

# Kennedy Energy Park

Rui Wang, Wen Kong

Department of Electrical Engineering and Automation, Shandong University of Science and Technology, Jinan, 250000, China

**Abstract:** Thanks to the development of science and technology, more and more grids have introduced the hybrid power plant. Kennedy Energy Park project is a 60.2MW hybrid renewable facility which is composed of wind, solar and the storage of energy facility. It fully uses the complementarity of sunlight at daytime and wind power at night. In addition, it is a kind of clean generation technology, which produces no nitrogen oxides or harmful gases. In the future, the hybrid project will be commonly used all over the world

**Keywords:** Renewable resources; PV cell; Wind power; KEP; Power system

## 1. Introduction

Australia has built the first hybrid power station near the capital Canberra. Kennedy Energy Park (KEP) [1] consists of 43MW of wind, 15MW of solar panels and 2MW of battery storage. This park began construction in the late of 2017 and it will be operated in 2018. In addition, wind lab is in charge of this project, this company will use the advanced model to simulate the flow of air to choose the satisfactory location to build the energy park.

## 2. The Complementarity of Wind and Solar Power

By accurate measurements and modelling, wind lab's expertise decided to build KEP in Queensland. Due to there could take highly complementation of wind and solar energy. To be specific, the photovoltaic system operates in the daytime and none at night. However, the wind also could meet the demand and do not require a highly storage. The histogram below shows the storage required of 80% renewable [2]. It clearly indicates that PV combined with wind power require the lowest proportion of battery size, which is 2MWh. In addition, if only produce energy by wind it will need 32MWh and PV is 48MWh.

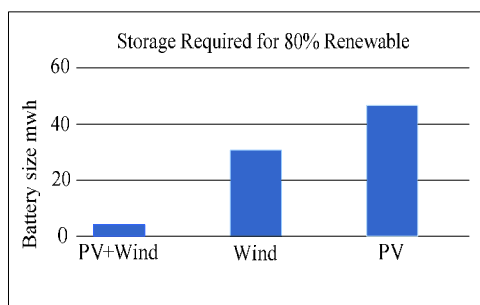


Figure 1. Renewable technology

One thing needs to be mentioned is that building solar power plants next to existing wind farms could save the cost of

20 percent. It is the best choice to connect the renewable power grid to the existing power grids.

## 3. Power Generation Principle

Wind power and sunlight power do not pollute air, they are called "environment friendly power".

## 4. Wind Power

For wind power, firstly, it could be converted into kinetic energy by wind turbines. Then, the generator will convert this kind of energy into electricity. The wind turbine could produce power ranging from 100 kilowatts to several megawatts. The small one is used in off-grid applications, the larger one is mainly used for powering an entire neighborhood. The formula of wind power [3] can be given as follows:

$$P_w = \frac{1}{2} r A v_w^3 \quad (1)$$

Where,  $r$  is the density of wind;  $A$  is the area of wind passes;  $v_w$  is the wind speed

## 5. Sunlight Power

Solar energy could be converted into electricity by photovoltaic solar cell (PV cell) and concentrating solar power (CSP) [4]. The former is made up of modules and conversion circuitry could directly convert sunlight, the latter uses tracking systems and mirrors to concentrate a large scale of sunlight into a small beam. In addition, it will heat the working fluid and be used to generate power.

## 6. The Pros and Cons of KEP

This hybrid park mainly has three advantages as follows:

- Benefit residents in improving their life quality by producing sustainable energy.
- Preserve natural resources and do not need deforestation and consume water, fuel.

·Promote the development of local business and factories in finance and technology.

KEP also have some disadvantages. First of all, it is time-variant and can not be controlled by any mover. In addition, due to the hybrid generation, the connection of grid becomes complex, in order to make sure the research could be finished on time, technology selection and the boundary settings are supposed to be prepared early. This could recommend which kind of project have the ability to be more appropriate. Lastly, the model of CFD could not simulate the complex flows and will have huge errors. More advance models should be introduced.

## 7. Conclusion

Considering the biggest merit of being friendly to environment, the hybrid power station has improved life

quality of human beings and the development of business and industries. Moreover, this power generation system just use renewable resources, there is no doubt that more and more countries will realize the significant of developing this kind of plant. All in all, the hybrid power station will have a brighter and promising future.

## References

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