Strategies for surviving sub-one percent growth and the emergence of the energy services utility

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Normal electricity growth has not resumed four years after the Great Recession ended

- According to Dr. John Caldwell of the Edison Electric Institute, normal growth usually resumes within five months after the recession ends; the longest it has ever taken has been twelve months

- The EIA's May 2014 Short-Term Energy Outlook (STEO) projects that electric retail sales will grow by 2.3% in 2014 and 0.0% in 2015; in the residential sector, the corresponding growth rates will be 3.1% and -1.5%
Electricity sales and the recovery

Sources: John Caldwell, EEI and the US Energy Information Administration
Of course, declining growth has been the norm and not the exception since 1950.

U.S. Electricity Demand Growth, 1950-2035 (percent, 3-year moving average)

Source: EIA, 2012 Annual Energy Outlook
Three new forces have shaped the recent drop in growth

First, consumer psychology has shifted as a new generation of consumers has arrived with new values and norms; new technologies are pushing them to explore the frontiers of energy efficiency on their own; and they are into belt-tightening, faced with continued economic uncertainty.

Second, utilities are stepping up their spending on energy efficiency programs, often prompted by energy efficiency standards and new legislation.

Third, states and federal governments are continuing to push ahead with aggressive enhancements to codes and standards.
Consumer confidence continues to be a drag on consumer spending

Index of Consumer Sentiment – Recent Changes

Pre-Recession Avg.  
(Jan-2003-Nov-2007) = 89.1

Post-Recession Avg.  
(Jun-2009-Nov-2013) = 73.0

Several states have passed laws either requiring or promoting energy efficiency

EERS Policy Approaches by State (As of September 2012)

Source: American Council for an Energy-Efficient Economy
New codes and standards could dramatically decrease baseline energy consumption

Impact of Codes and Standards on Total U.S. Electricity Consumption (TWh)

Source: IEE, Assessment of Electricity Savings Achievable through New Appliance/Equipment Efficiency Standards and Building Efficiency Codes (2010-2025)
Two more forces have appeared on the horizon

- The fourth force is distributed generation, led by the revolution in roof-top solar and supplemented by micro turbines.

- Roof-top solar is approaching grid parity, capitalizing on heavy upfront cash subsidies and spurred on by net metering tariffs that over-compensate solar customers.

- The leasing model pioneered by SolarCity is being copied rapidly by others.

- The fourth force alone can eliminate load growth.
Net metering enables distributed generation to expand

- In 2003, there were less than 7,000 U.S. customers on net metering
- By 2012, there were 297,000 (roughly half in California)
- That amounts to 0.2% of all U.S. residential customers
- In 2012, Hawaii had the highest share of residential customers on net metering (5%)

Sources:
With distributed generation, net-zero energy homes become a reality

- In Austin, Texas, the Zero Energy Capable Homes program requires that new single-family homes be net-zero energy capable by 2015
- The largest community of net-zero homes in the U.S. is rising in West Village at UC Davis in California
- The California Energy Commission has called for all new residential construction to be zero net energy by 2020 and for all new commercial construction to be zero net energy by 2030
The fifth force is fuel switching

- The revolution in shale oil and gas is pushing fuel prices downwards

- The use of gas for commercial air conditioning and in industrial process is going to become economic, leading to significant inter-fuel substitution away from electricity in the commercial and industrial sector

- Gas-fired residential heat pumps may also begin making inroad into the home HVAC market
What are the options for electric utilities?

To deal with the five forces, utilities can pursue one of four strategies

1. Stay the course
2. Push electrification
3. Become a wires company
4. Become an energy services utility
First strategy – stay the course

The assumption is that growth will resume by itself; declining energy prices will herald an industrial revival and boost electricity sales

CERA’s Larry Makovitch has put forward a provocative argument along these lines

— http://www.powermag.com/issues/features/Expect-U-S-Electricity-Consumption-to-Increase_5634.html

This is a very high risk strategy, as noted on the next slide
Second strategy – electrification

Push on plug-in electric vehicles and other plug loads


Conduct research, development and demonstration of new industrial processes that are electricity-intensive

The results of this strategy will only payoff in the long run; they will provide very limited benefits in the near-term

- Efforts to boost electricity sales in the 1980s and 1990s have borne little fruit
Third strategy – the safe haven

Utilities can become a wires company, but many utilities are already wires companies

All wires companies face the risk of collecting insufficient revenue since the bulk of distribution charges are tied to sales and as sales growth slows down, they will not be able to cover their fixed costs
Fourth strategy - become an energy services (ES) utility

In contrast to a traditional energy utility, which sells electricity to customers, an ES utility sells customers end use services such as lighting, heating and cooling.

