Evaluating Sustainable Housing

Name

Professor

Course

Date

**Client:**

Sustainable housing in Nova Scotia: Nova Scotia is a place that is relatively cold .Due to the cold conditions people are often forced to use a lot of money to settle numerous bills that arise due to heating in houses. Heating is inevitable, since people need to keep themselves warm while in the house because of the cold. There are no single houses in Nova Scotia that does not have a heating system. Therefore, the high heating bills are a common expectation of many households in Nova Scotia.

**Research question**

Geothermal heat pumps have various names such as geo exchange, earth energy, and earth-coupled systems. A geothermal heat pump is a cooling or heating system, which is centrally placed as the pumps heat from the ground or to the ground. Its source of heat is the earth during winter and during summer; its heat source is the heat sink. The geothermal heat pumps draw energy from the ground through capturing the heat below the frost line, and, hence use the energy for heating homes. This design uses the advantage that there are moderate temperatures from within the ground, which escalate the efficiency, and, at the same time bring down the costs of operating heating and cooling systems. It might be combined with the solar heating to come up with a geosolar system that is even greater when it comes to efficiency.

The research is, therefore, aimed at answering the following questions. Will geothermal heat pumps in Nova Scotia lead to reducing the energy that is consumed in the houses within this place.wil the installation of the geothermal heat pump result to a reduction on the high heating bills that the people of Nova Scotia have to deal with? Will the Geothermal heat pump installation result to people in Nova Scotia saving money on heating? Are there any other advantages that come with the installation of geothermal heat pumps in the houses apart from reducing the energy consumption? Are there any disadvantages that come with the installation of the geothermal heat pumps? Are the geothermal heat pumps sustainable?

Thesis statement

Sustainable housing in Nova Scotia incorporates geothermal heat pumps in their plans when houses are being designed. Due to the setting of geothermal systems from where the energy is transmitted to how it gets into the house, and eventually heats the house they lower the energy consumption. The low energy consumption trickles down to the cost of energy, and it will be reflected in the heating bills. The geothermal heat pumps, however, cannot be installed in places that are small and rocky. This is because a lot of drilling is required for the pumps and it can be quite expensive in such places, since one has to be in close proximity of geothermal energy plants. Therefore, the geothermal heat pumps will come as a relief to the residents of Nova Scotia who have been struggling with high heating bills. They will save a lot from the geothermal heat pumps, and this will only be realized if they are incorporated into the housing systems. Therefore, geothermal heat pumps can only encourage sustainable housing.

**The importance of the question:**

The question is very important since it is a popular belief by people that a lot of money is required when installing e high efficiency equipment, which will save energy and reduce energy consumption. The truth of the matter is that a lot of energy that will be used in heating homes and eventually brings down substantially the heating costs that are incurred. Several sources of energy have been in use in Nova Scotia this include firewood, however this is an unclean way of heating homes. Apart from being unclean, firewood is also an energy source that gets depleted at an alarming. Another energy source is electricity where heat pumps and boilers run purely on electricity. This is by far the most expensive heating method and a lot of money is spent on the cost of electricity. Apart from energy depletion and high costs of energy, prices of oil have also brought up the cost of energy through various ways for instance, oil production in Canada. Many oil companies have seen a reduction in profits that they used to make. The declining energy prices show that oil prices are on a downward pressure as the world economy undergoes a recovery. Various technologies have been put in place to curb the problems of energy sources in heating houses and reduce the consumption of energy. This includes several energy retrofits such as attic insulation, energy star vinyl window, solar pre-heating equipment and heat pumps. The housing organizations, which aim to upgrade houses and make them sustainable when it comes to energy consumption make the houses insulated from the loss of heat, ensure that there is an improvement in the circulation of air, as well as lead to reduction of the carbon footprint.

**How the course themes are applicable to the research topic**

When it comes to civil engineering, the theme of sustainability is quite relevant to the topic of research, because of usage of equipment, which are of high technology required to be put in houses, and homes to solve the problem of high energy bills. The house will need an upgrade, which will be aimed at solving the high-energy bills, which residents from Nova Scotia have to deal experience. This project is quite feasible, especially when it comes to the installation process. Engineers will design equipment that will facilitate utility, durability, as well as being economically friendly to the residents of Nova Scotia.

