

Let It Snow! Let It Snow! Let It Snow!

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Energy You Can Shovel?

Inside this issue:

While a lot of people are talking about 'green' energy in the future, the Swedes have gone 'white' in their quest to cut costs and greenhouse gas (GHG) emissions in a more primitive yet extremely effective way.

The first use of thermal storage dates back to the Middle Ages when wealthy Arab potentates had ice shipped (in wicker baskets hauled by camels) from mountain tops to cool their food and drink and impress their subjects. In Europe and early America, it was common to harvest blocks of winter ice from ponds and rivers, store them in thatch-covered caves or underground bunkers, and sell them to food purveyors to keep produce fresh. Once large scale mechanical refrigeration was possible, ice was made any time of the year and delivered to homes to do the same. Earlier

generations made good use of such 'ice boxes' until standard refrigerators made ice delivery obsolete after World War II. Today, thermal storage is promoted as a demand management technology for lowering stress on the power grid and for saving customers on time-of-use electric rates.

Starting in 2000, a hospital in Sundsvall, Sweden has been using stored snow as a cooling source and heat sink. So far, it's the only one of its kind, but nobody can complain about its efficiency: it cut electric use and demand for cooling by 60% to 85%. In essence, the system stores the cold from winter air in ice crystals through simple snow-making machines, and uses it later as a form of thermal storage.

During the winter, the machines fill a pit with a large mound of snow that is then covered by an insulating blanket of wood chips. During the cooling season, a

drainage system below the pit catches water as the snow melts and circulates it (at about 36 F) through filters to a heat exchanger where it picks up heat dumped from the hospital's HVAC systems. The now-warmed water then drains back into the soil (at about 47 F). When snow cooling isn't sufficient to meet load, a standard chiller supplements it.

In Sweden's mild cooling season (fewer than 100 cooling degree-days versus New York City's 1100), this process works fine and saves a bundle. For details, go to http://www.snowpower.se/index_en.asp

Thermal storage for cooling is a well established technology, with hundreds of US installations, but the cooling is typically made by chillers operating at night using off-peak power. While slightly more efficient than daytime chilling, the main benefit derives from avoiding peak demand charges.

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"The Jersey Shore Boardwalk"
Published with permission from:
Jana Crawford O'Brien

Don't be LED into a Problem

While we all love technologies that save us money, some devices containing light emitting diodes (LEDs) have left us skeptical of vendor claims. Readers considering installation of new LED options need to be especially careful.

As usual, the devil is in the details or, in this case, how those details are tested and verified. A good source of unbiased data is the U.S. Dept. of Energy's CaliPER program, which tests LED lighting sources (Go to <http://www1.eere.energy.gov/>

buildings/ssl/caliper.html). Here are a few 'bottom line' conclusions from these reports:

- while LEDs are an energy efficient light source, some applications e.g., direct replacements for T8 fluorescent lamps do not end up cutting energy use without also seriously cutting light levels
- different brands of LED recessed downlights (also called 'high hats') vary greatly in light output even when wattage is about the same
- some LED replacements for incandescent MR16 spot lights

(often seen in track lights and elevators) can provide comparable output to 20-watt MR16s, but none presently matches the beam candlepower or lumens of 35 or 50-watt MR16s.

Field experience by others has found that the light distribution of some LED devices is also quite different from other sources, and may significantly alter the look of a space. The T8 replacements, for example, may create a 'cave' effect when used in standard troffers because little or no LED output is distributed using the fixture's own reflectors. Such reflected light illuminates vertical surfaces (e.g., walls,

stacks) as well as horizontal surfaces, thus softening contrasts. A few other caveats should be kept in mind.

- Some LED units may not be UL approved, or may violate the UL or warranty of the fixture in which they are installed, unless UL approved installation kits are used. Fire insurance policies may not cover an incident in which UL requirements are violated.
- Many LED devices bear a "CE certified" label, but few users understand what that means, thinking erroneously that it is some sort of testing lab. All it

Don't be LED into a Problem (cont from p. 1)

means is that the product is acceptable for sale in the European Union nations.

