

The Brattle Group

The Slowdown in Sales Growth and the Prospects for Transmission

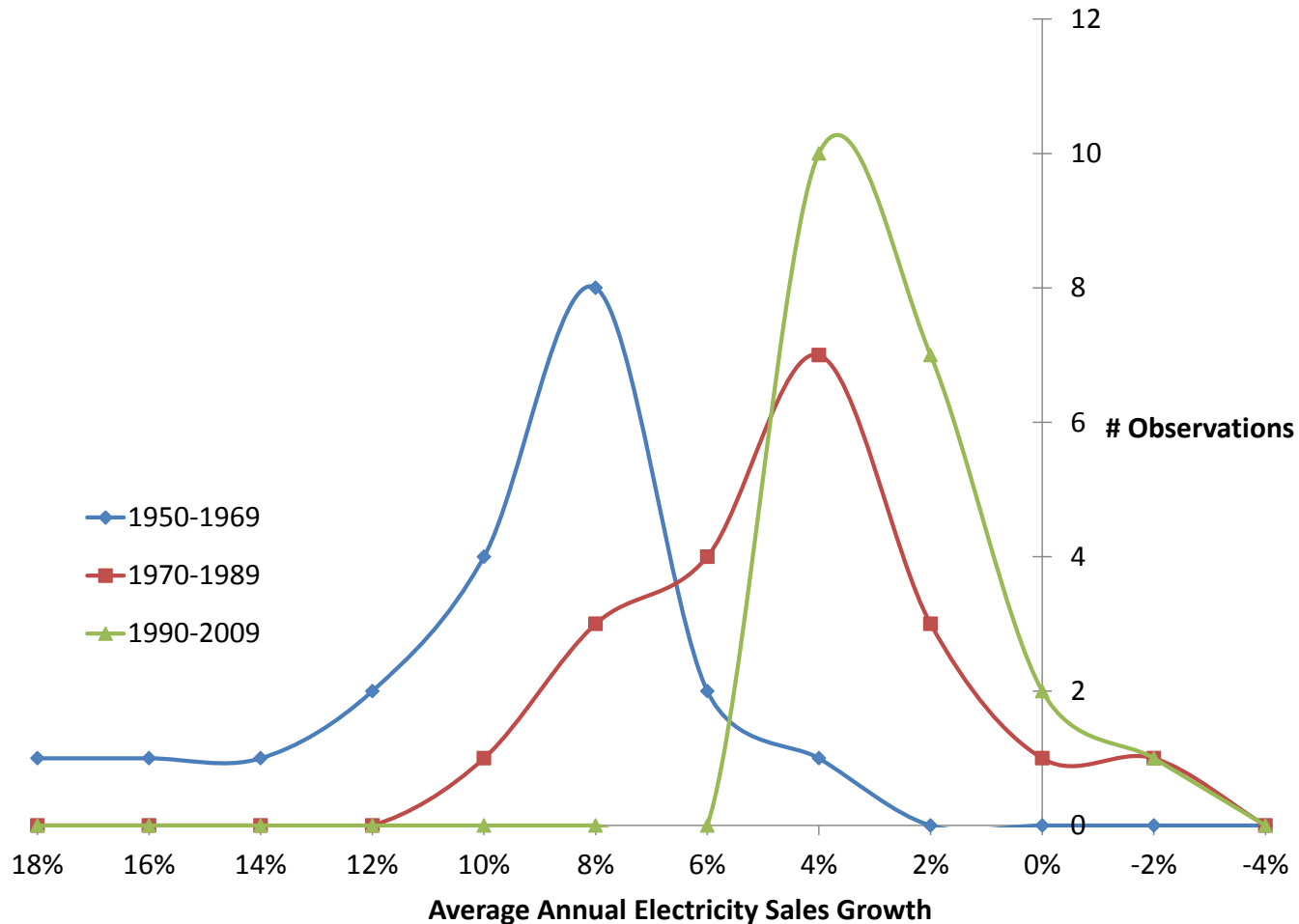


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EEI Energy Delivery Executive Advisory Committee
Charleston, South Carolina
February 28, 2013

SALES GROWTH IS SLOWING DOWN

Sales growth has been declining since 1950

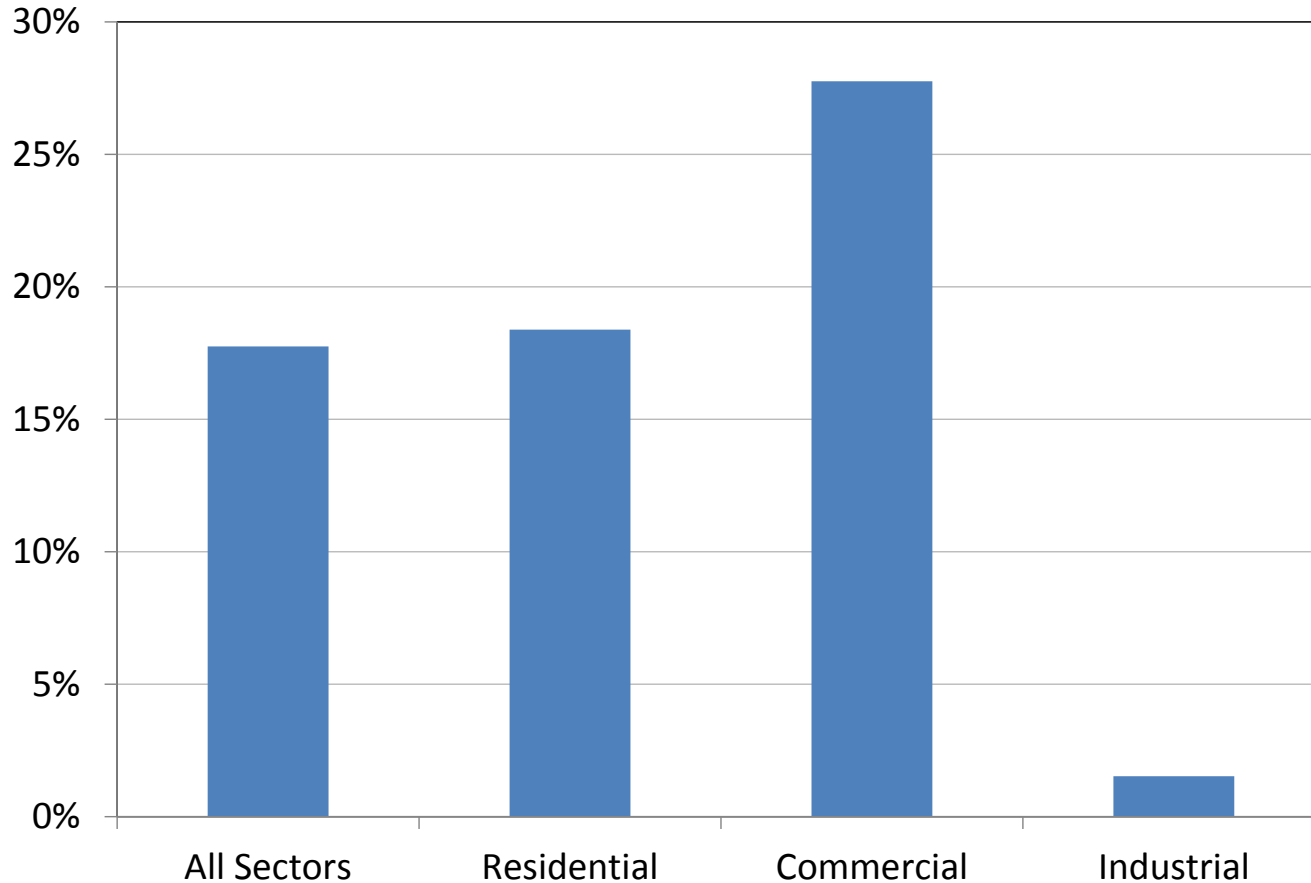
Electricity Sales Growth (Two-Decade Distributions)



