
SMART *power*

Climate Change, the Smart Grid,
and the Future of Electric Utilities

Electric Utility Business and Regulatory Models of the Future

Peter Fox-Penner
The Brattle Group
1850 M Street, NW Suite 1200
Washington, DC 20036
www.brattle.com

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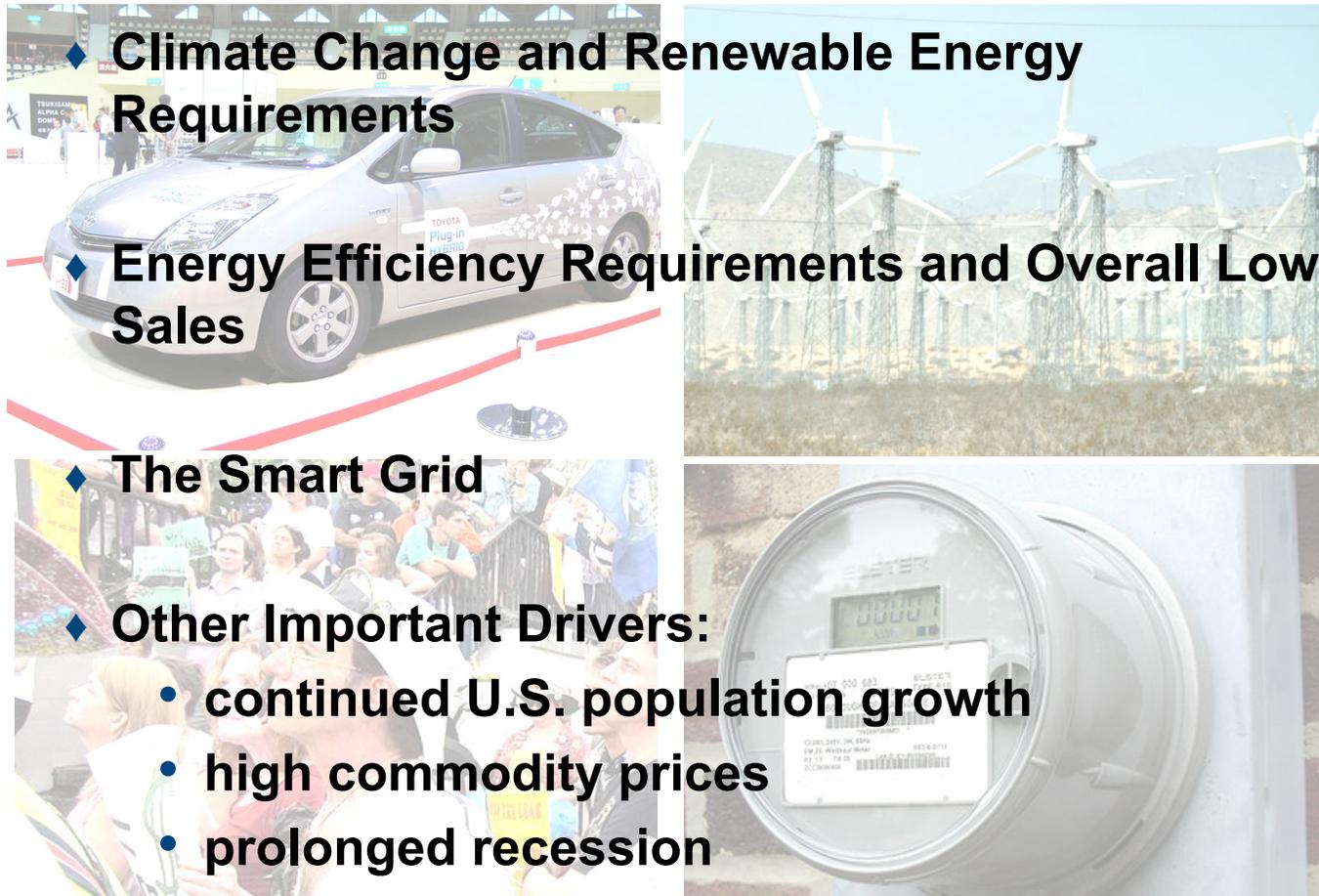


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Overview

- ◆ Brief Review of the Change Drivers
- ◆ Very Basic Business and Regulatory Models of the Future