Background

There have been evaluation studies on homes or areas, which qualify to be classified as sustainable housing. There are key principles that govern the type of upgrading system that will make homes save energy, and eventually save money when it comes to the cost of heating. Many upgrade systems available for use when it comes to heating homes. Among the systems that are used are the geothermal heat pumps, which are now becoming popular in many countries all over the world. People who have gone ahead to upgrade their homes particularly using the geothermal heat pumps have reaped many benefits from this technology. It is very significant to embrace sustainable housing and there are so many advantages associated to the whole concept (Svane, 2002). Many countries opt for sustainable housing to save on the operation cost of home energy. Some governments have also gone ahead to implement policies that help in reducing the cost of energy in an attempt to help people save when it comes to the cost of energy. The governments often form partnerships with private companies, which then give rebates to citizens who desire to upgrade their homes to allow facilitation of sustainable housing in upgraded homes. It is not only Nova Scotia, which intends to have suitable housing, but many other countries have a similar objective. Therefore, the issue of sustainable housing is not only Nova Scotia, but also many other parts of the world (Turrent, & Edwards, 2000).

**Discussion**

In a world that is undergoing rapid changes when it comes to technological advancement there is need to embrace new technologies and use them to best suit the needs of residents in Nova Scotia. There are now better ways of heating houses as opposed to the boilers, which are outdated because of advanced. The heating systems in homes are a large investment, and the system that is chosen should be reliable, efficient and last for a long time in one’s home. Therefore, with technological advancement there is a wide range of systems that one can choose from, which will help them solve heating problems in many homes across Nova Scotia. The concept of sustainable housing in Nova Scotia should incorporate important facts like change in climate and the economic development of people

In Nova Scotia, housing is simply not just a roof over one’s head, but the ability of a house to have a heating system that can be sustained remains very important to the people. Many governments set policies that pertain to sustainable housing considered a spectrum of the conditions that underlay housing, which are aimed at achieving four main dimensions of sustainability such as social, economic, cultural and environmental. Sustainable housing is termed as a project, which is aimed at saving money since it enables the building of houses in a way that would affect one’s expenditure by reducing the costs. Sustainable housing is thus a process that takes many dimensions which creates a link between protecting the environment with development that is economically sound. Nova Scotia’s climate is very cold, and at most times there is heavy build up of ice, therefore, necessitating the heating up of houses at a constant rate. Most of the people opt for electricity, which is a very expensive energy source to use in heating the houses, which results to huge heating bills that are quite unbearable. This means the improvement of technology sustainable housing in Nova Scotia can be achieved through the installation of geothermal heat pumps. This will help on reduction of heating bills, and in the long run save a lot of money on the energy bills which were quite high.

**How the geothermal heat pumps work**

Heat pumps move heat from a specific place to another one that is from outside a home to inside a home. It is made up of a condenser, which is the outdoor unit, and an evaporator coil considered to be the indoor unit. It also has a refrigerant that function as a way through, which heat is carried from one area to another. Geothermal heat pumps utilize the energy that occurs naturally, which is found deep underground to provide heating as well as cooling for homes. The crust of the earth is in a constant shifting state, and it changes and breaks down. As this process ensues, there is release of energy, which usual takes the form of heat, hot water, or steam. Contractors have taken this advantage of these resources and created homes that are very comfortable and efficient when it comes to energy as well as being affordable to run. Therefore, most homeowners, and developers should take advantage of this technology that uses geothermal heat pumps to take advantage of geothermal energy, which is present below the surface of the earth. These pumps are meant to be installed next to home, and to rest just above the ground. There is a piping mechanism, which is attached a specific unit, and is expected to run blow the ground for dozens and hundreds of feet. How deep the pipes are set is determined by the geothermal potential optimum for a particular area. This pump then forces water, which is cold through the pipes. Natural heating then takes place as the cold water passes through the energy pocket of the geothermal system. In a similar way, heated water goes back towards the surface and as it passes back heat, and removed with the use of a heat exchange system. The heat exchange system is operated using electricity and transfers heat energy that is found in the pipes into the air that is warm, which eventually heats homes. Old water found in the pipes then circulates back using the heat pump, and, hence there are minimal wastes this ensures that the system remains efficient. During summer time the water flow can undergoes reversing which will ensure that the houses stay cool (Beach, 2010).