Source: Ahmad Faruqi and Eric Shultz, "Demand Growth and the New Normal," *Public Utilities Fortnightly*, December 2012

The commercial sector leads growth through 2035, mirroring the deindustrialization of the economy

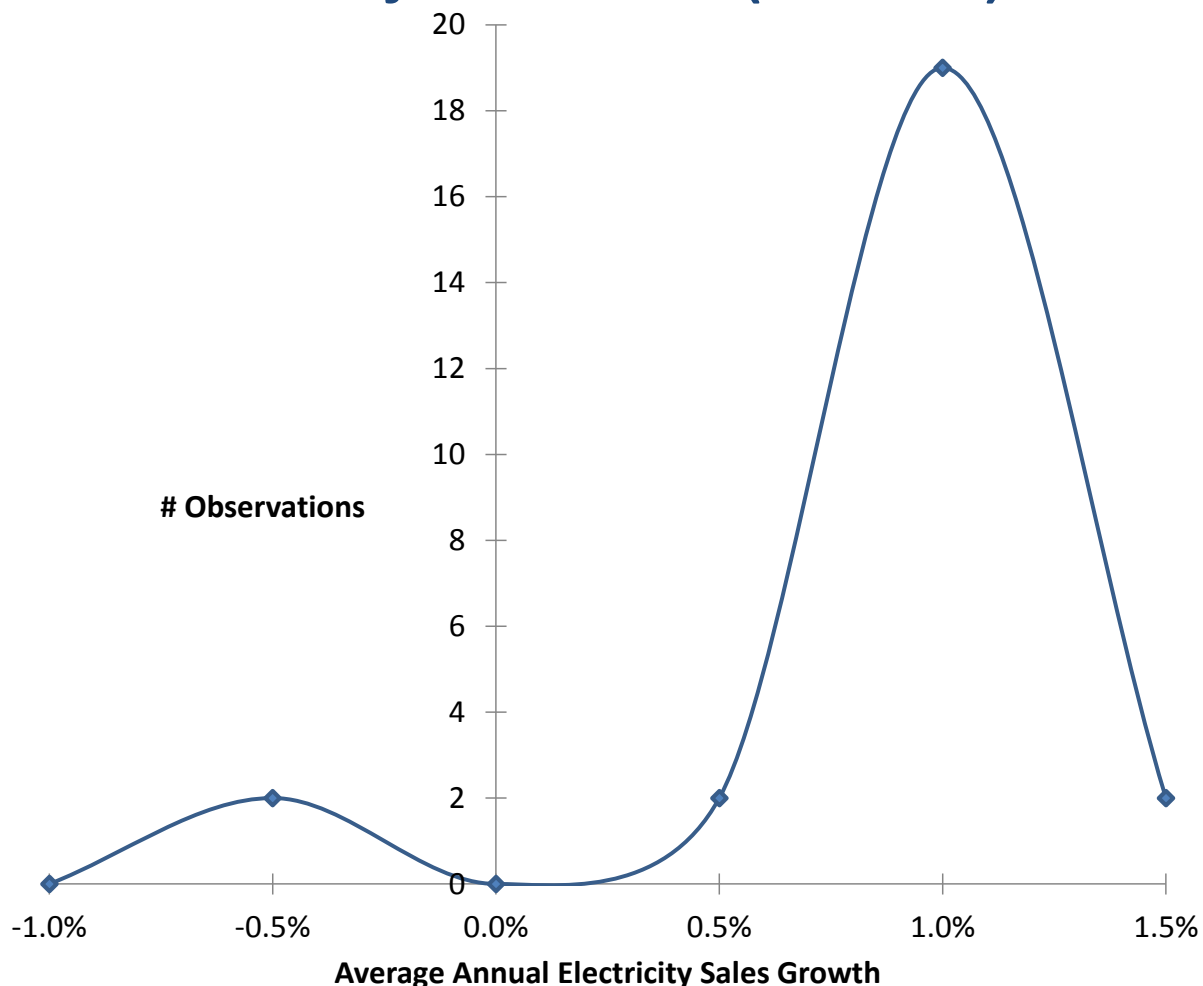
Cumulative Demand Growth (2010-2035)



Source: U.S. Energy Information Administration, Annual Energy Outlook 2012 with Projections to 2035, June 2012

Projected annual sales growth is closer to 1%

Electricity Sales Growth (2011-2035)



Source: Ahmad Faruqi and Eric Shultz, "Demand Growth and the New Normal," *Public Utilities Fortnightly*, December 2012

Five forces are creating the new normal

- 1. Weak economy**
- 2. Demand-side management**
- 3. Codes and standards**
- 4. Distributed generation**
- 5. Fuel switching**

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The recession reduced demand and the tepid recovery slowed *growth* in demand

- ◆ According to the EIA, the 2008-2009 economic recession caused a significant drop in electricity demand and we have only partially recovered from this drop
- ◆ According to NERC, the “pace and shape” of the economic recovery will dramatically influence electricity demand
- ◆ The exception seems to be the Motley Fool, which noted recently that electric utilities produce “something we use regardless of economic conditions.”

