

# Grid 2.0: Energy in a Distributed, Competitive, Low-Carbon World

Rocky Mountain Association  
of Energy Engineers

16<sup>th</sup> Annual Energy Forum

Remarks of Ron Binz

Denver, Colorado • October 22, 2015

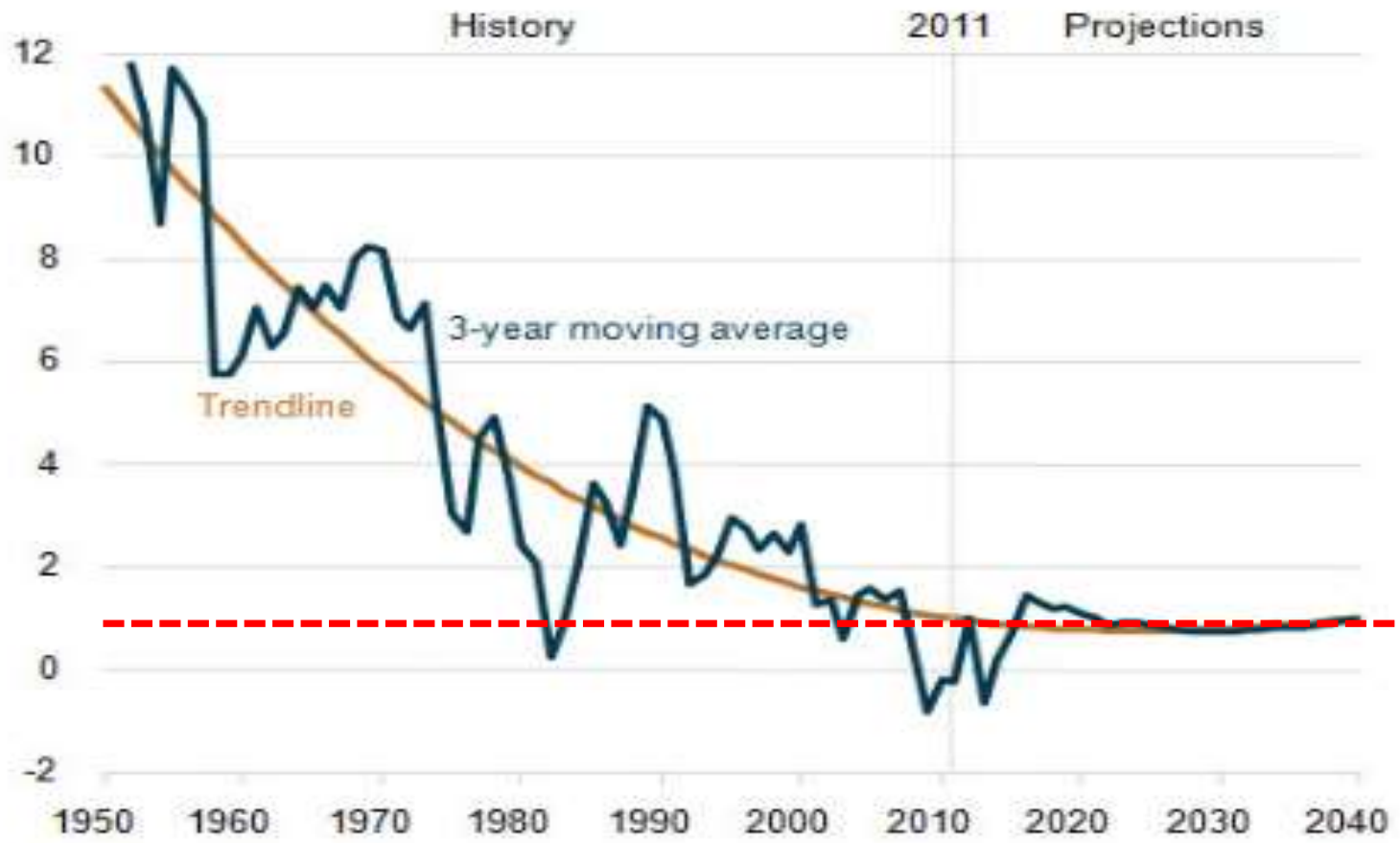
# What is “Grid 2.0?”

