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Storage and distribution of wind energy in Tamil Nadu – An empirical study

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Abstract

India is blessed with various renewable energy sources. Among all the renewable sources, Wind energy is a prominent renewable energy source in India. Among the Top five states in India; Tamil Nadu plays the first position with highest wind power generation. Now-a-days production is carried on in anticipation of products demand in the society. All the products are not sold off immediately. For the unsold stock of energy storage is indispensible. Wind energy is produced more during the months April- June, and July – Sep. this period is treated as peak period. In order to make their availability during minimum production period, they have to be stored using different methods of storage devices and makes use of the benefits of storage of wind energy. A grid-connected device for electricity storage can also be classified as a DER system, and is often called a distributed energy storage system (DESS). Distributed generation and storage enables collection of energy from many sources and may lower environmental impacts and improve security of supply. The produced wind energy stored in different countries like Canada, USA etc., and makes use of it whenever needed. In India Wind energy producers not able to produces and supply energy regularly due to lack of awareness about storage facilities. The researcher suggested that the government and non-governmental agencies motivate the wind energy producers to install storage facilities, and fulfill the energy demand supply gap.

Keywords: Renewable energy, wind energy, storage, Distribution, Demand, supply, wind potentials

1. Introduction

India is blessed with various renewable energy sources. Among all the renewable sources, Wind energy is a prominent renewable energy source in India. Wind energy has proven track record in India with 23,762 MW of installed capacity at the end 31.3.2015. Renewable energy in India comes under the purview of the Ministry of New and Renewable Energy. India was the first country in the world to set up a ministry of Non-conventional energy resources, in early 1980s. India's cumulative grid interactive or grid tied renewable energy capacity (excluding large hydro) has reached 33.8 GW, of which 66% comes from wind, while solar PV contributed nearly 4.59% along with biomass and small hydro power of the renewable energy installed capacity in India.

At the outset, Ministry of New Renewable Energy has revised its target of renewable energy capacity to 1,75,000 MW till 2022, comprising 100,000 MW Solar, 60,000 MW Wind, 10,000 MW Biomass and 5000 MW Small Hydro. It has been envisaged that solar power will play a significant role in rural electrification by 2020, by providing off-grid solar power generation in 20,000 villages across the country. This is consistent with the ambition of providing 24-hour power supply for each and every house in India by 2022.

Now-a-days production is carried on in anticipation of products demand in the society. All the products are not sold off immediately. For the unsold stock of energy storage is indispensible. Wind energy are produced more during the months April- June, and July – Sep. these are treated as peak period. In order to make their availability during minimum production period, they have to be stored. India wastes 15-20% of its renewable energy due to lack of storage. The variations in wind and solar energy, and the lack of adequate electricity storage facilities, result in about 15-20 per cent of all renewable energy generated in India going to waste, according to a top official in Panasonic India's energy division.

1.1 Renewable energy sources at india as well as tamilnadu

The state is blessed with various forms of renewable energy sources viz., Wind, Solar, Biomass, Biogas, Small Hydro, etc. Municipal and Industrial wastes could also be useful sources of energy while ensuring safe disposal. Renewable Energy (RE) sources provide a viable option for on/off grid electrification & wide industrial applications.

Tamil Nadu, India's sixth-most populous state, has emerged as a major hub for renewable energy over the last decade. More than one-third of its installed capacity of about 8,000 megawatts now comes from renewable energy sources like wind and solar. Wind power in the State of Tamil Nadu is one of the largest sources of renewable energy, the State being bestowed with rich wind resource. Contribution from Wind energy to the State has grown over the years from 1996.Among the Top five states in India; Tamil Nadu plays the first position with highest wind power generation

Table 1: Cumulative Installed Capacity of Wind Potentials in India (Mw)

S. No	State	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
1.	Tamil Nadu	4907	5904.4	6987.7	7162.3	7253	7455.2
2.	Gujarat	1864	2175.5	2966.6	3174.9	3414	3645.4
3.	Maharashtra	2078	2310.8	2733.3	3021.8	2976	4450.8
4.	Rajasthan	1088	1524.8	2070.9	2684.9	2820	3.4307.2
5.	Karnataka	1473	1730	1933.6	2135.3	2409	2638.4
6.	Andhra Pradesh	200.2	236	245.6	447.7	753	1031.4
7.	Madhya Pradesh	229	275.5	376.4	386	439	879.7
8.	Kerala	28	32.8	35.1	35.1	55	35.1
9.	Other	0	4	4.3	4.3	4.3	4.3
Total		11867.2	14193.8	17353.5	19052.3	21264.3	23447.5