Sales growth is recovering at a slower pace than in prior recessions

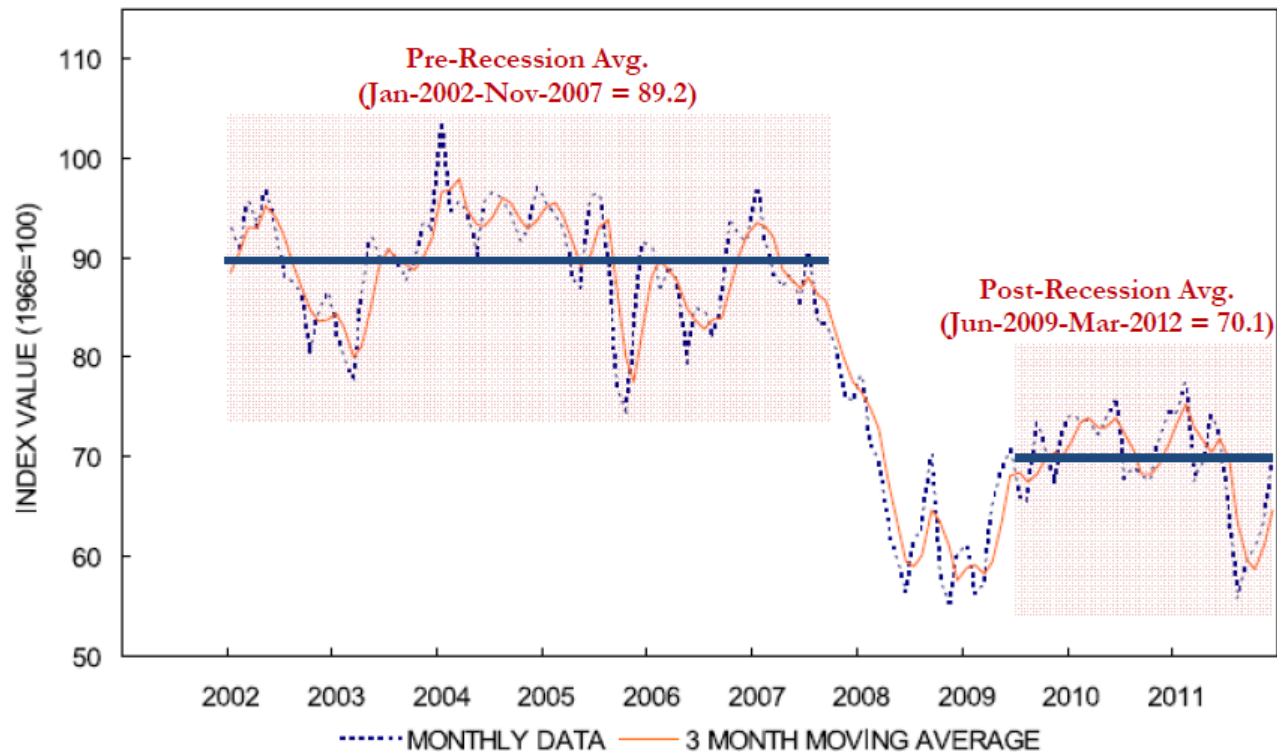
- ◆ According to Dr. John Caldwell of the Edison Electric Institute, electricity demand typically bounces back to pre-recession levels in about 5 months
- ◆ The longest electricity demand has ever taken to bounce back to pre-recession levels after the five prior recessions has been 12 months
- ◆ As of mid-2012, or some 36 months after the prior recession ended, demand has not returned to pre-recession levels
- ◆ The EIA's October 2012 Short-Term Energy and Winter Fuels Outlook predicted that sales would not get back to their pre-recession levels by the end of 2012
- ◆ The EIA also projects that total electricity sales will not return to the weather-adjusted pre-recession levels until 2014

Some of the recessionary impacts may be permanent

- ◆ Businesses have closed completely or relocated offshore
- ◆ People are unemployed, underemployed, or underpaid – thus reducing electric consumption and the purchase of electricity-consuming appliances
- ◆ The tepid recovery has engendered a new psychology of frugality
 - Forecasters find that even after they put actual economic growth rates in their models and back cast, they are still overestimating demand
 - Consumer demand curves appear to have shifted inwards

Consumer confidence continues to be a drag on consumer spending

Index of Consumer Sentiment – Recent Changes



Source: University of Michigan [Survey of Consumers](#)

Note: Consumer sentiment index fell from 82.7 in November to 72.9 in December

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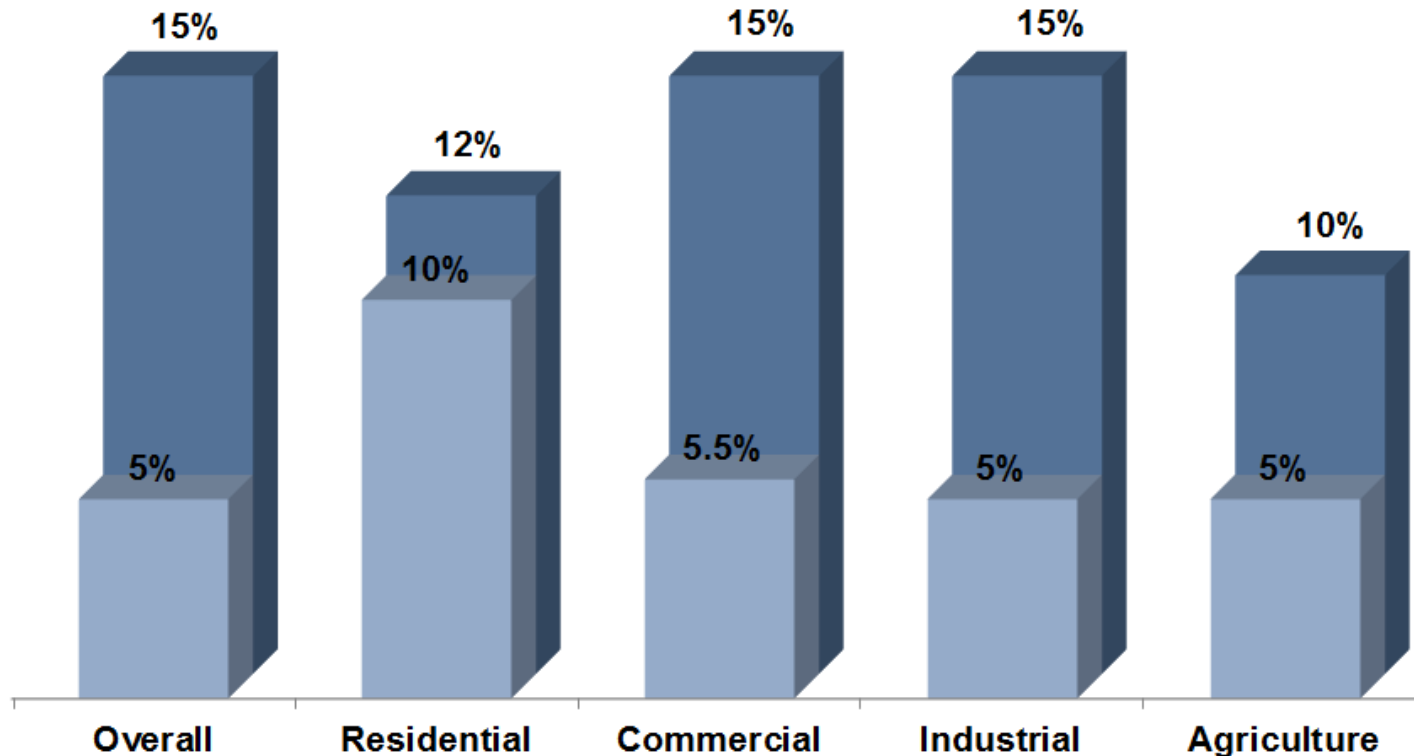
Demand-side management (DSM) contributes to reduced peak demand and electric energy consumption

