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Rethinking Electric Company Business Models

National Association of Regulatory Utility Commissioners
Staff Subcommittee on Accounting and Finance
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Discussion overview

The Math Does Not Lie

- Looking to 2020: Electricity Markets in Uncertain Times
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- The Numerator
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Beyond the Math

- A Time to Innovate?
- Disruptive Forces to Electricity Business Model
- Velocity of Disruption

Discussion overview

The New Math

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- Modeling Disruption in the U.S. Electric Sector
- New Market Entrants
- Evolving Electric Sector Business Models
- Electric Utility of the Future
- The Regulatory Clash

The math does not lie

Looking to 2020: Electricity markets in uncertain times

Between now and 2020, many unknown factors will impact the U.S. electricity sector, such as:

- The global and U.S. economy
- Coal, natural gas and nuclear fuel prices
- Federal and state energy policy and regulation
- The shale gas revolution
- Technological advances in energy
- Changing customer behaviors and demands

Despite uncertainty, if electricity sector stakeholders use a simple mathematical equation as the framework, they can focus on the variables and analyze them in relation to each other − **The math does not lie.**

The future can be evaluated with a simple mathematical equation

Cost of electricity sold ($)

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Number of kilowatt hours (kWh) consumed

=

Cost per kWh sold ($/kWh)

Variables in the equation

The Numerator: Cost of Electricity Sold	The Denominator: kWh Consumed
Capital and Operations Costs	**Consumption**
Capital costs • Generation, transmission and distribution additions • Environmental regulation compliance • Renewable portfolio standards • Nuclear safety regulations • Cost of capital/interest rates **Operations costs** • Cost of fuel, primarily natural gas and coal • Incremental operations costs of environmental compliance retrofits • New operating technologies	• Changes in weather • Changes in the economy • New sources of electricity demand • Technological advances in energy efficiency • Customer attitudes and behaviors

The numerator – Capital costs

Generation Investment

Aging fleet and early retirements

- Over $150 billion in new generation capacity from 2012-2020 – primarily gas fired.[1]

Transmission Investment

Grid reliability and renewables integration

- From $100-$120 billion in new transmission assets between 2012 and 2020.[2]

Distribution Investment

Changing infrastructure and smart meter installations

- $4.4 to $11.6 billion investment in new smart meters **alone** through 2015.[3]

[1] Estimate based on U.S. Energy Information Administration's (EIA) forecasts for new additional capacity, overnight capital costs, and lead time for various technologies.

[2] Based on The Brattle Group, Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada. Johannes P. Pfeifenberger and Delphine Hou, prepared for WIRES - Working Group for Investment in Reliable and Economic Electric Systems, May 2011.

[3] Based on $150-$400 per meter deployment cost, MIT, The Future of the Electric Grid. Dec 2011 and estimated 29 million smart meters to be deployed from mid 2012 through 2015 (IEE – Utility-Scale Smart Meter Deployments, Plans& Proposals, May 2012).

The numerator – Capital costs

Environmental
Compliance Investment

Evolving federal, state and local environmental regulations

- EPA's Mercury and Air Toxics Standards (MATS) - estimated incremental compliance cost of nearly **$55 billion** through 2020[1]

Renewables
Capacity Investment

Twenty-nine states have set mandatory Renewable Portfolio Standards (RPS) and eight states set voluntary goals

- U.S. needs to add **3.62 GW of** renewable capacity annually between 2012 and 2020 to meet RPS[2]

Nuclear
Safety Investment

New safety regulations required by the Nuclear Regulatory Commission (NRC) post-Fukushima will result in new compliance-related investment at nuclear plants

[1] U.S. Environmental Protection Agency, Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards, December 2011, p 3-14

[2] U.S. Partnership for Renewable Energy Finance "Ramping Up Renewables: Leveraging State RPS Programs and Uncertain Federal Support" 2012.