Source: (I) www.eia.in/club/user/amsapna/blogs/2040 (karnataka wind energy, wind policies)
(I)https://en.wikipedia.org/wiki/Wind_power_in_India 2015

The above table shows the cumulative installed capacity of wind potentials in India in megawatts. The table shows the various states of India which produces a major portion of wind energy ie Tamil Nadu, Gujarat, Maharashtra, Rajasthan etc for the last six year.

The above table shows the eight states wind potentials. According to the table, TamilNadu plays a major role and occupies the first place; Maharashtra occupies the second place in the production of wind energy. Gujarat occupies the third place; Rajasthan occupies the fourth place and so on. Kerala is the place where the minimum capacity of wind energy produced.

In the year 2014-2015 the total cumulative installed capacity of wind potentials in India were 23448 Megawatts. out of 23448, Tamil Nadu is the number one and has the total capacity of 7455.2 MW, Maharashtra 4450.8, Gujarat was 3654, Rajasthan 3430.7, Karnataka 2638.4, Andhra Pradesh 1031.4, Madhya Pradesh 879.7, Kerala 35.1 and others 4.3.The researcher concluded that from the table that in overall performance of wind potentials, Tamil Nadu occupies always first. So that the wind energy producer can utilize that Opportunities in proper manner.

1.2 Benefits of storage and managing peak load

The stores are used for feeding power to the grids at times when consumption that cannot be deferred or delayed exceeds production. In this way, electricity production need not be drastically scaled up and down to meet momentary consumption – instead, transmission from the combination of generators plus storage facilities is maintained at a more constant level.

An alternate and complementary approach to achieve the same effect as grid energy storage is to use a smart grid communication infrastructure to enable Demand response (DR). Both of these technologies shift energy usage and transmission of power on the grid from one time (when it's not useful) to another (when it's desperately immediately needed). Any electrical power grid must adapt energy production to energy consumption, both of which vary drastically over time. Any combination of energy storage and demand response has these advantages:

1. fuel-based power plants (i.e. coal, oil, gas, nuclear) can be more efficiently and easily operated at constant production levels
2. Electricity generated by (or with the potential to be generated by) intermittent sources can be stored and used later, whereas it would otherwise have to be transmitted for sale elsewhere, or simply wasted
3. Peak generating or transmission capacity can be reduced by the total potential of all storage plus deferrable loads (see demand side management), saving the expense of this capacity
4. More stable pricing: the cost of the storage and/or demand management is included in pricing so there is less variation in power rates charged to customers, or alternatively (if rates are kept stable by law) less loss to the utility from expensive on-peak wholesale power rates when peak demand must be met by imported wholesale power
5. Emergency preparedness—vital needs can be met reliably even with no transmission or generation going on while non-essential needs are deferred

Table 2: Awareness among the Producers

Awareness		Unawareness		Methods And Technology		Need For Aware, Ness Programme	
Respondents	Perce Ntage	Respondents	Percentage	Respondents	Percentage	Respondents	Percentage
22	14.7	128	85.3	150	100	150	100

Source: primary Data 2016

The table 2 clearly stated the awareness, methods, technology and need for awareness program among the wind energy producers regarding the storage of wind energy. According to the table 85.3 per cent of respondent states that they are not aware of the availability of storage and remaining 14.7 per cent of respondent stated that they just know about the availability of the storage of wind energy. The researcher enquired about the storage of wind energy and most of the respondent stated that they don't have such a facility and also said that it takes high cost.

The researchers concluded from the above table that minimum number of respondents explained that the wind energy producers just know about the storage of wind energy and a majority of them are not knowing of it. The researcher wanted to know about the methods and modes of technology used to store the wind Energy. All the 150 respondents that are 100 per cent of the respondents stated that there is no knowledge

relating to the storage methods and technology. So, the Government, non-Governmental organization and windmill companies has to come forward to provide necessary awareness programs like workshop, lectures, symposium, seminar, Conference, meeting etc to wind energy produce at various levels and also the government should take necessary steps to create the awareness among Green Energy importance at primary level to higher education level through curriculum.
The researchers wanted to know about the operation process at time of production from 150 respondents in the study area. According to the respondents statement during the process the mill has stopped after over the fulfillment of the grid capacity. But no one respondent wanted to shut down or stops the machine during the nature of production.

