
SMART *power*

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

The Sustainable Utility Future

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New England Electricity Restructuring Roundtable
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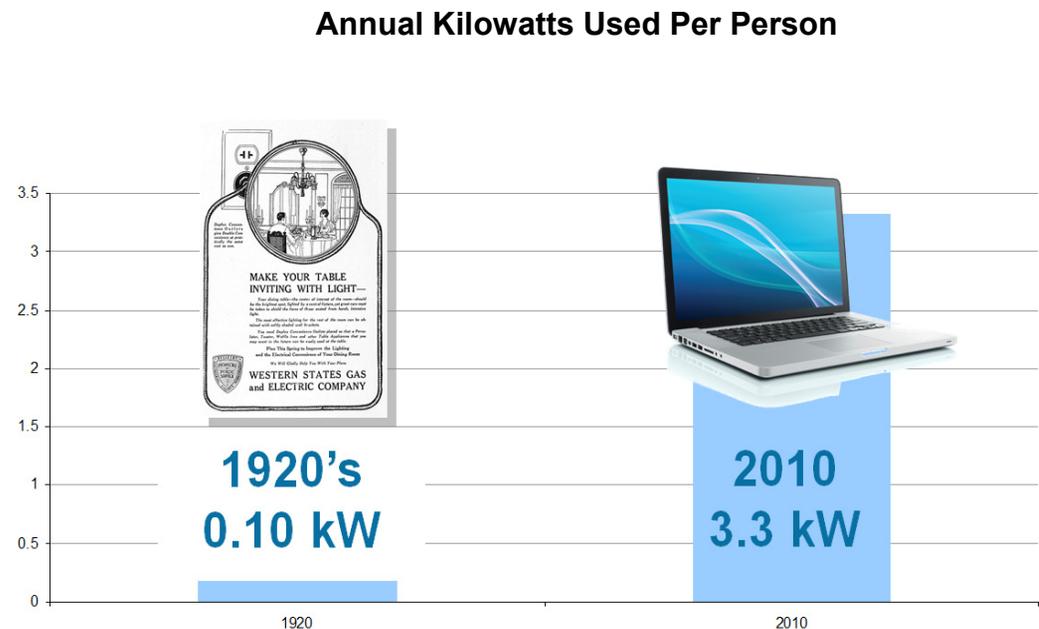


Solutions that inspire change.