The numerator − Operations costs

Fuel for Electric Generation

Natural gas price needs to rise to ~\$4.50 to \$5.00/MMBtu[1] to make much of U.S. shale production economical

New Technologies

Recent technological advancements such as smart grid and electricity storage could decrease operations costs

Emissions Retrofits

Emissions retrofits' can increase electric plant operating costs other than fuel by over 50 percent[2]

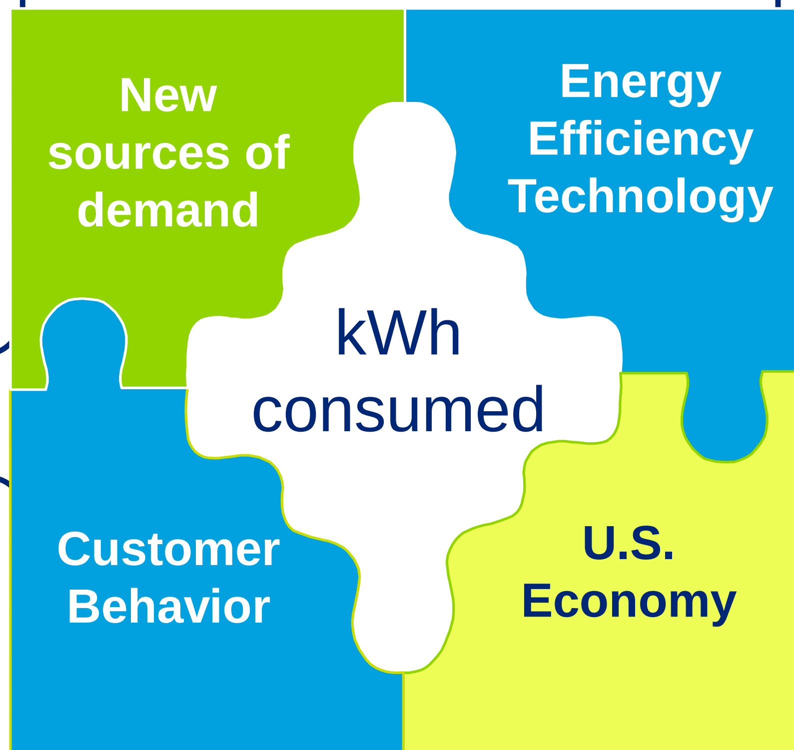
[1]Tim Roberts, Ethylene – Good Today, Better Tomorrow – A Year Later, Goldman Sachs Chemical Intensity Day, Lyondellbasell, March 2012

[2] Based on a sample 300 MW coal fired power plant and investment costs converted to \$/kWh using a 15 percent fixed charge rate and 60 percent capacity factor. Source: Jim Lazar and David Farnsworth, "Incorporating Environmental Costs in Electric Rates," Regulatory Assistance Project (RAP), October 2011, p.15

The denominator - Kilowatt hours consumed

- Increased electronics
- Computer server farms
- Electric vehicles (EV)
- Water management

- Technology advances in energy management
- Customers able to "do the same with less"



- Changing electricity consumption trends by businesses and consumers

- Permanent demand destruction
- Resurgence of U.S. manufacturing as result of shale gas

Increases kWh consumed

Uncertain Impact on kWh consumed

Decreases kWh consumed

Consumer resourcefulness extends to energy

Findings of Deloitte reSources 2012 Study* of over 2,200 demographically-balanced household decision makers:

- 83 percent of consumers reported they took steps to reduce their electricity consumption – up from 68 percent in the 2011 Study.

- The primary steps taken were behavioral in nature –
  - turning off lights,
  - shutting down electronics when not in use,
  - adjusting the thermostat in the summer and winter, and
  - changing over to compact fluorescent lights.

- While interest in purchasing smart energy technologies was relatively low, it was growing, with younger adults clearly more receptive to making the investment.