1.3 Methods of wind energy storage in Tamil Nadu

1. **Advanced Batteries Methods**

   An example of an advanced battery technology is lithium-ion batteries, which are available in varying sizes from utility scale to consumer electronics. Batteries composed of other chemistries offer different advantages. In general, advanced batteries offer several advantages

   More efficient than lead-acid batteries

   Provide more energy with a smaller unit than traditional batteries

   Last twice as long as conventional batteries

   Some varieties, such as sodium sulfur batteries, can operate under much higher temperatures. High-power and high-capacity uses, such as in a power grid

   Charge is circulated through the battery from a rechargeable and portable external unit that can be moved to where it is needed on demand

   The wind industry needs: a way for residential- and utility-scale wind producers to store power for use when the wind isn't Blowing, or for storing power for use during peak grid energy use when the cost of electricity and demand is higher.

2. **Fuel Cells**

   Fuel cells are not a recent technology. They were first invented in the 1800's, and they were also used in NASA space flights for a source of backup power and drinking water a by-product of the conversion of hydrogen to electricity. Hydrogen is the most abundant substance in the universe, but on Earth it is combined with other elements and therefore must be extracted from other sources to be used. This extraction process requires an energy input. For utility-scale electric production, hydrogen is typically extracted using natural gas, which can be costly and releases carbon dioxide, albeit at significantly lower amounts than combustion.

3. **Compressed Air Energy Storage**

   Compressed air on a near-utility scale or a utility scale functions similarly to air compressors used in construction applications. Air is compressed into a reservoir, such as a rock cavern or an abandoned mine, relatively slowly during low energy demand periods. When needed as an energy source during high demand times, the air is released rapidly. The released air can turn a turbine to generate electricity.

4. Superconducting Magnetic Energy Systems (SMES)

SMES provide peak power for short durations, which can be helpful to manage quick fluctuations in power quality. SMES store energy in the magnetic field created by electricity flow through a superconducting coil. Used to bridge periods of power instability or short-term interruptions, such as what may occur while switching from grid electricity to a backup power supply.Store energy in the magnetic field created when current travels through supercooled conducting material.SMES produce immediate high power, but for a very short time. New R&D is underway to improve the cooling process, using either liquid helium or liquid nitrogen

5. Flywheel Energy Storage (FES)

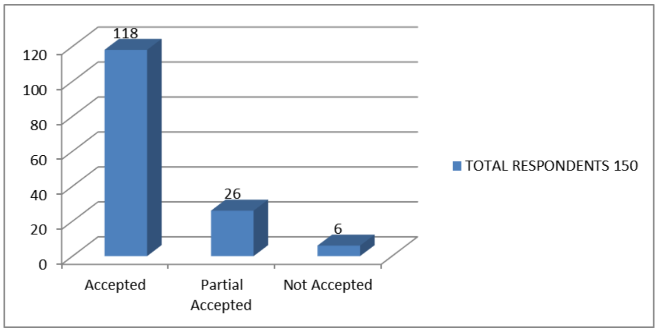
Flywheel energy storage involves bringing a large-sized (large mass) wheel up to a high rotational speed using available power during low demand times. The flywheel turns on a very low friction shaft, so very little energy is needed to keep it spinning once it has reached speed. When energy demands increase to peak, the kinetic energy of the flywheel is used to provide power back to the grid very quickly. Because flywheels typically remain running and available at a moment's notice, they can be used to meet quick energy demands while grid operators wait for other peaking power systems to spin up to full operation.

