

## **Matching the power output and the river flow**

In Canada the river flow rates rise sharply in March and then fall equally quickly in June. That coincides nicely with the need to replenish the heat in the exergy stores. In the winter the river flow rates are at an intermediate value and that too matches the need to run the heat pumps at a medium dwell duration to provide winter heating, with most of the heat actually coming from the heat that was stored during the spring and early summer. For those periods the system design can be adjusted to match the inherent energy supply with the normal demand for heat and electricity.

However, there is a problem in August, when the rivers are at their minimum flow yet there is still a large demand for air conditioning, and the nature of that problem reverses in October, when there is no longer any need for cooling and only a modest need for heating, but the water flow increases. The challenge is how to utilize that extra river energy. By that time the air is too cold to use the increased hydro power to boost the heat storage. The proposed solution to those problems is to deliberately chill the ground around the outer rings during the early summer, then allow the ground to return to its ambient value (10 degrees in Ottawa) in October, and then finally return the outer ring to its nominal 6 degrees in November by running the outer heat pumps. The system will then be making good use of the increased November flow and it will also be taking advantage of the summer chilling of the outer ring to enhance the air conditioning. The amount of energy that can be stored in the ground in this way is very large and is more than adequate to handle the required adjustments.

If Canada modifies its hydro power system to make more efficient use of the available energy from the river flows then it could readily meet all of its electricity needs using just hydro power, leaving a surplus for export to the US. Since the storage systems also make good use of local energy sources to provide heating, cooling and DHW they provide a clean and economical solution for most of our energy needs for static applications. All of the logical building blocks for such systems are available, but our energy supply managers are still mired in the ideas of the previous century. The response to this concept from federal, provincial and civic energy supply managers has been uniformly hostile. We could save tens of billions of dollars and also eliminate GHG's from the buildings/power sector if we do some housecleaning in our governments. If we fail to undertake that reform then the dismal future predicted by plans like Ontario's LTEP will come to pass.