- LED devices are promoted via the expected longevity of their lamps, which may be 50,000 to 100,000 hours (roughly 10 to 30 years, depending on annual burn hours). But their warranties are often much shorter (5 years or less) because the power supplies may not last as long as the lamps. Many LED fixtures do not allow replacement of either lamps or power supplies, so the entire fixture may need to be replaced, cre-

ating maintenance and inventory issues.

- When the first LED exit signs appeared in the '90s, some burned very brightly for the first year and then became considerably dimmer while never burning out. Excessive voltage applied to the lamps made them burn brighter but impacted their long-term output. Some screw-in LED units have exhibited similar behavior. Without an independent lab test verifying longevity of output, buyers should be wary of claims that they will maintain acceptable

output over the claimed lifetime.

Given the above information, how should you react to a proposal to install LED lighting? When faced with being an early adopter of new technologies, it helps to consult the experts, in this case, the Department of Energy (as previously described) and NYSERDA.

NYSERDA recommends that the products you choose be listed with the Energy Star or Design Lights Consortium's Qualified Products List. If you want to insure that the manufacturer's performance criterion is valid, you should ensure

that the Illuminating Engineering Society testing standards, LM79 and LM80, have been used. NYSERDA also requires LM79 and LM80 testing.

While NYSERDA does not have a prescriptive rebate for LEDs at this time, they will consider an application for funding under their Existing Facilities Program. The funding level is \$0.16 per annual kWh saved. They will require that savings be measured and verified.

When looking into emerging technologies, consult the certifying agencies before you purchase.

An Energy Price Forecast

Since the historic highs during the summer of 2008, oil and gas prices have plummeted to levels near their five year lows. Previous articles in LA Confidential explained how the 2008 fluctuations were not strictly market related. They were influenced by trading activities. Having hopefully curbed those investment practices, at least for the short term, we anticipate that market forces will once again drive energy prices.

As we enter the New Year, the crystal ball is unclear, showing a mixture of positive and negative factors that may affect the future of energy prices. This article will outline some of the key factors that will influence near term energy prices.

Economic Trends – "It's the economy, stupid." This slogan of the 1992 Clinton election campaign holds true again. The single most important factor influencing energy prices is the economy. A classic example is in the five years before the New York City economy went bust, offices and consumers were stocking up electronic gadgetry and TV's, raising the peak electric demand by nearly 9%. More recently, however, Con Edison downgraded its peak demand forecast to a 1.7% growth over the next five years.

On a positive note, reports from the US Commerce Department

indicate that the economy expanded by 2.8% in the third quarter of 2009. Analysts at Jefferies & Co. offered more positive news through their GDP data which suggests that the economy is in the early stages of a, "... fragile, fitful and obviously prolonged recovery." As U.S. and world economic conditions continue to gradually improve, this will lead to a stronger demand for energy. Additionally, many funds believe that 2010 would be a boom year which may yield greater investments and speculative wagering in commodity markets.

Goldman Sachs projects oil prices to rise to an average of \$90 a barrel in 2010 and \$110 in 2011 fueled by a strong growth in emerging markets. Goldman also recently lowered its 2010 price forecast for NYMEX natural gas futures to \$6 per million British thermal units (mmBtu), down from a previous forecast of \$7.30 per mmBtu.

Supply - Fundamentally, gas inventories remain abundant with current storage levels being 11.3% higher than five year averages. Further technological innovations in liquefaction and re-gasification infrastructure have improved efficiency and lowered the cost of LNG. The Energy Information Agency (EIA) reports that U.S. imports of liquefied natural gas may increase 44% in 2009 to 506 billion cubic feet (bcf) as global production rises. New liquefaction facilities coming online primarily in Qatar, Russia and Indonesia could

also raise global production capacity by nearly 20% in 2009, to 10.4 trillion cubic feet per year. These additional supplies coupled with discussions of adding nearly 103 Bcf/d of capacity and a potential 10,100 miles of new large pipeline may mitigate capacity constraints arising from added gas production and place further resistance on gas prices.

