AE-Street Capital Costs

The following lists the early-model capital cost of an AE-Street system based on the design of the existing Kingston system:

Cost of energy = $0
Cost of delivery = $0
Cost of boreholes and associated components *
< $690/kW (~$100/metre of borehole depth)
Cost of inter-home distribution < $20/kW
* *for 9-hole demand peak version*

Total curbside power cost < $710/kW

This does not include the homeowner costs: the link to the house, the heat pump and the heat distribution system, for which the key point is that those components are cheaper than the conventional furnace + AC combination.

There is considerable room for cost reductions from the economies of scale in putting multiple storage sites along the street, but even as it stands the $710/kW is a very attractive figure, especially considering that the energy is free, the operating cost is very small and that it reliably delivers the energy whenever you need it and in whatever quantity is needed.

There is a substantial additional benefit in the form of reductions in electricity demand arising from doubling the energy efficiency of ICT buildings (which account for a large part of the total national power consumption) and the reduction in power for AC demand arising from the use of a cold heat sink. In addition, the ability to store electric-source energy at rates up to 500 kW/site creates the opportunity to generate large additional amounts of CO_2-free power. These benefits will eventually result in further decreases in the capital cost.

The basic delivery of clean energy, the reductions in power demand and the indirect increase in the power supply all result in potential national CO_2 reductions amounting to up to 100 million tonnes, for which a cap-and-trade program should deliver a cost reduction for the AE systems via a mechanism that has not yet been determined. Based on a reduced household production of 10 tonnes per year and an offset value of $20 per tonne that would amount to $10,000 per year per site, or about $87/kW of capacity. Such offsets are expected to increase, possibly to as high as $100 per tonne. The scope for cost reductions could easily cut the construction cost in half, making the net capital cost of AE systems much lower than the initial $710 per kW.

Technology	Year on line	Cost ($/kW)
Advanced open cycle gas turbine	2008	398
Conventional open cycle gas turbine	2008	420
Advanced gas/oil combined cycle	2009	594
Conventional gas/oil combined cycle	2009	603
Distributed generation (base load)	2009	859
Distributed generation (peak load)	2008	1032
Advanced combined cycle with sequestration	2010	1185
Wind	2009	1208
Coal-fired plant with scrubber	2010	1290
IGCC	2010	1490
Conventional hydropower	2010	1500
Biomass	2010	1869
Geothermal	2010	1880
Advanced nuclear	2011	2081
IGCC with carbon sequestration	2010	2134
Solar thermal	2009	3149
Fuel cell	2009	4520
Photovoltaic	2008	4751

The table above shows estimates (in $US) for the capital cost of various power generation systems (not considering the capacity factor). *Data Source: US Energy Information Administration*

Technologies	Capacity factor (%)
Gas turbine combined cycle	80-90
Nuclear	90
Average US coal plant	68
Biomass	68
Geothermal	90
Hydropower	44
Wind turbine	30
Solar	20

The capacity factor can greatly increase the total cost of the power generators.

An AE system has a capacity factor of very nearly 100% so even at the prototype cost of $710/kW the capital cost is immediately competitive with most existing power sources (but bear in mind that it is delivering heat, not electricity). There is considerable room for capital cost reductions with experience, plus potential for reductions related to the conservation features, cap & trade offsets and energy storage.

The energy cost is already zero, making this the least expensive energy source in Canada.