AE-Street Systems

(See http://sustainability-journal.ca for further info.)

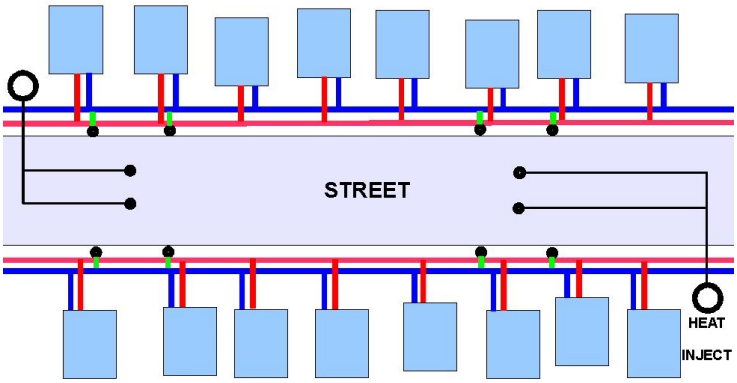

Fig. 1 ***Distribution lines along the street provide the homes and other buildings with access to both heat for home heating and a cold sink for cooling.***

Fig. 2 ***The components of an AE-Street system have been successfully tested at a site in Kingston.***

The heat pump provides both underfloor and forced air heating

Fig. 3 ***The heat pump both heats and cools the home.***

Atmospheric Energy (AE) Street systems provide a means for whole communities to share an energy source (and sink) that can be used for both heating and cooling buildings of all types, ranging from small homes to skyscrapers. AE-Street systems can be more economical to build and operate than conventional heating and cooling systems that use natural gas, heating oil, electricity, etc., and they produce no greenhouse gases. AE-Street systems use the summer air as their source of energy. They collect the heat from the air and trap it in the ground.

AE ground heat exchangers are permanently sealed so they do not require access after installation. They can therefore be placed under city streets, under buildings, under sidewalks or parks, etc.. Figure 1 shows a sample layout that has two heat traps that are fed by heat injectors (Figure 2) in the center of their storage volumes. Heat moves very slowly through the ground so the extraction points (deep heat exchange boreholes) are located at distances that maximize the collection in the middle of the winter, when the heat is most needed.

The temperature of the ground is raised by about 7 degrees C to a depth of about 100 metres to provide 100,000 kWh of storage per site. The depth and the field size (typically 7 metres square) need to be adjusted to suit the thermal conductivity of the ground, which should preferably be bedrock with minimal groundwater flow. The number of storage traps along the street is selected to match the heating demands of the buildings, and they are located at places that are geologically suitable and convenient for drilling. Because of the higher energy density in the ground and the use of ground heat exchangers that have very high efficiencies the boreholes are much shallower that those required by ground source heat pump systems and the costs are consequently much lower. The energy itself is of course free and the capital cost of the underground part could potentially be covered by the cap and trade and feed-in tariff programs that are being developed.

A homeowner would be responsible for the cost of the connection to the AE-Street distribution line and for the heat pump (Figure 3) that provides both heating and cooling. These costs are normally less than the cost of a conventional furnace and air conditioner with the associated chimneys, air heat dump etc.

If widely used across Canada such systems would provide over 1500 petajoules of energy and would reduce GHG production by up to 100 million tonnes. In Ontario they would eliminate the problem of the excessive power demand in the summer that is caused by air conditioner power demand.