

A Quick GHG Solution

According to a report from CANARIE (www.isgtw.org) a huge part of the world's output of CO₂ is attributable to the use of electronics for information and communication technology (ICT). Their estimate is that 3 to 4 % of all of the world's GHG production is attributable to that source, and that the rate of emission is doubling every 3 or 4 years.

AE-Street systems provide a solution to this problem that can be implemented quickly and inexpensively. The solution carries with it four other ancillary advantages.

A large office building typically generates so much heat from its ICT equipment that it requires little or no heat in the winter. 100% of the electric energy that is used is converted into heat that is normally dissipated into the atmosphere to get rid of it. If that heat is instead injected into the ground at AE-Street storage sites then nearly 100% of it will subsequently be used to heat the nearby homes and other buildings during the winter. A building that uses 10 MWh of electric power to operate its electronic equipment will thus deliver 10 MWh of heat to the AE storage site, and since the site balances the IN and OUT heat all 10 MWh is in turn delivered to the neighbouring homes. The result is that there is no dissipation of heat into the air from the office building and the homes are now using a clean source of energy instead of natural gas, so everyone wins (except the gas company!).

The heat island effect that is experienced in many large cities is caused by this massive dissipation of heat into the downtown air. By getting rid of the heat island effect we can make our city centers more comfortable in the summer.

Air conditioning systems that use the air as the heat sink operate with comparatively poor efficiency, exhibiting low Coefficients of Performance (COP). The first AE system has demonstrated that the efficiency can be tripled if the cold ground is used as the heat sink. The cooling demand for Canadian homes is so low that they dump comparatively little heat into the ground, which means that there is a large heat sink capacity available for the office buildings. The consequence is that the air conditioning systems use relatively little power (or natural gas in some cases).

Most office buildings require some space heating during the coldest part of the winter. Typically that heat is provided by natural gas furnaces. With an AE-Street system the building's own heat is stored in the ground

and will then be recovered for space heating in January and February. That both saves money and reduces the CO₂ generation even further.

A fourth and much less obvious ancillary advantage is that AE-Street systems can store energy from renewable energy fields like the 86 turbine wind field on Wolfe Island near Kingston or the solar fields near Napanee and Arnprior. Storage makes such sources much more efficient because their peak outputs may not coincide with periods of peak demand so the excess energy can be stored in the ground. That in effect makes the renewable source continuously useful instead of just being sporadically employed.

The wholesale price of electricity typically drops to around 1.5 cents per kWh for about eight hours during the night because of the lack of demand. If the wind energy that is collected during that period is stored then there is no significant economic loss attached to its conversion from electricity to heat. Thus one third of the wind field's output can be efficiently stored and there is at all times the capacity to handle any exceptional output that might occur. (nb. This explanation is incomplete)

An even less obvious advantage is that this storage is useful for nuclear power as well. As things stand Ontario cannot expand its nuclear power capacity because its output is already at the low annual demand limit. If the demand drops below the reactor capacity then typically a reactor will need to be shut down, and they are slow and complicated to start up again. If the excess power is again stored in the AE-Street store then this problem is solved. If AE-Street systems were widely deployed then their total storage capacity would be well in excess of both the nuclear and wind energy storage needs.

The present policy of the Ontario government is to spend 2.1 billion dollars to expand the power grid so that it can better cope with the great supply variations from renewable sources connected to the centralized systems. That expenditure would not be needed if the power systems were organized as community systems so that, say, the Wolfe Island wind field fed its power directly to the Kingston power utility that might also handle the ground part of the Kingston AE-Street system. The full output and the full variability of the wind field could thus be used locally with very little involvement of the centralized grid.

Fossil fuelled stations offer an important advantage in that they are able to react quickly to sudden load changes. That role could instead be filled using gas manufactured from garbage, contributing to the elimination of fossil fuels in the buildings sector.