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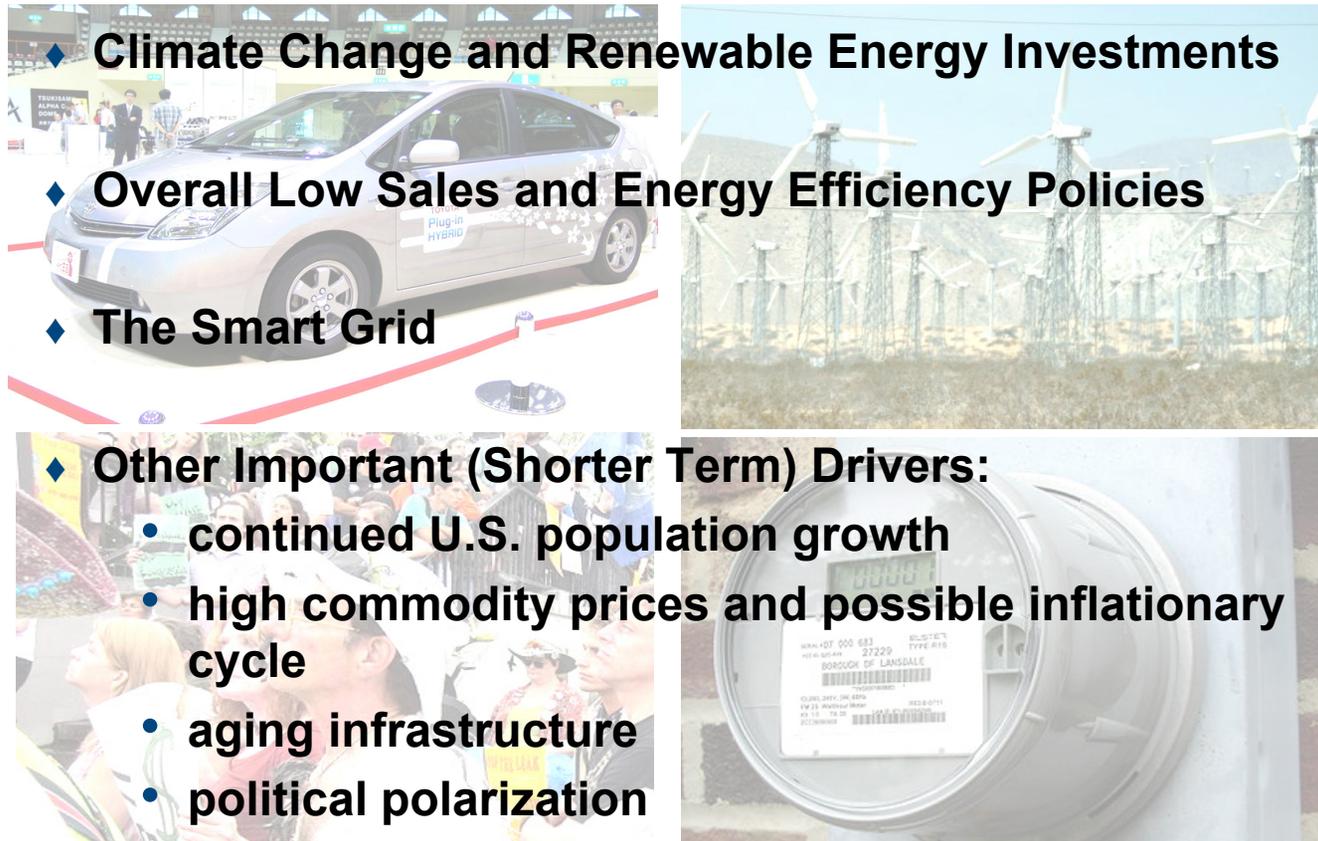
Electrification of America

- ◆ 100% productivity increases
- ◆ 99% reliable power in nearly every dwelling from largest grid on earth
- ◆ 4% or less of disposable income
- ◆ Financial stability since the 1930s
- ◆ Per-Capita Use up 300% 1920-2010



Data Sources: EIA Annual Energy Review 2009; Digest of Education Statistics, The National Center for Educational Statistics, July 2009; Bureau of the Census U.S. Department of Commerce.
Image Sources: National Museum of American History and The Schenectady Museum Archives.

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



- ◆ **Climate Change and Renewable Energy Investments**
- ◆ **Overall Low Sales and Energy Efficiency Policies**
- ◆ **The Smart Grid**
- ◆ **Other Important (Shorter Term) Drivers:**
 - continued U.S. population growth
 - high commodity prices and possible inflationary cycle
 - aging infrastructure
 - political polarization

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 against the great oil spill disaster in the Gulf of Mexico. 30 May 2009. Infrogmation (talk) of New Orleans.

Enormous U.S. Investment Needs

- ◆ 350 TWh new green energy from state RPS by 2030- \$120 billion
- ◆ New transmission to integrate renewables and maintain reliability- \$ 250 billion
- ◆ Decarbonize existing generators - \$1 trillion
- ◆ Replace aging distribution system with smart grid - \$600 billion

