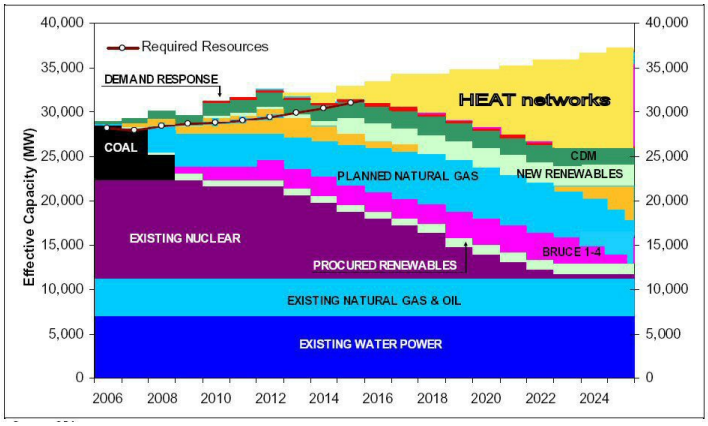

The graph above is a modified version of Figure 1.2.14 from the Ontario Power Authority recommendation on future electric power choices, with the changes being the replacement of HEAT networks energy (shown in yellow) for the new nuclear power stations proposed by the OPA, plus a reduction in the previously planned use of natural gas for power generation (shown in orange).

Note that both this graph and the OPA graph depict the capacity needed to supply the peak load, which has a significantly different pattern than the graphs for total energy consumption.

The OPA plan calls for continued expansion of the use of fossil fuels right to the end of the Kyoto planning period, with a consequent increase in greenhouse gas production even over the current excess. The HEAT networks option would meet the Kyoto objective, primarily because of the reduction in the use of natural gas and oil for home heating.

The OPA plan proposes a nuclear program that would burn up all of Canada's supply of uranium in a matter of a few decades, leaving us dependent on tar sands and coal for future energy production, and in the process greatly aggravating the pollution problem. If a nuclear program is needed at all it should employ breeder reactors and the considerable system extensions entailed in fuel processing.

The OPA plan assumes that the new nuclear reactors will be much less expensive than previous Canadian reactors, and they will be built in about half the time. No provision is made for dismantling the existing reactors, which would progressively be taken completely out of service in both scenarios. The OPA plan assumes that the considerable cost and risk of the nuclear systems will be entirely borne by governments (but no cost allowance has been made). The OPA plan calls for conservation measures that will be paid for by homeowners, and it will entail substantial increases in fuel cost for those homeowners. In contrast, the HEAT networks option would result in declining fuel costs, a permanently sustainable energy supply, and the ability to expand energy usage without the need to spend billions on conservation measures. However, Ontario will either have to share hydro power coming from neighbouring provinces or rely more heavily on combustible fuels.

The Role of Combustible Fuels

The standard building block from which the HEAT networks are built is a heat storage module that is 30m in diameter and 200m deep, containing 48 heat exchangers. The heat exchangers are the only man-made component of the modules, and they are the same as those used for ground source heat pumps, which have been installed for many decades and now number over one million. The storage capacity of the modules can be precisely determined from simple calculations, and the heat leakage from a module of that size is negligible, so the performance is reliably predictable regardless of the size of the system (i.e. the number of modules employed) or the source and uses of the energy. One of the potential sources of energy is combustible fuels.

In both the OPA and the HEAT networks scenarios combustible fuels are important contributors to the systems' effective capacity but they are relatively minor contributors to the total energy supply (subject to an uncertainty in the OPA data if the nuclear input should fall behind schedule).

In Canada 56% of our electricity production is from hydro energy. The HEAT networks would displace about 22% of the electric energy presently used for air conditioning, refrigeration, water heating and for electrically heated homes, and both graphs show 15% being supplied by wind power. That leaves only 7% to be provided from other sources, including combustible fuels.

In the long term that 7% might well be supplied by wind or solar driven generators that utilize the HEAT networks modules for storage, but for several decades to come it is more likely to be provided by fuels that are waste products, for example methane collected from garbage sites or from plasma converters, or the natural gas that is dissolved in oil and that makes up about 16% of its energy content. A switch to HEAT networks for home heating will also make huge quantities of natural gas available and affordable.

There are some useful advantages to be gained in combining combustible fuel sources with seasonal storage. Such systems automatically become district heating systems, and the distribution temperature can be high enough to eliminate the need for heat pumps in the homes. That reduces the capital cost and also reduces the winter electric power demand. Since seasonal heat storage is provided such systems are much more efficient than conventional co-generation systems, which waste any heat that is produced in the summer.

The HEAT network option could start almost immediately, and the modules have a very long life with minimal maintenance. In addition to radical reductions in the use of fossil fuels for heating it would also permit some reduction in that used for power generation, and it would provide a stable, very reliable energy future.