Generation of electricity using compressed air energy storage system coupled with wind mill

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***Abstract*— Current days due to reduction of fossil fuels, increase in fuel consumption, higher fuel costs and harmful effects of such fuels on environment, more attention is being paid to renewable energy sources. We can't predict the generation of power from renewable energy sources due to their stochastic nature. Therefore, if the high level of renewable energy sources is available easily then we can catch the demand. A suitable way to overcome this challenge is using energy storage systems. Compressed air energy storage system uses compressed air as a medium to store energy in another kind of energy storage that can be used in big scales. Whenever electricity demand is low, the generated electricity can be used for air compression. Windmill uses compressed air energy storage when energy demand is high to generate electricity, electricity can be generated by using stored energy. By using this system energy can be generated at low cost in peak demand.**

***Index Terms*— Compressed air energy storage, wind mill, air turbine**

I. INTRODUCTION

Compressed Air Energy Storage system is used with a wind mill. During off-peak hours, energy is stored then during peak hours is delivered to the costumers. Storing Energy during off-peak hours and using it during peak hours, besides management of load peak, provides balance between power demand and supply. [1] It also makes the network more reliable and leads to more economic Compressed Air Energy Storage plants use off-peak energy to compress and store air in an air-tight tank storage. Upon demand stored air is released from the compressed tank, heated and expanded through a Air turbine to generate electrical energy.

The current days invention relates to a novel machine (the Compressed Air Turbine-Generator, or to manage energy gathered from renewable sources, such as so Wind power. Compressed Air Energy Storage is a promising mode of clean energy storage. A major challenge facing this technology is the need to efficiently convert the compressed air energy into electricity. Commonly, the high-pressure air is used only to improve the efficiency of a Air turbine generator. [2] This project focused to improve the effective use of renewable energy. This project converts the energy stored in compressed air directly into electrical power without producing greenhouse byproduct gases or other pollutants. This new capability will add important flexibility to the optimization of ecologically friendly energy systems.

II. WORKING

Fig.1. shows the power plant configuration in which main sub section is highlighted.

- Wind mill tower & wind blade
- Compressor unit
- Air reservoir
- Pneumatic motor
- Alternator

The small scale CAES system proposed in this study has sized to provide storage of energy from stand alone. Renewable Power Plant that has been designed to satisfy the energy demand. Fig. shows the total configuration of power plant when the wind mill's blades subjected to the natural air force then this blade rotate in one direction , this will rotate the gear connected to wind mills as shown in Fig.3.1 This rotation is transferred to the compressor to the gear box or belt drive. It causes the compressor start to working and sucks the natural air. Compressors compress the air and fed this air to the air storage tank, where air is stored at high pressure. This high pressure air fed to the air motor through pneumatic host pipe with high pressure. Pneumatic motor is coupled with the alternator and hence shaft of alternator rotates and it produces electricity.

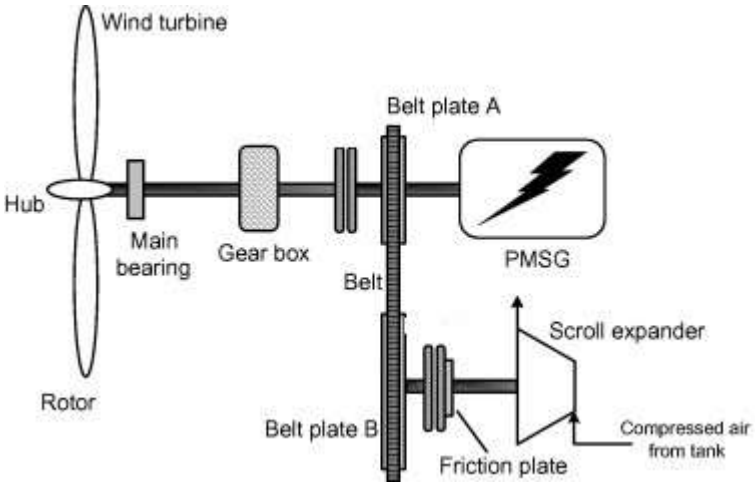

Fig.1. Compressed air energy storage system

III. FLOWCHART

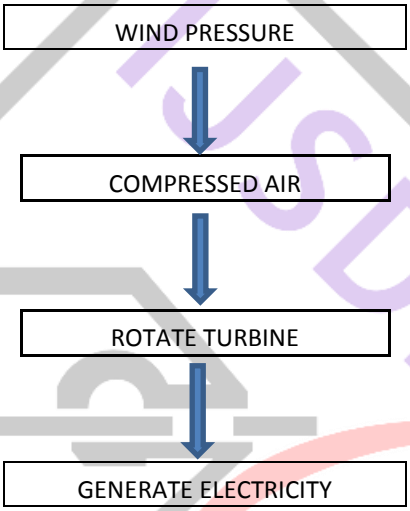

Fig.2. Flowchart of compressed air energy storage system

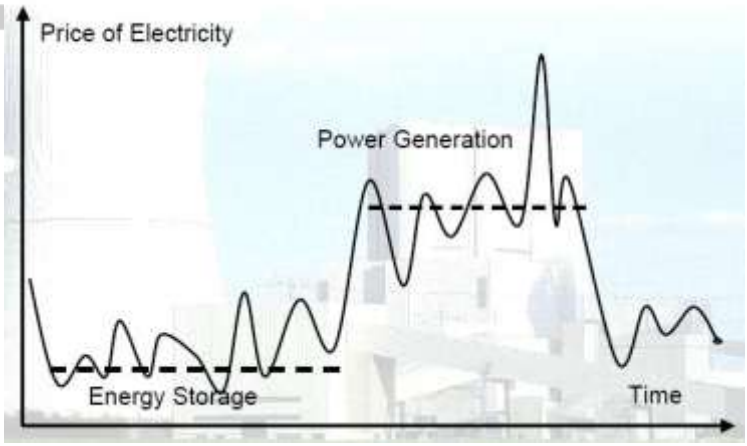

Fig.3. Energy storage during cheap hours [3]

IV. ADVANTAGES

1) A compressor can also be easily controller using flow control valves and a variable speed gearbox.
2) The possibility to store energy generated by wind in the form of compressed air. This compressed air could serve as a buffer for peak loads and could store excess energy in off peak hours.
3) It requires less maintenance.
4) To produce large volumes of moderate-pressure air.
5) Pollution free.

6) Provide stable low and pressure.

V. FUTURE SCOPE

1) We can implement this project for train lightning.
2) Remote area application is possible.
3) We can do rural area electrification
4) Industrial application.

VI. CONCLUSION

Regarding to the high costs of energy carriers, energy storage is a necessity. Because of stochastic nature of wind, storing wind energy makes these plants more cost effective and more reliable. During normal and off-peak hours when a large amount of installed capacity is out of service and power generation cost is low, generated electricity is used to compress the air and during peak hours and times when the network cannot supply the costumers or when electricity is expensive stored energy in CAES is used to generate electricity.

VII. ACKNOWLEDGMENT

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