* Deloitte Development LLC. Deloitte reSources 2012 Studies: Insights into Corporate Energy Management Trends and Insights into Emerging Trends of Energy Customers. May 2012

Businesses' commitment to energy management practices intensifies

Findings of Deloitte's reSources 2012 Study* of business activities of over 600 companies with greater than 250 employees:

- 90 percent of U.S. businesses have set goals for managing electricity usage.
- Of these companies, 85 percent cite reducing electricity costs as essential to staying competitive – up from 76 percent in 2011.
- Other reduction goals:
  - Natural gas – 58%
  - Carbon footprint – 56%
  - Transport fleet – 51%
- The average target for reduction in electricity consumption is 23 percent over approximately a 3.5 year period.
- Other average target reductions:
  - Natural gas – 23%
  - Carbon footprint – 23%
  - Transport fleet – 25%
- 35 percent of businesses report some level of self-generation of electricity with another 17 percent planning to do so in the future.

* Deloitte Development LLC. Deloitte reSources 2012 Studies: Insights into Corporate Energy Management Trends and Insights into Emerging Trends of Energy Customers. May 2012

The math suggests a dilemma

The Dilemma

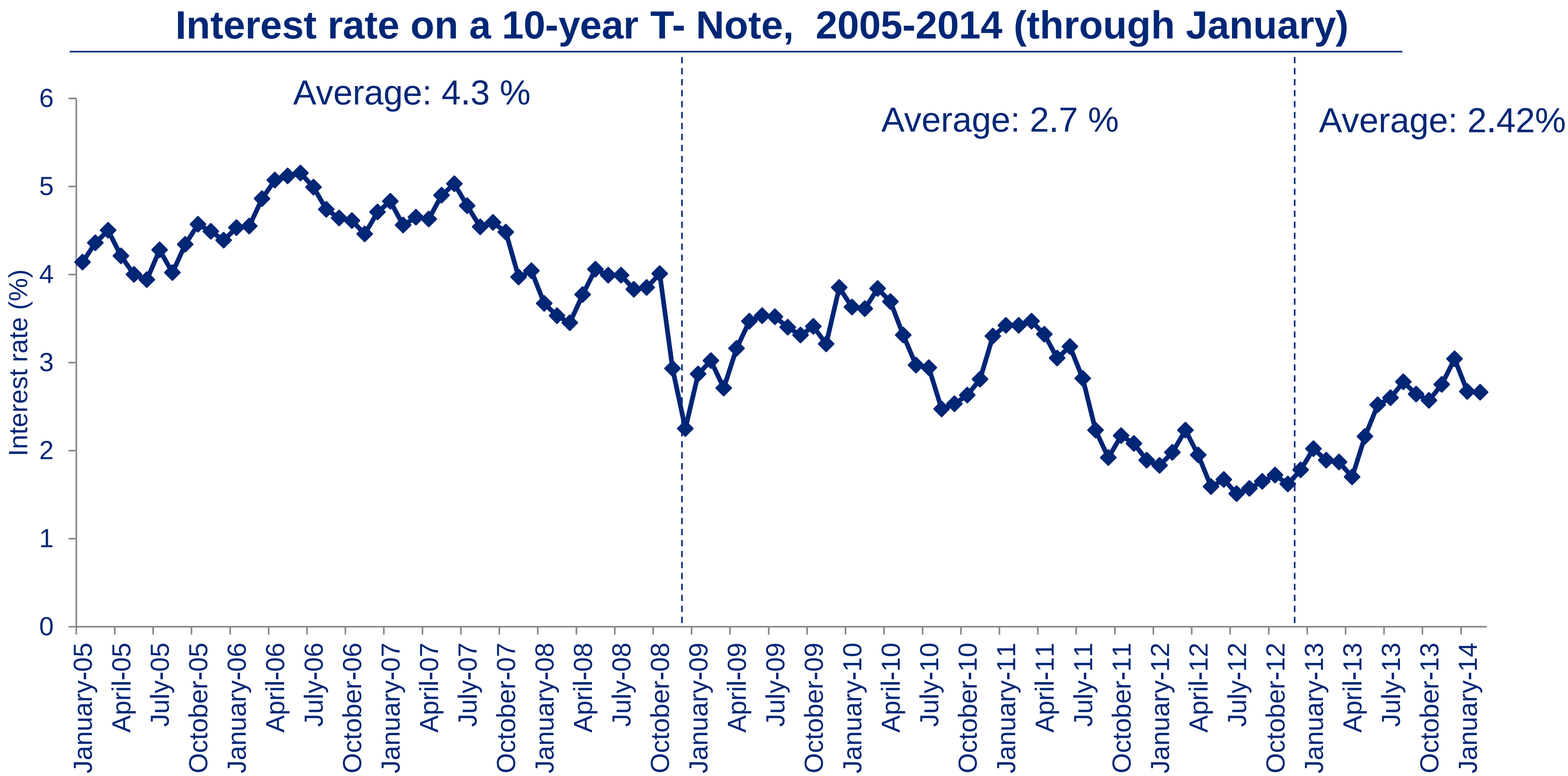
$$\frac{\text{Increased Costs}}{\text{Decreased kWh Consumed}} = \text{Higher Cost Per kWh}$$

