

Chilled-Out Buildings Save Energy, Money

by CHRISTOPHER JOYCE



Mike Ruocco/NPR

Inside Veolia Energy's Plant Three in Baltimore, blue pipes carry chilled water that will be sent out to cool nearby buildings. The green pipes carry condensed water that removes heat from the chilling system, and orange pipes carry a refrigerant. The yellow pipes are for a future cooling system.

September 29, 2010

text size **A A A**

This year Congress tried and failed — yet again — to pass energy legislation to curb global warming. But the death of the climate bill hasn't stopped efforts to use energy more efficiently. In fact, it puts the spotlight back on some rather old-fashioned ways to cut emissions and electricity bills.

Downtown Baltimore is home to an unusual experiment that seems almost quaint — cooling buildings with ice. It's a service provided by Veolia Energy, a small fry in the world of energy companies. Veolia doesn't run big coal or nuclear power plants — instead, it tries to deliver "efficiency" — basically getting more out of the electricity grid.

Veolia does this with a concept called "district cooling," which sends water chilled by ice at a central plant out to several nearby buildings. A nearly 10-mile circuit of cooling pipes connects the downtown buildings, including the convention center, government buildings and hotels, to a squat brick building with two domes about 30-feet high next to it. They're the kind of structures that never catch the eye.

"They fit back behind a little commercial strip in an alleyway, but are hardly noticeable from the street itself," says John Gibson, a vice president at Veolia Energy.

Enlarge

Mike Ruocco/NPR

Cooling towers on the roof of the ice-cooling facility vent heat from the system.

Inside the domes are tanks filled with water. A lot of tubes run through the water tank carrying chilled glycol, a fluid that freezes at a very low



temperature — far below that of regular water. This process runs at night, and ice forms around the tubes.

"During the day, when we are using the ice to produce cooling for customers, we run water over the outside of the ice and melt it and actually provide cool water out to the distribution system," Gibson says.

That's one of two ways they cool water. The other method runs room-temperature glycol through

those same iced-over tubes. The glycol is cooled by the ice surrounding the tubes, and the now-cold glycol is used to chill a different water supply that gets piped to refrigeration units in city buildings.

Nighttime Electrical Efficiencies

Why ice? The ice essentially stores the cheaper energy that's available at night.

"It allows you to basically make ice at night, when electrical demand is lower and costs are lower, and then melt that ice during the day to supplement your mechanical refrigeration," Gibson says.



Mike Ruocco/NPR

John Gibson is vice president of the South Region of Veolia Energy North America. He says customers save about 10 percent on energy costs because they don't need to use as much mechanical cooling in their buildings.

He says his customers don't need to buy their own refrigeration units, so they save about 10 percent on cooling costs by using Veolia's district setup.

Using nighttime electricity also takes the heat off the electricity grid, the national network of power lines and substations. By using ice, Veolia doesn't need to use as much electricity during the day.

Dan Delurey, who heads the Demand Response and Smart Grid Coalition, says the most inefficient time on the electricity system is the peak period during daytime hours.

"Normally during a hot summer afternoon, that's when you have the least efficient plants put into service," he says. "But also the physics of

transmitting the electricity mean that it's less efficient to do it during that middle-of-the-day peak period."

In fact, if you put a lump of coal into a power plant, you normally only get one-third of its energy content at the socket in your home — the rest is lost at switching stations and from overheated power lines. There is less loss at night.

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Delurey also points out that electricity made at night is more likely to come from wind turbines because that's when the wind blows best. So ice



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cooling also functions as a way to store wind energy.

Gibson says it's not cheap to build all of the pipes and pumps for a district cooling system, but it saves money in the long run, especially if existing underground infrastructure can be used.

Efficiency advocates point out that with no immediate prospect for a tax or price on carbon in

fossil fuels, off-the-shelf techniques like this — that get more out of the existing grid — are looking a lot more attractive.

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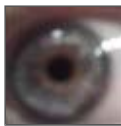
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Recent First



Mark I (imback) wrote:

Some questioned this statement from the article:

"Delurey also points out that electricity made at night is more likely to come from wind turbines because that's when the wind blows best. So ice cooling also functions as a way to store wind energy."

It's called the nocturnal low-level jet. It doesn't blow at the surface where the wind is relatively calm at night but above the inversion a couple hundred feet up where the wind turbines would be located. Here's an informative website: <http://www.windwisdom.net/nlj.htm>

Thursday, September 30, 2010 2:14:12 PM

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Bill Cook (Bill_Cook) wrote:

How neat! It does many good things at once.

I'd heard of this idea before as a residential application, but distributing cooling is something new to me. It makes sense, though. You can certainly distribute heating, so the reverse would be true.