- The name given to the fundamentally changed electric power sector.
- Elements of Grid 2.0:
  - Transactive energy
    - Intelligent agents
  - Significant levels of distributed resources
  - Clean energy resources
  - New regulatory methods

# Why is This Happening?

- IT applied to the power sector
  - Consider Entertainment, Communications, Commerce, Education, Research, News, Banking, Social Connections, ***Knowledge***
- Environmental requirements
- Consumer empowerment
- Liberalization; trust in markets
- Changing electricity use

Figure 75. U.S. electricity demand growth, 1950-2040 (percent, 3-year moving average)





# Why “Transactive?”

Transactive Energy:

*A set of economic and control mechanisms that allows the dynamic balance of supply and demand across the entire electrical infrastructure using value as a key operational parameter.*

*-GridWise Architecture Council*

# Why “Transactive?”

- Enabled (forced?) by Internet of Things
- Every source and load can transact with any other source or load.
- Frequent, small transactions
- No hierarchy
- Relies on forward contracts, spot market

**Figure 1-7. The Transactive Energy Process is straightforward. There are tenders and transactions. There are two kinds of transactions: “forward” and “spot.”**



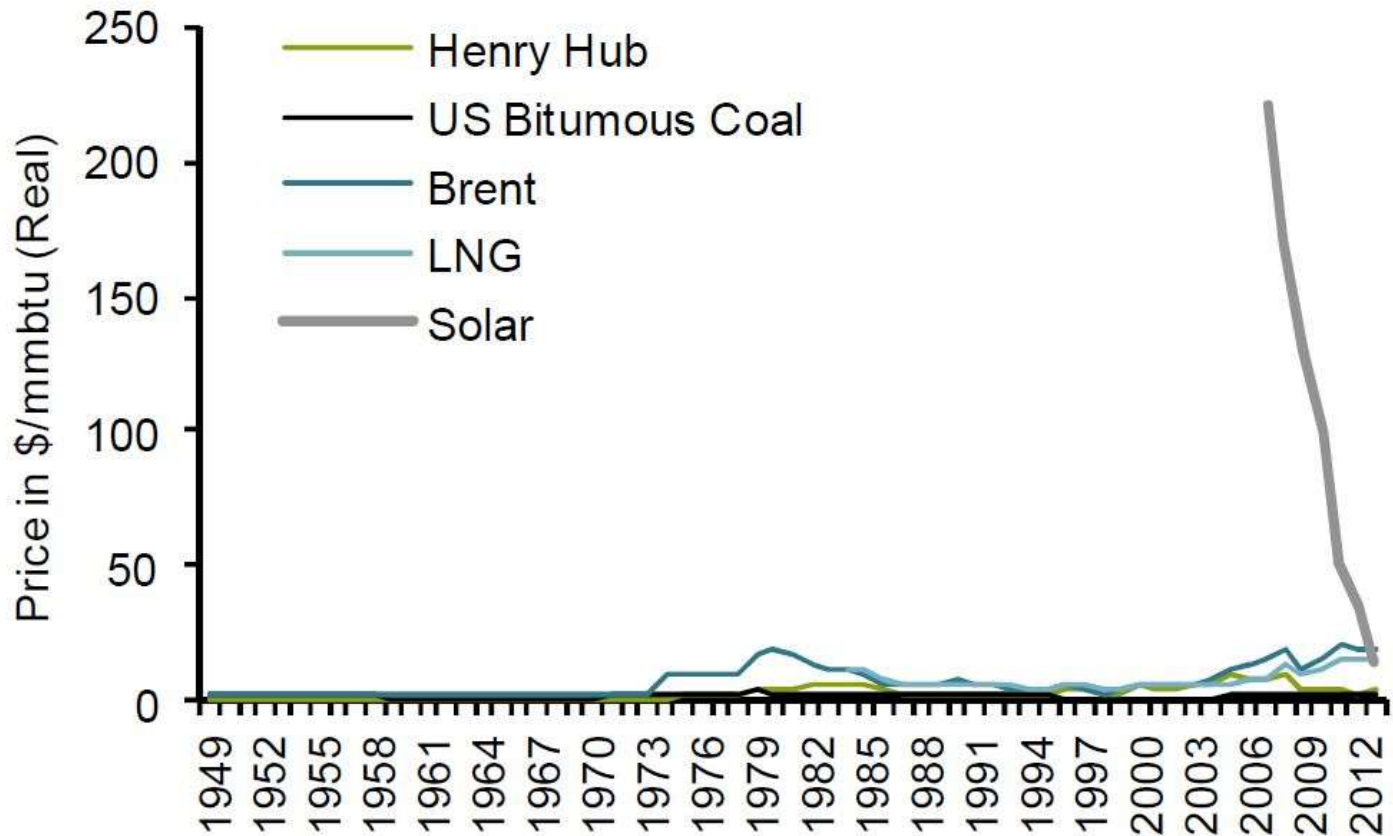
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Credit: Dr. Edward Cazalet