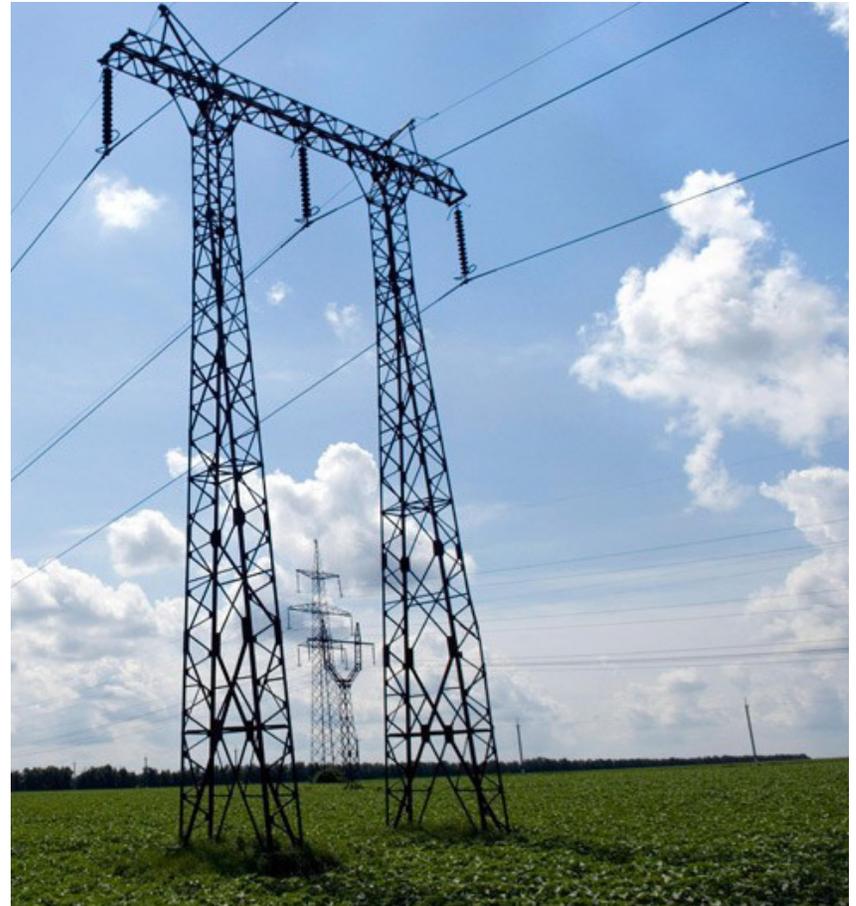