Of course, the ES utility still has the task of delivering electricity like a traditional wires company, but the business proposition is fundamentally different.
There is historical precedent for selling energy services

In 1881, Thomas Edison began selling energy services, charging customers a fixed amount per lamp

- The main competition came from gas lamps


- Sant proposed that utilities could sell energy services to compete with end-use equipment manufacturers, such as General Electric

Four decades later, Peter Fox-Penner coined the term, Energy Services Utility in *Smart Power*, Island Press, 2000
Energy service companies (ESCOs) first emerged in France

Since the 19th century, energy service contracts have existed in France where the idea of the ESCO was born

- The largest ESCOs in France operate as subsidiaries of the main utility companies, offering heating (chauffage) contracts
- These are long-term agreements that guarantee a certain performance level that is specific to metrics, such as temperature and humidity levels

ESCOs differ from ES utilities in that they do not necessarily have utility affiliation.

- ESCOs provide customers with energy efficiency services and receive a share of the energy savings
ESCOs success in the United States

The National Association of Energy Service Companies (NAESCO) now lists over 40 members including Honeywell, Siemens Industry, and Lockheed Martin

NAESCO reports that ESCOs have achieved $50 billion in verified energy savings since the 1990s
Some utilities sell energy services but are regulated on the sale of electricity

Utilities in many states such as California, Illinois and Maryland offer energy services to their customers under the umbrella of demand-side management programs – these programs are designed to bring the benefits of energy efficiency and demand response to the power system while allowing customers to lower their energy bills

In April 2014, the New York Department of Public Service released a new state energy plan that proposes to transform the state’s utilities into platforms for selling energy services
The business proposition for the ES utility

The ES utility is incentivized to maximize customers’ energy efficiency and makes money on how much efficiency it sells

Where wholesale markets exist, it can bid demand and energy savings from its customers into those markets

- It may sell a customer a fixed-price contract to light a 500 square foot workspace with 70 lumens/square foot
- The utility can diversify its offerings by charging different rates for different levels and types of service
- The utility can also take advantage of new technology trends and offer new energy services, such as electric vehicle charging
Services that can be offered by ES utilities include:

- Lighting
- Space Heating
- Space Cooling
- Water heating
- Water pumping
- Industrial machine drive
- Electric vehicle charging
The ES utility will need a new skillset

Unlike a traditional utility, the ES utility will not meet new demand by building more power plants

- Instead, it will need to understand its customers’ need for end use energy services and their demand profiles and also understand the current and future offerings of competitors

It will need to invest in acquiring new operational and business skills in order to price and deliver its energy services

Tailoring energy service products to individuals with customer-level data is one area where the deployment of the smart grid, notably that of advanced metering infrastructure (AMI) can help
AMI will facilitate the transition from traditional utility to energy service utility

The AMI-enabled company will be able to provide a wide range of existing and new services effectively

- Energy efficiency
- Demand response
- Electric vehicle charging

To quantify the possibilities opened up the deployment of AMI, we present in the appendix the results of a case study of a medium sized utility operating in the Midwest
Conclusions

The slowdown in sales growth appears to be here to stay.
Utilities will require new strategies and tactics to sustain themselves in the face of the protracted slowdown.
Many business functions including sales forecasting, rate design and load market research will have to be reinvented.
But ultimately utilities may need to reinvent themselves.
Some will probably turn into energy services utilities.
Appendix

A case study of how a medium-sized utility can use AMI to become an energy services company
Ten programs could be offered by the AMI-enabled energy services utility

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
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<tbody>
<tr>
<td>PTR</td>
<td>Peak Time Rebate (PTR)</td>
</tr>
<tr>
<td>PTR + IHD</td>
<td>PTR with In Home Display (IHD)</td>
</tr>
<tr>
<td>PTR + IHD + PCT</td>
<td>PTR with IHD and Programmable Communicating Thermostat (PCT)</td>
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<tr>
<td>PSP</td>
<td>Power Saving Pricing (A form of real time pricing)</td>
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<td>DLC</td>
<td>Direct Load Control</td>
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<td>TOU + PHEV + HEMS</td>
<td>Time of Use (TOU) rate with Home Energy Management System (HEMS) for electric vehicles</td>
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<tr>
<td>CPP</td>
<td>Critical Peak Pricing (CPP)</td>
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<tr>
<td>CPP + IHD</td>
<td>CPP with IHD</td>
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<tr>
<td>CPP + IHD + PCT</td>
<td>CPP with IHD with PCT</td>
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<tr>
<td>CPP + HEMS + PCT</td>
<td>CPP with HEMS and PCT</td>
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In the study, we assumed that participation ramp-up follows an S-shaped curve.

