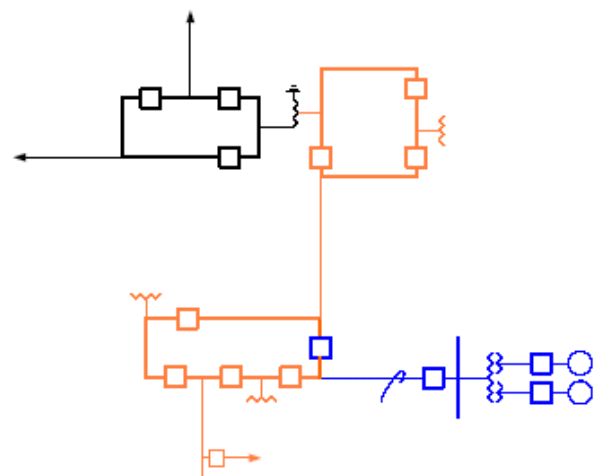


HEPG at 25: Looking Back and Looking Forward

Steve Huntoon

**Harvard Electricity Policy Group
June 8, 2018**



A Stroll Down Memory Lane

- ◆ *Phillips Petroleum* decision in 1954 (disaster typified by Fuel Use Act of 1978).
- ◆ Three branches finally stumble on to rational natural gas policy (see Prof. Dick Pierce's "Reconstituting the Natural Gas Industry..."):
 - Natural Gas Policy Act of 1978.
 - *Maryland People's Counsel* decisions.
 - FERC Order No. 436.
- ◆ Precursor to Energy Policy Act in 1992.

The Way We Were

“The performance of the still-regulated electricity industry during the 1993-94 winter was almost as disappointing as the [then regulated] gas industry’s performance during the winter of 1976-77. The P-J-M pool, serving the middle Atlantic states, avoided a catastrophic regional blackout only by implementing brownouts and rolling blackouts, and by convincing the federal government, the governments of several states, and virtually all private businesses in the region to cease all operations for a day.”

“It is interesting to speculate about the manner in which a market-driven electricity industry would have performed during the winter of 1993-94.”

Prof. Dick Pierce, 1994

And now we know.

What Hasn't Changed

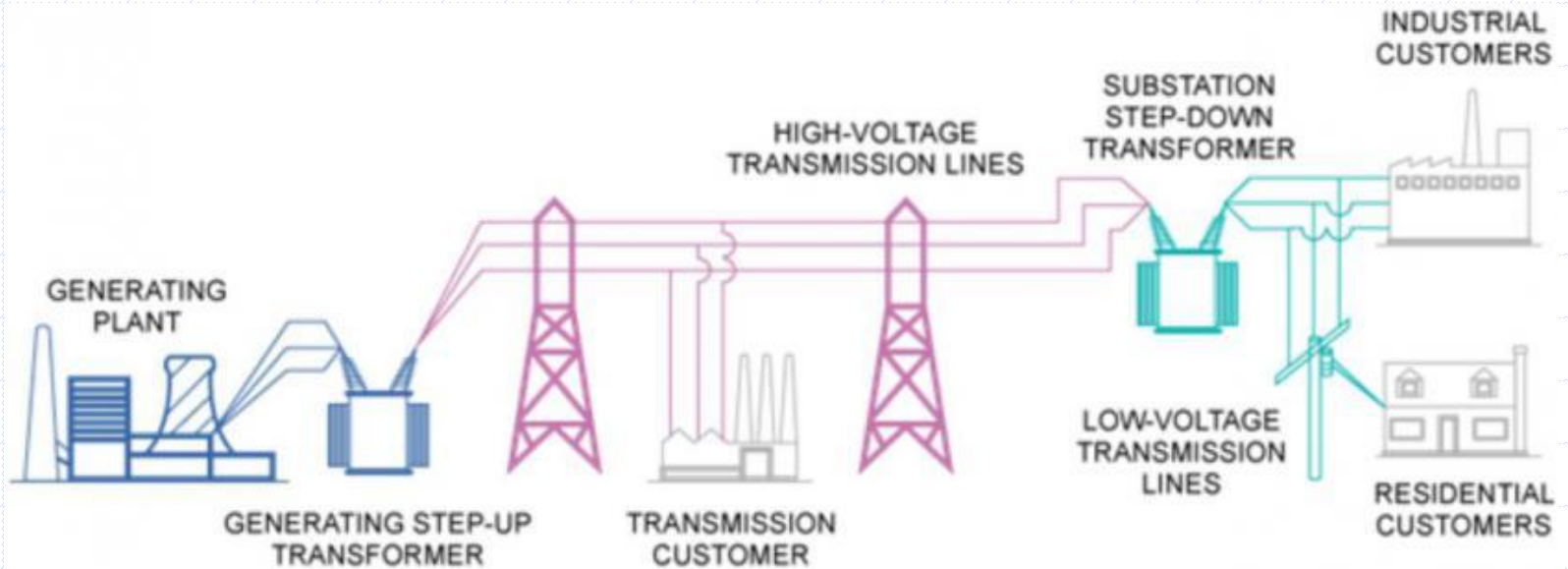
◆ Unreal:

"The [Grid Evolution] Summit will kick off with a keynote address from Jeremy Rifkin, economic and social theorist, and best-selling author. Mr. Rifkin will explain The Third Industrial Revolution: the convergence of the digital Communication Internet, the Renewable Energy Internet, and the Mobility and Logistics Internet, riding atop an Internet of Things platform, creating a seamless 21st century smart infrastructure for transforming the way society manages, powers, and moves economic and social activity in the era of resilience."