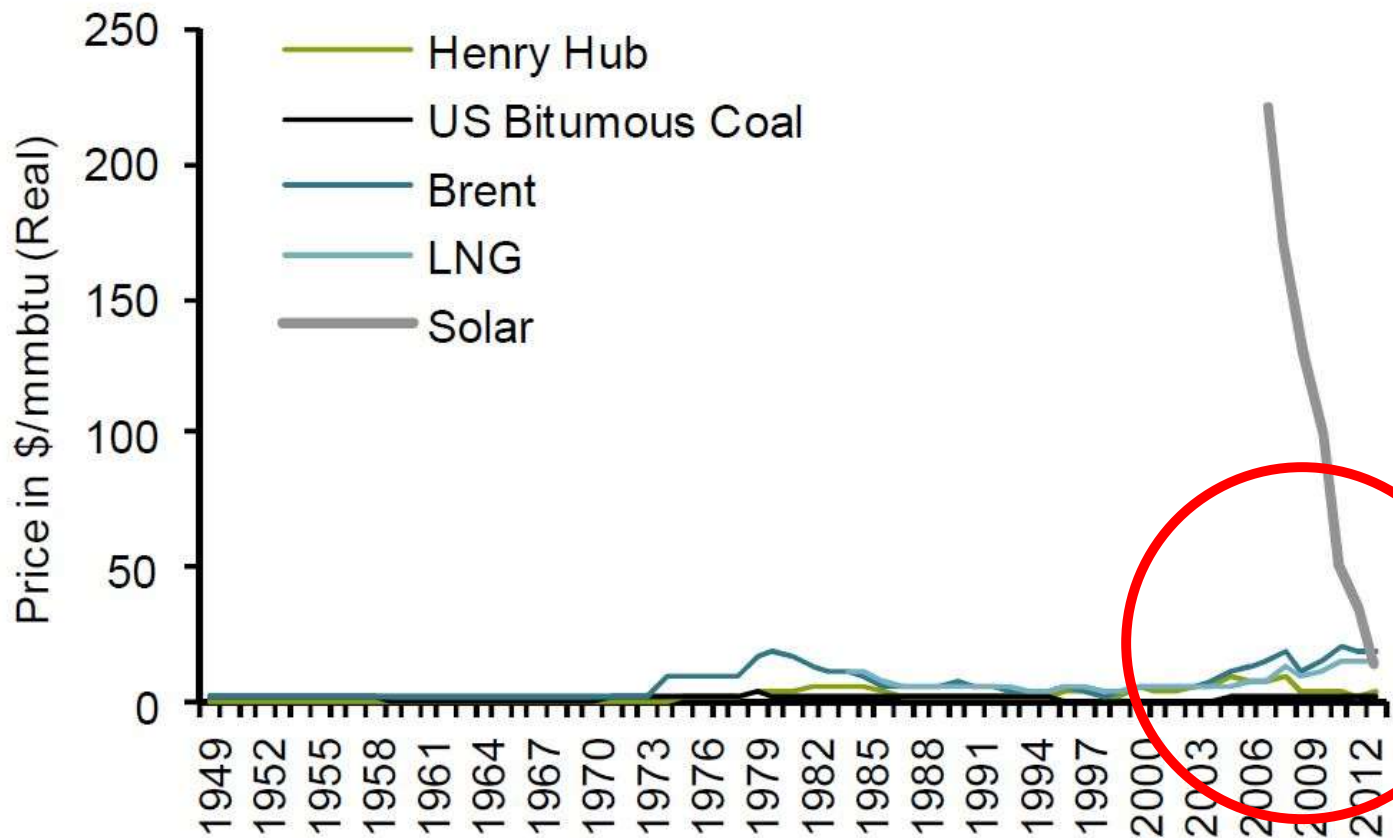
Why “Clean?”