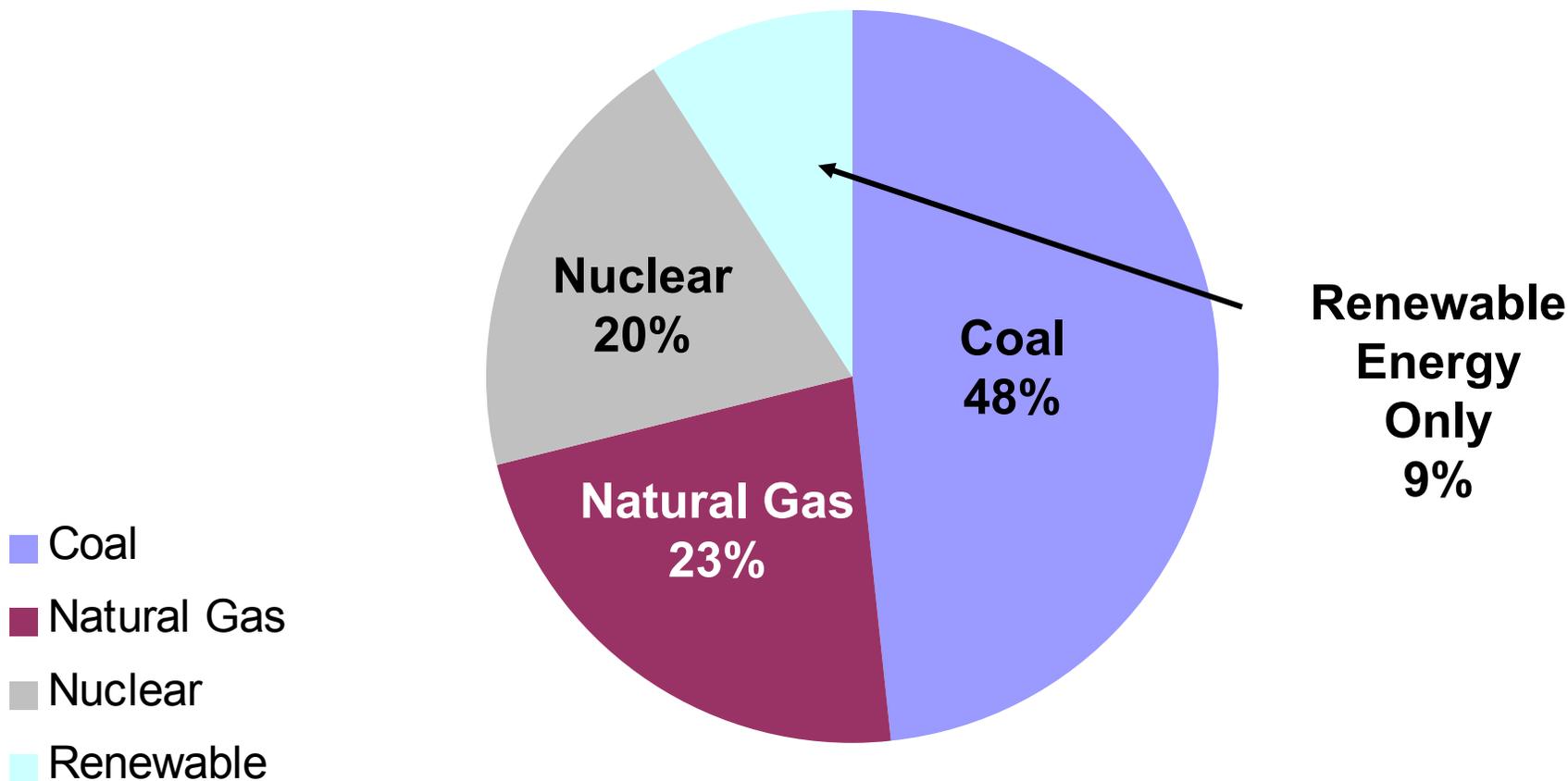


