Newfoundland and Labrador energy

At first glance the energy supply and consumption patterns for Newfoundland appear to be very similar to those for PEI. Both lack a natural gas distribution network and both largely use heating oil for space heating. However there are two major differences: the island of Newfoundland has a substantial hydro capacity (1,254 MW) and the Province has substantial reserves of natural gas that might be utilized. There appears to be no need for either wind turbines or solar PV except at isolated sites.

In addition to the hydro generation on the island there is presently 5,444 MW of hydro generation in Labrador, for which a further 824 MW is planned at Muskrat Falls, to be followed later by a further 2,250 MW from Gull Island. The plans currently call for 900 MW of the power from these sites to be transmitted via an underground link to the island and for the installation of an added link from the island to Nova Scotia, rated at 500 MW.

To simplify this initial review the numbers will be based on the 2010 consumption data (from NRCan OEE) for the residential sector on the island. It will be assumed that exergy storage systems will be used for heating residences, but that will take time to implement. The operating cost of using air-source/storage for space heating is about three times less than the cost of heating with electricity, the DHW needs very little power, and the ability to control the timing of the storage input is of considerable value to the grid, so the capital costs should be shared.

The existing sources of energy are (2010, island residences):

Electricity	14.3 PJ
Natural gas	0.0
Heating oil	5.4
Other (coal & propane)	0.2
Wood	2.9
TOTAL	**22.8 PJ**

The existing applications are (2010):

Space heating	16.0 PJ
Water heating	2.4
Appliances	3.6
Lighting	0.9
Space cooling	0.0
TOTAL	**22.9 PJ**

(Note: The 0.1 PJ discrepancy between the source total and the applications total was in the NRCan OEE numbers)

The proposed new mix of energy sources are:

Hydro	9.8 PJ
Air-heat	10.7
Wind	0.0
Solar thermal	2.4
Solar PV	0.0
TOTAL	**22.9 PJ**

Note that the hydro demand drops from 14.3 PJ to 9.8 PJ, a drop of 31%. A reduction of 31% in the total hydro load would make about 395 MW available, almost enough to provide the power needed for the link to Nova Scotia. However, that assumes that the space-heating systems are installed quickly, and that might not happen.

Recovering electricity

In the PEI case there would be times when there would be no power from either of the intermittent electricity sources so at such times there would be no recovery of electricity, making it debatable to claim that the system was storing electricity. At such times an external power source such as the NB link would be needed by the PEI network. In the Newfoundland case there would always be power available so the system could always absorb electricity when the operator chooses to do so and the electricity will always be recovered via a drop in the power demand during the high demand periods so the system is acting just like an electric battery.

Exporting 500 MW

The above numbers indicate that an additional 105 MW would be needed to be able to export the planned 500 MW of power to Nova Scotia. One way of achieving that might be to increase the size of the solar collectors that are used for DHW by a factor of 2.7, increasing the solar thermal contribution to about 6.5 PJ and reducing the hydro contribution to about 5.7 PJ. That would require increasing the physical size of the core to keep to the same operating temperatures. Such an increase might be pushing the feasibility limits but solar thermal collectors that are used with high temperature stores are particularly cost-effective so such an approach is both technically and economically attractive where it is possible. The end result would be that Newfoundland would have all of the energy it needs, in the forms that are needed and the province could still export 500 MW of power, with the future option to market the full 3,000 MW from Gull Island and Muskrat Falls to new markets for electricity. All of the energy would be GHG free.

Conclusion

These are "first stab" estimates that do not include the commercial/institutional or industrial numbers and that are based on the use of a technology that is unfamiliar to most people so the next step should be to undertake more rigorous studies. However, the principles are straightforward, the hardware is all conventional, and the potential benefits are very substantial.