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Micro-Hydro Power

Millions of years ago, this planet was beautiful to behold. If one stood on the foremost point of a mountain, one would observe that the earth was rich with life and unadulterated air blowing around the blooming, green plants. Fast forward to the present, and all that would be seen is the abhorrent smog that fills the horizon. The air is sometimes so polluted that people are warned to keep their children inside, lest they inhale the toxic fumes. This perversion of the once unclouded atmosphere is the result of years of human beings using non-renewable energy sources to power almost every aspect of their lives. This unhealthy way of life can be changed, but in order to do so the world must unite in its effort to cleanse its power sources and reinvent its way of life. Many alternatives to the non-renewable fossil fuels used today have already been implemented, including solar power, wind power, hydro power, and geothermal power. When first introduced, none of these energy sources were utilized on a large enough scale to constitute a monumental difference. This is due to the fact that employing devices to harness renewable energy was costly, environmentally harmful, and often considered too much of a hassle to be bothered with. However, as technology has advanced, application of renewable energy sources has increased.

The term ‘renewable’ means that the energy will not run out- it can be reused as many times as needed. This makes water, wind, and sun good sources of renewable energy because they are not

in danger of running out, unlike like the fossil fuels so commonly used today. An excellent place to find a ubiquitous supply of these renewable energy sources is in the mountains. However, mountain dwellers do not reap the benefits of living in these bountiful environments. This is because mountain neighborhoods lie outside of the main power grids, which are most often designed to supply energy to lowland communities. Those who live in the mountains are often left out of the power supply, even though they live in the middle of an area full of potential energy. Mountain inhabitants are forced to use forms of energy that scar the environment, and are in need of an alternate energy source that will be able to reach them in their communities. Solar power is not always affordable and wind turbines have drawbacks as well, such as availability of space, higher costs, and harmful environmental effects. Hydro power requires reservoirs or lakes and even if there is a reservoir nearby, it would not be able to reach the mountain populace because they are not connected to the power grid. However, there is a form of hydro power that would be able to reach isolated mountain communities, called micro-hydro power. Micro-hydro power is an excellent source of clean, reliable energy that is a perfect fit for secluded, mountain areas. Because this green energy source is efficient, affordable, and has almost no effect on the environment, it should be implemented in mountainous regions to provide power to scattered and isolated mountain communities.

Micro-hydro power is different from regular hydro power because it operates on a smaller scale. Hydro power is harnessed by instituting reservoirs and building dams. As the water from the reservoir flows through the dam, it creates electricity (“Fire Mountain Solar”). The power generated from this process is used to provide power to homes and communities, whether they are connected to the power grid or not. Micro-hydro power uses the same concept as hydro

power does, but on a smaller scope; micro-hydro systems are usually considered any system that generates up to 100 kilowatts of power, while regular hydro power systems can generate up to over 10,000 megawatts of power (“Fire Mountain Solar”), (“Hydroelectricity”-Wikipedia). While hydro power uses large dams and reservoirs, micro-hydro power is harnessed by temporarily diverting the flow from smaller rivers or streams and sending it over a waterwheel or turbine. As the water forces the wheel to turn, electricity is created and the water then flows back to the original stream or river.

There are four different types of water turbines used to harness micro-hydro energy: impulse style, small impulse style, reaction style, and a submersible propeller. Impulse style and small impulse styles work like a toy pinwheel; as water falls on the turbine, it pushes the blades around in a circle and generates electricity. Small impulse water turbines are ideal for sites with a minimal amount of water flow on a steep hill, and impulse turbines are best for sites where the water source has a high head, (the vertical distance between where the water enters the turbine system and where it reaches the turbine runner), of 20 feet or more (“Micro Hydroelectric Power”). Reaction style turbines require a larger amount of water flow than impulse turbines, but can operate with as little as two feet of head. This makes them ideal for flat or low land sites with a large water flow. Reaction style turbines route the water through a pipeline into some type of encased housing. As the water exits the house and drops through the blades, it turns the turbine. Submersible propellers are the most simple and least efficient of the four different designs. When this turbine is submerged in water, the force of water rushing past the turbine turns the blades to generate electricity. Submersible propellers work best for locations with fast moving, deep water. It was originally designed for marine use, but could easily be implemented in a deep enough

river or stream. These different turbines come in a range of output voltages, and can be matched with the overall voltage of your electrical system. For mid-sized systems, 12 volts is the common voltage; large systems can output 24-48 volts of electricity ("Micro Hydroelectric Power").