- ◆ The drivers for DSM are increasingly environmental in nature, being driven by concerns about climate change
- ◆ All areas in NERC's forecast are expecting increases in DSM over the next 10 years
 - Across the whole forecast, DSM is projected to hit 55,000 MW by 2021 or 4.5% of the on-peak resource portfolio

Source: NERC, 2011 Long Term Reliability Assessment

Brattle's survey of 50 experts shows that energy efficiency is likely to have a big impact

Electric Energy Efficiency Savings Forecast



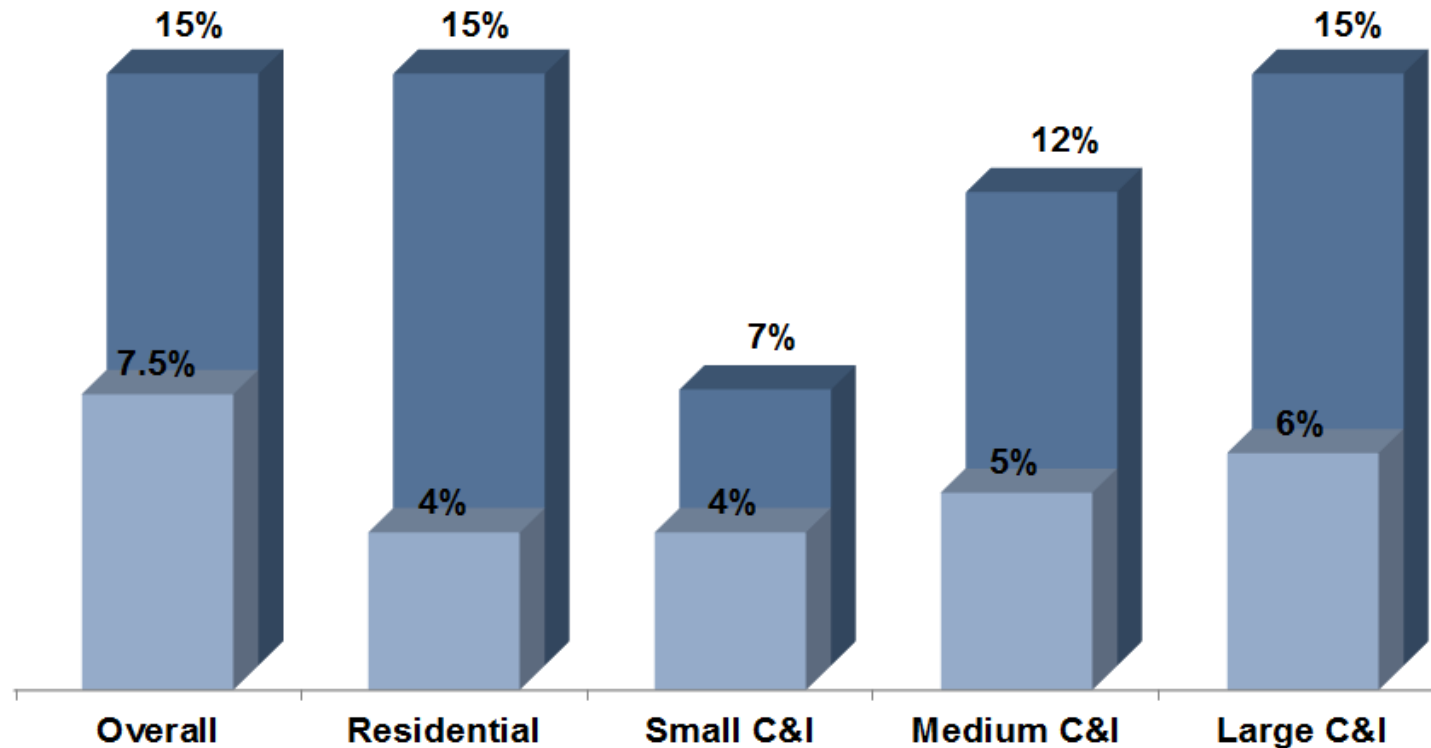
Median of Low and High Estimates
10 Years From Now

Behavior-modifying programs are the newest element in the energy efficiency portfolio

- ◆ In the new generation of consumers, conservation is not just a personal virtue
- ◆ Web portals and social media are raising the energy consciousness of consumers
- ◆ About 7 million households in North America are saving 1.4 billion kWh of electricity per year due to home energy reports that compare their monthly usage to a peer group

The *Brattle* survey indicates that demand response is expected to lower peak demand by 7.5% to 15%