Wednesday, September 29, 2010 3:31:48 PM

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J Rhinehart (Jeni) wrote:

FYI, I was talking to a local power lineman here a few months ago about the proposed plan of building another nuclear power plant near here. I asked if it was really necessary. He said no, not for us, we have plenty. He said the company, Duke Energy, is looking to have excess energy that they can sell to other power grids.

Unfortunately, that's not what the company is telling us when they try to justify building another nuclear power plant.

Wednesday, September 29, 2010 3:04:25 PM

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J Rhinehart (Jeni) wrote:

My great-great grandfather's journal described an ice house being built & used here in the South. He had colder winters then, they had thick ice on rivers here in SC in the 1860's. He would haul chunks of cut ice from the river to the ice house, fill it up to the roof in the middle of winter, then use the ice until it melted in the middle of June or July. If they had had a bigger house with more insulation, they might could've had ice into August. I wonder what they knew about insulation then.

We couldn't do that today, the temperatures around here in the winter aren't as cold, our rivers don't freeze anymore. With bureaucracy, there would probably be all kinds of regulations about harvesting ice from the rivers, too.

Wednesday, September 29, 2010 2:57:31 PM

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Corey Johnson (RankineCycle) wrote:

The "2/3" energy loss at power plants is due to the thermodynamic upgrade which occurs when we convert heat into work.

An easy way to look at it is when your butcher receives a side of beef, he will be able to trim off some really good high-quality parts and produce steaks (electricity). The rest is low-quality meat which he converts into ground beef (waste heat).

While the butcher sells his low-quality meat, power plants in this country usually throw away their low-quality energy. When you pass by a power plant with large cooling towers (Think of the Simpsons if you've never been fortunate to see it), the vapor being emitted represents this "unusable" thermal energy which is unable to be converted into mechanical work/electricity. Read about the Second law of thermodynamics to learn more.

We do not have to throw away this energy, we only do it by choice - cheap fossil fuels and the fact that people seem to dislike living near power plants. Instead of pumping cold water through the district heating network as this article states, we can pump hot water to buildings for heating effectively utilizing the wasted heat. All major cities in Northern Europe have done this for decades. We're way behind on this.

Wednesday, September 29, 2010 2:45:04 PM

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Dave Thomas (CosmoBoy) wrote:

Couple points to be clarified here:

The losses in transmission network are only about 6.5% (in 2007), not 2/3 as lackadaisically thrown out in the article. Burning coal in the furnaces and steam production process is where the losses are (and unavoidable, for that matter - physics 101 it is).

Also, peaking plants do not "pollute more", since they are natural gas powered plants - coal

plants which carry the base load of the power system actually pollute much more.

Wind is NOT a cost-effective solution - only about 1/3 of its installed power can be counted on - in other words, to get *reliable* 1000 MW, we need to build wind farms with 3000 MW capacity. Nuclear plant always (save when in maintenance mode) produces its nominal output always - you get 1000 MW from a 1000 MW plant.

Wednesday, September 29, 2010 2:29:49 PM

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Phil Jones (zzzzzzzzzzzz) wrote:

If you want to get rich, figure out a way to economically store large quantities of electricity.

Wednesday, September 29, 2010 2:24:46 PM

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Phil Jones (zzzzzzzzzzzz) wrote:

It is so refreshing to see NPR report an energy story based on actual honest-to-god economics instead of wishful thinking, questionable science, political hogwash and nonsense. This is a perfect example of innovation responding to a market-derived price signal.

Many of the massive expenses of so-called "green" energy are being hidden by the public's failure to comprehend the necessity of building 100% fossil-fueled redundancy to backup unreliable "renewable" energy sources such as solar and wind. Our essential inability to store large quantities of electricity provides an opportunity to arbitrage the price differentials that exist between periods of peak and slack electricity consumption.

The value of pumped storage facilities does nothing but increase as the differential between spot and baseload electricity prices widens.

Wednesday, September 29, 2010 1:10:41 PM

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Penny Lane (croowww) wrote:

Our only hope is to make better use of the energy we have, since the Republican Senators and BlueDog Democrats are refusing to accept that business as usual is NOT sustainable.

NPR, please stop saying "Congress" is not moving on energy. The House is passing bills left and right and they are ROTTING in the Senate.

Wednesday, September 29, 2010 12:36:33 PM

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Larry Andreo (landreo) wrote:

Reality check on Reality Check:

Freon, the brand, is still listed on Ebay. The manufacture of types of Freon is being phased out or has been phased out as far as production. You can still buy Freon and transport the many types of Freon. Look on E-Bay. What is in the plant's coolant pipes is likely not Freon but some other refrigerant. Freon is often used generically. The copy editors did OK.

Wednesday, September 29, 2010 12:34:05 PM

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