wind. There is lot of risk in it. 3. The undetermined requirement of load affected the quality of supply. This is also a major problem.[10,11]

After all these studies we can conclude that how Renewable sources are important for us and for environment also. There are lot of advantages in Renewable energy as compare to conventional sources. As we can say that there is lot of work has been done and still ongoing in the Rajasthan state in the sector of Renewable Energy. Most of work is done in the sector of Renewable Energy Specifically in solar and wind power. There are various schemes and policy has been developed by Rajasthan state and Ministry of new and Renewable energy sources (MNRE) to promote the Renewable energy projects in different – different cities of Rajasthan. The state has set a target of 22000MW energy in the year of 2022 by solar and wind. But to achieve these targets there are some challenges also regarding Solar and wind. Some of



challenges are high temperature, high penetration level of wind and lack of waste material according to solar, wind and Biomass Energy. So there is demand to speed up the generation of electricity from the Renewable Energy sources to get the target.

III. RESULTS

Jaisalmer – Wind Urja India is a 38.4MW onshore wind power project. It is located in Rajasthan, India. The project is currently active. It has been developed in single phase. Post completion of construction, the project got commissioned in September 2010.

Description

The project was developed by IL&FS Wind Energy and is currently owned by ORIX with a stake of 100%.

The project cost is \$52.608m.

The Concrete towers installed at the project site are 75m high.

Development Status

The project is currently active. The project got commissioned in September 2010.

Contractors Involved

Wind World (India) was selected to render EPC services for the wind power project.

Wind World (India) was selected as the turbine supplier for the wind power project. The company provided 48 units of E-53 / 800 kW turbines, each with 0.8MW nameplate capacity.

Wind World (India) is the O&M contractor for the wind power project, commencing from the year 2010.

Methodology

All power projects included in this report are drawn from GlobalData's Power Intelligence Center. The information regarding the project parameters is sourced through secondary information sources such as electric utilities, equipment manufacturers, developers, project proponent's – news, deals and financial reporting, regulatory body, associations, government planning reports and publications. Wherever needed the information is further validated through primary from various stakeholders across the power value chain and professionals from leading players within the power sector.[12,13]

IV. CONCLUSIONS

The first wind power project of Rajasthan established in Amarsagar village in Jaisalmer district, has achieved a record production of over 16.51 lakh units of power till May this year. was in the fourth position, in new and renewable energy development that includes wind power and biopower apart from solar. The total new and renewable generation in the state stood at 17040.62 MW followed by Gujarat with 16587,90 MW. Tamil Nadu was third with 16099 MW. Tamil Nadu which was on top has slipped to the third position.

Maharashtra is in the fifth slot with 19657.08 MW.

Rajasthan has made all-around progress in solar, wind, and biopower and its ground-mounted solar generation were 11493.75 M,748.44 MW, the off-grid solar generation was 322.68 MW. In wind power, the state generated 4326,82 MW and 125.08 MW in biopower.

Rajasthan has the maximum number of households electrified through the solar-based standalone system.

Under the Saubhagya scheme, as many as 1,23,682 households were electrified through the solar-based standalone system in Rajasthan, followed by Chhattisgarh (65,373), Uttar Pradesh (53,234), Assam (50,754), Bihar (39,100), Maharashtra (30,538), Odisha (13,735) and Madhya Pradesh (12,651).

Interestingly, Rajasthan receives solar radiation of 6.0–7.0 kWh/m². As the area has low rainfall, about 325 days have good sunshine in a year, and in western areas in the Thar desert it may extend up to 345–355 days.

The desert sun produces an unbelievable amount of energy that reaches the earth. The amount of energy that is absorbed by the earth in one hour is more energy than mankind uses in one year. The total amount of solar energy reaching the earth in one year is huge twice as much energy as ever existed from all sources of coal, oil, natural gas, and uranium combined.



With its abundance of sunlight, Rajasthan has tremendous potential to emerge as one of the leaders in solar power generation. According to the Government of India's policy for the solar sector – Jawaharlal Nehru National Solar Mission (JNNSM) – a target of 20 GW of solar installations by 2022 has been set. Rajasthan alone will contribute to achieving half the target.

Mukesh Ambani's Reliance New Energy Solar Ltd will make its foray into solar power by investing Rs 1 lakh crore in Rajasthan, the hub of green energy in the country.

The company's representative Umesh Bhandari stated that it intends to set up 6000 MW solar power projects in the arid districts of Jaisalmer, Jodhpur, Barmer, Jalore, and Bikaner that could provide employment to 10,000 persons later

Reliance Industries Limited has formed Reliance New Energy Solar Limited (RNESSL), investing Rs 100,000 (~\$1342) for 10,000 equity shares of Rs 10 (~\$0.13) each.

In Rajasthan, RNESSL will require one lakh acres of land to set up its solar plants. The company decided to invest in the state after it started work on developing the Dhirubhai Ambani Green Energy Giga Complex on 5,000 acres of land in Jamnagar in Gujarat.

The state under its Solar Power Policy cleared customized investment proposals worth Rs 34,200 crore (US\$ 4641 million) in the hybrid energy sector in the state. Most of these are related to solar energy. The state's solar power generation potential has been estimated at 142 GW owing to favourable conditions.[14]

"The state government has set an ambitious target of 30 GW of solar power generation by 2024-25," Rajasthan Chief Minister Ashok Gehlot has said.

High solar radiation and wind speeds and an abundance of barren land make Rajasthan suitable for utility-scale solar parks. And it is already home to the world's largest solar park – the 2.25 GW Bhadla Solar Park, located in the Jodhpur district.

"These factors make Rajasthan an attractive destination for domestic and foreign investors looking for opportunities in renewable energy, electricity grid infrastructure, and associated manufacturing," said Subodh Agarwal, additional chief secretary

Currently, Adani Green Energy is setting up a 9700 MW solar and hybrid project in the state on 20,000 hectares of land in the desert. Other companies that have invested in solar power in the state include Repower which is setting up a 10,000 MW project, JSW which is also setting up a 10,000 MW project, and Greenco which is setting up a 4500 MW solar power plant in western Rajasthan.

New Delhi-based renewables developer Azure Power this month commissioned a 600 MW grid-connected solar power project awarded to it by the Solar Energy Corporation of India (SECI).

Azure Power commissioned the project in phases, with the last 100MW going online recently.[15]

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