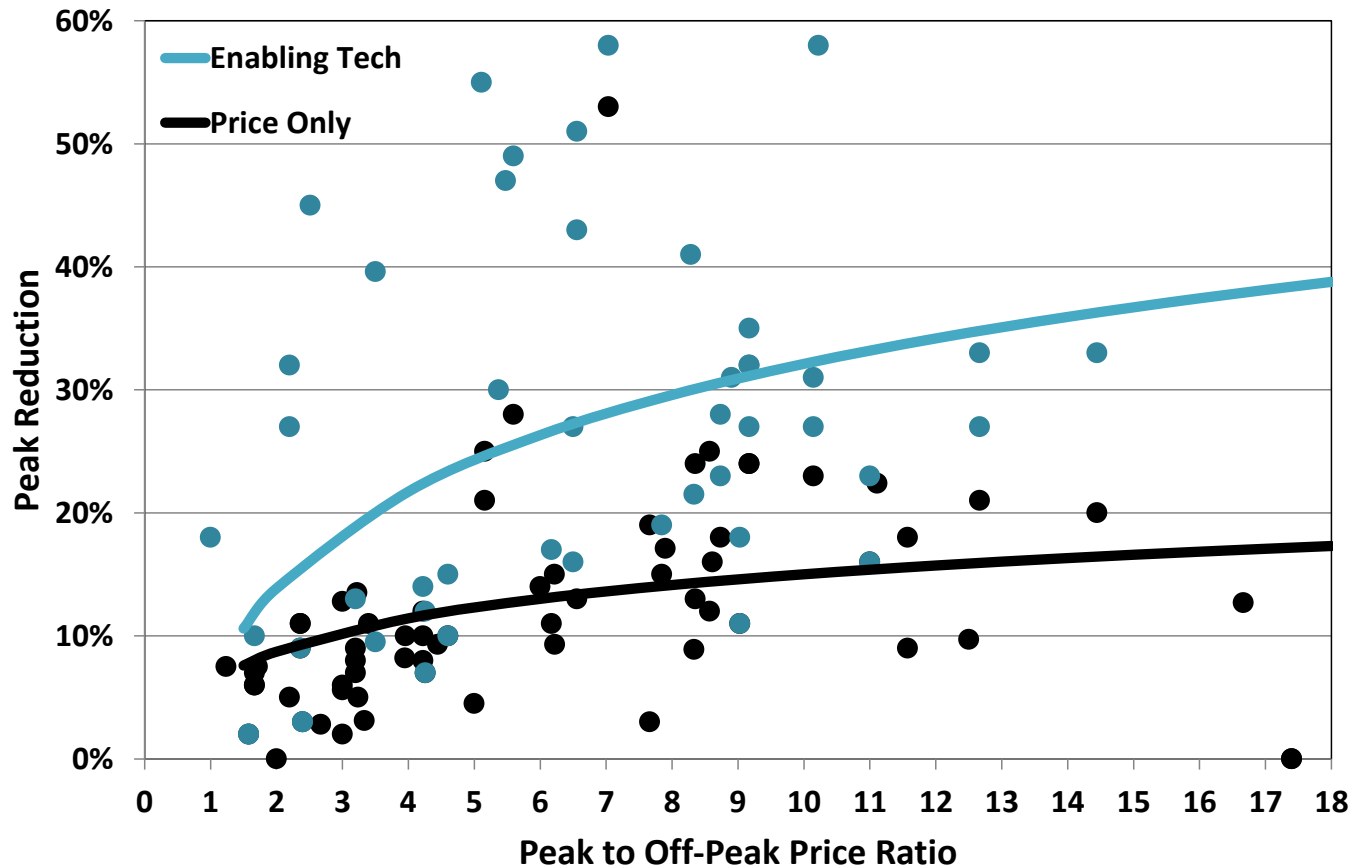
Forecasted Peak Demand Savings



Median Low and Median High Estimates
10 Years From Now

Dynamic pricing is rolling out, spurred on by pilots and rapid smart meter deployment

The Arc of Price Responsiveness



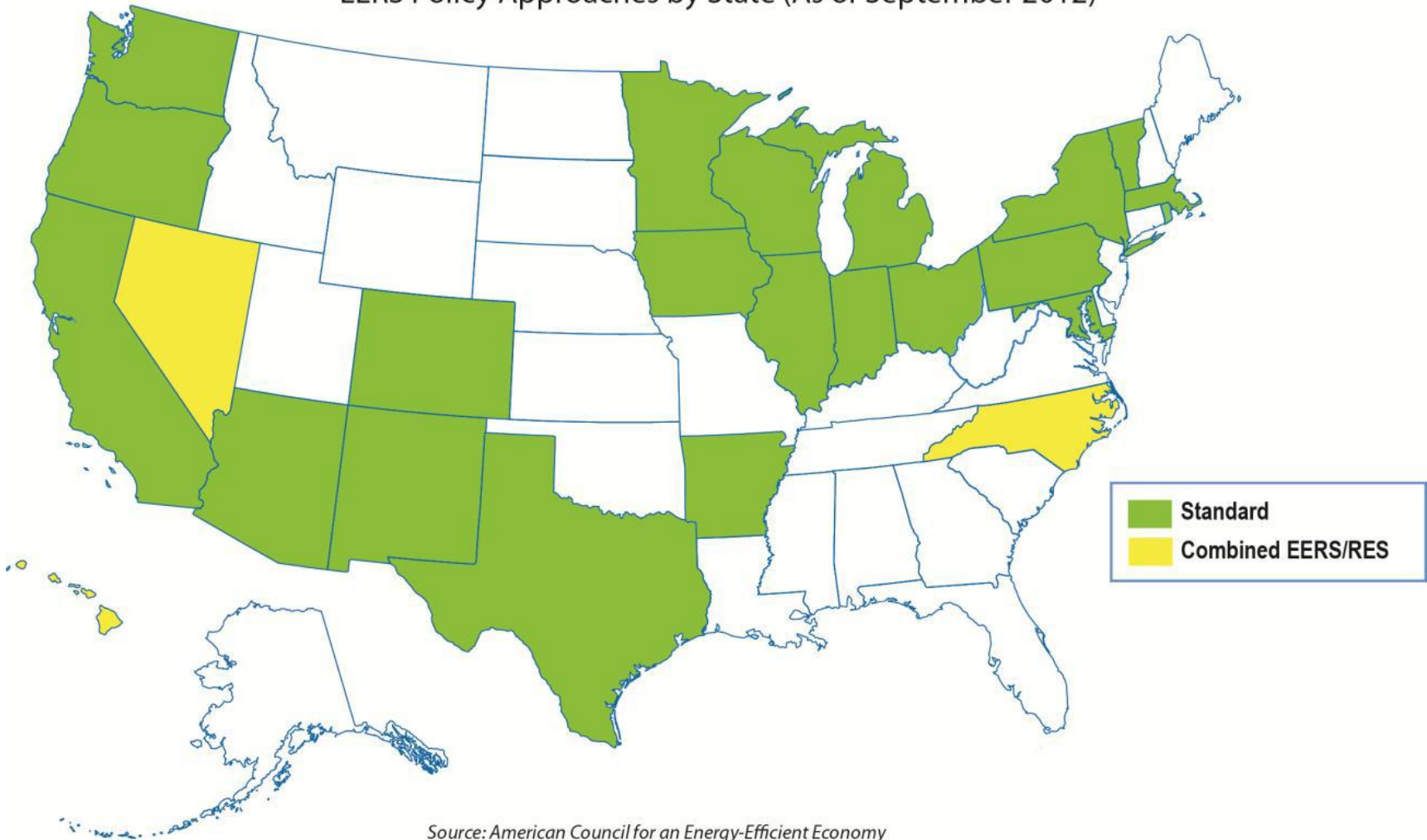
Ahmad Faruqi and Eric Shultz, "Consistency of Results in Dynamic Pricing Experiments -- Some Initial Findings," DistribuTECH 2013, January.

