Luthin Associates Confidential

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Winter Wonderland

Making the Best Use of Your Portfolio Management Score

You've developed your EPA Portfolio Manager (PM) rating - either to comply with NYC Local Law 84, or voluntarily - but what can you now do with that score? While that grade compares your building to comparable others in your area, it cannot be used to calculate actual usage, or potential savings by improving it – but it might guide you on what to do next. If your score is 75 or better, pat yourself on the back, apply for EPA's ENERGYSTAR Building Label, and issue a press release lauding your facility's energy efficiency. If it's much below 50 (the median score), however, give some thought to *retrocommissioning* or having an *energy assessment* performed. Either process may find enough savings to warm even the coldest bean counter's heart.

Retrocommissioning (RCx) is essentially a rebooting of your facility's energy systems. RCx professionals examine and test (and possibly repair) controls, with an eye to restoring them to their optimal settings. For systems that are less than ~15 years old, this process is often the most cost effective way to secure energy savings. No engineering, design, or new equipment is involved, and the only expenditures (aside from the RCx service) may be to repair or re-program damaged, out-of-date, or corrupted systems.

Luthin Associates, Director of Regulatory Policy, John Dowling, pictured at Solitude resort.

The payback period on RCx cost is often measured in months, not years. Because systems get out-of-whack or disabled over time, RCx is recommended every 3-5 years. If HVAC and/or lighting systems are over 20 years old, tweaking them may not be your best bet. Instead, consider upgrading and/or replacing those that are not performing efficiently, especially if your PM score is ~30 or less.

In such cases, an energy assessment (we used to call them "audits") may be more appropriate for finding savings options.

In the last 10 years, improvements to energy efficiency in lighting and HVAC systems are yielding 20% to 50% savings, producing home-run ROIs. Many upgrades are also eligible for rebates and tax incentives, as are the costs of the assessments. New York City's Local Law 87 also requires audits and RCx.

Take your PM score as a hint of what needs to be done, and an indication of the opportunity that awaits you. Then, do an audit and a retrocommissioning study.

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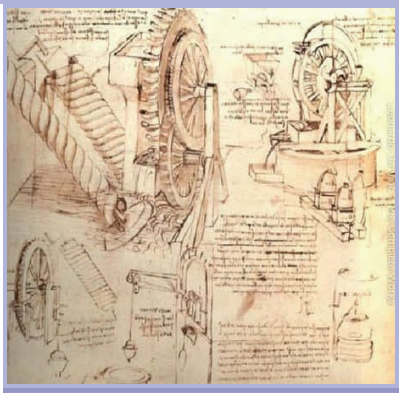
What's New in Harnessing the Power of Water

Most of the discussion on renewable energy these days focuses on solar PV, solar thermal, hydroelectric, and wind (both on-shore and off-shore). These forms of renewable energy may be the most developed, scalable and commercially available ones, but there are other forms of renewable energy that have been in use for many years and that should be considered for specific applications. There are several ways to use water to generate electricity in addition to that of hydroelectric power, which is produced from large dams on large rivers. Tidal energy is one of the oldest forms of energy used by humans. Tide mills in use on the Spanish, French and British coasts date back to 787 A.D.

Traditionally, tidal energy was harvested by erecting a dam across the opening to a tidal basin. The dam includes a sluice that is opened to allow the tide to flow into the basin; the sluice is then closed, and as the sea level drops, traditional hydropower technologies are used to generate electricity from the elevated water in the basin. In order for this technology to work well on a large scale, an extreme tidal range is required, generally an increase of at least 16 feet between low and high tides. A newer, less disruptive and more environmentally friendly method is to use underwater turbines. These turbines are placed in areas with large tidal movements, and are designed to capture the kinetic motion of the ebbing and surging of ocean tides in order to produce electricity. New turbine designs experimenting with the shape, size, spacing and orientation of rotor blades, and with synchronous movement of multiple turbines, are being developed to make this method more affordable and efficient.

Another way to capture the power of water is through wave energy. Kinetic energy exists in the wave motion of the ocean, and that energy can be used to power a turbine. In a simple example of harnessing wave energy, a wave rises into a chamber forcing the air out. The escaping air spins a turbine which can turn a generator. When the wave recedes, air flows through the turbine and back into the chamber. Some newer systems use the undulating motion of the wave to power a piston that moves up and down inside a cylinder, with the piston used to turn a generator.

