

Wind Energy for Mountainous Regions

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Wind energy is very sustainable and a clean source of renewable energy. Mountain communities that desire to be on the energy grid must employ wind power because wind turbines are easier to install than other sources of renewable energy and wind speed is increased due to higher altitude, which increases power output (National Geographic). Utilizing a new invention called the wind-lens, introduced at the European Wind Energy Association in the fall of 2011, increases wind turbine power output by 400% (Ohya, Karasudani and Nagai). The wind-lens also addresses the drawbacks of conventional wind turbines, which are noise, visual impact on natural scenery, and hazard to birds.

The power that can be produced in mountain communities is much greater because of their high altitude (National Geographic). To illustrate wind power as a viable solution, a town in mountainous China, Dali, has wind turbines at an altitude of 3,000 meters. The wind farm at Dali produces the same amount of energy as burning 20,000 tons of coal reducing 50,000 tons of carbon dioxide every year (Cartillier). “Yearly emissions eliminated by generating energy from a 1 MW (megawatt) wind turbine instead of 1 MW (megawatt) of conventional sources: over 1,500 tons of carbon dioxide, 6.5 tons of sulfur dioxide, 3.2 tons of nitrogen oxides, and 60 pounds of mercury in one year” (Pennsylvania Wind Working Group). Another community that uses wind power as a source of energy is Oregon. One project in Oregon, directed by Columbia Energy, is building 40 wind turbines in the Steen’s mountain to produce energy for 30,000 homes (Cockle). Wind turbines are a vital source for rural farms as they produce energy and

require very minimal space. Wind turbines are also safe enough that livestock can feed at the foot of the wind turbines. Building of wind turbines in Dali, Oregon, and rural farms demonstrates that wind energy is a viable solution to mountain communities energy needs.

With the invention of the wind-lens, conventional wind turbine power output can increase 400% (Ohya, Karasudani and Nagai). Wind-lens is a shroud and brim that covers the wind turbines blades. The brim of the wind-lens causes a low pressure region behind the blades of the turbine, which in turn causes high pressure wind to be channeled through the shroud. The high pressure wind causes a power increase because power is proportional to wind speed cubed (Ohya and Karasudani, A Shrouded Wind Turbine Generating High Output Power with Wind-lens Technology 635). This invention maximizes a wind turbines power output, which means that less wind turbines are required to produce the same amount of power. Less wind turbines keeps the natural landscape from being interfered with at a minimum. The wind-lens also reduces the need for tall towers and long blades. Lower towers and shorter blades reduce the visual impact of wind turbines in mountain communities (Ohya and Karasudani 648). Wind energy alone can produce the United States' annual energy need with the aid of the wind-lens. Currently the United States consumes around 26.6 billion megawatts hours a year. With United States having 850,000 square miles of high potential energy yields from the wind. Using 20 percent of the 850,000 square miles, approximately one-fourth the size of Alaska, for six 1.5 megawatt wind turbines for every kilometer land squared will produced 8.7 billion megawatts hours. With 8.7 billion megawatts hours are enough to satisfy one-third of the United States annual energy consumption (Limer). With the use of the wind-lens technology, which could increase wind turbine power output by 400% (Ohya and Karasudani, A Shrouded Wind Turbine Generating

High Output Power with Wind-lens Technology), wind energy alone could satisfy United States annual energy consumption.

Opponents of wind energy in mountainous regions claim that wind turbines are very noisy and will cause disturbance to people and wild life living near wind farms. Wind farms are required to be built 300 meters away from nearby houses (British Wind Energy Association). This reduces the sound heard from wind turbines. At 300 meters away, wind turbine only produces 35-45 decibels, noise is measured in decibels. Wind turbine noise level is a lot less than a car 100 meters away traveling at 40 mph. The night time background noise of a rural setting is the same as wind turbine noise level. This means that wind turbine noise can be drowned out by a nearby stream or breeze in trees or hedgerows which is likely in mountainous regions (British Wind Energy Association). The wind-lens also reduces the noise level of wind turbines even farther. Wind turbine noise is generated from the blade tip of the wind turbine. This is because the blade tip is moving quickly causing disturbance in the air, which creates noise. The shroud of the wind-lens suppresses the disturbance caused the by the blade tips, significantly reducing the noise the blade tip produces (Ohya and Karasudani, A Shrouded Wind Turbine Generating High Output Power with Wind-lens Technology).

Another reason opponents argue against the use of wind energy is the visual impact wind turbines have on surrounding landscape. Opponents claim that to utilize wind turbines effectively, wind turbines towers are required to be very tall (Pennsylvania Wind Working Group). This influences the natural landscape by bringing in man-made objects into the scene. The visual impact of wind turbine is reduced in mountainous communities because of their high altitude, which means increased wind speed (National Geographic). Increased wind speed reduces tower height, minimizing visual impact. With the wind-lens technology, tower height

can be lowered even farther. The wind-lens increases the wind speed that acts on the blade of the turbine increasing power output significantly. The wind-lens does not need to be exposed to high altitude wind to obtain the equivalent power as conventional wind turbine, which allows wind turbine tower height to be lower drastically. Not only can the tower height be lowered, the length of the blades can be shorten and still produce the same amount of power as conventional turbines (Ohya and Karasudani, A Shrouded Wind Turbine Generating High Output Power with Wind-lens Technology). The wind-lens can also make wind turbine more aesthetically pleasing than a conventional wind turbine.

Environmentalists claim that wind turbines kill birds and bats, but the amount that wind turbines harm is far less than other factors. “Wind farms currently kill far fewer birds than the estimated 100 million that fly into glass buildings, or up to 500 million killed yearly by cats. Power lines kill an estimated 10 million, and nearly 11 million are hit by automobiles, according to studies” (Fears). Compared to other factors, buildings kill 60,000% more birds and cats kill 300,000% more birds than wind turbines. Government regulation also reduces the amount of birds killed by wind turbines. Government has restricted wind turbines from being built in the flight path of migratory birds (Pennsylvania Wind Working Group). Wind-lens also address the safety concerns of bird. The wind-lens surrounds the blades of the wind turbine; this makes the wind turbine more visible allowing birds to see the wind turbine to avoid it rather than running into the blades of the turbine. The wind-lens also gives added protection because the wind-lens surrounds the blades of the turbine. The encased blades ensure that objects are not thrown off from the wind turbine as it is spinning, increasing safety (Ohya and Karasudani 648).

Wind turbines are a very viable source of energy for all mountain communities. Wind turbines do not take much land area and are very safe. The effects of wind turbines are very

minimal and effects are further reduced by government regulations and the new invention, wind-lens. The wind-lens can increase power output by 400%, reduce noise level generated from wind turbines, lower the height of turbine tower to reduce visual impact on natural scenery, and reduces the death of birds. So wind energy is an excellent way to get mountain communities onto the energy grid. Also by using the wind-lens technology, the number of turbines need to power a mountain community are reduced. The reduced number of wind turbines lessens the impact that wind turbines have on the natural landscape and also gives mountain communities the energy that they require to function in modern world. Less environmental impact with the same energy output will not only please environmentalist but also mountain communities that need the energy.

Wind energy is a sustainable source of energy and the environmental impacts are very minimal. With the addition of the wind-lens, environmental impacts are significantly diminished and wind energy alone can power the United States annual energy needs. Utilizing high wind areas, which includes mountainous regions, wind turbine power output is increased drastically. Concluding that wind energy is the choice that mountainous communities should use.

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