Five forces are creating the new normal

1. Weak economy
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Several states have passed laws either requiring or promoting energy efficiency

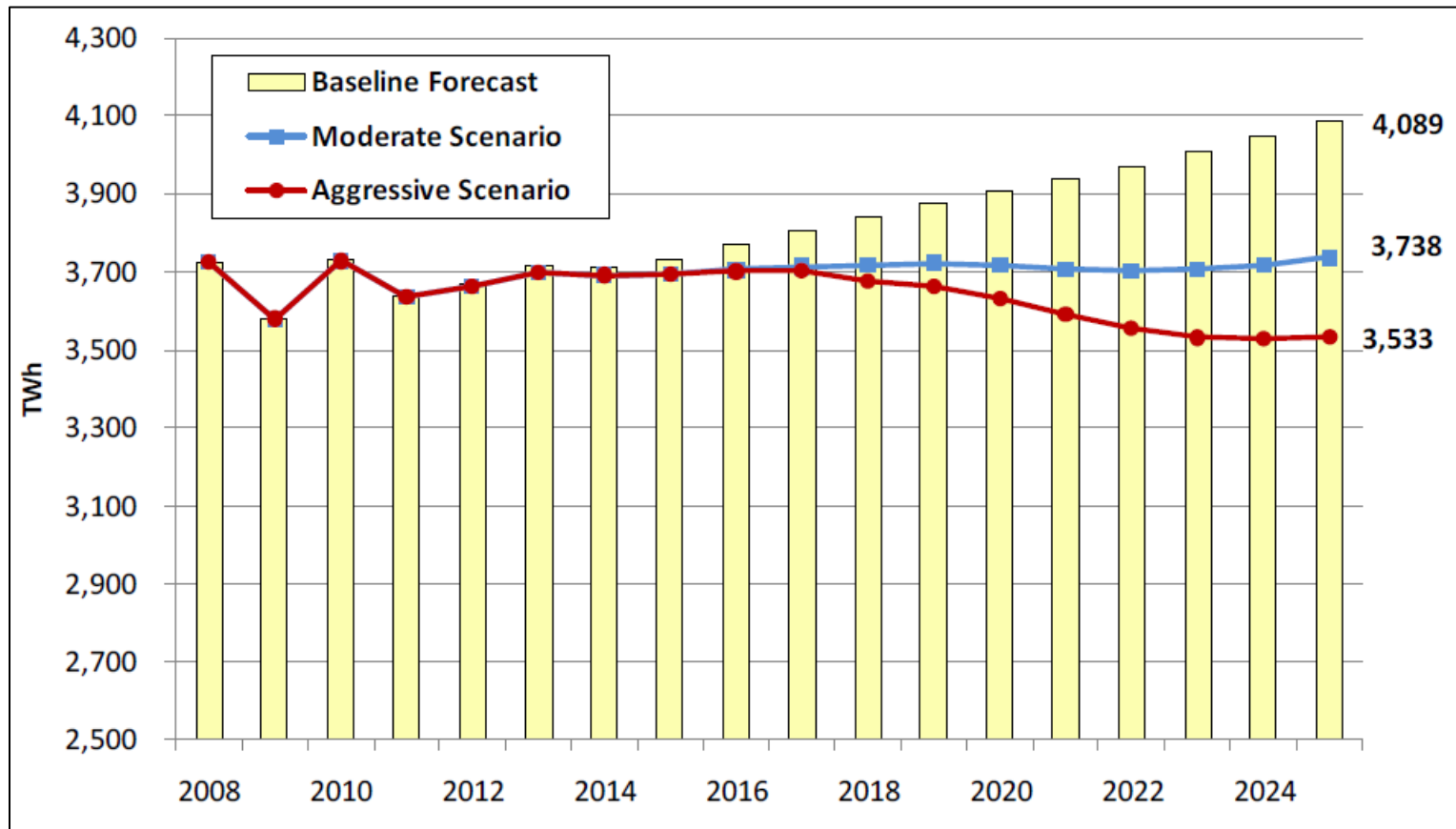
EERS Policy Approaches by State (As of September 2012)



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)

The EIA is attributing declining per capita residential electricity sales to EISA 2007

- ◆ New federal lighting standards were outlined in the Energy Independence and Security Act (EISA) of 2007, which went into effect on January 1, 2012
 - General-service lamps providing 310 to 2,600 lumens of light are required to consume 30% less energy than typical incandescent bulbs and compact fluorescent and LED lamps replace low-efficacy incandescent lamps
- ◆ The EIA forecasts that lighting per household in 2035 will be 827 kWh per year, or 47% below the 2010 level

Source: EIA, 2012 Annual Energy Outlook

Five forces are creating the new normal

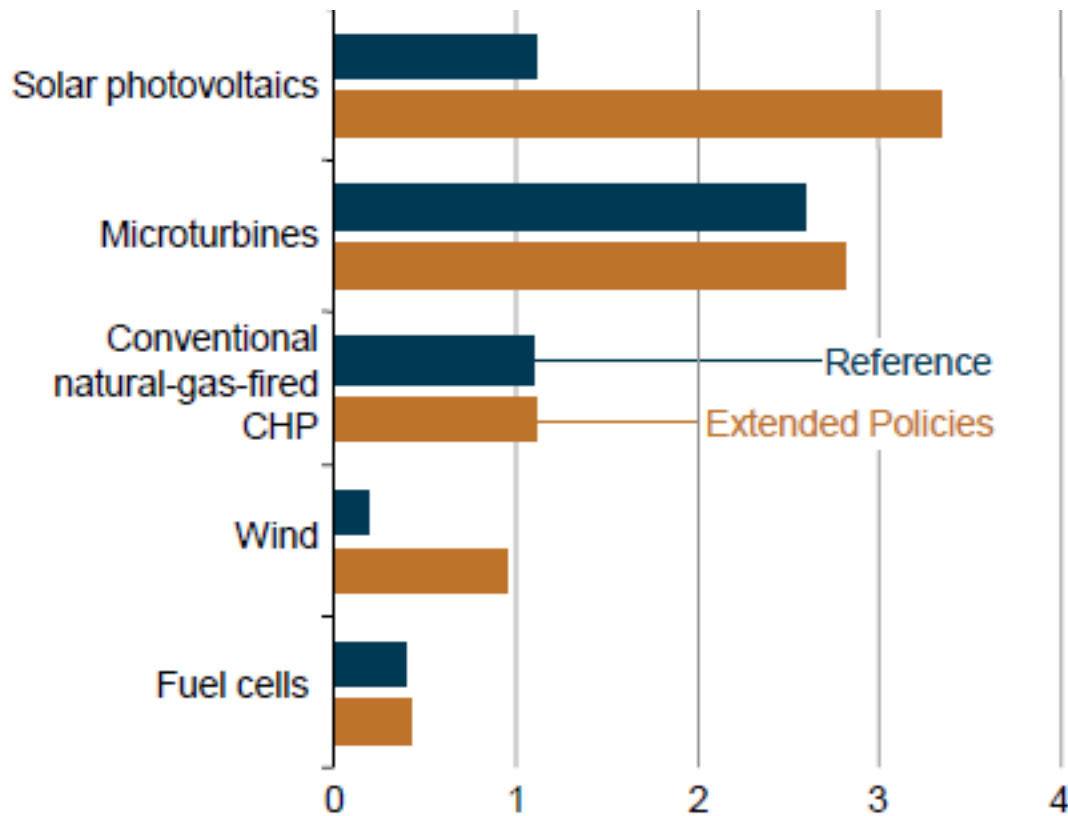
1. Weak economy
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Distributed generation with net metering could lower demand significantly