6. Pumped Hydro Storage (PHS)

Water is pumped from a low reservoir to a high reservoir (an artificial lake, retained by a dam) and therefore energy is stored as potential energy. The water is then released through turbines to generate power. It has a high capacity, a good efficiency and therefore a low cost. However, it has geographical constraints (mountainous areas are needed). The applications are: peaking capability, reserve supply and balancing capability to support renewable sources, load leveling and peak shaving. It can also work as load during low demand periods, if generation is too high. The size range depends on the dam. In Ireland, it is 292 MW for the Through Hill one but in country with mountains, it can be way higher, in Switzerland, La Grande Dixence has an installed capacity of 2000 MW and in China the Three Gorges Dam has an installed capacity of 22500 MW

7. Super capacitor

Super capacitors (or ultra-capacitors) work in the same way than usual capacitor: energy is stored in the capacitor by charge separation To achieve a great amount of energy stored, the area of the plates (If plate capacitor) and the relative permittivity of the dielectric must be high, while the distance between the two plates must be as small as possible. The applications in the grid are short term high power applications (frequency control, voltage control). It is also used in transport applications, as short duration energy storage for hybrid-electric vehicle [5]. Another interesting application is the Bridge Power Systems: the super capacitors can carry a critical load away from a failing source to a stable alternate one, via a rapid isolation from the failing source. 80-90% of the short circuits are just a momentary missing voltage replacement, which implies that no alternate source needs to be added (250 ms of average duration and therefore super capacitors are perfectly fitting. They are also useful if the load needs a high instantaneous current (motors).



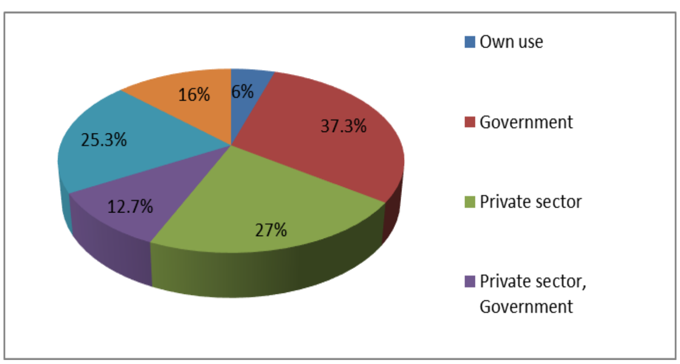
Source: Primary Data 2016

Fig 2: Willingness about Storage of Wind Energy

The above figure 1 describes the willing about the storage of wind energy production. According to the figure, the researcher concluded that 118 out of 150 respondents are accepted the storage facility of wind energy produced. The remaining 26 out of 150 respondents are partially accepted and finally, Minimum percentage of respondents are not accepted the storage of wind energy due to lack of awareness and also not ready to invest. So that government & non government organization have to take necessary steps to provide such a storage facilities.

1.4 Distribution of wind energy

Distributed generation, also distributed energy, (OSG) or district/decentralized energy is generated or stored by a variety of small, grid-connected devices referred to as distributed energy resources (DER) or distributed energy resource systems. Conventional power stations, such as coal-fired, gas and nuclear powered plants, as well as hydroelectric dams and large-scale solar power stations, are centralized and often require electricity to be transmitted over long distances. By contrast, DER systems are decentralized, modular and more flexible technologies, that are located close to the load they serve, albeit having capacities of only 10 megawatts (MW) or less. These systems can comprise multiple generation and storage components. In this instance they are referred to as Hybrid power systems.



Source: Primary Data 2016

Fig 2: Distribution of Wind Energy - Sector Wise

The above figure 2 clearly explained that the distribution of wind energy through sector wise. According to the figure 6 per cent used the produced energy for their own purpose. 37.3 percent of respondents sold their produced energy only to the government on the basis of agreement made already. The 2.7 percent of respondents sold to private sector only. The 12.7 percent of the respondents sold their produced energy both private and government sector.25.3 percent of the producers sold to government and for their Own use. The remaining 16 percent of the producers used their own purpose and sold to private sector and to the Government. The Researcher found that the majority number of producers distributed to the Government.

DER systems typically use renewable energy sources, including small hydro, biomass, biogas, solar power, wind power, and geothermal power, and increasingly play an important role for the electric power distribution system. A grid-connected device for electricity storage can also be classified as a DER system, and is often called a distributed energy storage system (DESS). Distributed generation and storage enables collection of energy from many sources and may lower environmental impacts and improve security of supply.

