

Experiment makes energy savings a game

September 10 2014, by Anne Ju

Let's face it: We're energy hogs. We want more light, we flip a switch. If we're hot, we crank up the AC, without a second thought on the power grid strain. It's what economists call inelastic demand – the resource is widely sought and always available, and there's little motivation to conserve.

Meanwhile, the expansion of electricity transmission and generation capacity, even with increases in [renewable energy sources](#), hasn't kept pace with demand. As the U.S. [power grid](#) operates closer to its capacity, spikes in demand can lead to tremendous cost increases.

Cornell researchers are tackling this issue with a behavioral economics-based twist. Led by Eilyan Bitar, assistant professor of electrical and computer engineering, an experiment in partnership with Consolidated Edison Inc. this summer has shown that consumers might be willing to back off of demand if there's a game of chance involved.

Among Bitar's research interests is designing what's called demand response programs – initiatives by power companies aimed at decreasing demand, as opposed to increasing supply in the [energy consumption](#) equation. These programs usually come in the form of marginal cost-based monetary incentives, but participation is usually low because there is not enough money involved.

Supported by a National Science Foundation grant, Bitar has led a summerlong project testing a demand response program that plays to the behavior of consumers when given the chance, however small, to win a

large sum of money. Their approach is rooted in the behavioral economics principles of risk-seeking agency in decision-making.

In the experiment, 200 households can opt in to a demand response program for remotely controllable wall-mounted air conditioning units in the New York City area. Depending on how often they allow Con Edison to increase their temperature set points to save energy during peak usage times, they're entered into a raffle with several tiers, starting at a chance to win \$5 all the way to several hundred dollars. The probability of winning, like the lottery, decreases as the prize increases – but there's a reason why people play the lottery, too.

"Essentially, we're leveraging on people's tendency to overweight small probabilities," Bitar said. "An important strength of these incentives comes from their ability to induce cost-effective reductions in demand in a way that consumers enjoy."

A control group in the experiment of about 5,000 households receives a standard \$25 payment for participation in the demand response program. The research team hasn't analyzed all the data yet, but preliminary results indicate a significantly higher participation rate in the lottery group.

Bitar's NSF project deals broadly with the challenges of integrating intermittent renewable energy into the grid by harnessing flexibility in the demand side of energy consumption. A specific objective in the proposal is to leverage principles of behavioral science.

"I'm not a behavioral economist, but we have been able to shed new light on how to optimally design these incentive mechanisms by applying basic principles from stochastic [involving random variables] control and optimization theory," he said.

Provided by Cornell University

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