Electricity Utilities Are Getting Hit By the Biggest Changes in Their History

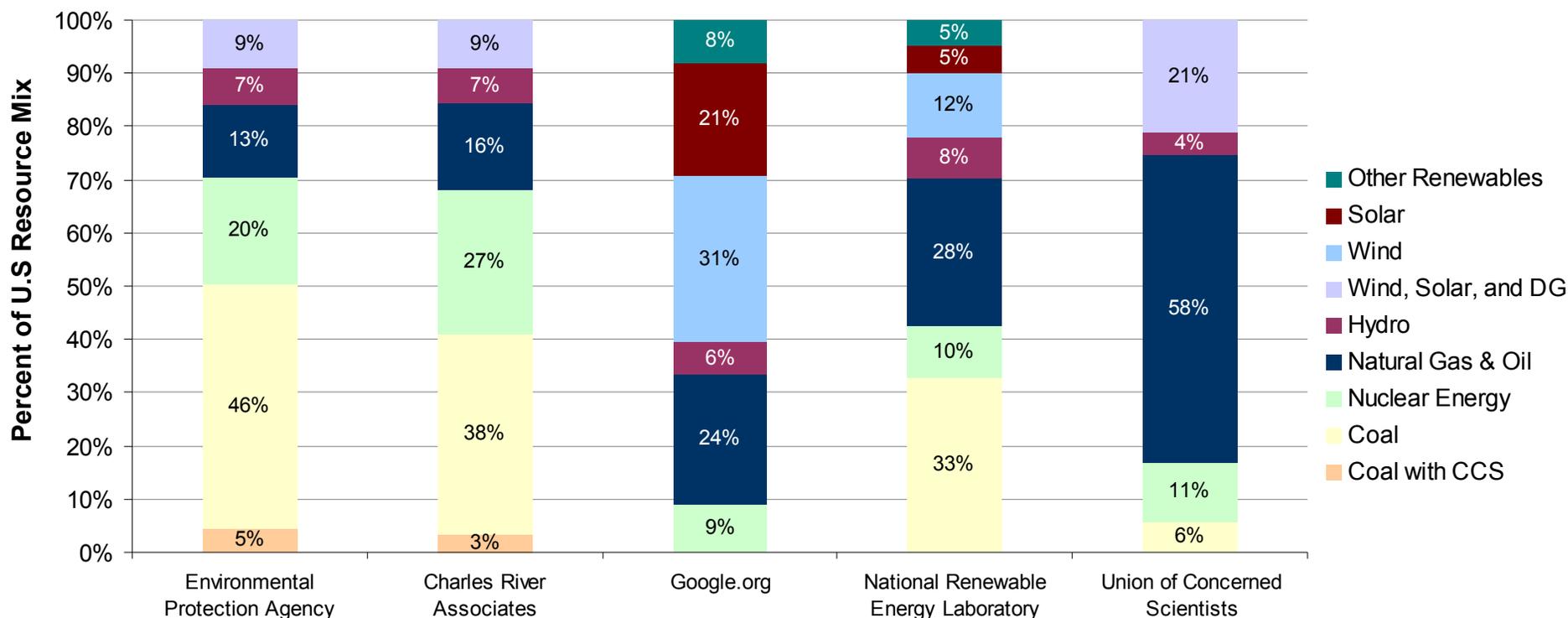


- ◆ **Climate Change and Renewable Energy Requirements**
- ◆ **Energy Efficiency Requirements and Overall Low Sales**
- ◆ **The Smart Grid**
- ◆ **Other Important Drivers:**
 - continued U.S. population growth
 - high commodity prices
 - prolonged recession

Photo Sources (From top left, clockwise): PHEV-MJTR. Edited with PS by Mariordo. Toyota Prius Plug-in Hybrid exhibited in Tokyo, 2008. 8 September 2008. Flickr; Wind Farm- Vincent McMorow-Purcell. Wind Farm, Palm Springs, California. August 21, 2004. FreeFoto.com; Smart Meter- Zuzu. Elster Type R15 electricity meter. 20 May 2008. Wikimedia Commons; Infrogmation of New Orleans. BP Oil Flood Protest, Jackson Square. Protest againsts the great oil spill disaster in the Gulf of Mexico. 30 May 2009. Infrogmation (talk) of New Orleans.

