POTENTIAL ISSUES WITH WIND ENERGY

Introduction

Wind energy is often the neglected little brother in the energy debate. When people think about renewable energy, they first think about solar, then hydro energy. When people think about wind energy, they think about noise, the drop in real estate values, and the death of birds. The purpose of this article is to provide a balanced look at some of the issues that surrounds wind energy production.

Wind energy has grown over 50% in 2008 according to the American Wind Energy Association (2006). In the United Kingdom, the proportions of wind power projects that have been proved rather than rejected have increased (Boyle, 2004). The technology of the wind turbine has improved significantly; now, Exro Technologies have developed turbines, Variable Input Electrical Generator (VIEJ), that can generate power at lower wind speeds and at a higher efficiency (Scientific American, 2009). Also, the costs of producing energy from wind have decreased to the point where it can be competitive with fossil fuels. In 2009, the cheapest energy is from coal, which can be produced at 2 cents per kilowatt hour, whereas the cheapest energy produced by wind was at 3.5 cents per kWh. In some areas, the price of coal power is at 5 cents a kWh and improvements in the grid infrastructure and turbine technology, the price of wind energy is expected to decline (Scientific American, 2009). Moreover, wind technology does not emit carbon dioxide – a greenhouse gas that has been shown to contribute towards global warming. Even with these benefits, wind production faces strong public opposition. There are four issues associated with wind that is brought up at every debate about wind energy: geographical placement, noise, environmental impact, and visual pollution.

Wind Turbine Placement

It is only possible to produce wind energy in areas where there is wind. A large wind turbine needs to be situated in an area where the average wind speed is above 7 m/s (Rodman and Meentemeyer, 2006). The benefit of a large turbine is that it operates at a higher efficiency. Of the wind turbines in operation, the best turbines in the best spots can only produce at 35% efficiency. The main technical problem is that it uses technology that is optimized for coal energy production. The body of the turbine, the nacelle, use copper wires and magnets to change kinetic energy into electrical energy. The generator is at peak efficiency when the kinetic energy is stable and it can reach a peak efficiency of over 90% as in hydroelectric or coal (Scientific

American, 2009). Wind, on the other hand, is variable. It is most efficient when wind speeds are at 10 or 11 m/s. When wind speeds are 25 m/s or greater, wind turbines have to shut down to prevent damage (Boyle, 2004). Engineers have developed blades that can change its angle (the pitch) when the wind speed increase so that a lesser percent of the wind makes contact with the blades. When wind speeds are less than 7 m/s, the speed of the turbine slows down and the efficiency drops dramatically. To counter this, gears are added to allow the blades to turn even with less force pushing it (Scientific American, 2009). The addition of gears decrease the efficiency, but not to the same extent as a slow moving turbine, and also, there is more mechanical noise (Boyle, 2004).

To be operating at a higher efficiency, wind turbines need to be placed in areas where there is constant wind that is not too fast or too slow. The best geographical areas in the United States that could support large turbines have been taken and this is an issue for scaling up wind power. Also, the areas that produce wind energy can be very far from cities where there is a high energy demand. This means that the electricity must travel long distances and in doing so, lose efficiency (Rodman and Meentemeyer, 2004; Scientific American 2009). This is an issue for most energy production anyways, and it requires improvements in electrical infrastructure. Another issue with wind energy is that one cannot have control over the production unlike that of coal (Scientific American, 2009). When the grid demands more energy, wind energy might not be able to produce at that specific time.

Major technological advances in wind power could alleviate this issue. The Exro's VIEJ turbine can produce wind at variable wind speeds because it measures the wind speed and automatically optimizes to it. The VIEJ can produce energy at 90% peak efficiency at optimal wind speeds and can even operate at low wind speed (de Vries, 2009). This will allow more land to be utilized for energy production.

Noise

Unlike the other forms of renewable energy, wind power faces more public opposition. One of the major concerns is that wind turbines are noisy. The wind turbine generates two types of noise: mechanical, and aerodynamic. The mechanical noise is produced by the generator and the gears turning inside the nacelle. This noise is usually the main problem (Boyle, 2004). New technology, such as the VIEJ turbine, does not have gears, which means there would be less mechanical noise. Also, other new turbines spin at a lower velocity,

which can also reduce both mechanical and aerodynamic noise. The aerodynamic noise is caused by the blades interaction with air and is usually more of a nuisance at low wind speeds because at higher wind speeds, the sound of the wind is louder than the swishing sound of the blades. The aerodynamic noise can be reduced by changing the shape and the number of blades of the turbine (Boyle, 2004). According to the Canadian Wind Energy Association (CanWEA), the modern residential wind turbines are between 52 – 55 decibels (dB) (2005). According to the St. Lawrence Wind Projects sound level report, the sound from wind farms in residential areas would be less than 48 dB. For context, the noise inside a home is between 45 – 60 dB (Prout, 2007).

It has been reported that wind turbines can cause health problems, which Dr. Pierpont named, "Wind Turbine Syndrome." The low-tone hum of the wind turbine can caused nausea, dizziness, and sleep disturbances (CTVNews, 2009). However, a CanWEA and AWEA funded study contradicts the claim that the noise from wind turbines can caused health issues. They found no evidence that suggest the audible or sub-audible sounds created by the wind turbines to have any adverse physiological effects (CTV Ottawa, 2009).

Environmental Impact

Depending on where the wind turbines on placed, the environmental impact of wind turbines can be minimized. Most plans for wind farm construction take into consideration areas that are eco-sensitive and contain endangered plant or animal species (Rodman and Meentemeyer, 2006). In the United States, the wind farms in Altamount Pass in Northern California are located in the route of migratory birds and as such, contributed to the death of 1 to 2 birds per turbine (Boyle, 2004). Several factors can affect the mortality rate of birds, such as: whether the turbines are place in a new location, built in bird migration routes, built on ridges and upward slopes, exist in a established feeding habitat, operate during times of poor visibility, and blade length (Drisdelle, 2009). According to a publication from *Nature*, the annual number of birds killed in the United States by wind turbines are 40 000. To put that number in perspective, 1.25 million birds are killed from collisions onto tall buildings and 57 million from cars (Marris and Fairless, 2007; Boyle 2004).

Visual Pollution

One of the most quoted arguments against wind turbines is that it is an "eyesore". The visual impact of turbines is hard to quantify, but there is a strong public opposition for the building of wind turbines because of

its visual impact. Also, it is hard to interpret whether people are specifically against building wind turbines or are against the building of any structure. It is often suggested that turbines lower real estate prices. Intuitively, this makes sense because many people do consider turbines to be an “eyesore”, and would not want to live near one. One study estimated that wind farms could cost Northern California 57 million dollars annually due to the loss of tourism (Rodman and Meentemeyer, 2006). A publication from the Lawrence Berkeley National Laboratory, suggests that wind turbines, contrary to what is often believed, does not cause a drop in real estate values. They found that the properties around the turbine and 8 kilometres away showed no statistical difference in value (Hoen, 2008; New Scientist, 2009).

Wind turbines do interfere with radio, television, and microwave signals, and to a lesser extent radar. This is because the blades of the turbine can scatter these signals. One possible solution to this problem is to build relay transmitter around the turbines or not build wind turbines in areas that are essential for telecommunication (Boyle, 2004).

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