

Wind Power? Are you a fan?

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Recently we have been focusing on the laws relating to renewable energy and sustainable development in Thailand. For the next few weeks we will continue this investigation by looking at wind power.



Wind power is one of the big five renewable energy solutions that exist today, the others being solar, water (hydro), biomass and geothermal. Global wind resource assessments have demonstrated that the world's technical potential for wind energy exceeds current global electricity production. To understand how wind power has developed over the last two decades it is important for us to first understand what wind is and how electricity is generated from monolithic windmills. Wind has been defined by the Oxford dictionary as "the perceptible natural movement of air, especially in the form of a current of air blowing from a particular direction". There are several different units which can be used to indicate the wind speed, the most common being knots, which is a unit of speed equal to one nautical mile (1.8km) per hour. Harnessing the power of the wind has been done by mankind ever since the first human hoisted a sail. Today a host of different wind powered generators operate across the globe in sizes varying from those for personal domestic use to near-gigawatt sized offshore wind farms.

So how are we able to harness this invisible "current of air" to generate electricity?

Modern day turbines have a tower generally exceeding 80 meters in height. This tower is then connected to huge three-bladed rotors. As the wind hits the angled blades of the rotors they spin, turning a shaft and gear box connected to the generator. The mechanical energy of the rotating shaft is converted to electrical energy in the generator through the use of an electromagnetic field. However, if the wind isn't blowing hard enough, the rotors won't turn and no power is generated; if the wind is blowing too hard the rotors will automatically brake so as not to turn at hazardous speeds. For wind power to work, the "current of air" has to be blowing within an ideal range of speeds. Fortunately, that range has been expanding with technological advances in turbine design.

The benefits of wind power cited by its advocates include that it emits no greenhouse gases or toxic substances into the air or water and there is no "fuel" consumed in generation; it is considered one of the cleanest forms of energy available to be harnessed. The European Wind Energy Association has statistics showing that wind energy in 2012 saved €9.6 billion of fossil fuel costs. It is these benefits that have caught the attention of the various global governments who utilize wind power to diversify their national energy portfolio and reduce reliance on fossil fuels. But wind power is not without its critics.

The first critique of wind power stems from the relatively low "capacity factor" of wind power facilities as compared to their nuclear, gas fired and coal fired brethren. The capacity factor is the actual energy generated by the facility during a given period of time, divided by the theoretical energy it could have generated within that time, such that the never achieved ideal is 100%. Though some wind projects might now achieve a capacity factor greater than 30%, they remain the exception. This compares unfavorably to the 80% + capacity factors typical of coal, gas-fired or nuclear plants. As a result, countries wanting to rely more heavily on wind power (and solar for that matter) must still construct or otherwise have available sufficient other generating capacity (usually fossil fuel based) available to deal with windless or cloudy days. This arguably increases the true installation and operating costs associated with reliance on these renewable energy sources. It also introduces problems for the traditional fossil fuel plants, because their economic viability is generally premised on them being operating continuously as baseload facilities

The second critique of wind power relates to the aesthetic qualities of wind turbines. Critics argue that erecting large wind turbines across the landscape ruins the beauty and nature of the land. In addition, it has been said that living close to a wind turbine has detrimental effects on hearing. Though not as loud as pneumatic drills and excavators, wind turbines can produce up to 55dB when measured at a distance of 100 m. To put things into perspective 55dB is roughly the same level of sound as you can expect from washing machines, electric shavers and dishwashers. In addition to sound impacts, the constantly rotating turbine blades can cast moving shadows which may be a nuisance for residents living in close proximity. These concerns may translate into negative impacts on proximal residential property values; of course coal fired power stations don't do much to enhance the aesthetics in a neighborhood either. Reports of bird deaths from wind turbines also abound, though so to do statistics showing that these bird deaths are relatively low compared to other causes of bird death.

A third critique of wind power is purely economic. The government subsidies required to make a wind project viable compared to a fossil fuel based generating facility remain sufficiently high that Germany, for example, recently announced that theirs have to be scaled back under the recently proposed Renewable Energy Act.

The arguments above have not deterred countries like Denmark where the wind energy is extremely popular. In 2013, 28% of Denmark's total electricity generation was by wind power, thus making Denmark the world's wind power hub. The Danes have set the ambitious target of achieving 50% wind power in their electricity system by 2020, which is in line with its overall vision to make Denmark completely free of dependence on fossil fuels by 2050. Other notable examples of where wind power has been harnessed effectively are Spain (16%), Portugal (16%), Ireland (12%) and Germany (11%).

So what about Thailand? Next week we will see whether the political and economic winds are blowing in favor of wind power generation in Thailand.

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