

Points of inflection loom ahead for demand response and distributed generation

Comverge Utility Conference
St. Petersburg, Florida

Ahmad Faruqui, Ph. D.

April 10, 2015



THE **Brattle** GROUP

DR – yesterday and today

The original impetus came from a desire to clip peaks

The focus was on load curtailment programs that targeted large commercial and industrial customers whose demand reductions were bid into wholesale capacity markets

But sales growth has not returned to its pre-recession levels in much of the country, six years after the recession ended

Many utilities don't see a need for new capacity for several years

DR in the future

The focus will shift to retail markets, regardless of what happens to FERC Order 745

Residential customers will draw more attention

Price-responsive demand will become more visible

The objective will be to improve load factor and not just to curtail peak loads

“Organic” consumers will be amenable to changing their load shapes

They are passionate about controlling their energy use not only to save money but also to lower greenhouse gas emissions and create a greener planet

They are likely to embrace dynamic pricing and help overcome regulatory apprehensions about a customer backlash

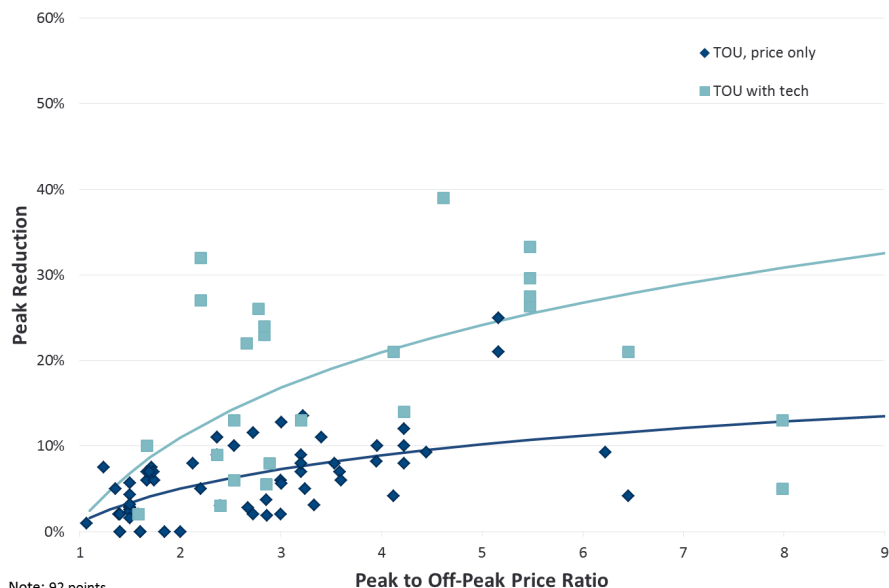
Change is already underway

- Canada has deployed default time-varying rates to 4 million Ontarians
- The Massachusetts DPU has issued a straw proposal for default time-varying rates
- The NY Commission just convened a major conference on time-variant pricing

There is plenty of evidence that consumers respond to price

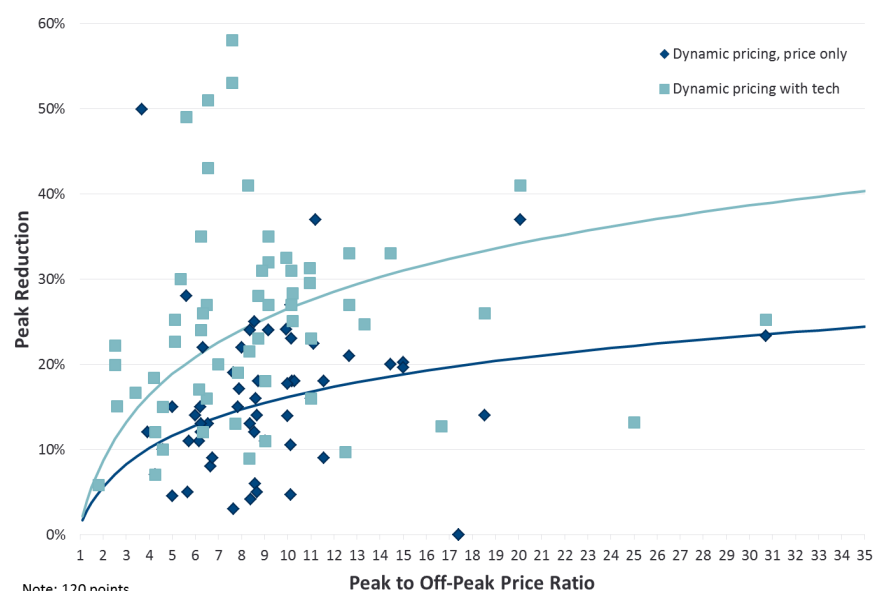
Furthermore, that enabling technologies boost price responsiveness

TOU Impacts



Source: Faruqi, Ahmad. "Arcturus." The Brattle Group.

Dynamic Pricing Impacts



Source: Faruqi, Ahmad. "Arcturus." The Brattle Group.