- Will rising electricity costs and prices lead to further decreases in the denominator and even higher costs per kWh?
- Will the price to individual consumers invoke even greater end-user investment in energy efficiency?
- Will there be a wave of new, economically priced technologies designed to enable greater consumer and business control over their energy consumption?

Since variables affecting results will vary from company to company, **every company must do its own math.**

The numerator − Capital costs

Future interest rates remain uncertain but are likely to increase from the current record low



Source: U.S. Department of the Treasury

Beyond the math

A time to innovate?

The potential for dramatic disruption to the existing electricity business model is coming from many directions:

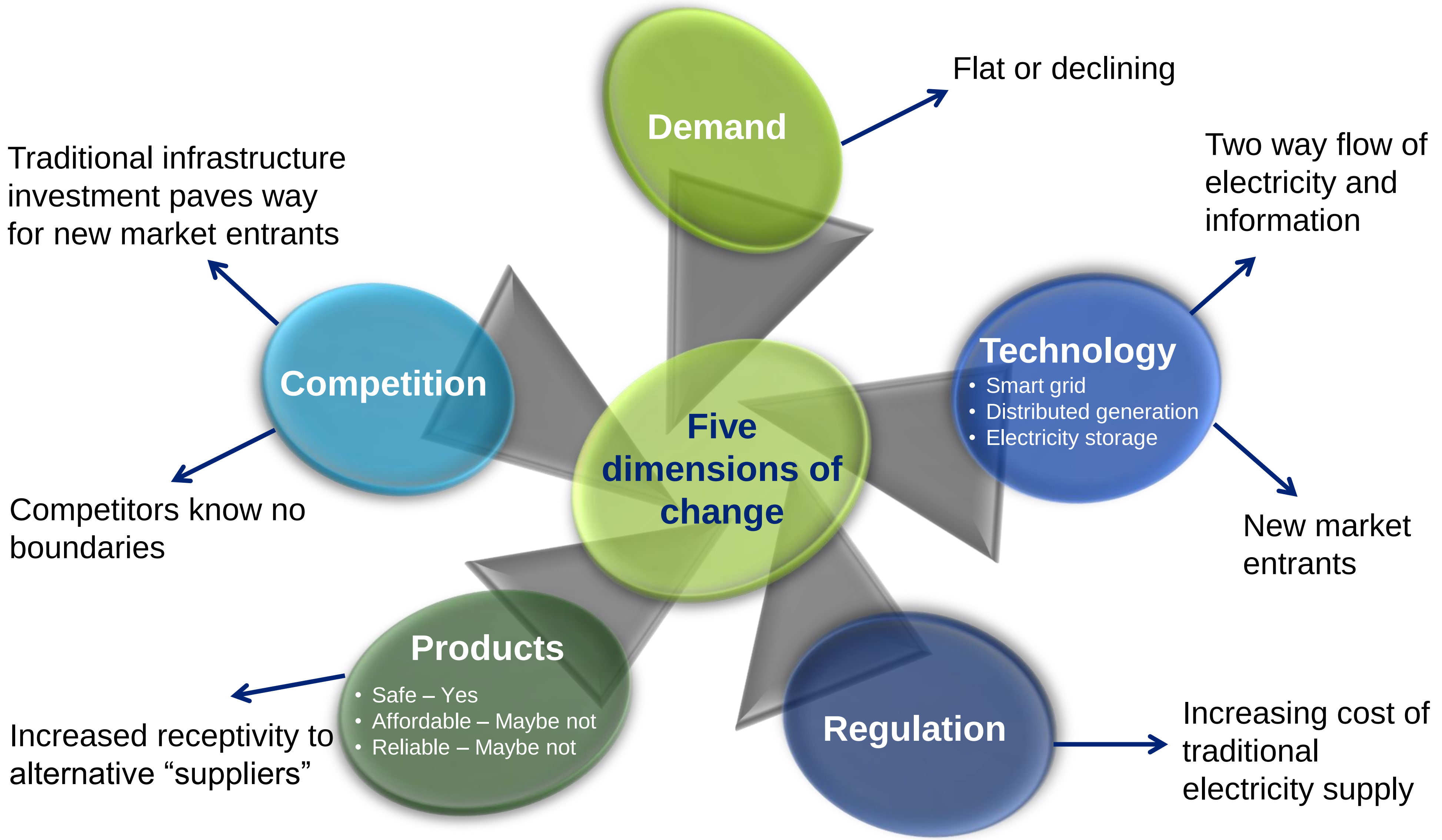
- Technological changes
- Moderating demand
- Extreme weather
- Costly regulation