## Welcome to the Terrordome... \$/MMBTU by Energy Type

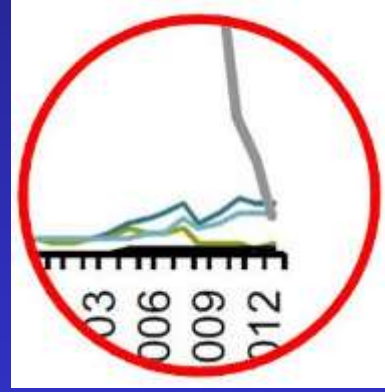


Source: EIA, CIA, World Bank, Bernstein analysis

## Welcome to the Terrordome... \$/MMBTU by Energy Type



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# NREL's estimate of continued cost reductions for wind energy

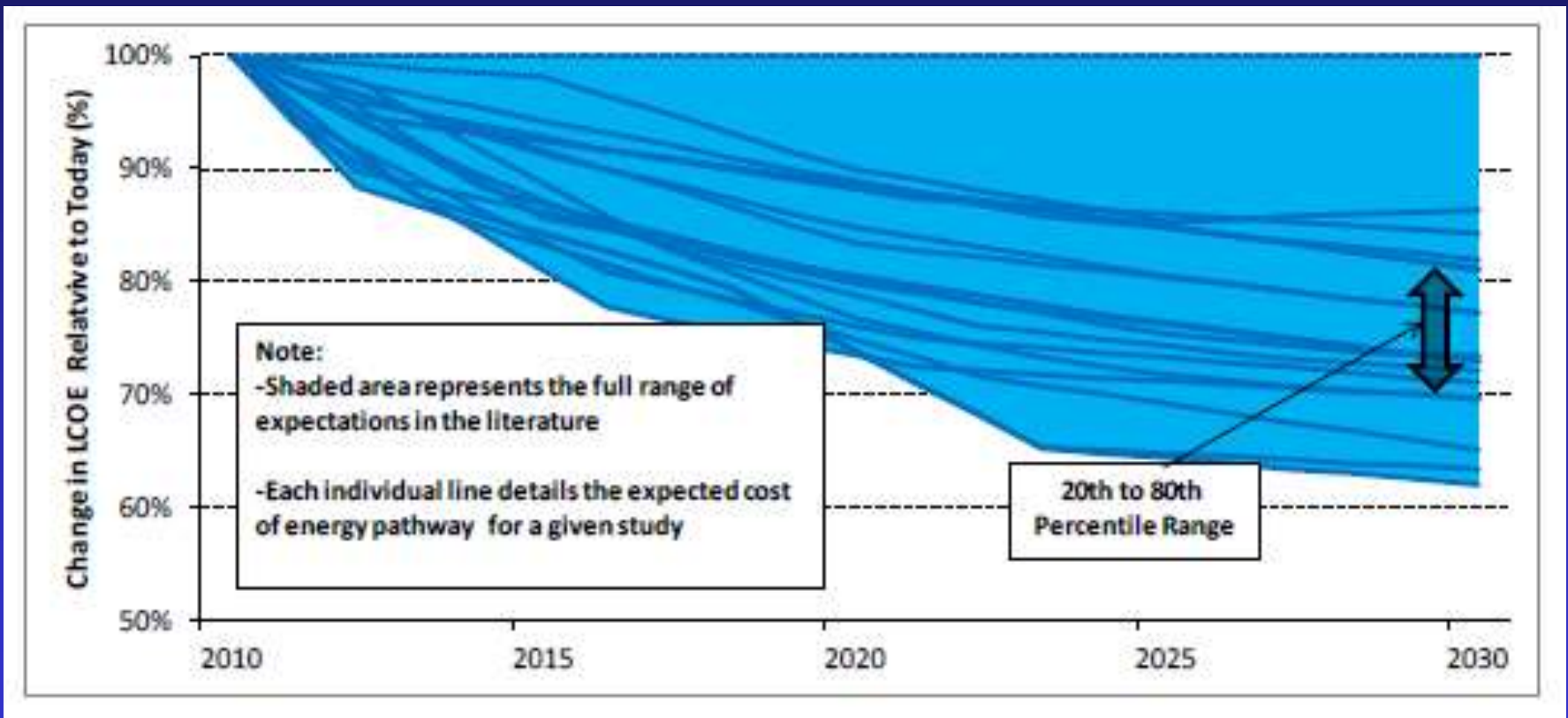
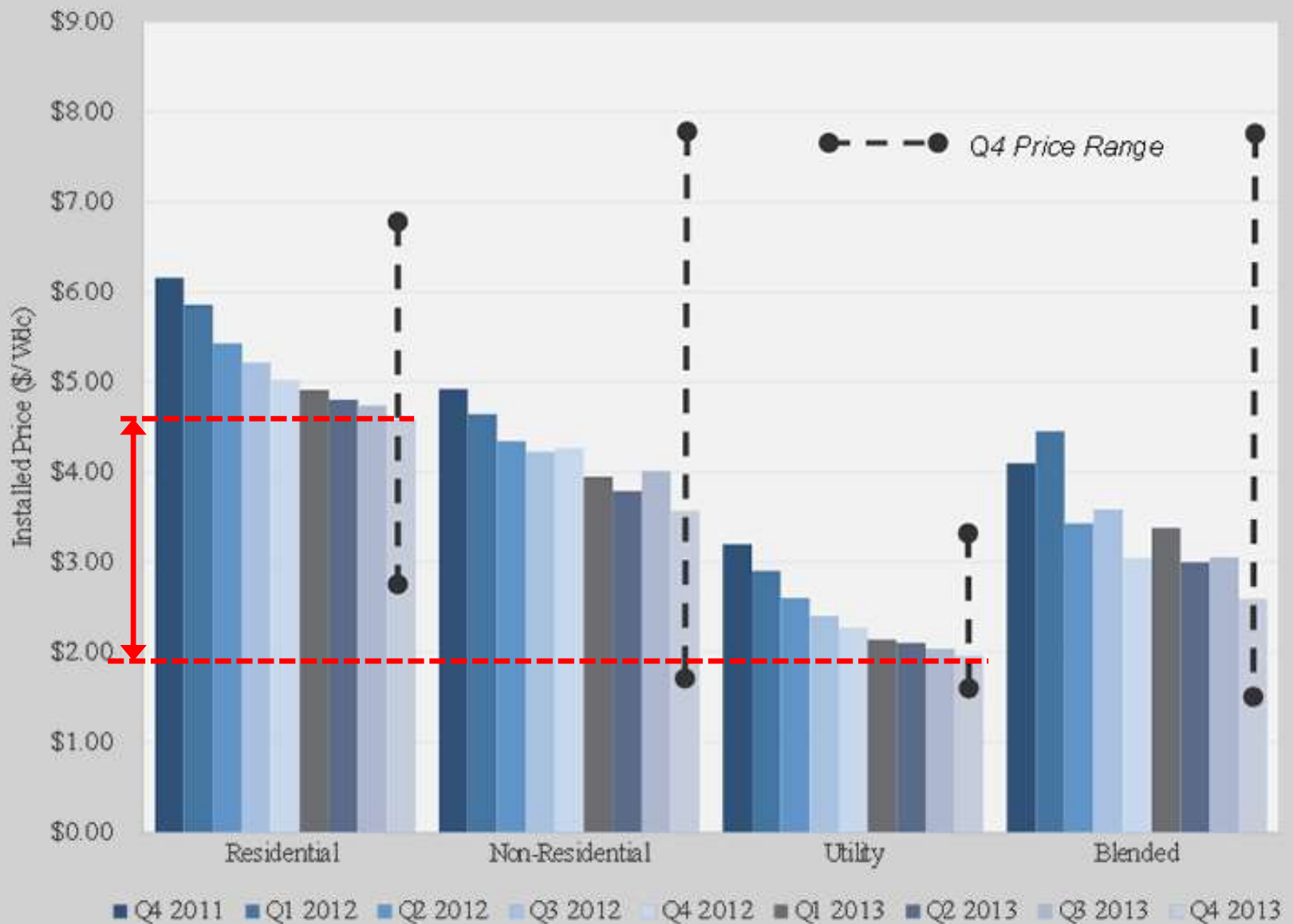
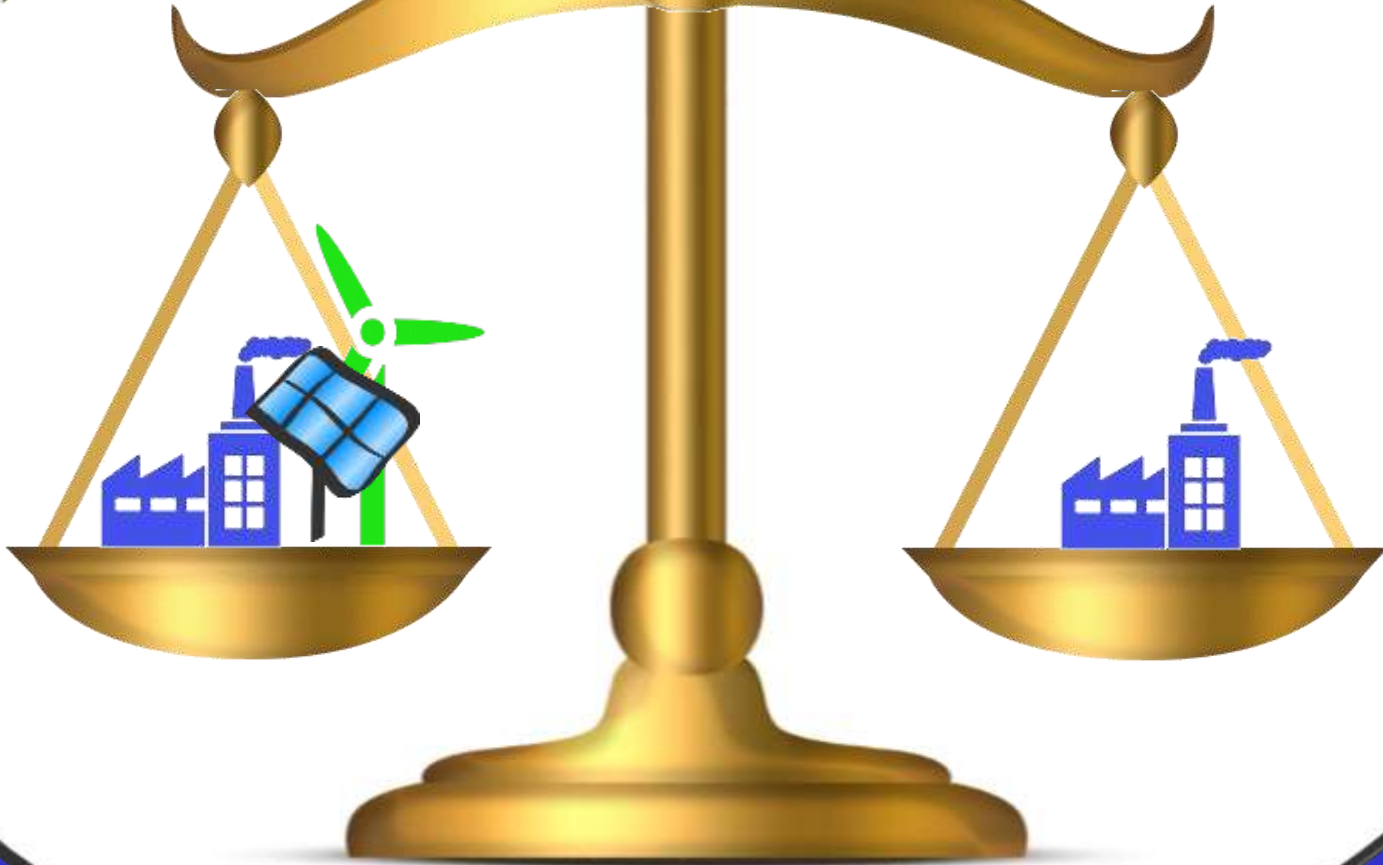


