

## What does Net Plus imply?

One of the implications of using the summer air as a source of energy is that it has a virtually unlimited capacity to provide heat for common applications like heating buildings and domestic hot water. That would be true even if Canada's population were in the billions.

The claim that “We must conserve energy!” is not actually true for those applications that can be served by AE systems. What we need to conserve is our environment, and to do that we need to stop using fuels that are fouling the air, and often the water and soil as well. If we are ever to reach the target of reducing GHG production by 80% below 1990 levels then we must stop using fossil fuels altogether for those applications for which there are readily available clean substitutes.

We need to recognize that the short term measures that are currently being promoted, such as setting targets that still fall far short of even meeting Canada's existing commitments, will just prolong the fossil fuel era. Such measures are counterproductive. For decades Canada has been following a policy of trying to improve the efficiency of systems that use fossil fuels in hundreds of ways, but our GHG production has continued to rise, and will continue to do so until we realize that we are on a dead end track. Such policies do not even have the theoretical potential to solve the problem. For buildings they are also absurdly expensive considering the much lower cost of using the air as the source of energy.

AE-Street systems offer an almost universally applicable method for heating and cooling all of our buildings, and they will save money in the process. However, the most significant benefit is the elimination of the GHG that is currently being produced by heating and for the electrical power consumed in buildings. The “Net Plus” objective therefore refers to the potential for reducing the GHG generation to a value that is less than the total that is currently attributable to buildings, including the power that we use for our computers, TV's, stoves, etc.

AE systems do not produce electricity but they can reduce the consumption of electricity, and can make the distribution of power more efficient, and can make it possible to substitute CO<sub>2</sub>-free power generators for ones that are burning fossil fuels. The objective of this note is to begin to evaluate those indirect benefits in terms of their potential to reduce CO<sub>2</sub> and to save money in the process. The cost factor is important because it is the key to persuading people and governments to change their habits.

**Canada's inherent advantages** Canada starts out with two huge advantages over other countries. One is that most of our electric power is already generated by CO<sub>2</sub>-free means, mostly by hydro generators. We can if we choose go to 100% CO<sub>2</sub>-free power by simply heating our homes with AE systems. Currently 34% of Canadian households use electricity as the primary heating source so there is ample capacity to make such a switch.

Canada's second inherent advantage is that our wide seasonal temperature swings make AE systems particularly (and universally) applicable. AE systems would add 2000 petajoules per year of energy to our energy resources.

AE systems do much more than just add a new source of energy. They also create the means to store energy on a very large scale. If we can store energy then we can employ wind power on a much larger scale, and can make wind turbines more economical and efficient. The present fixed output limitation of nuclear power can be avoided. Even hydro power benefits from this ability to store energy to handle both daily and seasonal demand fluctuations.

If Canada has abundant, inexpensive and clean hydro power it consequently has the key to solving the GHG challenges in the other sectors. Electrically driven public and private transport will reduce the GHG from the transportation sector. Industry's need for energy can likewise be met by electricity in many cases. Most other countries are using coal for their power production so these two natural advantages will provide Canada with a comparative advantage that spans all of our sectors if we wake up and put them to use.

**Conservation** In Ontario the primary electricity demand peak normally occurs in the summer and is caused by the power consumption for air conditioning. If our homes use AE systems for heating then they will use the ground as the heat sink for cooling. That results in a reduction in the cooling power consumption of up to a factor of three, eliminating the primary demand peak at almost no cost to either the consumers or the power producers.

AE-Street systems will serve both residences and large commercial buildings, and by simply integrating these two different types of building their needs are automatically complementary. Large buildings containing a lot of electronic equipment need to dump heat throughout most of the year. Residences need heat so they can utilize that dumped heat, which is

particularly valuable because most of it does not require long term storage, making the AE systems more efficient. The large buildings will in effect use the electricity twice, first for running their electronic equipment and then for heating. Moreover they will save a lot of money because of the higher efficiency of using the ground as the heat sink for AC, and they will eliminate the “heat island” effect that is currently created by dumping so much heat into downtown urban areas. Residences have relatively small cooling loads but high heating loads, so their ground systems have a high capacity to absorb the extra heat from the large buildings

Canada's power grids are inherently expensive, wasteful and unstable because we use a relatively small number of centralized power stations. AE systems provide a distributed power source and moreover they provide local energy storage that can level the load on long distance lines and can make individual communities much more self reliant and resilient. Using demand control as an adjunct to supply control would make the power grids simpler, less expensive and more reliable.

**Quantifying the results** Given the opportunity to connect to an AE-Street system, the choice is very simple for the homeowner. The AE option is cheaper, more stable and reliable, and it enables individuals to contribute to achieving a cleaner environment in a very large way since heating, cooling, DHW and power account for nearly all of a home's energy use. While it would be possible to devise mechanisms for passing on the “Net Plus” benefits to homeowners and owners of other buildings there is not much point in doing so. AE-Street systems are already the best and least expensive option for them. The more important objective is to evaluate the “Net Plus” benefits for governments and the energy supply/distribution industry.

If Canada stops using fossil fuels for the buildings and power generation sectors that would probably have little effect on production of those fuels. The US lacks both of the inherent advantages cited above so it will continue to rely on fossil fuels and will absorb the Canadian production in place of offshore imports. Such a shift would be neutral in terms of world wide GHG production.

### ***What then are the quantitative benefits to our governments over and above the direct GHG reductions related to space heating and DHW?***

The benefits from conservation are comparatively easy to quantify in approximate terms. Ontario would over time reduce the summer power demand by about 7,000 megawatts, which is probably about half of the Canadian total. At \$3600/kW (the typical effective cost of hydro) that would amount to a saving of over \$50 billion.

In Quebec, BC and the other hydro-rich provinces reversing the underutilization of electric power for heating could make huge amounts of power available for other sectors like transportation and industry, making those provinces primary centres for industrial development.

By freeing up our hydro power for more productive uses and at the same time providing large scale storage to support the development of wind power Canada could once again become a major manufacturing nation, based on an abundance of clean energy. As manufacturing operations become increasingly automated the availability electricity will become a more important factor than cheap labour. We will be able to reduce GHG emissions by repatriating the millions of jobs that have been “exported” to China.

**In the process such a trend will generate millions of high-paying jobs in Canada. To make that happen we will need to persuade our governments to consider the merits of the Atmospheric Energy concept. At the present time they are ignoring it.**

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