*PSP* only includes incremental customers on PSP due to AMI.
We base the per customer peak reductions on Brattle’s *Arc of Price Responsiveness*.
Energy reductions vary widely across studies, and we use a range for each option.
We also make the following assumptions

1. **Per customer impacts for non-residential customers**
   - We use assumptions derived empirically for the 2009 FERC report
   - 7% for price only and 14% for price plus technology
   - Applies to medium, large, and very large customers (in the FERC report, applies to customers greater than 200 kW)

2. **Costs per unit for non-residential customers**
   - ADR assumed to cost between $2,000 (low) and $3,000 (high) in this iteration
The nominal (undiscounted) net benefits are $664 million.
In present value, the net benefits are $381 million

*For the remainder of this section, results are shown in nominal terms

Total nominal net benefits are 664 million
Total discounted (PV) net benefits are 381 million
Avoided costs are dominated by avoided generation capacity costs and gasoline costs

Summary of Costs and Benefits

<table>
<thead>
<tr>
<th>Avoided gas costs</th>
<th>Avoided carbon costs</th>
<th>Avoided energy cost</th>
<th>Avoided distribution capacity costs</th>
<th>Avoided transmission capacity costs</th>
<th>Avoided generation capacity costs</th>
<th>Device costs</th>
</tr>
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<tbody>
<tr>
<td>$254</td>
<td>$19</td>
<td>$40</td>
<td>$86</td>
<td>$15</td>
<td>$31</td>
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<tr>
<td>Nominal costs</td>
<td>Nominal benefits</td>
<td>Net benefits</td>
<td>Total net benefits are 664 million</td>
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Most benefits come from residential DR and EE programs and electric vehicles (EVs)
Almost $500 million of the net benefits come from residential DR and EE programs

Summary of Net Benefits
Total net benefits are 664 million
Of the $500 million in net benefits, most come from PTR and power saving pricing.

### Net Benefits

Total net benefits are 664 million.

- Residential PTR, $139
- Residential PTR + IHD, $93
- Residential PTR + IHD + PCT, $96
- Residential PSP*, $115
- Residential DLC
- Residential TOU + PHEV + HEMS
- Residential PTR + IHD + PCT
- Residential PTR + IHD
- Residential PTR
- Residential CPP + HEMS + PCT
- Residential CPP + IHD + PCT
- Residential CPP + IHD
- Residential CPP
- Residential PSP*
Electric vehicles add another $113 million in net benefits
The non-residential DR and EE programs bring total net benefits up to $664

Total net benefits are 664 million

- Residential Programs
- Residential EV
- Residential DLC
- Residential CPP + HEMS + PCT
- Residential CPP + IHD + PCT
- Residential CPP + IHD
- Residential PTR + IHD + PCT
- Residential PTR + IHD
- Residential PTR
- Residential TOU + PHEV + HEMS
- Small C&I CPP
- Small C&I CPP + HEMS + PCT
- Small C&I CPP + IHD + PCT
- Small C&I CPP + IHD
- Small C&I CPP
- Medium C&I CPP + ADR
- Medium C&I CPP
- Large C&I CPP + ADR
- Large C&I CPP
- Very Large C&I CPP + ADR
- Very Large C&I CPP

Net Benefits

Millions

$0

$700

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Continuing the conversation


Continuing the conversation (continued)


Continuing the conversation (concluded)


Dr. Ahmad Faruqui is a Principal with The Brattle Group whose work is focused on the full spectrum of customer-side issues involving demand forecasting, rate design, energy efficiency, demand response, and the smart grid broadly speaking. He has worked for more than three dozen utilities around the globe and testified before a dozen state and provincial commissions and legislative bodies. His work has been cited in The Economist, The New York Times, the Washington Post and USA Today. He has appeared on Fox Business News and National Public Radio. The author, co-author or editor of four books and more than 150 articles, he holds a Ph.D. in economics from The University of California at Davis and B.A. and M.A. degrees in economics from The University of Karachi, Pakistan.
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