Figure 2.12 Average Installed Price by Market Segment, Q4 2011-Q4 2013



# The Scales of Utility Costs



# The Scales of Utility Costs





# The Take-Aways

- A gas plant plus a wind farm and a solar field
  - Can cost less than a gas plant alone
  - Can lower utility revenue requirements
  - And lower rates
- This analysis doesn't even count
  - Avoided carbon emissions
  - Economic development impacts

Why “New Regulatory Methods?”



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## Two Steps Forward

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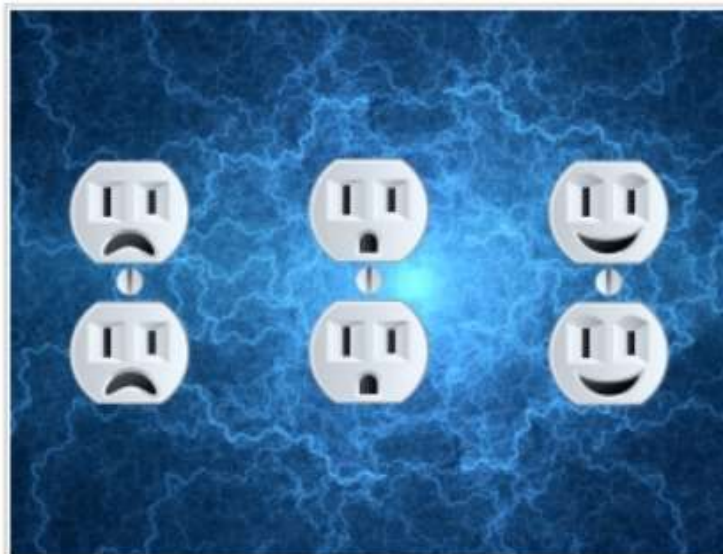
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### EDITOR'S CHOICE



**Why American Eagle hand-me-downs**  
**Slow Meat: 5 eating h**  
**Industry**

### VERGE SAN FRANCISCO



*Editor's note: Transforming the electricity grid will be a theme woven throughout [VERGE SF](#), including [eLab Ignite](#), a half-day workshop on October 27, presented in association with [Rocky Mountain Institute](#).*

Forget Peabody Coal, the Koch Brothers and all the rest. Never mind the frackers and miners. And don't pin your hopes on Solar City, Tesla and their ilk.

For all the power and influence of the major gas, coal, nuclear and renewable energy companies and their lobbyists, changing how electricity is

# Utilities 2020

- Foundation funded
- Conducted by Ron Binz and Ron Lehr, two former Colorado regulators
- Goal: to explore new business models and advocate new regulatory models to enable new utility business models to evolve.

- Thesis: Utilities must develop a set of new business models
- Thesis: Today's regulation may not be up to the task
  - Rarely rewards utilities for desired behavior
  - Lack of incentives for
    - firm efficiency
    - clean energy investment
    - energy efficiency
    - innovation
  - Rate structures need revision
  - Focus on commodity sales
  - Balky, judicial process