Tidal and wave energy are also central to a new energy production method using Push Plates. Several plates are connected with a chain that is gripped within an oval- shaped channel on a holding structure. The water flow pushes the plates, which are spaced so that the kinetic energy of the water flow works upon the plates to produce continuous motion. Strategically placed gears spin the shaft of a generator to produce electricity.



Leonardo Da Vinci's engineering drawing of water lifting devices.

Electricity can now also be produced from slow water currents in oceans or rivers by taking advantage of vortex-induced vibrations (VIV). These vibrations are an extensively-studied phenomenon, first noted more than five centuries ago by Leonardo Da Vinci, who named them "Aeolian Tones". Vortices are formed and shed on the downstream side of bluff bodies (rounded objects) in a fluid current. The vortex shedding alternates from one side of a body to the other, thereby creating a pressure imbalance resulting in an "oscillatory lift". Vibrations can be enhanced and utilized to produce electricity. One technology utilizes a cylinder that hangs horizontally across the flow of water. The presence of the cylinder causes alternating vortices to form above and below it, and they push the passive cylinder up and down to create mechanical energy which is then converted into electricity. These cylinders can be stacked like a ladder, can rest on a river bed, or be suspended under the surface of the water. This technology can work in currents of 2 to 4 knots, giving it an advantage over some other water harnessing technologies that work best at 5-6 knots.

Most of these water power systems are not feasible for utility- scale generation due to prohibitive cost, lack of sufficient resources, environmental concerns, and/or large area requirements. However, they can potentially be used in small-scale specific applications to reduce energy use and cost. For example, tidal energy could be used by a manufacturing plant located on the shore of a tidal basin to generate its power. Wave energy systems could be used to power a warning buoy or a small lighthouse. Slow water current systems could be used to power pumps for a desalination *(continued on page 4)*

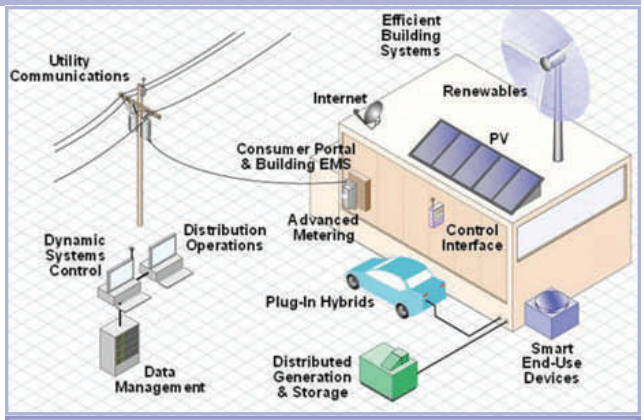
Saving Money Where You Live: HAN/HEM Comes to Town

One of the options hawked by Smart Grid proponents is the ability to show residential customers how they are using energy: not month-to-month, but minute-to-minute. Over 100 firms have entered this field, called variously "Home Area Networking" (HAN) and "Home Energy Management" (HEM). Such systems are working to combine smart meters with smart phones and smart customers, cutting utility costs even when it's cold.

As electric interval data from new meters opens the door to close inspection of one's power usage, opportunities arise for residential customers to more tightly control their consumption. Knowing when power is being wasted, and how much that waste is costing, can go a long way toward changing behavior. Where tariff options exist (e.g., voluntary time-of-use), some customers have been testing the waters to see if switching might yield savings.

The HAN/HEM market has been attracting both large and small companies, from sophisticated software providers to makers of 'intelligent' appliances. First out of the slot were some of America's heaviest cyber-hitters: Microsoft, Google, and Cisco. Each offered ways for residential and small commercial customers to see daily and/or hourly power usage through home energy displays (called "portals") and/or some smart phones. Included in the data were recommendations for cutting cost, such as time-based resetting of thermostats, adjusting start times of appliances, and other measures.

By the summer of 2011, however, each of the three big boys had dropped out of the race, citing poor sales (the recession didn't help), lack of customer interest, and/or mismatch with the rollout of smart appliances (many have been delayed, are incompatible, or are too expensive).



