

The Possible Use of Alternative Energy at Lyndon Institute’s Binny Woods

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Abstract

We researched a number of alternative energy resources including: hydroelectricity; solar; geothermal; and wind power to see if Lyndon Institute should incorporate these energy sources into our new science facility, Binny Woods, located on Burke Mountain. The purpose of our research was for us to investigate the power sources, in hopes of finding which, if any, would be the most efficient alternative energy source to recommend for the new addition of our school.

Introduction

In 1977, Lyndon Institute received a generous gift of 214 +/- acres along the base of Burke Mountain known as Binny Woods. This land was donated by the Kitchel Family who owned Burke Mountain at the time. In the deed, 50 acres were designated as “Forever Green” where no construction of roads, buildings, or any other development is permissible. As a group we studied four alternative energy options. Over the summer, and during our time with the EPSCoR project at Saint Michael’s College, we took field trips to a solar energy business, a geothermal business, a hydroelectric dam, and a commercial wind facility. At each destination we got to observe the way the energy was produced, and/or packaged and sold to the public. In order to give an accurate recommendation, each student was assigned one alternative energy source, and researched it in more detail to discover each source’s efficiency, and how each one could potentially serve as an alternative energy source for our site at Binny Woods.

Students at Hydro-Electric Dam



Future Binny Woods at Burke



Old Water Turbine



Our group with Dr. Alan Betts at Efficiency Vermont

Recommendations

For our building, we strongly recommend thorough, and heavy, fiber glass insulation with a minimum of 2x6 walls, as well as spray-foam insulation in the ceiling. Heavily insulating the building is crucial for conserving the heat in the winter, and air conditioning in the summer. Along with insulation, high efficiency windows that will prevent heat loss is also recommended. With an air tight building, a heat exchanger is also necessary to inhibit condensation inside. The alternative energy source that we highly recommend is geothermal. The piping would be easy to install due to deep, sandy loam at the site. Geothermal would provide our building with heat in the winter, and cooling in the summer even though there isn’t a big temperature gradient in Northern Vermont. We recommend solar panels coupled with a modern efficient hot water heater to heat our water for radiant heat in the floors. Hydro power could minimally benefit our building. For hydro power to be efficient, there has to be a certain amount of water dropping a certain distance to turn the turbine. At our site we have a limited amount of water, several springs that lead to a small brook. This is enough water to generate a small amount of electricity, so that the principal of hydroelectric energy production can be demonstrated for educational purposes. So, we recommend that a small hydro system be built in the future, even knowing that we don’t have enough water to produce much electricity. We do not recommend wind power as a source of energy for our building because the initial construction expense would be exorbitant, the one spot at our site that would be adequate for a wind turbine is designated “Forever Green”, and the property is not at a desired elevation for productive wind conversion.



Gould Geothermal



Radiantec Hot Water Heater

Methods

Energy Efficiency:

Talked to a building contractor, who is certified by Efficiency Vermont to perform energy audits

Hydro:

Took a field trip to the Lyndonville Electric Hydro Dam

Looked at old hydroelectric turbines still in production in comparison to modern hydroelectric techniques

Researched hydroelectric possibilities at the residential level

Wind:

Took a field trip to First Wind, the commercial wind facility in Sheffield, Vermont

Researched what factors contribute to a successful wind turbine installation, and what factors would make wind power an efficient energy source

Geothermal:

Went to Gould Geothermal Systems in Lyndonville, Vermont

Gathered additional information about how the geothermal systems would be used as an efficient energy source in our building (heating/cooling pipes throughout the flooring)

Researched pros and cons of this energy source, and factors of installation, and possible efficiency

Solar:

Took a field trip to Radiant Tech in Industrial Park, Saint Johnsbury, VT

Visited NRG Systems located in Hinesburg, VT

Evening field trip to Burke Mountain/Binny Woods to observe the shadow of the moon off of Burke so we knew how much sun we would get in the winter if we were to use Solar power as an energy source for our building

Information Collected

Wind Power: Wind Power is a controversial topic. It is the conversion of wind through turbines into a more useful form of energy. The usage of wind turbines to convert energy is the most popular, and commonly used. The turbines help create electrical power from large scales to power domestic homes, and can also power something as small as a battery. When considering the installation of wind turbines, there are a few crucial factors that will determine whether wind turbines would work efficiently in the desired area, such as, wind speed at the site, the turbulent force of the wind, the altitude of the site, and possible access to roads at the site. Our site, Binny Woods, located on the western, and shaded side of Burke Mountain is not an ideal place for wind turbines being that it does not fit the criteria for all of these factors.

Hydro Power: Hydro power is more desirable than other forms of renewable energy because it utilizes the most abundant liquid on the planet, water. Hydro power, or water power, is the energy derived from the force of moving water. A hydro power resource can be evaluated by its available power. It has the opportunity to be useful to our project because of the possible water sources that may be near, or built at our site.

Geothermal Power: Geothermal Power uses the natural heat from the earth to heat and cool homes. The heat from the ground is a universal resource that can be utilized for years anywhere in the world. It is completely harmless to the environment, even in huge power plants where it omits only nontoxic vapor. Geothermal plants run at 95-99% operating efficiency. Geothermal power would be a significant benefit to our environmental center on Burke Mountain because it can be used year round with very little maintenance. The heating/cooling pipes could be run through the flooring of the building to easily install the system. Even though the system is an expensive one, it will pay for itself in an estimated 3-8 years.

Solar Power: Solar power is radiated energy from the sun that has an effect on the earth. Solar energy doesn’t omit any harmful greenhouse gases, and can be used to both heat, and cool buildings. Unfortunately, solar power could only be used sparingly in our project because our environmental center site is located on the west, and shaded side of the mountain where there is not an adequate amount of sunlight to receive power year round, and therefore would not be an efficient use of this alternative energy source.



NRG Systems Energy Efficiency Facility



Solar Panels at NRG Systems

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