Geothermal heating in homes can also employ a technology, which is known as hot rock. This is applicable in areas where there are no geothermal energy pockets that are found close to the earth’s surface. The system requires a bore to be made through the crust of the earth as well as the layers of the rock, which are found below. The constant shift of the plate of the earth makes the rocks remain in a heated state, which is on a similar level as the natural heat. Cold water is then plumped under the ground using the bore that was created as the cold water goes through the rocks and undergoes heating at high temperature. The water is pumped into the surface through the heat pumps, and then passed through electric turbines to heat homes. Geothermal loops that are buried under the ground are made up of polythene, which is of high density, and a tough plastic, which is durable in an extra ordinary way but still allows the efficient passage of heat through it. When being installed there are sections of the pipe that are connected by joints, and then fused through heating, hence, the connections are stronger than the pipe (Beach, 2010). Water is the fluid in the loops, and it is environmentally safe and at the, same time, other solutions that do not freeze can operate the e closed system of the pipe. A geothermal heat pump thus functions in a similar way as a refrigerator to some extent. The geothermal units in Nova Scotia rely on the temperatures, which are held constant, and obtained from underground. There are many reasons on the incorporation of geothermal heat pumps in the housing system, and why their popularity is continuing to increase.

**Advantages of the geothermal heat pumps in heating houses**

The geothermal heating pipes are very efficient with their efficiency being about 400 times that of normal air conditions, and about 200 times more than the furnace that are used for heating. Their requirement is just about one kilowatt each hour for the generation of close to 12000 BTU while the usual systems use 2.3 kilowatts every hour for generating the same amount of energy. The main advantage of installing the geothermal heat pumps in hoes is the fact that they use very low energy. The systems use approximately 25-50% less electricity as compared to other common heating and cooling systems in home (conserve energy future, 2013).This is a translation of about one unit of electricity for moving about three units of heat from the surface of the earth. In the housing units, which were using a system that is all electric in heating the house in a period before retrofit, there was savings of about 42% of the pre-retrofit energy consumed for the heating. This, therefore, means that the use of geothermal heat pumps brings down the cost of energy drastically. Therefore, installation of the heat pumps will result to people saving a lot of money used in heating bills. The geothermal heat pumps also assure an individual of an all year round comfort, .while the heating bills are keeps reducing , these pumps are quieter than the other conventionally used systems, and hence an improvement of humidity around the home.

The design of the pumps gives room for flexibility, which can be installed in situations that are new as well as those that are retrofit. The hardware of the pumps only requires less space as compared to the convectional HVAC systems with the room for the equipment being scaled down in size depending on available space. The introduction of the heat pumps has seen improved aesthetics in buildings like the flexibility that comes with the pumps. This is because they are they are easy to use as well as cancel because they do not require cooling towers. These pumps eliminate roof top systems, which are convectional and hence pave way for a pleasingarchitecture design as well as roof lines. At the same time, limited penetration of the rooftop means that there is little or no likely hood for leaking to take place and hence no maintenance as well as better warranties for roofs. The equipment of the pumps that are found above the ground are found inside buildings as the equipment is sheltered from damage due to weather and at the same time protection from vandalism (Rye, 2010).

There is also very low environmental impact from using the pumps. The systems are very effective as it uses a lot of energy in maintenance of an indoor temperature, which is comfortable. Therefore, less energy is needed for the operation of these systems. Low costs of maintenance are also associated with the systems use. The pumps are very durable and require very little maintenance. There are very few mechanical components for the pumps as compared to other systems. Most of the components are found below the ground therefore they are sheltered from weather, which could otherwise damage them. The piping, which is found underground can last between 25 and 50 years, and therefore, there is no cause of worry at all. The components that are found inside the hours are very small and can be accessed easily in case any maintenance is required. They do not give out any form of noise and can be comfortably installed in one’s home.