Demand - Mother Nature and her weather tactics cannot be overlooked when it comes to forecasting energy prices. While long term prices should be lower, there will be upward pressure in the near future. The winter season has historically caused gas prices to rise. This was evident with the "ice-age" like conditions experienced in the North East in December that resulted in an 11.4% rise in 2010 gas prices over a span of less than 2 weeks (12/09 -12/22). WSI seasonal forecaster Dr. Todd Crawford says, "There may be a relaxation of the current cold pattern in the Northeast during January, followed by a return to more consistent cold in February and March." Should Punxsutawney Phil see his shadow, the WSI is forecasting 2,475 gas-weighted heating degree days during the January-March period, approximately 2.5% more than last year and 2% more than the 1971-2000 mean. The combination of low temperatures and the current role of natural gas as the heating season fuel of choice (heating oil being more expensive than natural gas at pre-

sent), may lead to increased short-term demand, placing upward pressure on gas prices.

If this cold weather does not deplete supplies, the next buying opportunity may be the end of February through early March prior to the gas injection season that starts in April.

Did You Know?

Burning Trash in an incinerator with natural gas produces less greenhouse gas (GHG) than letting the trash rot in a landfill

Why?

While burning the gas and the trash produces carbon dioxide, letting it instead decay in a landfill would yield a large volume of methane which, pound for pound, has about 20 times the GHG impact of CO₂. Of course if the landfill can harness the methane and use it to fire boilers or a co-generation system then the landfill option is better.

Source: Clean Air— Cool Planet Rev. 6.4 software for GHG inventories

What the Cap and Trade Law Could Mean To You

After Congress is finally done with health care, the next big issue may be the Senate debate over a climate change bill. The House passed its own version in June 2009 calling for a 17% reduction in greenhouse gas (GHG) emissions (relative to 2005) by 2020.

Like the House, the Senate is expected to produce a law setting up a cap-and-trade process similar to that done in 1990 to cut sulfur oxide emissions that cause acid rain. Cap-and-trade provides limited emission allowances that may be sold by firms that do not need them because their plant is relatively "clean". The allowances would be purchased by firms who find it a more economical solution than to modify their plant. Each year, the total number of allowances is reduced, raising the value of those remaining. This increases the value to be realized from cutting one's emissions. Both the Senate and House versions also offer new energy efficiency funding focused on cutting GHG emissions.

For large energy users in the Northeast, most impacts will be indirect, e.g., slightly increased costs for electricity, fuels, and utility steam. Only very large facilities e.g., institutions covering at least several million square

feet, will be directly affected, and then only if they have large fossil-fueled central plants.

Even large real estate organizations with portfolios covering millions of square feet are off the hook because both Congressional proposals (and EPA's backstop rules if Congress fails to act) look only at single source emitters annually emitting at least 25,000 metric tons (MT) of carbon dioxide (or its equivalent in other GHG) annually.

The major targets are industrial facilities such as power plants, refineries, steel mills, and chemical plants. Some large universities, medical centers, and industrial parks with central boiler plants may, however, also be affected (several hundred have been identified as meeting the 25,000 MT criterion). However, the potential for such regulation has been in effect since the federal Clean Air Act of 1990 was passed. This legislation contains a proviso that allows states to "exempt hospitals and educational institutions" from EPA emission regulation. In New York, the appropriate agency would be the Department of Environmental Conservation (DEC). Since GHG has not yet been regulated in the US, no exemptions have been requested, but a process exists to seek them. We will be keeping a close watch on this issue.

So does your facility emit 25,000 MT of GHG? Even if it does, the criterion mentioned above applies only to Scope I Direct Emissions which are those generated at your plant such as boiler or cogeneration fuel or chilled water produced by gas fired equipment. Electricity or Con Edison steam would not be factored into this equation. For reference, 25,000 MT of GHG is the out put of about 470,000 Decatherms of natural gas or 2.1 million gallons of #6 fuel oil.

Those holding properties in states wherein most electricity is produced from coal will likely see the biggest hits to their power budgets (that's about half the states, mostly in the Midwest, Appalachia, Great Lakes, and the south). Depending on how the final law is written, rate hikes of 10-15% are possible in those areas. While these increases are significant, power prices have varied by that much (and more) due merely to recent wholesale fuel price fluctuations and we may be seeing similar increases locally due to pending utility rate increases, taxes and new charges such as the Power Factor which we discuss in a related article.