These factors are challenging the foundation of the traditional electricity model: *the provision of safe, reliable, and affordable electricity to customers – in exchange for steady, predictable returns to investors.*

If **affordability** and **reliability** are called into question, so is the long-term viability of the current electric sector value proposition.

Disruptive forces to electricity business model

Disruption to the existing electricity business model along five dimensions requires electric power companies to consider new business models.



Velocity of disruption

Three scenarios paint the picture of the likely potential for significant disruption:

Dimensions of Change	Scenario 1 Most Disruptive	Scenario 2 Most Likely	Scenario 3 Least Disruptive
Demand (electricity consumption) (higher or lower)	Lower	Lower	Higher
Technology Change (high or low)	High	High	Low
Regulation (more, same, less)	More	More	Less
Products (new or existing)	New	New	Existing
Competition (more, same, less)	More	Same (in short term)	Less

The math in action

The numerator is going up and the denominator may well be going down, over time, for the first time in the history of the U.S. electric industry

The Math at Work

The numerator – capital costs

- **New generation** ↑
  - – Aging plants
  - – Early retirements
- **New transmission and distribution** ↑
  - – Reliability
  - – Smart grid
  - – Renewable portfolio standards
- **Environmental – Emissions restrictions** ↑
  - – Capital retrofits
  - – Parasitic load
- **Interest rates** ↑

The numerator – operations costs

- **Fuel** ↑
  - – Natural gas at historic lows
- **Emissions retrofits** ↑
- **New technologies** ↓

The denominator – killowatt hours consumed

- **New sources of demand** ↑
- **Impact of Recession** ↔
- **Efficiency technology advances** ↓
- **Distributed generation** ↓