Aggressive renewable energy standards will create a new application for DR

The share of renewable energy resources in their generation mix continues to rise for most utilities

The “duck curve” of net loads looms in the distance, not just in California, but in many parts of the country

“Fast” DR, which combines pricing with enabling technology, can be used to integrate renewables into the grid

In the early 1980s, the concept was propounded by MIT’s Fred Schweppe as “homeostatic control” and by EPRI’s Clark Gellings as “flexible load shaping”

Fast DR will facilitate Dynamic Pricing 2.0

Simple time-of-use (TOU) rates with fixed periods and rates that are fixed in advance will not suffice. We will need RTP coupled with enabling technology that would allow customers to respond rapidly to changing prices

- Even without enabling technology, about 25,000 residential customers in Illinois are on real-time pricing today

OGE has about 20% of its customers on variable peak pricing, an advanced form of critical peak pricing (CPP) where the peak period price varies by day

- To facilitate customer response, customers are provided a smart thermostat and load response is quite robust

Dynamic Pricing 2.0 (concluded)

In the house of the future, enabling technology will be commonplace:

- Smart thermostats, smart appliances, smart light bulbs and smart plug loads. In other words, home energy management systems will be pervasive
- These will allow these households to manage their loads dynamically in real time

If prices fall in the middle of the day, as solar kicks in, or in the middle of the night as wind kicks in, customer loads will rise automatically

As prices rise later in the evening, loads will fall automatically

Some organic consumers are “prosumers” who engage in DG

Solar PV prices continue to decline

The leasing model has made the solar PV option affordable, even without subsidies and tax credits which are being phased out

Net energy metering, combined with volumetric rates, some of which incline steeply as in California, has made DG an attractive proposition

But rate design could change, slowing down DG growth

Today, a very large portion of utility costs are fixed but a very small portion of utility revenues are fixed

- Most utilities use a two-part rate design with a monthly fixed charge and a volumetric energy charge
- Typically, the fixed charge is very small (in some cases, it is zero) and does not come close to recovering even half of the utility's fixed costs

As sales growth slows down, this two-part rate design will not recover the utility's required revenues, forcing utilities to raise rates for all customers, creating an inequity

To remedy this, utilities are moving to add demand charges to residential tariffs, creating unique opportunities for DR

The emergence of a residential three-part rate is inevitable

The concept is not new

- Three-part rates have been widely deployed to commercial and industrial customers for the better part of the past century, backed up by a storied academic tradition that harkens back to Hopkinson and Wright

Lack of metering and a concern that residential customers won't understand demand charges have prevented its application to residential customers

Already, three-part rates are being considered for DG customers today, and the key question is whether they should be opt-in, default or mandatory. Later, we may see them being offered to all customers.

Conclusions

Both DR and DG are nearing points of inflection

DR will continue to grow but the focus will shift to retail markets, residential applications, and price-responsive demand

DG will continue to grow because of falling solar panel prices and net energy metering conventions but its growth will be tempered by likely changes in residential rate design

References

Brown, Toby and Ahmad Faruqui, “Structure of Electricity Distribution Network Tariffs: Recovery of Residual Costs,” Australian Energy Market Commission, August 2014.

http://brattle.com/system/publications/pdfs/000/005/076/original/The_Structure_of_Electricity_Distribution_Network_Tariffs_and_Residual_Costs.pdf?1422374425

Faruqui, Ahmad. “Time-variant pricing (TVP) in New York,” The REV agenda and residential time-variant pricing, NYU School of Law, March 31, 2015.

http://policyintegrity.org/documents/Faruqui_03.31_2015.pdf

Faruqui, Ahmad and Wade Davis. “Dynamic Pricing 2.0: The Grid-Integration of Renewables,” presented at the IEEE PES GM 2013 Meetings, Vancouver, Canada, July 23, 2013.

Faruqui, Ahmad and Sanem Sergici, “Arcturus: International Evidence on Dynamic Pricing,” *The Electricity Journal*, August-September, 2013.

References (concluded)

Faruqui, Ahmad. “Moving Demand Response Back to the Demand Side,” presented at the IEEE Power and Power Society General Meeting, National Harbor, Maryland, July 28, 2014.

Faruqui, Ahmad, Ryan Hledik, and Neil Lessem. “Smart by Default,” *Public Utilities Fortnightly*, August, 2014.

<http://www.fortnightly.com/fortnightly/2014/08/smart-default?page=0%2C0&authkey=e5b59c3e26805e2c6b9e469cb9c1855a9b0f18c67bbe7d8d4ca08a8abd39c54d>

Faruqui, Ahmad et al. “Year Two Analysis of Ontario’s Full Scale Rollout of TOU Rates,” December 16, 2014.

<http://powerauthority.on.ca/sites/default/files/conservation/2013-Evaluation-of-TOU-Rates-Year-Two-Analysis.pdf>

Hledik, Ryan. “Rediscovering Residential Demand Charges,” *The Electricity Journal*, Volume 27, Issue 7, August–September 2014, Pages 82–96.

Presenter Information



AHMAD FARUQUI, PH.D.

Principal | San Francisco

Ahmad.Faruqui@brattle.com

+1.415.217.1026

+1.925.408.0149 (cell)

Ahmad Faruqui, a principal with The Brattle Group, leads the firm's practice in understanding the changing needs of energy consumers. This work encompasses rate design, distributed generation, energy efficiency, demand response, demand forecasting and cost-benefit analysis of emerging technologies. During his career, he has worked for more than 125 clients, including utilities, system operators, and regulatory commissions, in the US and in Australia, Canada, Egypt, Hong Kong, Jamaica, Philippines, Saudi Arabia and Thailand. He has filed testimony or appeared before state commissions, government agencies, or legislative bodies in Alberta (Canada), Arizona, Arkansas, California, District of Columbia, Illinois, Indiana, Kansas, Maryland, Michigan and Ontario (Canada). He has spoken at conferences in Australia, Bahrain, Brazil, Egypt, France, Germany, Ireland, Jamaica, and the United Kingdom. His work has been cited in publications such as *The Economist*, *The New York Times*, *USA Today*, *The Wall Street Journal* and *the Washington Post*. He has appeared on Fox News and National Public Radio. The author, co-author or editor of four books and more than 150 articles dealing with energy issues, he holds bachelor's and master's degrees from the University of Karachi and masters and doctoral degrees from the University of California, Davis.

The views expressed in this presentation are strictly those of the presenter and do not necessarily state or reflect the views of The Brattle Group, Inc.