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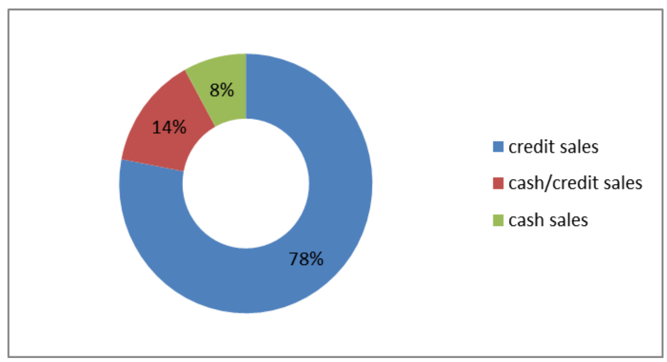

Source: Primary Data *2016Primary* Data 2016

Fig 3: Sales Methods Adopted For Distribution

The Figure 3 shows the sales method adopted or modes of payment for the distributed wind energy to various sectors. According to the figure, the researcher concluded that from the above table that Majority of the respondents that is 78 per cent stated that they are distributing the produced energy only on credit basis and also they are not getting the payment in time. 14 per cent of respondents stated that they are having cash as well as credit payment. Only few that is 8 per cent states they are getting cash in hand. Tamil Nadu electricity Board should regulate the settlement of payments to the producers periodically. Then only they can get motivated themselves and involve in the installation of more number of windmills and minimize the wide Demand and Supply Gap.

DER systems typically use renewable energy sources, including, but not limited to, small hydro, biomass, biogas, solar power, wind power, geothermal power. These systems increasingly play an important role for the electric power distribution system. A grid-connected device for electricity storage can also be classified as a DER system, and is often called a distributed energy storage system (DESS). By means of an interface, DER systems can be managed and coordinated within a smart grid. Distributed generation and storage enable collection of energy from many sources, decreasing environmental impacts and improving security of electricity supply

1.5 Sales Agreement

The state Andhra Pradesh**,** Rajasthan, Madhya Pradesh, Maharashtra Allowed under Electricity Act 2003 subject to regulation framed by respective SERs. The state of Tamil Nadu No Escalation Allowed under Electricity Act 2003 subject to regulation framed by respective SERs.

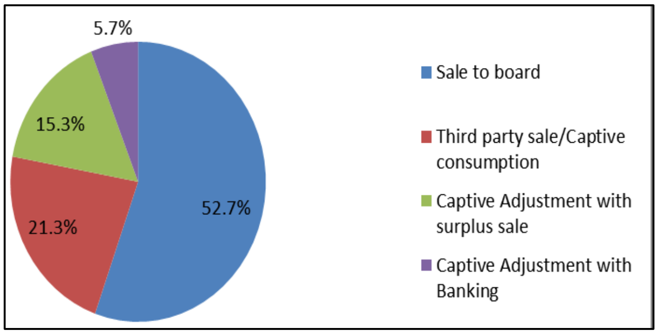

Fig 4: Sales Agreement Adopted For Wind Energy
Source: Primary Data 2016

The figure 4 depicts the Sales agreement adopted for wind Energy. According to the figure 52.7 per cent respondents made the agreement with (TNEB) Sale to board.21.3 per cent respondents stated that they are adjusted with the surplus sale.15.3 per cent respondents stated that they are having third party sale. The 5.7 per cent respondents stated that the Captive Adjustment with banking. The researcher wanted to know about the position of excess energy after Distribution to the Government and own use. The producer cannot involve making a legal agreement in properly. In this situation the producers and buyers made false agreement. Likewise, on the basis of sister concern or some relatives etc. Both of them affected, if there is any difference of opinion. The researcher suggested that the Government should give free-hands to distribute to the needy person. They can contribute growth and development of the economy at their maximum level.

1.6 Environmental impacts of Distributed Generation

Distributed generation can benefit the environment if its use reduces the amount of electricity that must be generated at centralized power plants, in turn can reduce the environmental impacts of centralized generation. Specifically:

1. Existing cost-effective distributed generation technologies can be used to generate electricity at homes and businesses using renewable energy resources such as solar and wind.
2. Distributed generation can harness energy that might otherwise be wasted—for example, through a combined heat and power system.
3. By using local energy sources, distributed generation reduces or eliminates the “line loss” (wasted energy) that happens during transmission and distribution in the electricity delivery system.