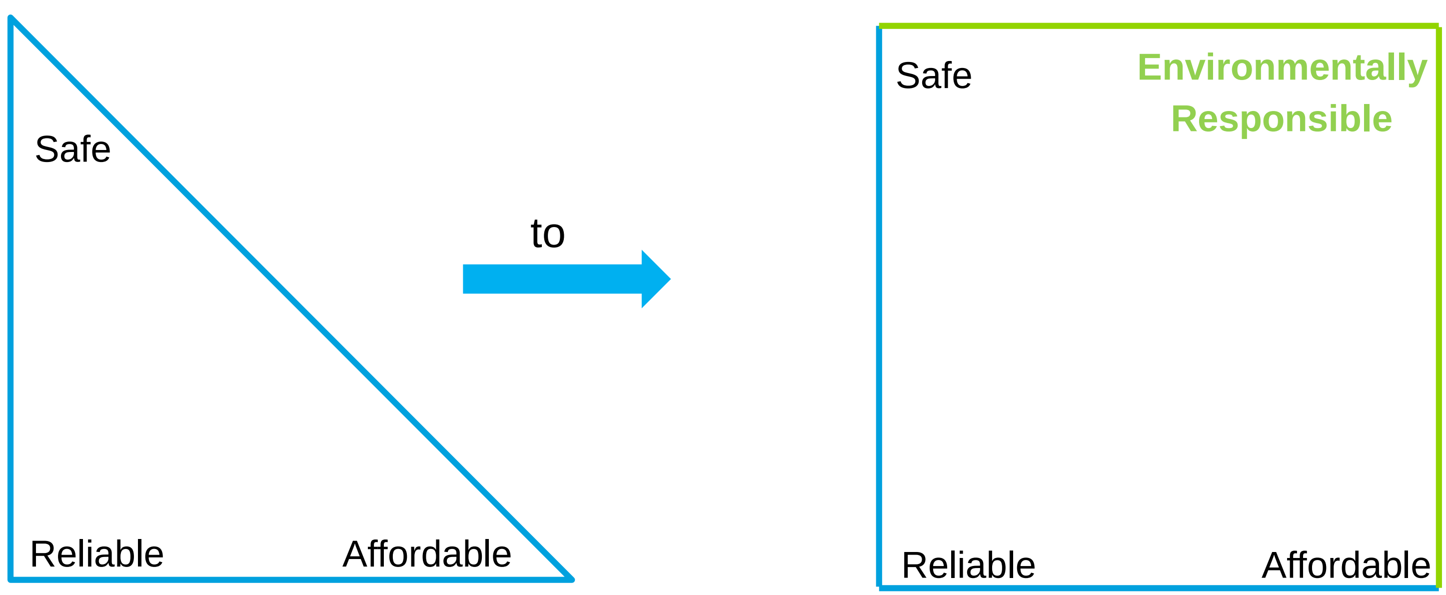
	2008	2009	2010	2011	2012	2013	2014E
Annual change in electricity consumption	-0.63%	-3.67%	4.38%	-0.10%	-1.50%	0.33%	0.43%

The new math

Solving for coming disruption

A fundamental shift is already occurring in the electric sector's relationship with the marketplace.