Image Source: Electricity Transmission. Невідомий. 10 April 2009. Wikimedia Commons.

Our Sources of Power Will Change Dramatically

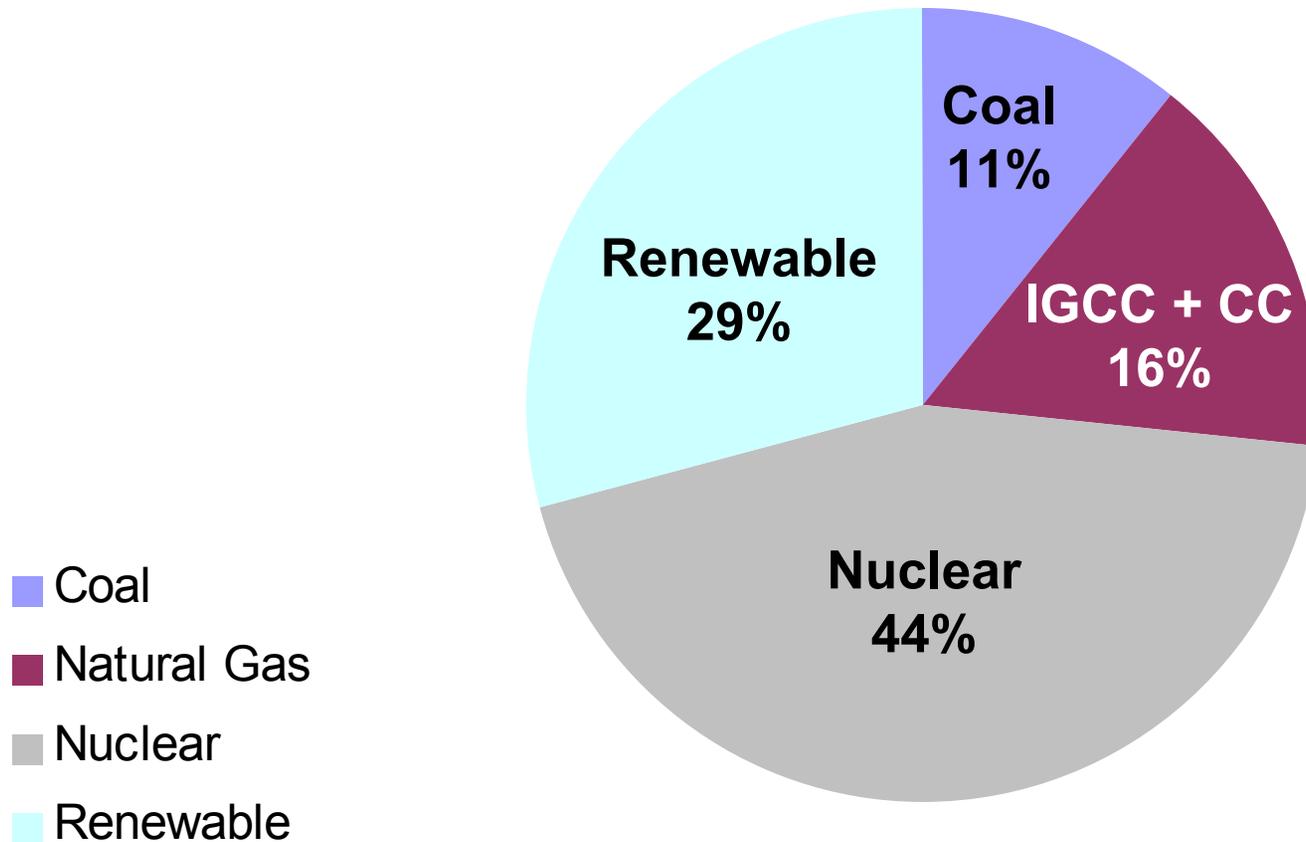
Electricity Production 2008



Data Source: "Figure ES 1. U.S. Electric Power Industry Net Generation," Electric Power Annual, Energy Information Administration, January 2010.
Notes: Oil resources are included in Natural Gas. Renewable energy includes conventional hydro power.