However, distributed generation can also lead to negative environmental impacts:

1. (I)Distributed generation systems require a “footprint” (they take space), and because they are located closer to the end-user, some distributed generation systems might be unpleasant to the eye or cause land-use concerns.
2. Distributed generation technologies that involve combustion particularly burning fossil fuels can produce many of the same types of impacts as larger fossil-fuel-fired power plants, such as air pollution. These impacts may be smaller in scale than the impacts from a large power plant, but may also be closer to populated areas.
3. Some distributed generation technologies, such as waste incineration, biomass combustion, and combined heat and power, may require water for steam generation or cooling. Distributed energy technologies may cause some negative environmental issues at the end of their useful life when they are replaced or removed. Distributed generation estimated at about 200 gigawatts in a 2007 study by the Federal Energy Regulatory Commission (FERC). The total nameplate capacity of U.S. centralized power plants was more than 1,100 Gigawatts as of 2012, according to the U.S. Energy Information Administration.

1.7 Opinion of Canadian about wind energy Storage

Maritime Electric saving money through Wind Energy Institute of Canada's undertaking says researcher CBC News Posted: Feb 19, 2016.The Wind Energy Institute of Canada is storing electricity from North Cape turbines in large batteries to use when energy usage is at its peak. (Rick Bowmer /AP).A $24-million demonstration wind energy storage project in North Cape, P.E.I., is not only helping Maritime Electric save money, it could ultimately change how this renewable resource is used in Canada, says a researcher. Wind energy isn't reliable because it's only available when the wind blows, but being able to store the energy could increase how much is used. Two years ago, the Wind Energy Institute of Canada started storing electricity from its wind turbines in two batteries the size of shipping containers using seed money from Natural Resources Canada's Fund. In the colder winter months, some of that stored energy is being used when the Island's electricity demand exceeds what can be shipped over from New Brunswick. Using stored wind energy means the utility has to burn fewer diesels in its Charlottetown generator, said David Watson, the institute's wind integration researcher.

"During peak periods in the wintertime the cable to New Brunswick can be at its maximum, so to avoid going over the maximum the diesel generators in Charlottetown are used and during those periods we typically discharge the batteries to provide some of that power. "The electricity is stored in batteries that are the size of storage units. (Wind Energy Institute of Canada).The energy can sit in the battery for weeks, with the occasional top-up. Since mid-December; Watson and Maritime Electric have been in daily contact, looking at the wind and temperature forecast to determine when the likeliest time of highest electricity use will be.

Watson said the batteries can provide enough electricity to power 600 homes for two hours. That’s less than one per cent of Maritime Electric's customer base but Watson said it's about proving that storing and using the electricity to cut costs can be done successfully.

During non-winter months, Watson said the energy is stored overnight, when there is less demand, and then used later in the day when more electricity is needed. "We charge the battery from 1 a.m. typically to about 5 a.m. or 6 a.m. and then we discharge the battery during our local peak, which is between 5 p.m. and 7 p.m. when everyone gets home and starts making supper," said Watson."So that allows the electricity from the wind to be used when it is most valuable, because the most valuable electricity is during the peak periods.

1.8 Calculation of Storage of wind Energy in Canadian Model

Brandy Giannetta, the Ontario regional director at the Canadian Wind Energy Association, said that they are having technologies for storing electricity. According to the International Renewable Energy Agency, lead-acid or lithium-ion batteries cost $25 to $30 per kilowatt-year to store 10 megawatts, while pumped hydro storage costs $5 per kilowatt-year for 200 megawatts, which is enough electricity to power 2 million 100-watt light bulbs.

To store wind energy of 10 megawatts using lithium acid or Batteries, the amount to be calculated for the state of Tamilnadu using Canadian Method:

1 Canadian dollar = Indian Rs 51.8

For Indian rupees = $ 30 * 51.8

Kilowatt = Rs 1554

1kilowatt =1000 watts/units

1 Mega watts = 1000 kilowatt

10 Mega watts = 10000 kilowatts

Therefore, for unit per year = Rs 1554/10000 =.1554 paisa

For small machine 600 kilowatt the producer can produce 15, 00,000 units.