License to Do Business



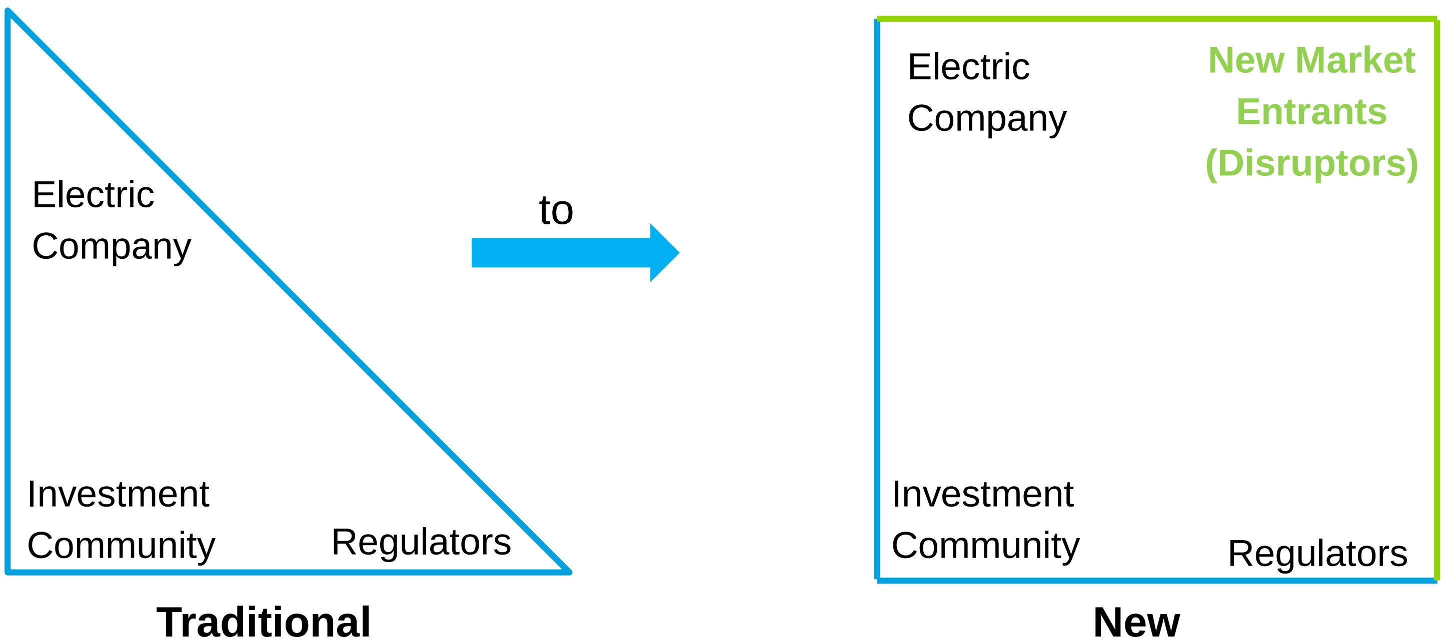
Traditional **New**

Environmentally responsible electricity is no longer an option.

Solving for coming disruption

Participants in the Game of Providing Electric Services

Key stakeholders are:



Disruption = Circumstances where traditional central generating station model ceases to function as the primary provider of safe, reliable, affordable and environmentally responsible electric service to customers – businesses and consumers.

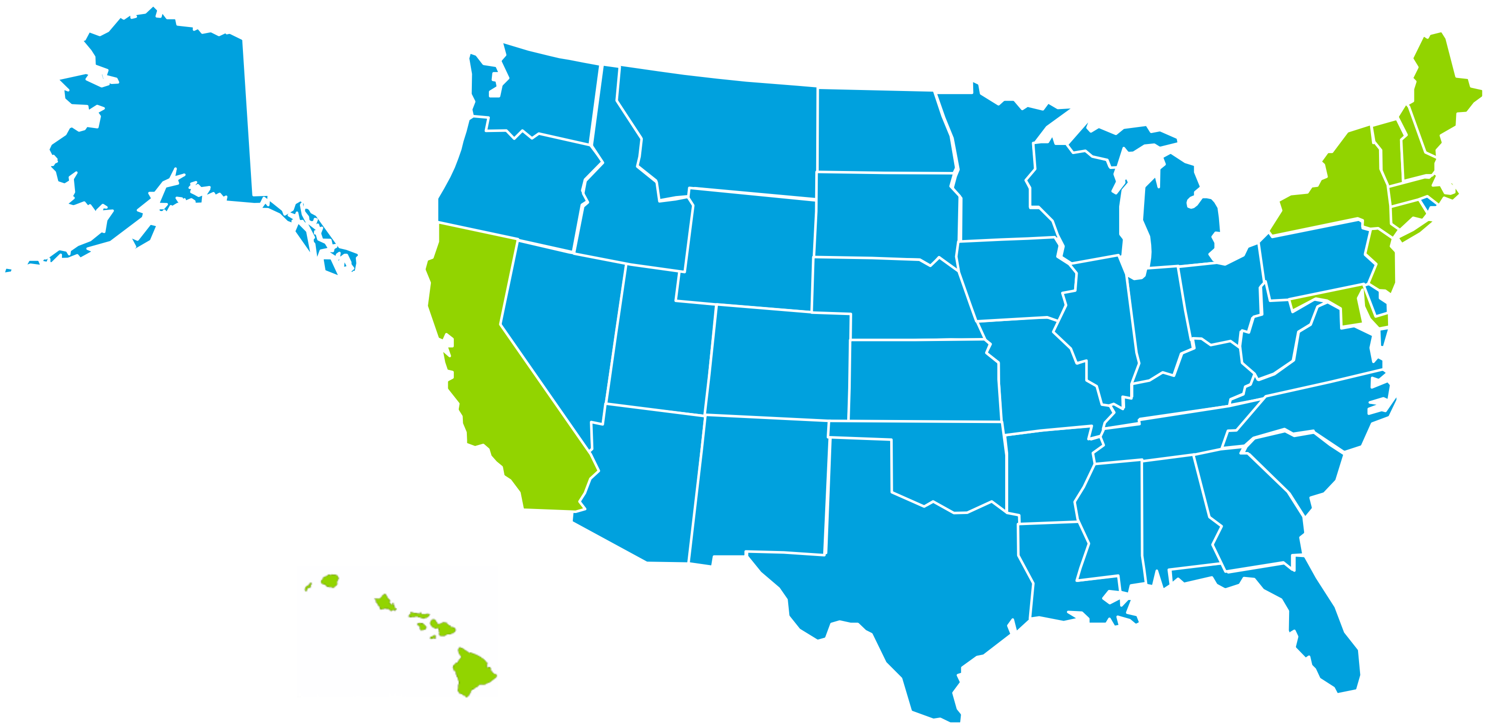
Modeling disruption in the U.S. electric sector

