

The Building as a Power Plant

At forum I produced on energy efficiency and commercial buildings in May, Joel Makower (www.greenbiz.com) talked about the idea of buildings as power plants, drawing an elegant parallel between **the trajectory of energy technology and that of information technology**:

The first computer systems were hardwired to “dumb” terminals – drawing information from a big, smart mainframe. Then came PCs which were able to do things themselves, as well as talk to mainframes and other PCs. Soon everything will talk to everything – phones, televisions, cars, watches, refrigerators – and all wirelessly.

Energy systems are developing along similar lines: Most of us still live in systems where a central "mainframe" power plant feeds energy to "dumb" terminals — our homes and businesses. Increasingly, some homes and businesses are becoming smarter with solar and other renewable systems to generate power, selling excess energy back to the grid. In the not-too-distant future, major appliances like refrigerators and heating and air conditioning systems will be "talking" to the electric grid, making adjustments or in response to shifting energy demands and rates. Electric vehicles and hybrids will store electricity in their increasingly more powerful batteries and will sell extra power back to the grid when needed. We'll be able to make energy transactions from our vehicles, PCs, PDAs, and cell phones. And much of this will take place wirelessly.

Large commercial buildings will play a huge role in the creation and management of energy – and thus the quality of our lives - in the next few years. The best buildings will not just be energy-neutral. They will be energy-positive. This is not a fantasy – it's happening:

Abu Dhabi's Masdar Initiative www.masdaruae.com/ is an aggressive carbon-reduction program launched 2 years ago. The \$22 billion dollar Masdar City is a mixed-use project which will be a cutting-edge example of efficient building best practices with the goal of being zero-carbon, zero-waste, and zero-energy.

The architectural firm of Adrian Smith and Gordon Gill www.smithgill.com has designed the centerpiece of this development and headquarters of the Initiative – a 1.5 million square foot building that will produce more energy than it consumes – making it **the world's first large scale positive energy building**.

It features eleven spectacular, towering glass-enclosed wind cones, each one programmed differently at the base level and all used to bring in cooler ground-source air from the subterranean levels below, diffuse daylight throughout, siphon warm air up and out of the building and delineate pedestrian walkways.

Plans call for the roof to be covered with a 290,000-square foot photovoltaic array (currently envisioned as polycrystalline cells) that will harvest the intense solar energy in the desert and convert it to power for the building. Beneath the curving roof, which articulates and promotes the pattern of air movement, is a vast garden space.

Both geothermal and wind turbine technologies are being considered. State-of-the-art building skin technologies are being explored, with plans being altered as newer and better-performing materials become available.



An energy-positive building may be a few years off for Toronto, but energy-*smart* buildings are becoming a reality - *how* smart our buildings will be is up to us. We all know about peak demand: It's 4 pm on a hot summer day in Toronto. Air conditioners are blasting in offices and in homes and demand will rise further as people go home and turn up their AC power up their appliances. Our local providers are getting dangerously close to maxing out their available power, brown-outs are imminent and everyone's prices are spiking.

But imagine this: A group of intelligent, demand-responsive Toronto commercial buildings are communicating with the grid *and each other*. They are turning off their air conditioning or refrigeration units at staggered 5-minute-per-hour intervals for a couple of hours in a cooperative, highly efficient way. This would be imperceptible to the tenants and hugely reduce overall demand. Crisis averted, quality of life in our city maintained and dollars saved for building owners and tenants.

What is required to make this vision a reality? More than current demand response programs - incentives and rebates for building owners with some teeth: **serious** tax credits, **meaningful** discounts on equipment upgrades (Like HVAC systems that can deal with a fast on/off scenario, meters and sensors) and **real** incentives for investment in alternative energy solutions (like photovoltaics, fuel cell and, geothermal energy production and microturbine installations) and **rapid** fast-tracking of approval for energy-efficient buildings. Some US cities are simply changing the way property taxes are calculated for net zero or energy-positive buildings. What a great idea.

To send comments or provide information and data on the building greening activities of *your* firm, please contact Karen Sisco, member: CaGBC, CUI, Toronto CREW and CORENET
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