THE INTELLIGENT UTILITY NETWORK

TRANSCRIPT

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NARRATOR: A butterfly flaps its wings in China, and some time later a thunderstorm drenches Chicago. We've all heard some variation of that description, of how one event can contribute to a seemingly unrelated event through a series of exquisitely intricate interactions.

This old proverb can apply directly to the electric system, where a seemingly small and routine activity like the flick of a light switch or a slight turn on the thermostat can have a dramatic effect on energy consumption. Regulating temperatures of home appliances during peak power periods, for instance, can prevent grid overloads as a pilot test has already proven.

This is just the start, because information technology provides enormous opportunity for saving on electricity. Now imagine if your home appliance was smart enough to tell you how efficiently it was running, shut itself off when energy use peaks, or perform diagnostic tests without you having to call a repair person.

Manufacturers are already making major strides in building energy efficiency into individual household appliances. The next giant step is to apply smart energy technology systems to the entire home, along with voluntary measures to conserve energy.

This is a future that's not too far off for residents in Washington State, where Pacific Northwest National Laboratory and IBM have been conducting a year-long experiment in smart power distribution, called GridWise.

The Olympic Peninsula is a large arm of land in the western part of Washington State that lies across Puget Sound from Seattle. Since January, residents there have been testing new technology as a way of lowering electricity costs and helping the power grid keep up with the growing demand for electricity in the region.

The area was selected as a test bed because its local grid had been under strain due to large population and industrial growth.

The volunteers in the study receive real-time information through the Internet and automated equipment that will adjust energy use based on price: higher during peak times; lower during off-peak hours.

A combination of automation software and advanced analytical tools gives homeowners more information about their energy use and cost, and researchers want to know if this will modify their behavior. Ron Ambrosio of IBM Research and part of the team running the pilot describes how this pricing program works.

AMBROSIO: So every five minutes, all the thermostats in the real-time contract houses are sending information into our middleware that says, okay, here's the current temperature, we also already know what the user's preferences are, you know, what their desired set point is and whether they want to be aggressive or not aggressive in responding to price signals.

And that information kind of helps define a curve. Think of a mathematical formula with a curve. And depending on what the temperature is and how far it is from the desired set point, we can calculate a bid, a particular price that that device is willing to, say, as long as the price of energy is at or below this amount on the next cycle, then I'll keep running. If it goes too high, then I'm going to turn off.

NARRATOR: Currently most utilities charge a flat rate per kilowatt hour to homeowners regardless of the wholesale cost of power or the cost of transmission and distribution. Researchers are analyzing how customers react to the real cost of delivering energy to their homes, through the use of simulated electric bills and pretend money and a mock account that Ambrosio explains will eventually be converted into cash they get to keep.

AMBROSIO: Depending on how good they are at being responsive, how aggressive they are, they'll have more money left in that account at the end of the quarter and they'll actually get a check back from the National Lab. You know, maybe $100 or something if they're really doing a good job, enough to take the family out to dinner or something.

So there is some economic benefit, but honestly, I think most of the people participating are doing it because they really believe it's an important thing to do. And helping to develop this kind of technology so that it's feasible to deploy it broadly is going to benefit everybody.

NARRATOR: By decentralizing power generation and adding digital intelligence to the power network, we can build an energy infrastructure that's more flexible, better able to take advantage of renewable energy technologies and more resilient in times of crisis.

If all goes as planned, Ambrosio says the result will be decreased demand on the utility and lower cost for the consumers.

AMBROSIO: By running the existing infrastructure and anything new that's built more efficiently is going to keep energy costs down more so than if we didn't do this. And making the grid more stable, more resilient to problems like we had in August of 2003 is the other major benefit here.

NARRATOR: In another related study, computer chips have been embedded in dryers that can sense when the power transmission system is under stress -- something that happens about once a day on average.

Shutting down a heating element on a clothes dryer for a few minutes while the drum continues to tumble would likely go unnoticed by the home owner, but a small adjustment like this can drastically reduce power demand within the home, transforming appliances into smart devices that are more energy efficient and cost effective on an individual and national scale.

Obviously, turning off a single appliance won't be able to rescue a grid that's in trouble. Turning off hundreds or thousands, however, could provide the margin to keep a grid stable. In fact, the widespread adoption of these technologies could eventually save consumers $80 billion over 20 years by offsetting the cost of building new transmission substations and other power distribution equipment.

Until now, computers were a weak match for the power grid whose complexities taxed the most sophisticated, most powerful systems. It's one thing to collect data, it's another to turn it into useful information.

But breakthroughs are occurring every day in our understanding of how to harness information and data to facilitate real-time decision making. The clever software working behind the scenes called middleware is designed to link together previously fragmented data on demand, provide customized intelligence to gain faster insight, and automatically sense and respond to potential bottlenecks.

Ultimately technology is taking us in the direction of a fully-connected home, where every appliance and electronic device will be able to exchange information via the Web through a central hub. Agreed standards on appliances will enable a new freezer, dishwasher or other device to plug into the home network at the same time the home is equipped for power and water.

Sound like Utopia? It's really not. It's simply an example of what technology can do by ensuring that all processes work together to create real-time communications when they're needed most.

And as resident in the Pacific Northwest are discovering, it's an example of how technology can become our ally in using energy more efficiently and wisely. And that's How It Works.

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