A Rapidly Changing Resource Mix

Projected U.S. Resource Mix in 2030



Notes: Totals may not add to 100% due to rounding. DG stands for distributed generation.

Sources: "EPA Analysis of the American Clean Energy and Security Act of 2009, H.R. 2454 in the 111th Congress", U.S. Environmental Protection Agency, June 23, 2009.

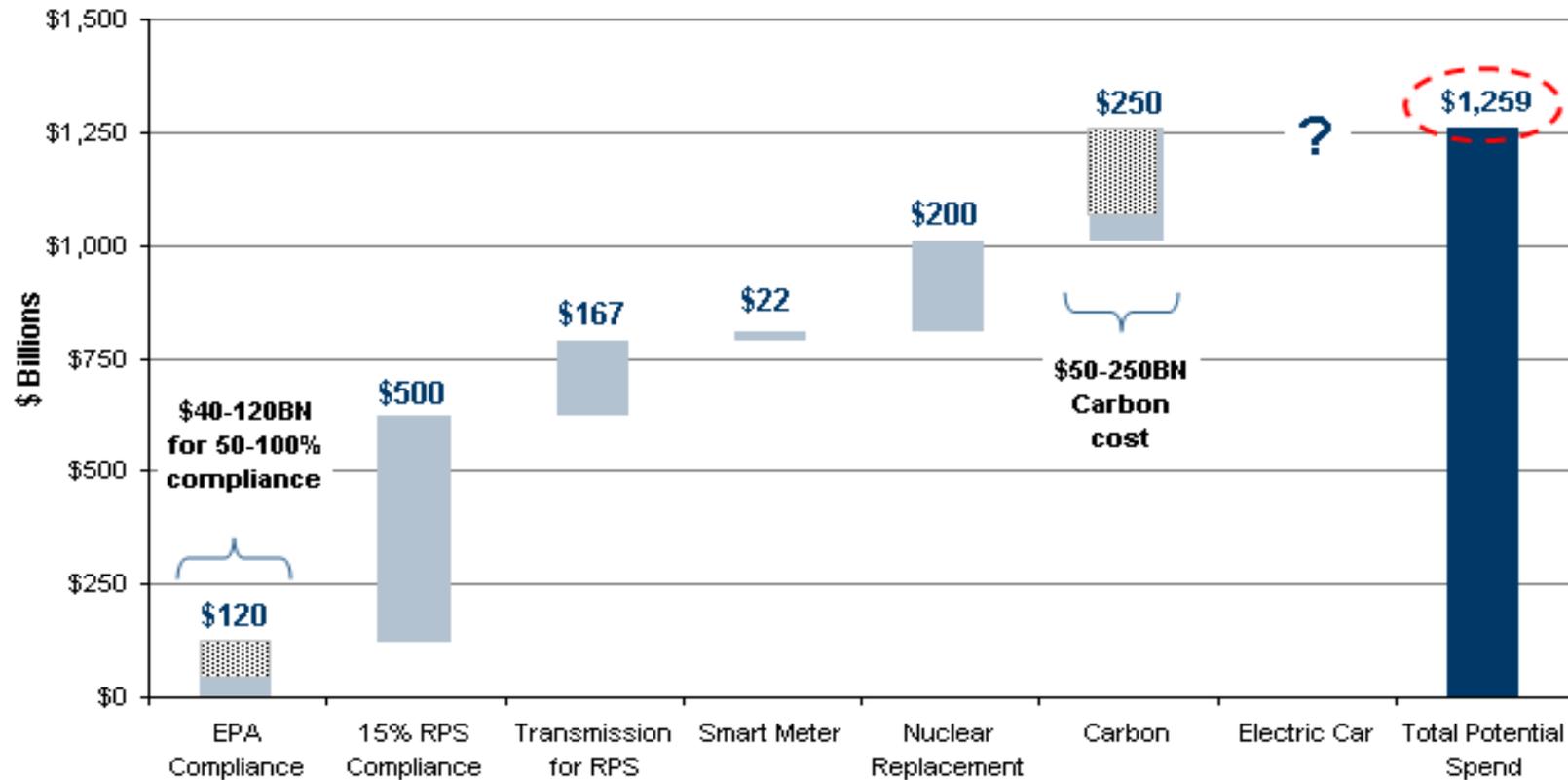
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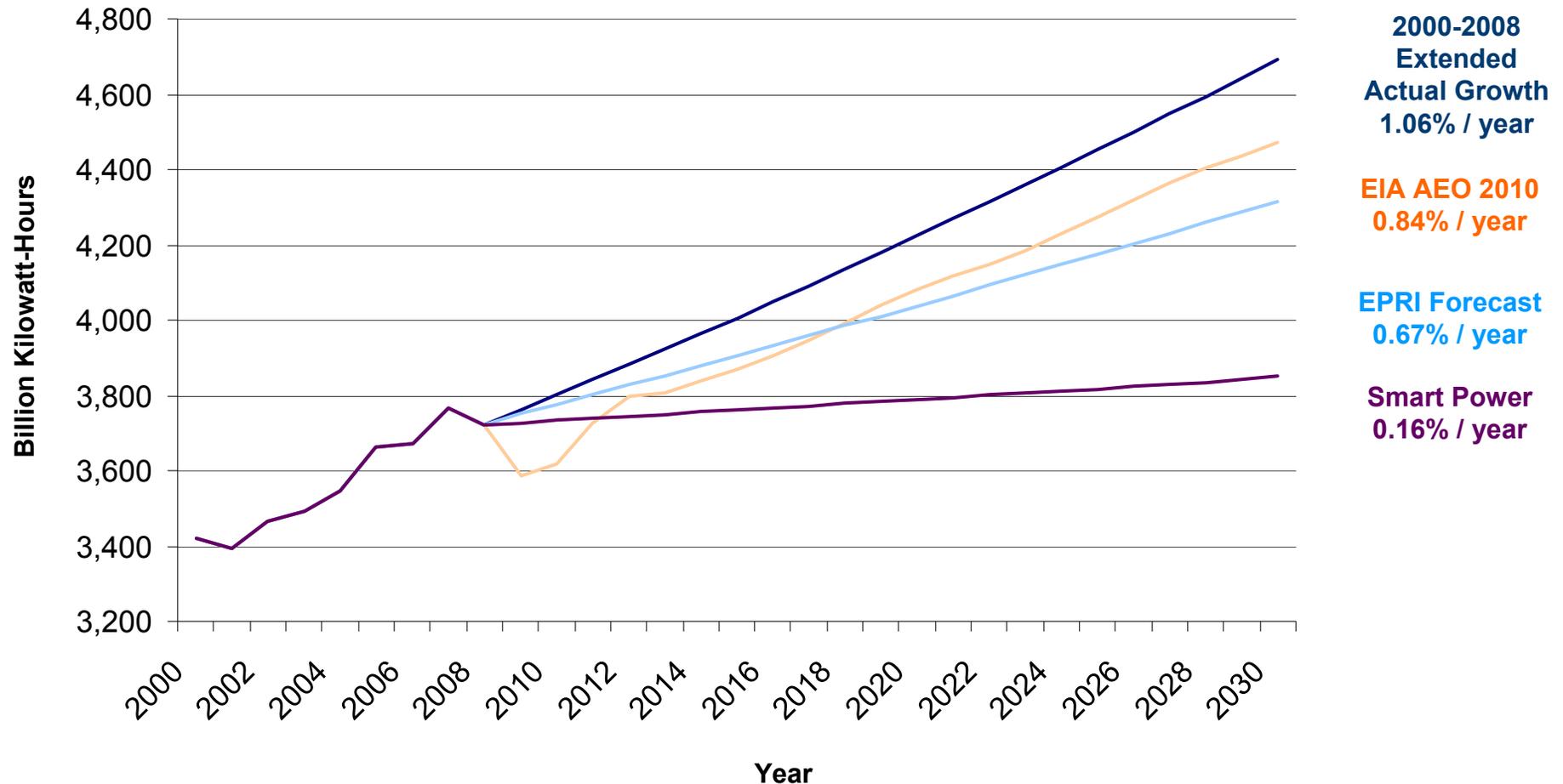
Hey Rate Payers, Can You Spare a Trillion?