- ◆ Distributed generation (DG) – including rooftop solar PV – is anything that produces electricity (or other form of energy, such as water heating) on the customer side of the meter
- ◆ The growth in DG depends on:
 - retail cost of electricity – ***Increasing***
 - cost of on-site generation – ***Decreasing***
 - net metering regulations – ***Varies by state***
 - storms and outages – ***More frequent than before***

The EIA predicts significant increases in distributed generation, especially with more investment tax credits

Additions to Electricity Generation Capacity in the Commercial Sector in Two Cases, 2010 – 2035 (Gigawatts)



Source: EIA, 2012 Annual Energy Outlook

Net metering enables distributed generation to expand

- ◆ In 2003, there were less than 7,000 U.S. customers on net metering
- ◆ By 2010, there were 156,000 (roughly half in California)
- ◆ In 2010, that amounts to 0.1% of total U.S. electricity sales
- ◆ In California, the 5% cap is predicted to be reached by 2015

Source: Net Metering: A Worrisome Trend, The International Energy Newsletter, July 2012.

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
- ◆ *If all of this comes to pass, who will pay for the grid?*

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More customers may switch away from electricity to natural gas

- ◆ Lower gas prices from fracking could result in people shifting away from electricity and towards gas for heating
- ◆ Oak Ridge National Laboratory has developed gas-fired heat pumps, which could supply both heating and cooling
- ◆ Higher cost of electricity would further encourage customers to switch away from electricity

A host of other forces are suppressing demand

- ◆ Continuing deindustrialization
- ◆ The arrival of disruptive end-use technologies
 - An *iEverything* appliance, Green Buttons, and smart phones
- ◆ The emergence of new entrants who plan to disintermediate utilities from consumers
- ◆ The passage of new legislation requiring lower carbon emissions
- ◆ Looming water shortages and heat waves evoke the scenarios laid out in *The Limits to Growth* by the Club of Rome in 1972

A Random Walk down Forecast Street

◆ California

- New home construction has collapsed
- Manufacturers are resorting to self-generation and microturbines, causing the share of electricity sold to manufacturing to drop from 33% to 10%
- Advanced metering has rolled out and dynamic pricing is following suit
- An interfaith group is pushing for more renewable energy in the name of God
- NRG will be funding the installation of electric car charging stations

◆ Midwest

- Weather-adjusted use per household has dropped in the third quarter for the past two years

◆ New England

- Both energy efficiency and demand response can bid into forward capacity markets

A Random Walk – continued 2

◆ **New York**

- Housing construction has slowed down, possibly due to delayed family formation

◆ **Pacific Northwest**

- Industrial self-generation is rising, old industries are shutting down, and new industries, such as server farms are not creating many jobs

◆ **PJM**

- Price responsive demand has been given the green light by FERC
- Advanced metering is rolling out
- More than 2 million customers will be on dynamic pricing in the next few years

A Random Walk – continued 3

◆ Southwest

- Was hit hard by the collapse in the housing market, along with declining population growth

◆ Tennessee Valley

- Homeowners are taking actions to save money, because of all the buzz about energy efficiency

When all is said and done

- ◆ The drop in sales growth seems to be permanent, not transitory
- ◆ It would be a mistake to attribute the drop just to the recession and assume that it will go away once “normal” economic activity resumes
- ◆ As seen on Slide 2, the drop is consistent with the historical trend
- ◆ The *new normal* may be growth at about half of the pre-recession value, in the 0.7% to 0.9 % a year range

Survival in a sub one-percent growth world calls for new thinking

- ◆ Both utilities and regulators have to come up with new solutions that delink earnings from sales
- ◆ Utilities have arrived at a fork in the road and will have to consider becoming smart wires companies *or* integrated energy service companies
- ◆ But for that to happen, enlightened regulators will have to rewrite the rules of the game
- ◆ For the new rules to work, it will be necessary to involve those who intervene in utility rate cases, especially consumer advocates