- Disruption will occur at different times and in different ways across the U.S. that is subject to predictive modeling
- Disruption was modeled state by state across four dimensions:
  - **Demand** for electricity
  - Investments in new electric service **technologies**
  - Customers' incentives to purchase electric service **(product)** from other sources
  - Magnitude of **policy and regulation** promoting environmentally responsible electricity and energy management
- Model was designed to divide the 50 states into 5 tiers of 10

Findings of the model

States where disruption is most likely to occur first (Top Tier):

- California
- Hawaii
- Maryland
- Connecticut
- New Jersey
- Maine
- Vermont
- Massachusetts
- New York
- New Hampshire



New market entrants

New market entrants are businesses that provide electric services previously provided by regulated utilities or power generators, or that offer new services previously not widely available to electric customers.

- New market entrants can provide services:
  - ➢ Up to the electric meter
  - ➢ Behind the electric meter
- Emerging behind the meter services include:
  - ➢ Distributed solar
  - ➢ Fuel cells
  - ➢ Small scale natural gas generation
  - ➢ Electricity storage
  - ➢ Microgrids
  - ➢ Energy management hardware and software
- Recent trends of new market entrants suggest:
  - ➢ Changing role of new market entrants
  - ➢ Maturity curve for new technologies is short
  - ➢ Solutions to solar affordability barrier exist

Evolving electric sector business models

Electric Sector business models can be examined across four dimensions:

Defensive	or	**Offensive**
	AND	
Up to the meter	or	**Behind the meter**

Behind the meter strategies are the "new frontier" of opportunity and risk created by:

- Developing technologies – particularly distributed solar and storage
- Changing face of electric customer
- Evolving "energy management mandate"

Under the new license to do business, environmentally responsible electricity will come at a price and will create an energy management mandate.

The electric utility of the future

Envision an electricity marketplace where the line between offensive and defensive strategies will blur.

The electric transmission system will function largely to deliver power from large scale renewables.

The electric distribution system will function largely as a “network” manager responsible for ensuring reliability by managing variable supply and demand in a manner that achieves maximum energy efficiency.

- Will manage both in front of and behind the meter
- May or may not own assets behind the meter

The business model will look more like an information company than a seller of electrons.

Potential game changers

Forces other than technology will also shape what constitutes a successful business model. Two potential game changers are:

- Changing face of the electric customer
  - Energy costs impact the corporate bottom line
  - The birth of the resourceful consumer
- Broadband = The gateway behind the customer’s meter?

The regulatory clash

There is an inherent trade-off between the elements of the license to do business:

Cost of Affordable Electricity

Safe + Reliable + Environmentally Friendly = Affordable Electricity

Definition of affordable can no longer mean lowest price to customers.

Must consider the maximum level of acceptable risk and what it will cost to ensure that level is not exceeded.

Q & A

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