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Comment re. OPG application for approvals, filed June 4, 2010

In its statements of its objectives, its request for approvals, its outline of new initiatives and its explanations for the drivers of deficiency the OPG has failed to deal with the greatest deficiency of all – the continued reliance on energy sources that are no longer viable. This Comment deals primarily with one alternative source of energy (Atmospheric Energy) that has the capacity to radically shift our sources of energy away from fossil fuels which are imported into Ontario to a natural source of clean energy that is universally available in all parts of the Province of Ontario.

The OEB is in a good position to consider that basic question because unlike other regulatory bodies it deals with all electric power issues, not just the limited range covered by OPG, and in addition it deals with natural gas, which is an interchangeable source of energy that is used for heating, for power generation and for transportation.

In a speech made on May 13, 2010 to the Ontario Energy Network Mr. Howard Wetston, Chair of the OEB observed that "the energy landscape is changing" and that the OEB's responsibility were likewise evolving so that "the Board must now promote electricity conservation and demand management" and "promote the use and generation of electricity from renewable energy sources". As the energy supply mix changes it is essential to consider all of the energy sources concurrently. For example, switching from gasoline to electric propulsion for cars is of little use if the electricity is produced by dirty sources like coal or natural gas (especially with the latter getting dirtier with the current shift to shale gas). Ontario's electricity production is primarily dependent on energy sources that do not produce CO2 so we need to retain that capability in the face of rising power demand. This Comment shows how Ontario could reduce the use of fossil fuels to nearly zero.

Atmospheric Energy (AE) systems can deliver more energy than Ontario's nuclear power station fleet but they do not directly produce electricity. Their impact on the electricity market arises primarily from their ability to control demand. That achieves the same objectives as the conventional practice of matching supply and demand by controlling the supply. Ontario presently suffers from two huge demand peaks, a protracted one that lasts through the winter and a shorter (but equally intense) peak caused by the power demands of air conditioners in the summer. AE systems could provide most of the energy that we need in the winter by heating buildings with heat extracted from the summer air and they would also eliminate the summer demand problem by tripling the efficiency of the air conditioning systems via the use of the ground as a cold sink.

A major problem in the existing power system is that the wholesale price of power drops nearly to zero a night, which puts the Province in the position of producing expensive nuclear power that is then sold for almost nothing. AE systems potentially provide a very simple and inexpensive solution to that problem by controlling the nighttime demand (increasing it according to current supply and demand conditions). Moreover, that ability to store energy to control demand makes it possible to increase the Province's nuclear capacity or alternatively to employ much larger wind power systems. For the latter the storage needs to cope with the supply variations of the wind turbines as well as the demand variations. Storing wind energy makes it possible to build wind generators that produce more power than may be required at a particular time so the wind contribution could if desired be increased well beyond the usual limit of approximately 17% of the supply total.

Atmospheric Energy Systems

Unfortunately the Ontario Energy Ministry has declined for many years to report on the potential for using Atmospheric Energy systems even though the concepts and the first working systems were developed in Ontario, so it is necessary to provide a brief technical explanation here. For more complete descriptions of the technology and its development see www.sustainability-journal.ca .

We we drive our cars, heat our homes, operate our computers, or do almost anything that uses energy the end result is that the energy is dumped into the air around us. In spite of the fact that all of the world's human use of energy ends up in the atmosphere there is almost no increase in the atmosphere's temperature that is ascribable to the human contribution. Most of the heat in the atmosphere comes from the sun, and the global warming effect arises from trapping of the solar heat, not from our use of energy. For all practical purposes the heat in the atmosphere can be considered an unlimited energy resource.

Given a cold body it is very easy to extract heat from the air using a simple, compact heat exchanger. We have a suitable cold body under our feet. If we extract heat from the daytime summer air and transfer that heat into the ground then it will very slowly move away from the injection point but remains close enough to be extractable in the winter when we need the heat. There are millions of ground heat exchangers in use so this does not require the development of new ground exchanger technology. There are a number of ways of recovering the heat so three of them will be briefly described.

AE systems can be used for new buildings or for retrofits to existing buildings. It is potentially applicable to all buildings in Ontario. First and foremost it provides a very inexpensive alternative to the use of natural gas, heating oil and electricity for heating buildings. That is of course of relevance to the OEB beyond the narrower considerations of EB-2010-0008 but it also has direct relevance to many of the specific requests from OPG.

Community-wide systems

If each house in a community injects as much heat in the summer as it uses in the winter then the heat can be recovered using conventional heat pump methods. Since the injection and extraction are equal the ground temperature cycles above and below the normal ambient ground temperature so that there is no annual loss in the strored heat in either the lateral or vertical directions. There is a very small heat contribution coming from below the storage volume because the centre of the earth is hot, but the macro effect is that the system stores a great deal more energy than could be achiecev by the use of conventional ground source heat pumps.

Isolated installations

A farmhouse would not use the above approach because most of the injected heat would escape from the collection volume and would not be utilized by neighbours. However, the system can be modified so that the heat is injected into the centre of the storage volume and then collected by 3 or 4 outer extractors that are located far enough from the centre so that the heat just reaches them when it is needed in the winter. Such installations are just as efficient as the community-wide systems (the first example was installed in Kingston).

AE-Street systems

AE-Street systems are a variant of the Isolated systems except that the boreholes are deep enough to provide heat for many homes. The heat store can be buried under a city street and the heat distributed to

the neighbouring buildings via community energy pipelines. This type of system has three very important advantages with respect to this Comment:

(1) the cost per home is very low
(2) linking large buildings like IT buildings that generate a lot of heat with home that have a large heat demand makes both types much more efficient
(3) city-run community heating systems provide the means of storing hundreds of petajoules of electric heat as described above. The conversion of electricity to heat is not a limitation, partly because we use so much electricity to generate heat and partly because the electricity has so little economic value in the middle of the night.

Recommendation

The OPG request for approvals lacks what should have been its core consideration – how to make a start in the pending energy switchover. The request should be returned to OPG with the requirement that it be revised to include an outline of how it will respond to the switchover, spelling out the immediate and future impacts of the new energy sources like Atmospheric Energy.

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