For those directly affected, the simplest approach may be to switch from coal or fuel oil to natural gas. On a BTU basis, gas's carbon content is about 35%

lower than fuel oil (and half that of coal). Such a switch might allow one to limbo under the 25,000 MT limit.

For those concerned about the pass-through of costs to the bottom line of their electric (or utility steam) bills, energy efficiency options and switching away from electric resistance heat should be high on the agenda.

If Congress doesn't act, EPA is empowered to regulate facilities holding Title V emission permits. Its first step would be to require they provide data showing equivalent carbon output. For those exceeding 25,000 MT/year, EPA could require use of Best Available Control Technology (BACT) to minimize carbon emissions, or else pull their operating permits (EPA cannot mandate fuel switching). This rule, however, would only apply when a new plant is being built, or an existing plant undergoes "substantial" renovation.

Aside from improving fuel use efficiency (e.g., flue gas economizers, combustion/boiler controls), no off-the-shelf devices are available for directly cutting CO₂ emissions, so even a BACT requirement should not strike fear into plant operators. New technology (called carbon capture and sequestration, or CCS) is being developed for large coal-fired power plants, but is at least a decade away from commercialization.

How Does Your Power Factor?

At the request of the Public Service Commission, Con Edison recently filed a rate change that would apply an additional charge to facilities with a power factor of less than 0.95. This new charge, the Reactive Power Demand Charge, is scheduled to start in October 2010 and would apply to the distribution component of the bill. The other New York utilities are also implementing similar programs.

The purpose of the PSC order is to increase energy conservation. Reactive Power in layman's terms is the additional power that must be supplied to meet

the load requirements of equipment that has a high inductive characteristic. Inductive characteristics are related to the use of magnetic fields in equipment such as motors, relays, transformers and ballasts. The Power Factor is the ratio of the Active Power (the amount of power needed to turn a motor for example) to the Total Power that flows through the utility meter in order to meet the motor's power requirements.

An illustrative analogy of reactive power is the horse pulling a barge through a canal. Because the horse can not walk in front of the boat, the sideward force exerted on the boat will tend to pull it towards

the side of the canal. The pilot compensates for this sideward force by applying the rudder to keep the boat straight. This opposing force requires that the horse exert more effort to move the boat at the desired rate. In this case, the ratio of the work needed to pull the boat without the rudder to the work needed with the rudder is the Power Factor.

Up until this rate filing, the additional energy delivered by the utilities due to poor power factors was included in the utility's line loss factor. The line loss factor, 6.7% for Con Edison, is applied to customer bills to

account for this "lost energy" as well as losses from theft, transmission lines and transformers within the distribution system. The PSC's rationale in this order is to provide a market motivation to facilities with poor power factors that will cause them to correct the power factors through the installation of equipment such as capacitors. The end result is increased power factors that require less energy utilization i.e. less power must be generated to meet the load requirements of the customer.

So how bad will this hit the pocket-book of your facility? Unfortunately, a good amount of detail is still being developed. The rate

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CPA Meetings 2010

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June 15	July 20

Power Factor (continued from p. 3)

structure filed by Con Edison applies a charge of \$1.42 per kVar. The kVar to be billed each month is derived from new meters that will be installed. The formula to determine the power factor is to divide the total demand by the square root of the total demand squared less the reactive power squared or $PF = kW / \sqrt{(kW^2 + kVar^2)}$. This billing charge only applies if the factor is less than 95%.

To determine the actual impact, we analyzed the load profiles of about 60 facilities consisting of offices, apartment buildings, hospitals and universities. Individual facility usage ranged from 500 to 8,000 kW. We calculated the rate impacts based on estimated power factors of 80, 85 and 90%. We found, that the average impact increased the bill by 1.9% of the delivery portion

of the utility bill for a 90% power factor with a 3.0% impact for an 80% power factor. These calculations were based on a worst case scenario in which the kVar charge is applied to the peak kVar. It is possible that the charge may wind up being based on the incremental level below 95%. This would reduce the amount of the increase.