Assumptions:

EPA Compliance: \$600/KW; RPS: 15% by 2020, Transmission Cost 1/3 of RPS Spend; Smart Meter: 85% Implementation; Nuclear Replacement: 25GW Replacement at \$8000/KW
 Source: Energy Velocity, NRC, Company Data, Credit Suisse Estimates

A Future of Declining Sales Growth



Data Sources: Energy Information Administration. "Table 8.1 Electricity Overview, 1949-2008," The Annual Energy Review, 2009.
 Energy Information Administration. "Table 8. Electricity Supply, Disposition, Prices, and Emissions," The Annual Energy Outlook, 2010.
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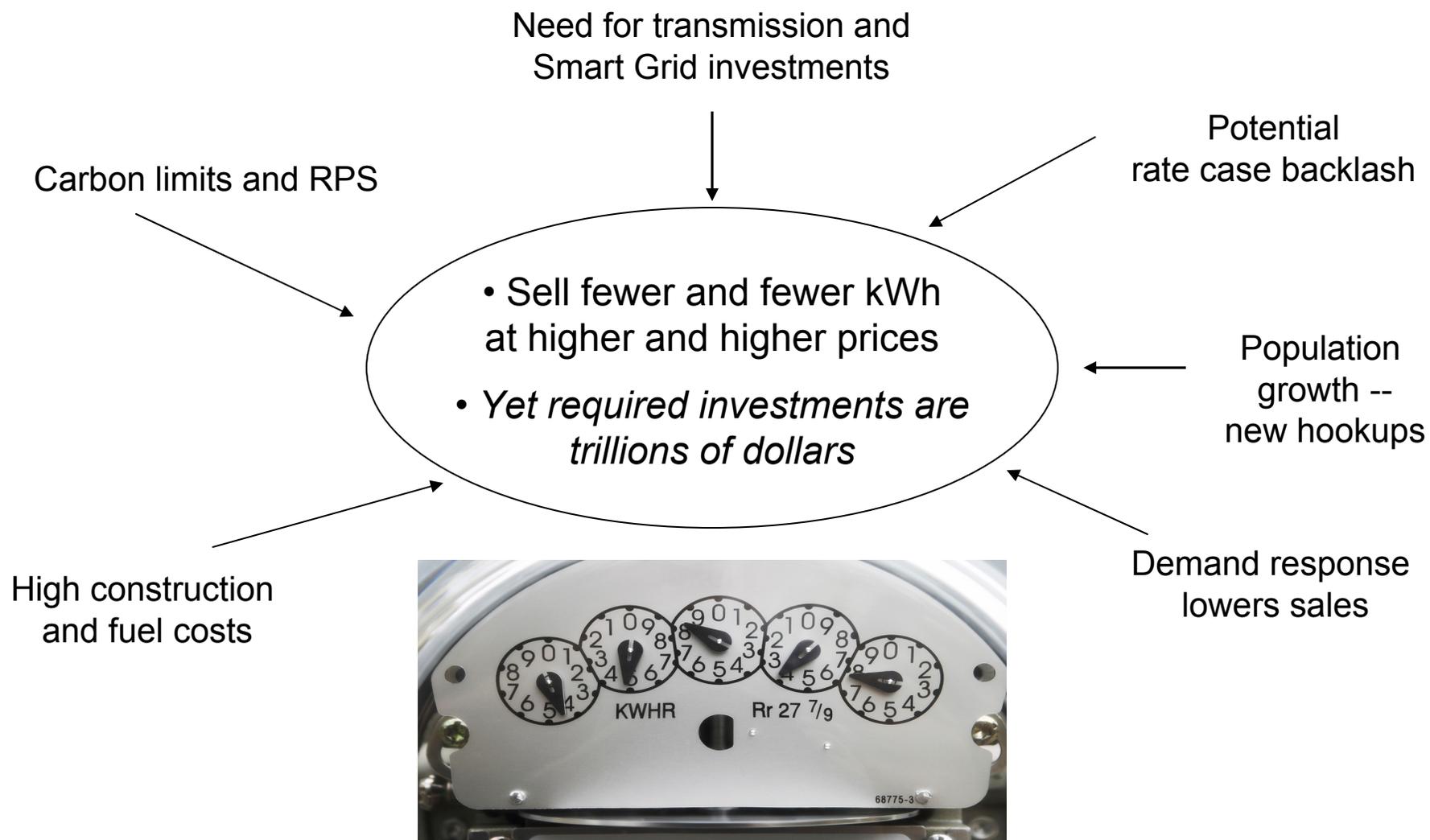
The Smart Grid Will Change Everything

- ◆ Allow Deployment of PHEVs
- ◆ Integrate Distributed Generation/Storage
- ◆ Improve Grid Reliability
- ◆ Cyber Security/Privacy
- ◆ Above all: The Business Model, Pricing and Regulation



Photo Source: PHEV- Wikimedia Commons, MJTR. Edited with PS by Mariordo, 09/07/08.