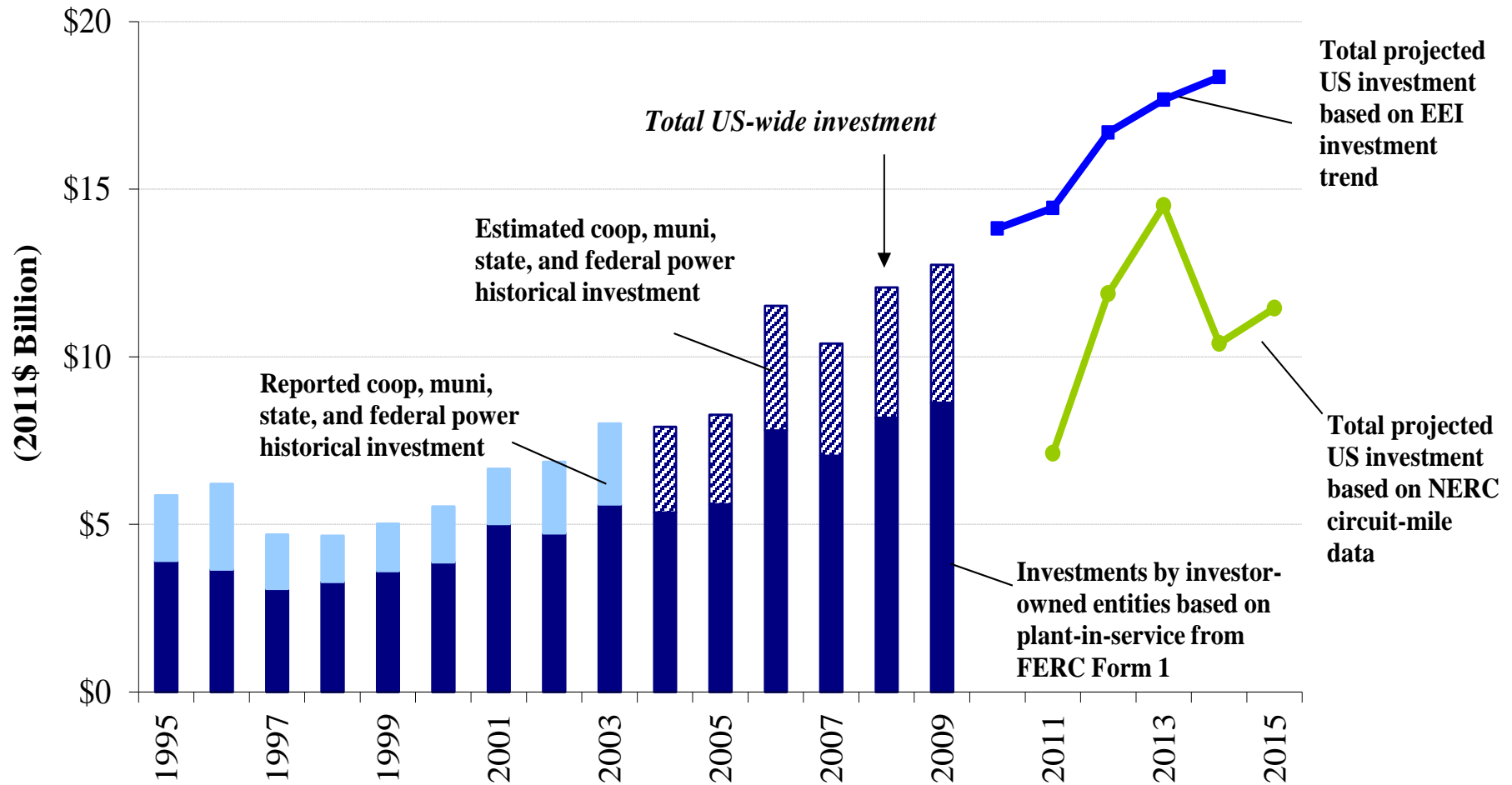
THE PROSPECTS FOR TRANSMISSION

Implications of slower sales growth on transmission investments

- ◆ A couple of years ago, *Brattle's* Johannes Pfeifenberger forecasted that transmission investments would average \$12-16 billion a year (see next slide)
 - He estimated that 1/3 of that would be driven by load growth, another 1/3 by renewable integration and economic projects, and the final 1/3 by replacement of aging infrastructure
- ◆ So if load growth drops to half of the previously expected amounts, that would shave off about \$2 billion a year in transmission investments
 - Some of this has already happened, as PJM has cancelled two major west-east lines (PATH and MAPP) due to reduced reliability needs caused by reduced load forecasts

Brattle's projections of transmission investments through 2015 made a couple of years ago

\$60-80 billion in projected (2011\$) investment for 2011-15



Sources and Notes: The Brattle Group © 2012. The Brattle Group, *Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada*, prepared by J. Pfeifenberger and D. Hou for WIRES, May 2011.

How does shale gas affect transmission?

- ◆ Low gas prices reduce coal-to-gas price differences and lower congestion between coal-heavy regions (such as the Midwest or Southwest) and gas-heavy regions, such as the east coast and California
 - This greatly reduces the potential for “economic” transmission projects because there is less congestion and relieving it is less valuable
- ◆ Low gas prices also undermine the economics of renewable power projects (wind and solar)
 - States will tend to soften their RPS standards or change them in a way (e.g., by allowing hydro imports from Canada to count against RPS) that will reduce the need to build and integrate renewable projects

Implications of reduced build-out of renewables

- ◆ This will require less transmission to get the remote renewables (e.g., in the Northwest/Southwest, the upper Midwest, the TX/OK panhandle) to load centers (e.g., the coasts, Chicago, eastern TX)
- ◆ On the other hand, the cost of renewable power projects (both wind and solar) has been dropping and there is good hope that the cost reduction is sufficient to offset the impaired economics due to low gas prices
 - In the Midwest wind power contracts have been signed at \$30/MWh, which makes them economic compared to conventional power

The bottom line

- ◆ Transmission investments are clearly under greater scrutiny but since much of the existing infrastructure was built in the 60s and 70s, replacement needs (and associated upgrade opportunities) will still drive investment decision
- ◆ We think the \$12-16 billion average annual investment amount may not drop by much more than 1/3
- ◆ However, recovering it over a smaller sales base may present some regulatory challenges

Continuing the conversation

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Continuing the conversation (continued)

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Biographical Information



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Dr. Faruqi has consulted on customer strategy with more than 50 utilities and transmission system operators and appeared before a dozen state and provincial commissions and legislative bodies. He has advised two dozen clients on demand forecasting issues.

In the past decade, he has developed models for forecasting monthly and hourly loads. He helped develop an hourly load forecasting model to assist a competitive wholesaler in bidding for default service. For a utility, he diagnosed why energy sales were below forecasts even after adjusting for the effects of the economy. He assisted a transmission system operator understand why peak demand was being under-forecast by a large amount. And he assisted a regulated provider of steam analyze the customer's decision to switch from purchasing steam to self-generating of steam.

More recently, Dr. Faruqi has been involved in the estimation of hourly, daily and monthly demand models in the context of dynamic pricing. Dr. Faruqi has managed the design and evaluation of large-scale dynamic pricing experiments in California, Connecticut, Florida, Illinois, Maryland and Michigan two of which have won awards.

His analysis of the factors that influence customer demand has been cited in publications such as The Economist, The New York Times, and USA Today and he has appeared on Fox News and National Public Radio. The author, co-author or editor of four books and more than 150 articles, papers and reports on efficient energy use, he holds a Ph.D. in economics from The University of California at Davis and B.A. and M.A. degrees from The University of Karachi.

Brattle's utility industry and regulatory experience

We bring institutional expertise in key industry subjects, including finance, resource planning, and regulatory experience:

- Climate Change Policy and Planning
- Regulatory Finance, Cost of Capital
- Demand Response and Energy Efficiency
- Electricity Market Modeling
- Energy Asset Valuation
- Energy Contract Litigation
- Environmental Compliance
- Fuel and Power Procurement
- Incentive Regulation
- Rate Design and Cost Allocation
- Regulatory Strategy and Litigation Support
- Renewables
- Resource Planning
- Retail Access and Restructuring
- Market-Based Rates and Competitive Analysis
- Mergers and Acquisitions
- Strategic Planning
- Transmission
- Valuation and Risk Management
- Wholesale Power Market Design

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