15, 00,000 * .15paise = RS 2, 25,000

1.9 Revenue Generation

If the producers invest RS 2, 25,000 for 600 Kilowatts for storing wind energy per annum they can get the sum amount of profit. For 600 KW machine, the energy produced can be 15, 00,000 units. If there is an excess production of approximately on an average 3, 00,000 units. The calculations are as follows:

3, 00,000 *3.51 = RS 10, 53,000

"The ability to be able to ramp it up and ramp it down allows them to better".

2. Conclusion

The produced wind energy can be stored with the help of any one of the storage devices explained above. The energy produced during the peak season is stored and it can be utilized during the off seasons. Wind Energy producers can utilize the availability of the whole wind throughout the year and also fulfills the gap of demand at maximum level. The producers cannot stop the machines where there is no demand and also they can earn more profit with the help of storage and also it is applicable to medium and large size machine.

2.1 Role of USA in wind energy Storage

In 2009, an estimated 147 megawatts of energy-oriented storage were developed, the report found. But in 2015, 1,321 megawatts are expected to be produced, with revenues of $1.98 billion. The report forecasts overall market size to reach 85,000 megawatts in the United States and 450,000 megawatts worldwide.

2.3 Demonstration projects

Still, recognizing a need for energy storage is one thing, but proving that storage technologies can work is another. One of the largest U.S. demonstrations of battery-based storage uses sodium-sulfur, or NaS, batteries manufactured by Japan's NGK Insulators. American Electric Power Co. Inc. has installed 7 megawatts of the bus-sized batteries to ease congestion on its transmission lines, and it has an additional 4 megawatts under development. Meanwhile, Xcel Energy Inc. is testing a 1-megawatt NaS battery to manage its wind power in Minnesota. Beacon, a publicly traded company, has been researching and developing its flywheel design for about 10 years and is confident the technology is ready to be scaled up significantly. The company applied this month for $47 million in DOE stimulus grants to build two more 20-megawatt plants, one in New York and another in the PJM Interconnection. Awards for the $615 million program are expected to be announced in November, the company said. In addition to flywheels, companies are looking to technologies like massive lithium-ion batteries and underground caverns of compressed air for grid-scale storage.

3. Conclusion

India has more wind energy potentials than other countries, at the time of peak season during the month June to September. During the summer season public faced high power cut, due to over usage of power. During Power cut the cottage, small scale industries and agriculture are not able to function regularly. In this situation employees are also losing their earnings. The same period wind blows also high. Wind energy producers not able to produces and supply energy regularly due to lack of awareness about storage facilities. The researcher suggested that the government and non governmental agencies motivate the wind energy producers to install storage facilities, and fulfill the energy demand supply gap.

4. References

1. https://en.wikipedia.org/wiki/Wind_power_in_India
2. https://en.wikipedia.org/wiki/Renewable_energy_in_India
3. http://articles.economictimes.indiatimes.com/2015-02-28/news/59612714_1_renewable-energy-capacity-mw-wind-generation
4. http://www.publishyourarticles.net/knowledge-hub/business-studies/what-are-the-importance-of-storage
5. http://www.thehindu.com/business/Industry/India-wastes-15-20-of-its-renewable-energy-due-to-lack-of-storage-Panasonic-Energy-head/article14638013.ece
6. http://www.tnerc.gov.in/orders/Tariff%20Order%202009/2016/Wind/Wind%20%203%20of%20%2012.pdf
7. https://en.wikipedia.org/wiki/Wind_power_in_India
8. https://en.wikipedia.org/wiki/Grid_energy_storage
9. http://mdcleanenergy.org/all-about-energy/advanced-technologies/distributed-generation-energy-storage
10. http://energyexemplar.com:89/wpcontent/uploads/publications/2014_Hanze/Distributed%20vs.%20Centralized%20Energy%20Storage%20for%20Power%20Sytsem%20Applications.pdf
11. http://mdcleanenergy.org/all-about-energy/advanced-technologies/distributed-generation-energy-storage
12. http://www.eai.in/ref/ae/win/policies.html

13. http://www.cbc.ca/news/canada/prince-edward-island/wind-energy-1.3454865
14. http://www.canadiangeographic.ca/blog/posting.asp?ID=881
15. https://www.scientificamerican.com/article/wind-power-turbine-storage-electricity-appliances/Can wind be stored