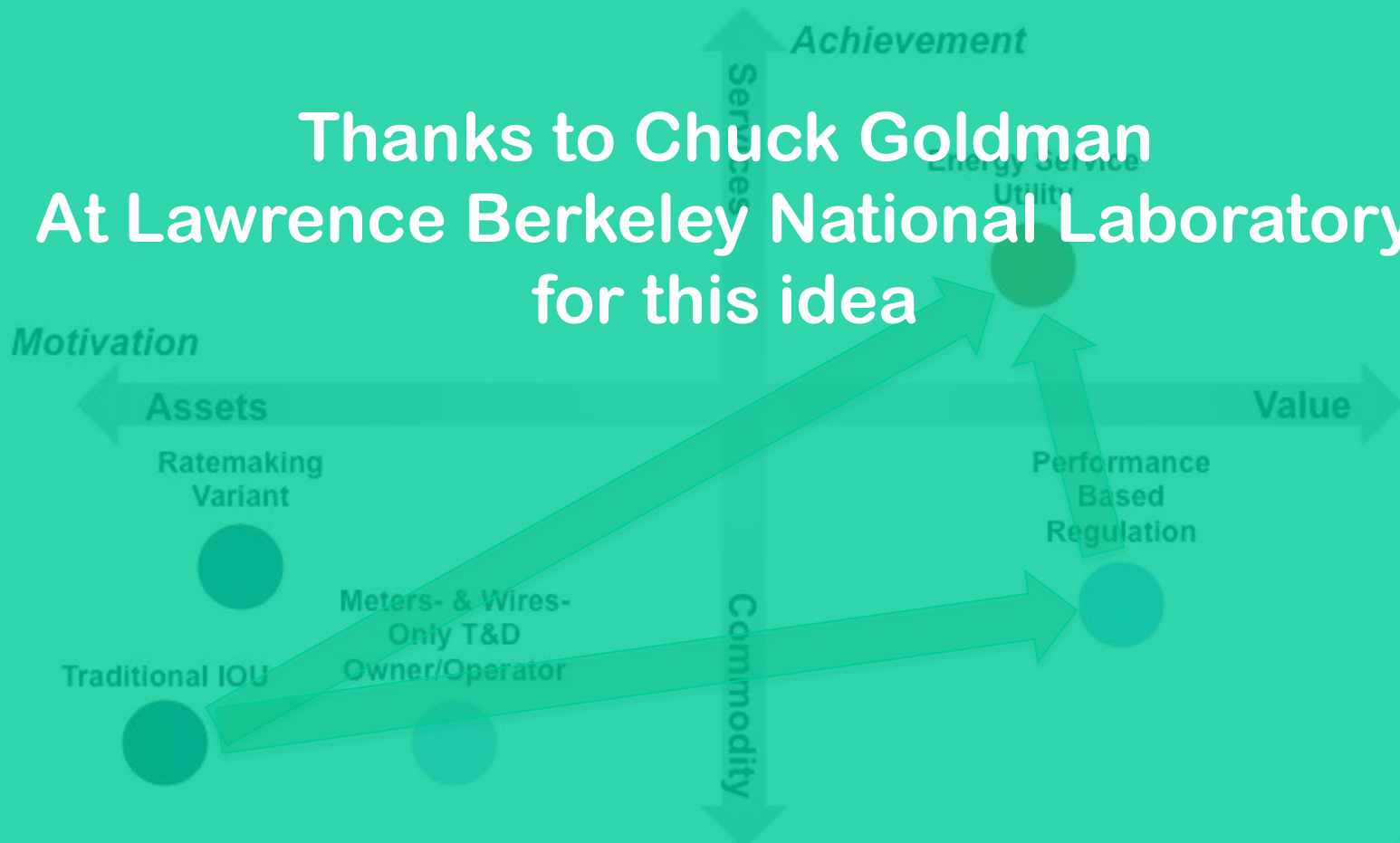
# Three Potential Regulatory Models

- The UK “RIIO” model
  - Price cap built on RPI-X
  - Output regulation
    - Reliability, Environmental, Innovation, Price, Efficiency, Social Responsibility
- The “Iowa Model”
  - Seventeen years of constant rates, settlements
- The “Grand Bargain”
  - Comprehensive multi-year output-oriented deal
  - Regulator led



# Continuum of Utility Business Models: Profit Motivation vs. Profit Achievement

Thanks to Chuck Goldman  
At Lawrence Berkeley National Laboratory  
for this idea



# Thank You

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