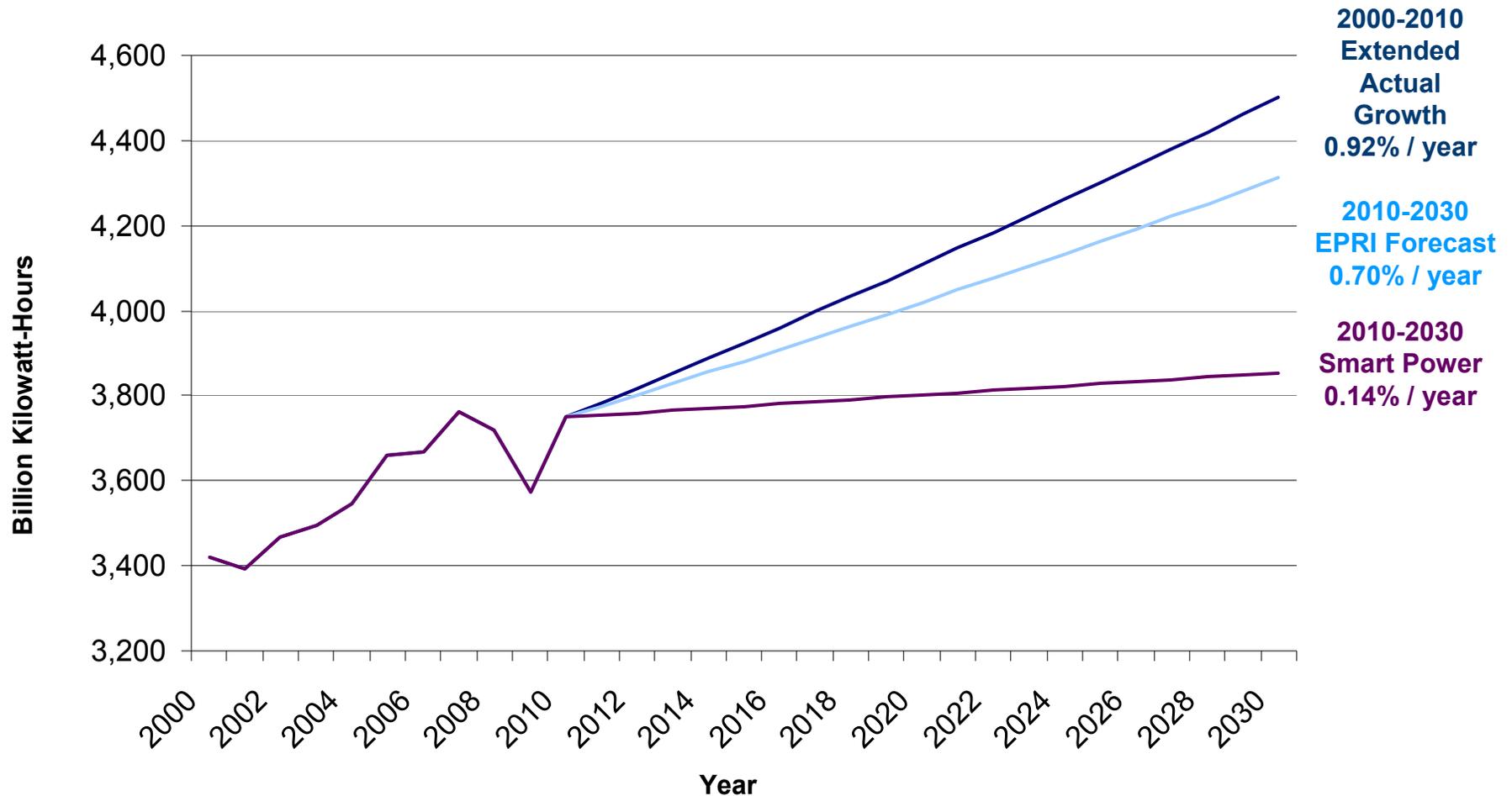
Our Sources of Power Will Change Dramatically

Electricity Production 2050



Data Source: "EPA Analysis of the American Power Act in the 111th Congress," Environmental Protection Agency, June 14, 2010.

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, 2011.
 "Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S.," The Electric Power Research Institute, January 2008.
 Peter S. Fox-Penner, "Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities," Island Press, 2010.

Doing Energy Efficiency Right

- ◆ Energy efficiency is our “first fuel” – but do it cost- effectively
- ◆ Price signals and markets are essential, but not enough – must ensure a source of low cost capital
- ◆ Ensure a source of low cost capital
- ◆ Put someone in charge – make them accountable/give them incentives
- ◆ Really only two options:
 - State and local governments
 - Utilities
- ◆ So let’s be clear: either energy efficiency is or is not a primary mission for our utilities
- ◆ If it is, make it integral to their profit model
- ◆ If it isn’t, we need strong state and federal policies and funding

Over Time The Smart Grid Will Change Everything

- ◆ Integrate distributed generation and storage
- ◆ Improve grid reliability
- ◆ Improve the benefits of PHEVs
- ◆ Raise large new cyber security and privacy issues
- ◆ Above all: Change the business model and regulation



Photo Source: EVB Energy Ltd. Smart meter used by EVB Energie AG. 12 August 2008. Wikimedia Commons.

Adding it All Up...

- ◆ ...The industry must change or die
- ◆ Trillions of dollars of investments needed
- ◆ Costs increasing faster than sales
- ◆ Threats from customer and community generation
- ◆ Smart-grid enabled rivals trying to steal the customer
- ◆ Two evolutionary business models and paths

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

Some Signs of Change

- ◆ Utilities and regulators both aware of these issues
- ◆ Great interest in both new models
- ◆ Feeling of change in sync with other national issues

But...