So when does all of this start? Con Edison's original plan indicated that the charges would take affect in October 2010 for customers greater than 1,000 kW and a year later for those with a demand of 500 or greater. However, due to the large number of meters to be installed, almost 8,000, Con Edison will not be able to install all of the meters until 2013. Therefore, Con Ed has re-filed with the PSC to stagger the implementation for the cus-

tomers with demands greater than 1,500 kW so that some of the customers may not receive reactive power billing for several years. Con Ed plans on giving the smallest customers (500 to 1,000 kW) a full year of power factor data prior to billing. The 1,000 to 1,500 level would get six months and the larger customers would get three months.

At this time the schedule and method of billing is undetermined and the subject of an ongoing collaborative effort between the PSC and the utilities.

What can a facility do to improve their load factor? The short answer is to install power conditioning equipment such as a capacitor. The long answer and hopefully the clarification of the above issues will be addressed in our next edition.

On A Personal Note: Catherine Luthin

*"Oh the weather outside is
frightful
But the fire is so delightful
And since we've no place to
go
Let it snow! Let it snow!
Let it snow!
It doesn't show signs of
stopping.....
Let it snow! Let it snow!
Let it snow!"*

From the Lyrics of:
"Let it Snow! Let it Snow!" (1945)
Sammy Cahn & Jule Styne

theme I hope will attract the attention of our readers. (I actually prepare months ahead of time in order to get an issue out.) Little did I know what an appropriate theme I had selected. As I am writing this in early January, it is a balmy 22 degrees; however, the wind chill makes it seem like minus 4 degrees. The forecast for tonight is for more snow, my favorite weather person states, "... the snow amounts could reach 4 to 6 inches by late tonight followed by a potential of another 2 to 4 inches for tomorrow in frequent snow showers".

Why do we care about the weather? As our Energy Forecast Article indicates weather plays a big part in short term energy pricing. It is not a coincidence that as it gets colder the price of energy get higher, it's just simple supply and demand.

We shouldn't be annoyed with all of this snow. I know John Dowling (Luthin's regulatory guy) is happy on the ski slopes of Windham with all this accumulation. Our civilization has been using snow since the Middle Ages for thermal storage, and in "Energy You can Shovel!" we learn how a hospital in Sweden is

using snow as a cooling source and heat sink.

All this talk of snow makes me yearn for Barcelona which I visited in early December, where it was "sweater weather". My colleague Lindsay Audin, (aka Energywiz,) told me that I was going to really love the architecture of this city. He was right! The city has many architecturally significant buildings from 11th century cathedrals to churches of a more modern design.

I was lucky to have a tour guide with a hometown advantage. Luthin's intern, Annie Rooney, was studying at Barcelona for the semester and she introduced me to the work of Antonio Gaudi as his designs have some relevancy to modern sustainable principles.

Born in 1852, Gaudi was a Catalan architect who belonged to the modernist style (Art Nouveau) movement. His buildings are unlike any buildings I have ever seen. They are hard to describe, words like individualistic, organic and naturalistic come to mind. All of his work was influenced directly by natural forms, and are highly sculptural and modern. I became enamored with his work and toured Casa Batlio, Park Guell, his

Cathedral, Sagrada Familia, and Casa Mila.

All of his work had sustainable element such as natural sun lighting for interior and exterior rooms; recycled materials like broken tiles for mosaics; vents in the attic, doors and chimneys to allow air to rise and circulate though the entire building. A lot of thought went into his designs. Gaudi died in 1926, when he was run over by a tram, a victim of modernism! Work on his cathedral, "Sagrada Familia," is ongoing. It is anticipated that in another 50 years it may be completed. If you are ever in Barcelona, I recommend a visit. You will not be disappointed.

According to New Jersey State records, it snowed on six days in December. On December 19 thru the 20th on the coast of New Jersey where Luthin Associates is located, the official New Jersey climatologist report states that a total of 20.5 inches fell. I exaggerated and told everyone we had two feet of snow. It took my husband seven hours to dig us out. Shortly after, we brought a snow blower so our carbon foot print will have to absorb the increase. Each newsletter issue I pick a



Photo: Annie Rooney
Luthin Associates Intern
"La Sagrada Familia"
Barcelona, Spain