**EB-2013-0321**

**Why energy storage should be a fundamental consideration in the EB-2013-0321 review**

At the April 23 Technical Issues meeting the OPG Panel was asked if they had considered the potential for using electricity storage in conjunction with the refurbished Darlington power station. The answer was "No". The following briefly explains why that was the wrong answer.

The issue that is before the Board in this particular case is the future price of power, particularly the power that comes from the OPG nuclear and hydro facilities. In Ontario the dominant factor that determines the price of power is the capital cost of the generation facilities - the nuclear power stations, the gas-fired peaking stations and the hydro generators. Those are all centrally located sources of power so that creates an additional cost to build a grid that distributes the power to the consumers and to provide a match between the demand, which goes through large fluctuations, and the various electricity supplies, which must at all times meet the current demand.

If the system incorporates electricity storage there is no longer any need for the baseload+peaking generation concept. Ontario could, for example supply 100% of its power from nuclear stations, or conversely it could close down all of its nuclear power stations and rely instead on intermittent sources of supply like wind turbines, solar power and hydro power. Moreover, if the electricity storage uses a distributed approach under which the stores are located close to the points of consumption then the grid only needs to handle the average demand, not the much larger peak period demands, and it doesn't need to be a "smart grid" that tries to blend the supplies from distant sources, so the cost of building and maintaining the distribution grid is greatly reduced.

If the system includes storage then the electricity can be generated at a constant rate that is determined by the average annual demand, not the peak demand, which implies that Ontario could begin shutting down its generation plants, not expanding or refurbishing them.

One of the candidates for large scale energy storage is to store the energy in the form of heat that can be stored in a suitable medium such as the ground. Thermal storage makes it possible to utilize natural sources of energy (the air, solar energy, waste heat, and natural ground heat) to meet the thermal demands of our buildings. Enwave is an existing example of such a store, and there are many other examples. We use electricity for air conditioning, for space heating and for domestic hot water so if those needs were instead met from local energy sources via distributed storage systems then the average annual demand for power will drop accordingly. The combined effects of these two changes in the system design would be a very large reduction in the need to generate power (MW) even though the actual energy consumption (in MWh) is unchanged .

The storage system itself needs electricity to run heat pumps that adjust the temperature of the stored heat to the values that are needed for the various applications (space heating, etc). The heat pumps do not create energy, they just change the temperature and the location of the heat (in technical terms, they boost the exergy). The electricity is converted into exergy that is stored along with the energy from the natural sources and that exergy is recovered when the heat is extracted and put to good use. Such systems can be designed to draw power only when there is surplus power available, and they use little or no power at all when the energy is recovered because the heat is already at the required temperature. Such systems offer the potential to shift the timing of the power demand and they are orders of magnitude cheaper than other demand-shift alternatives like battery storage.

If OPA is unwilling to consider these opportunities for cost reductions then we would suggest that the OEB should not approve their application for price increases.

Ron Tolmie
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