An illustration of a smart grid residential application.

But many other (all smaller) vendors have stuck it out, finding niche opportunities, mostly with the early adopter crowd. And a variety of utilities and federal/state agencies have been supporting prototype programs to test and expand the HAN/HEM marketplace. In New York, JumpStartNY installed data loggers in hundreds of homes, allowing customers to observe their usage in one-minute increments via a continually refreshed 24-hour load profile.

A neat recent entry to this arena is PlotWatt, a cloud-based program that uses interval data (i.e., 15-minute kWh consumption readings) to profile usage much like the JumpStartNY program. But it takes that option a big step further by *learning* the power startup signatures of major appliances, allowing segregation of each's usage. Doing so then allows PlotWatt to separately show their consumption and operating costs. Check out an example at www.plotwatt.com. PlotWatt uses utility interval meter data (if available as a web-based stream), or output from a PowerCost Monitor, BlueLine Innovation's strap-on device, for converting a standard glass-cased meter into a crude interval meter. The monitor converts real-time usage into a WiFi signal sent to its receiver, which in turn forwards it to PlotWatt via a web connection, or directly to a PC.

Such home-based use of interval data is spurring interest in time-of-use rate options, demand for smart appliances, and other ways to cut peak demand on the grid. If successful, that could help contain utility operating costs – and cut our utility bills.

Luthin Associates' John Dowling, pictured again skiing the slopes at Solitude resort.

New in Harnessing the Power of Water (Cont')

facility, to perpetually power ocean sensors, to supply uninterruptible power for small, critical coastal as well as offshore facilities, without the logistical challenge of supplying traditional forms of energy.

Osmotic power, or *salinity gradient power*, is an emerging technology that uses the energy available from the pressure gradient resulting from the difference in salt concentration between seawater and river water. Methods for generating power from this technology include Pressure-Retarded Osmosis (PRO) where water is pumped into a chamber where the pressure is lower than the difference between fresh and salt water pressures.

Fresh water is also pumped into the pressure chamber through a membrane, which increase both the volume and pressure of the chamber. Energy is created from a turbine, spun by the pressure released as a result of the equalization of the salt and fresh water pressures. Reverse Electrodialysis (RED) is a second method being developed and is essentially the creation of a salt battery using an array of alternating anion and cation exchange membranes to generate electric power from the free energy of river and sea water.

The technologies related to osmotic /salinity gradient are still in their infant stages, even though the principle was discovered in the 1950s. Standards and a complete understanding of all the ways salinity gradients can be utilized are important goals to strive for in order make this clean energy source more viable in the future.

Factoid

A new solar power plant generates electricity, even when the sun doesn't shine. A recent winner of the Platts energy award, SolarReserve's system uses a technology originally developed for nuclear breeder reactors to handle molten salt. Employing its concentrating mirrors to melt the salt at 1000ºF, it is then stored in a tank and later used to boil water that runs a turbine at night, providing power from the sun 24/7.

On A Personal Note...

This issue is dedicated to the "Winter Wonderland," the songwriters were inspired by a scene similar to that on our cover. Had we used this theme last year, we could have used a photograph of our building covered by two feet of snow. But winter is often a time of paradoxes as to date, this winter has been 20% warmer than normal. We also have photos of our downhill racer, our Director of Regulatory Policy, John Dowling. John's knowledge and expertise regarding energy policy is a key component to Luthin Associates' success. In his down time, John is an accomplished skier who has been known to helicopter onto a pristine ski slope. John uses "slalom" techniques to mediate rate cases, weaving in and out to find the best route to a satisfactory conclusion.

The New Year brings new beginnings and for Luthin Associates there is one significant change. We are moving to a new location, a building we purchased on Main Street in Allenhurst, New Jersey, about 3 miles north of our current building. The staff is excited (as you can see from their snow-person smiles) because we will have almost three times as much space as our current location in Avon by the Sea. This new location also brings us closer to the beachfront and has a scenic view of a lake in our back yard. The building rehab included extremely efficient HVAC, energy efficient window replacement, and where possible, the reuse of existing materials and utilization of sustainable materials. We are also evaluating a solar installation and we will have state of the art electricity and data back-up systems.

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