The Old Business Model Makes No Sense



What are the Solutions?

- ◆ Enact a national climate policy
- ◆ Choose leadership and capital source for energy efficiency – government or utilities
- ◆ Re-purpose utilities and regulation
 - New mission
 - New regulation and markets
 - New business models

The Smart Integrator (SI)

The Smart Integrator operates a regulated Smart Grid offering independent power and other services at market prices.

- ◆ The distribution (wires) company is incentive-regulated or publicly owned.
- ◆ The distco integrates upstream supply, local supply and storage, and operates the grid to ensure reliability.
- ◆ It may directly control some customer systems for grid management.
- ◆ Emphasis is network operator, not commodity sales.
- ◆ Energy efficiency is not a natural role of the Smart Integrator, but it can be added on.

The Energy Services Utility (ESU)

The Energy Services Utility changes the utility from a pipes-and-wires business to a customer-service-centric model:

Unlike the Smart Integrator:

- ◆ The utility is strongly and directly incentivized to get into the business of energy efficiency.
- ◆ The ESU might own and generate power or buy generation to bundle with energy service technology.

All other roles are the same as the Smart Integrator:

- ◆ Delivering energy
- ◆ Operating Smart Grid
- ◆ Dynamic pricing – possibly less nodal

Massive Regulatory Challenges

- ◆ Energy service regulation would require a massive retooling of state regulation.
- ◆ Deciding and continuously modifying allowed energy services and setting their rates/incentive terms.
- ◆ How much pre-control over the amount of capital, approved measures, etc?
- ◆ What does the utility do in-house vs. outsource? Does this model squelch too much innovation?
- ◆ “ESU lite” might work better – strong EE incentives, some services pricing, less nodal pricing.

Vertical Integration vs. Competition in Generation

**Less Integration
More Competition**

**More Integration
Less Competition**



- ◆ Regulators unload commodity price risk (long and short term) onto deregulated suppliers/consumers – less capital pressure on utilities

- ◆ Greater retail and wholesale competition benefits

- ◆ Fewer business mission conflicts

- ◆ Intracompany hedging of nega - and mega-watts as well as more traditional merchant/price volatility risks

Vertical Integration vs. Competition in Customer Power Management and Efficiency Services

**Less Integration
More Competition**

**More Integration
Less Competition**



- ◆ Fast-moving customer technologies – regulation can't keep up
- ◆ No utility customer premises service competencies

- ◆ One stop shopping – network and customer hardware
- ◆ Utility-scale energy efficiency capital
- ◆ No “split pricing” incentives



Are There Hybrid Scenarios?

Yes, many.

Will They All Be Difficult to Regulate/Deregulate?

Yes – though some more than others.