**Disadvantages of the geothermal heat pumps**

The geothermal heat pumps as seen as advantageous, but, there are few disadvantages that can arise from their use. One of these disadvantages is the initial expense of installing the pumps. The installation of the geothermal pump is very expensive, .however the connection made to the ground enables the pumps to perform more efficiently. The cost of installing is about two times that of the convectional used systems. The system is still driven by electricity, and therefore, there are still costs that are associated with electricity. In case the pumps are designed poorly or they do not meet the needs of the house then problems arise. There is need for a clear understanding of heat movements within the earth and both the cooling and heating requirements of the house, this should be done before designing and installation. It is not possible to create a heating system that has no impact on the environment. Even though the system has low impact to the environment, there are still some disadvantages no matter how small such as leakage of water from open loop systems. The process also requires experts for installation as the task is challenging and cannot be executed without help from an specialists. Few companies offer the installation services as compared to the installation of other convectional systems being used in the entire process. In case one secures a good installation company, they are able to eliminate most of the potential problems that are associated with the use of the pumps (Geothermal heat source resource, 2012).

**Suitability of the ground heat pumps**

The pumps are highly rated when compared to other convectional heating systems. Many people recommend the use of these pumps as heating systems in homes, since they are very suitable. The installation does not require a lot of space, and, hence, it will be very suitable for homes regardless of their sizes. The system will also ensure that the homes are well insulate, since the pumps work best through the production of heat at temperatures, which are low compared to the traditionally used boilers. Therefore, it is very important that a home is well insulated and draught proof so that the heating system can be effective. The system will pay itself in a quick way since it is replacing the use and cost of electricity and coal from the system. The system can combine installation with other building, and hence reduce the cost of installation.

**Nova Scotia Financial Incentives for use of geothermal heat pumps**

The government of Nova Scotia collaborates with natural resources Canada to offer programs to owners of homes, which include both detached and semi-detached homes, who need to make an improvement in the energy efficiency of their houses. People receive close to $15000 for every household depending on the work that is intended to be done towards improving the efficiency of energy. The programs was initiated because many people needed a way by which they could improve the energy efficiency, and at the same time save on the cost of heating. Most of the people, however, did not have the money that was required to make the changes they needed very badly and, therefore called for the intervention from the government of Nova Scotia and other stakeholders so as to enable the people to live up to their dreams of better housing which is sustainable.

There are many contractors who are into the installation of the geothermal heat pumps. Examples of such contactors is the LEED mechanical contractor, Action refrigeration, Glen Mar HVAC,H.E Armstrong Mechanical Ltd and many other contractors who aim at encouraging geothermal heating use among the people.

Conclusion

Sustainable housing in Nova Scotia offers geothermal housing, which draws energy from the ground through capturing heat, which is below the frost line. This energy is then used in houses as a means of heating the rather cold houses that are found in Nova Scotia as a result of the cold weather that is found in this region. The people of Nova Scotia need heating systems that are relatively cheap as well as efficient. The geothermal heat pumps will offer this solution alongside other advantages that they come with. Due to the numerous advantages that are associated with the pumps, they have gained a lot of popularity among the people of Nova Scotia. Despite the fact that there are some disadvantages that can be associated with the pumps the advantages override these disadvantages. Therefore, installation of the heat pumps will result to people saving a lot of money used in heating bills. The geothermal heat pumps also assure an individual of an all year round comfort, .while the heating bills are keeps reducing , these pumps are quieter than the other conventionally used systems, and hence an improvement of humidity around the home.

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Homeowners that use the geothermal systems should be expecting to save 30-75% of what they spend annually on the energy bills. In addition to the saving they will also help the environment since they will not be using fossil fuels or other technologies. The situation has lead to the development of green house gases the fact that there are many companies that offer the installation of the geothermal heat pumps in Nova Scotia shows that the system is increasingly becoming popular in the achievement of sustainable housing throughout Nova Scotia. If the geothermal system are incorporated in most houses then the people will surely save a lot of money in the heating bills. People, who are environmentally cautious, will embrace this technology without any difficulty. Geothermal heating systems often add value to the home and hence the houses can be made more attractive to people intent to buy houses. The systems run for a very long period without being maintained. There is a complex interrelationship, which exists between housing and sustainability, which has been addressed by policies of creating housing that is sustainable.

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