Blueberries Help Store Wind Energy

Creative solutions to power storage help balance Northwest grid

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What do juicy, plump blueberries stored in a cold warehouse in Albany have to do with wind energy produced in the Columbia River Gorge? Just for fun, choose the best answer below:

A) Transmission lines carry wind power from the Gorge to the SnoTemp Cold Storage facility.

B) Wind energy producers have a particularly strong affection for blueberry muffins.

C) Consumers Power is testing whether extra wind energy can be "stored" in blueberries.

D) The blades used in wind turbines are similar to those used in the blueberry juicing process.

Even though it may not seem like the most obvious answer, "C" is correct—although "B" might not be far behind. Wind energy actually can be stored in blueberries, in much the same way batteries store electric power. There is nothing special about the properties of blueberries—other food products can be used for thermal storage as well. This has more to do with the properties of the power system.

You have to use electricity the very moment it is created. And what's more tricky, there must be a precise balance between how much electricity is used, compared to how much is generated, at every moment.

Power system managers are good at predicting how much electricity people will use in a given day and during each season. For the most part, people in the Pacific Northwest use the most electricity on cold, winter, weekday mornings. They get up to go to work or school, crank up the heat, turn on lights and the coffee maker, and take hot showers, mostly between 6 and 9 a.m. A secondary peak happens in the late afternoon or early evening when folks get home, turn on the TV and fire up the oven for dinner. Conversely, there is little electricity use in the wee hours of the morning when most people sleep.

"Power system operators are prepared for those peaks and valleys of electricity use, and they adjust the generation of electricity up and down to accommodate these patterns," says Lee Hall, smart grid manager for the Bonneville Power Administration. "A lot of that flexibility comes from the federal hydro system, in that the turbines in the dams are fairly easy to ramp up or down, based on what the consumers of electricity need."

If you have too much electricity or not enough, the system can become unstable and blackouts can occur. It's a careful and important balance that is the cornerstone of reliability for any power grid.

"The hydropower system is getting stretched thin due to many reasons," Lee says. "And we need to find balancing resources to help support it."

That's where a special BPA pilot project, which included CPI and SnoTemp, comes in. Project management contractor Ecofys U.S. and technology vendor EnerNOC also participated in the project, as did several other commercial facilities in the region.

With the large influx of wind power recently in the Pacific Northwest, sometimes there can be too much of a good thing—clean, carbon-free power. It's hard to imagine, but in the spring—when high winds can coincide with heavy stream flows—our region can face an excess of power. Rather than waste it, we need to find a place to store the extra energy. The region seeks creative solutions, such as using cold storage warehouses or other forms of thermal storage, to do just that.

It is not about hooking up electrodes to blueberries or other foods stored at SnoTemp. Rather, partners in the pilot project found they could

Refrigeration units at SnoTemp were modified as needed to adjust for available power levels from Bonneville Power Administration.

Albany SnoTemp Plant Manager Craig Poole shows how the refrigeration unit can be adjusted as needed.

successfully modify use of the refrigeration condensers and evaporators at the warehouse to reduce or increase electricity use, while keeping the temperature of the frozen food (mostly berries, corn and beans) well within acceptable levels. At all times, the cold storage facility maintained superb food quality.

"For SnoTemp, our top priority is making sure we provide the best and most appropriate environment for the food that our customers are storing here," says General Manager Jason Lafferty. "Food quality is job No. 1, but if we can help the region be more environmentally friendly, that's a win/win."

Working through Consumers Power, EnerNoc sent a special signal to simulate an increase or decrease in wind power to the Albany SnoTemp facility. The partners successfully moved electricity use up and down, within 10 minutes, to represent what BPA needed to balance for wind generation. The Albany SnoTemp facility was one of the most successful participants, well exceeding the project goals.

"We were thrilled to be part of this ground-breaking project," says James Ramseyer, CPI's director of customer and energy services. "We know that being innovative, national leaders in clean and affordable

A forklift operator unloads a truck filled with food ready for cold storage.

energy is important to our customers. That doesn't happen by sitting back and watching the industry. You have to try new things, and more importantly, you have to work together as a region. That's what we're doing here, and it's very exciting."

The region, with BPA taking the lead, is continuing a plan to scale-up commercial, industrial and residential pilots to find the most cost-efficient ways to address a variety of constraints on the power system. Something to consider the next time you enjoy blueberries on top of your ice cream. ■

For more information on this project and a complete evaluation of results, check out BPA's website at www.tinyurl.com/bpagov1.