- ◆ State regulation very difficult to change
- ◆ Vertical integration returning?
- ◆ Smart Grid and smart pricing have slowed down
- ◆ Energy efficiency policies are uneven
- ◆ Most changes are crisis-driven

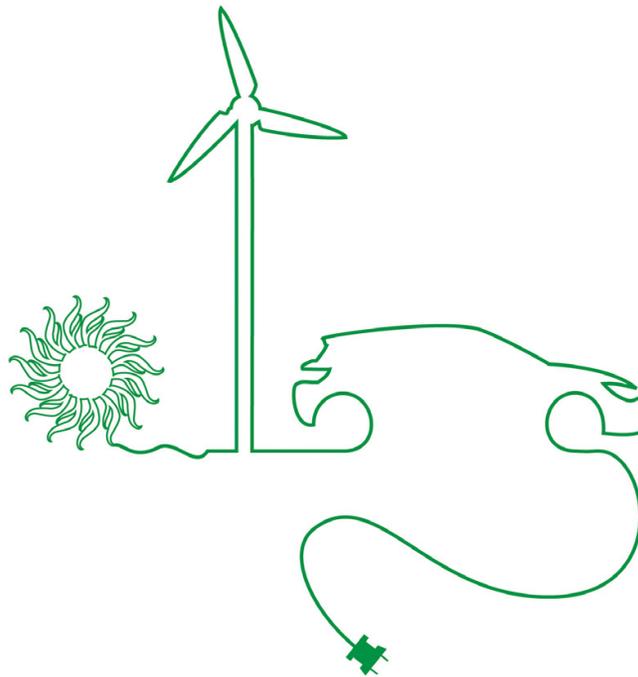
Conclusion

- ◆ **No federal law, but a nationwide movement to reform regulation**
- ◆ **Policy-maker and regulator dialogues and public discussion**
- ◆ **Energy regulator education and resources**
- ◆ **Invest in the Smart Grid in stages, with customer buy-in**
- ◆ **Pass and fund strong energy efficiency and climate policies**

Thank You

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The Brattle Group

About *The Brattle Group* and The Author

The Brattle Group (www.brattle.com) provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governments around the world.

We combine in-depth industry experience and rigorous analyses to help clients answer complex economic and financial questions in litigation and regulation, develop strategies for changing markets, and make critical business decisions.



Dr. Peter Fox-Penner, principal and chairman emeritus of *The Brattle Group*, specializes in economic, regulatory, and strategic issues in network industries. He is a frequent speaker on energy topics and the author of *Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities*. (www.smartpowerbook.com)

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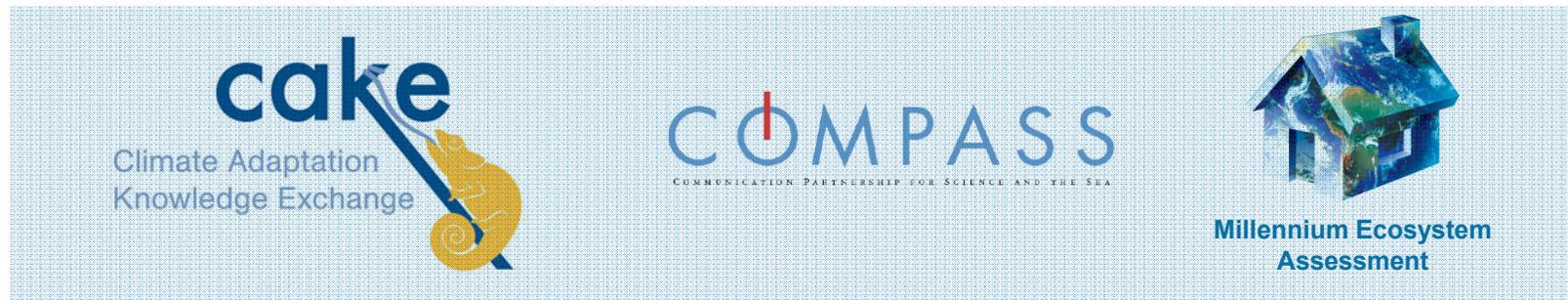
About Island Press



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