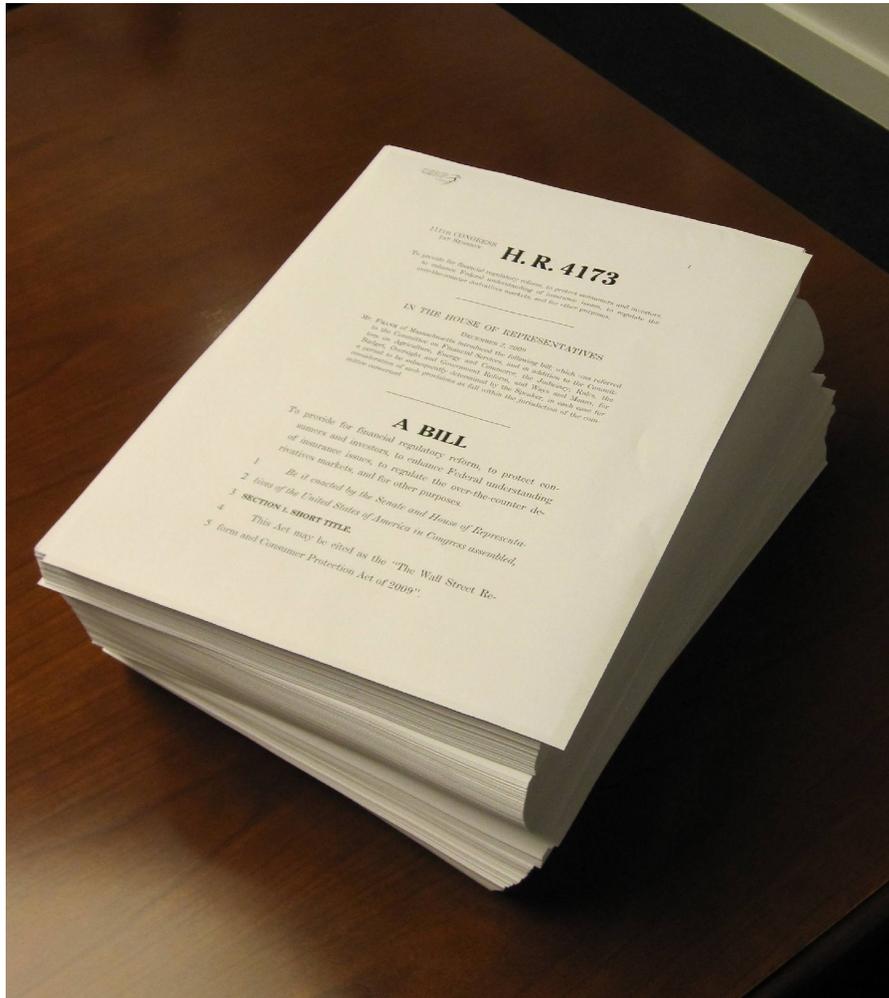
Do We Need a Deep, Nationwide Retooling?

Yes.

Summary

- ◆ Decarbonizing generation, EE policies, lower sales, and the smart grid together render current utilities unsustainable.
- ◆ There are two pathways to future sustainable utilities:
 - Smart Integrator: regulated utilities become network only.
 - Energy Service Utilities: Sell (regulated) energy services, not kWh.
- ◆ One path may not dominate, but the key economic forces to watch are vertical synergies versus new unregulated retail innovators.
- ◆ The regulatory and institutional issues raised by the transition will be critical and call for more resources now.
- ◆ An extremely difficult simultaneous transition of business model, regulatory laws, and industrial architecture ...
- ◆ ...but the status quo is not an option - - unless prices shock us by staying low!

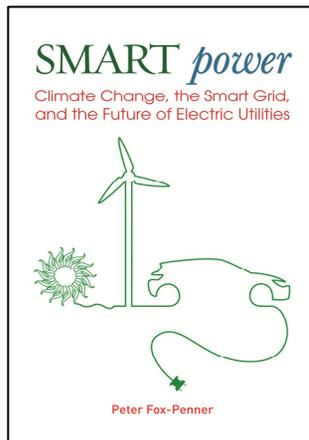
Conclusion



- ◆ No federal law, but a nationwide movement
- ◆ Fund state policy-maker and regulator dialogue
- ◆ Explain the changes to the public at large
- ◆ And pass and fund strong energy efficiency and climate policies

About Us

- ◆ *The Brattle Group* provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governments around the world. Please see the final slide for a list of recent *Brattle* reports.
- ◆ Peter Fox-Penner is a *Brattle* Principal and Chairman Emeritus, former senior official at the DOE, and the White House Office of Science and Technology Policy. He serves on several boards including the Advisory Board for Enviance, Gridpoint, and the Solar Foundation.
- ◆ Peter Fox-Penner's, *Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities* (Island Press, 2010), examines the future of the power industry.
www.smartpowerbook.com.



"This book should be required reading for all industry regulators as they prepare to confront the challenges of this new paradigm."

– Mark Crisson, CEO of the American Public Power Association

"If you're serious about policies that place energy efficiency on a level playing field with new energy supplies, and energy policy generally, this book is essential reading."

– Art Rosenfeld, former Commissioner of the California Energy Commission

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