Micro-hydro energy is able to supply power to small areas instead of large cities, like large-scale hydro power is designed to do. "Micro-hydro power is especially effective at supplying the energy needs of isolated, scattered upland communities" ("Sustainable Building Best"). This is because one of the best suppliers of water is the runoff created from snow-melt in the mountains. Spring months are the best time for harvesting micro-hydro energy because this is when the highest amount of water flow from runoff occurs. The summer months will have the smallest amount of water flow, which is one disadvantage to micro-hydro power ("Alternative Energy"). But as long as adequate planning is done before establishing the micro-hydro power systems, one will be able to count on a year-round supply of energy. For mountain dwellers, the energy harvested from micro-hydro power can be integrated into their own homes in a cost-efficient manner because the energy is coming from a nearby location ("Micro Hydroelectric Power"). Even if the scattered homes in the mountains are not connected to the power grid, they would still be able to receive a supply of micro-hydro energy.

Micro-hydro power systems can be set up for any price from $1,000-$20,000 depending on the size ("Alternative Energy"). This price is relatively small when compared to other renewable energy sources, and the excess energy harnessed can often be sold back to the local utilities ("Fire Mountain Solar"). Other cost benefits for installing micro-hydro power include: "…income tax credits, property tax exemptions, state sales tax exemption, loan programs, and

special grant programs" ("Fire Mountain Solar"). One of the problems seen in the past with large-scale hydro power in the mountains is that the construction and upkeep of the reservoirs and dams has destroyed and scarred the landscape. It has deprived people of agricultural land space as well as increased flooding and landslide risk. Many mountain inhabitants have been forced to relocate because of the effects of regular hydro power systems ("Fire Mountain Solar"). Unlike regular hydro power, micro-hydro power would not run into these types of problems because it is environmentally friendly. Of all the forms of renewable energy, micro-hydro power has one of the smallest impacts on the environment. It does not significantly change the flow of water in the river and the water can still be used for other purposes after going through the micro-hydro system. In fact, some argue that micro-hydro power actually has a positive impact on the environment because it increases farming efficiency and reduces the need to use other sources for fuel ("Fire Mountain Solar").

Hydro power supplies 19% of the world's total electricity supply, or about one billion people ("Energy"). Only 5% of the world's micro-hydro power potential has been taken advantage of ("hydroelectric power"). This is due to the fact that micro-hydro power is often unheard of or unknown about. There are disadvantages to micro-hydro energy, such as the fact that certain site characteristics are required for micro-hydro power to be harnessed, and once it has been established there is no room for expansion. Another downfall to micro-hydro energy is that as stream size fluctuates during different seasons, so does the output of power. Specifically, summer months will have less water flow and therefore less power being harnessed ("Alternative Energy"). If one was wishing to power an entire city with one micro-hydro turbine, it would not be smart or cost-efficient. However, when proper caution and care are taken in planning a micro-

hydro site, the energy harnessed can be beneficial and cost-efficient for areas with small amounts of people, like mountain communities. This further supports the cause that micro-hydro energy is a good solution for mountainous regions because the communities established there are smaller and therefore cover a more limited amount of space than lowland towns and neighborhoods do.

Micro-hydro power plants are not as big as large-scale power plants and are not meant to provide power to entire large cities. However, micro-hydro power is an effective and beneficial way to power smaller communities not connected to the main power grid- specifically, mountain communities. Mountainous regions are replete with renewable energy sources just waiting to be harnessed. Micro-hydro power is a meritorious solution for powering small, isolated mountain communities that have otherwise had to rely on harmful fossil fuels to power their homes because they were not reached by the main power grid.

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