◆ Reality: Basic physical design of industry hasn't changed and won't change.

◆ Reality: Basic product of industry hasn't changed and won't change.

Grid 1992, 2018, 2043



The Cover of Our Product: 120 Volts at 60 Cycles Per Second AC



Plain Old Power Service

- ◆ Plain Old Power Service is here to stay.
- ◆ Travis Kavulla: “Utility regulation is pretty boring, and it is meant to be.”
- ◆ *Wall Street Journal*: “Investors need to remember that disruption is a lot easier to peddle than it is to actually do.”
- ◆ Providing reliable POPS at lowest reasonable cost is our raison d’etre.
- ◆ Any doubt? Just ask Puerto Rico.

What Has Changed

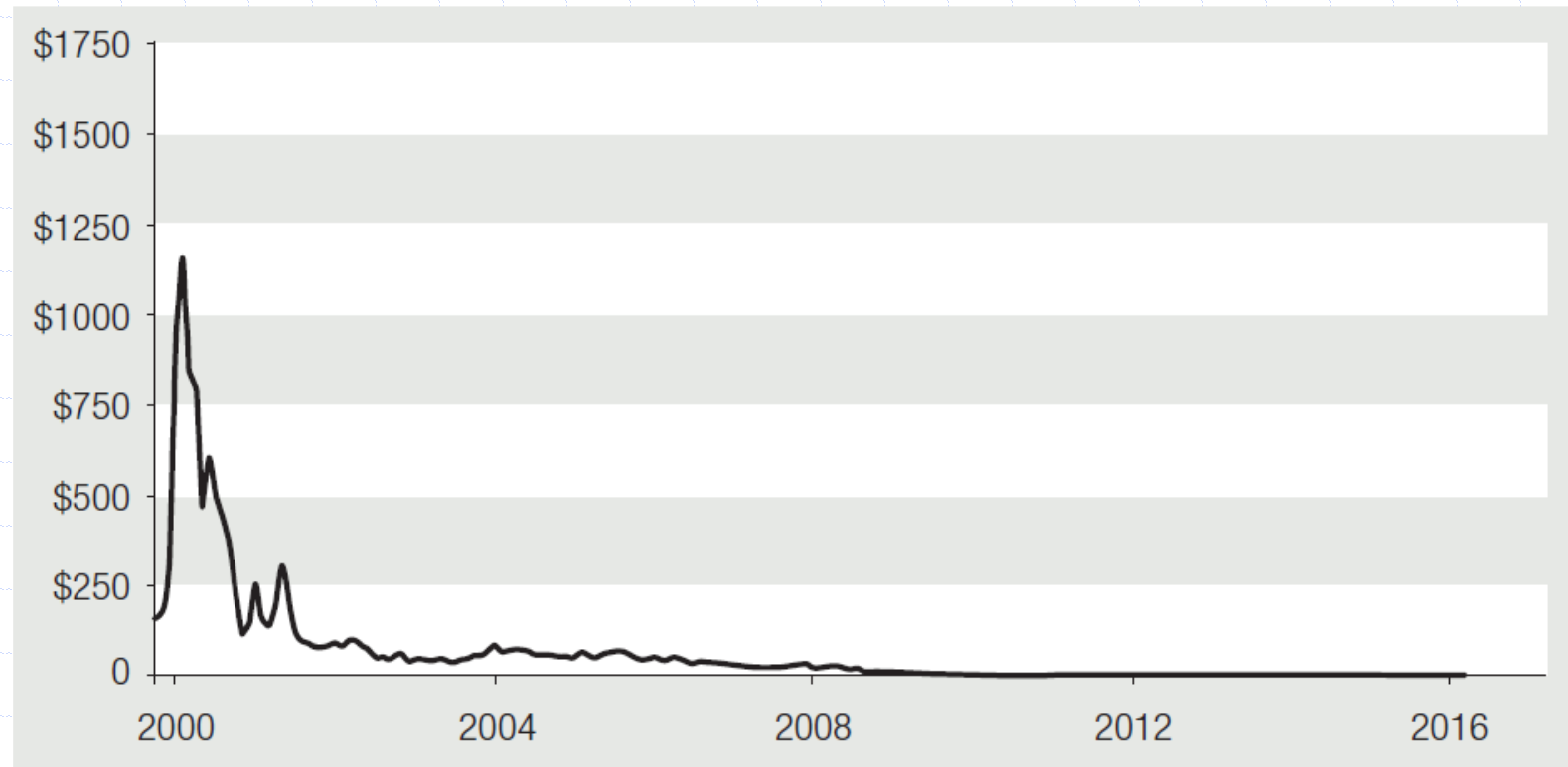
- ◆ Within the physical design of the industry there have been changes in how industry elements are owned and managed.
- ◆ A common theme is increased unbundling and competition.
- ◆ As many predicted, competition has been a good thing.
- ◆ Generation (e.g., avoided new nuclear), wholesale and retail markets, and even transmission.

Yes, Even Transmission

- ◆ Before transmission competition, it's the color of the Model T. Any solution as long as it's the transmission owner's solution.
- ◆ Now, for example, single congested corridor in PJM elicits 44 proposals from nine entities with costs from \$6 million to \$192 million.
- ◆ Application fees more than admin costs.
- ◆ Muy bueno!
- ◆ FERC, RTOs and states can do much more.

Let's Not Get Sidetracked by Hype

Whose stock price is this?



Let's Not Subsidize Hype, Eight Flavors

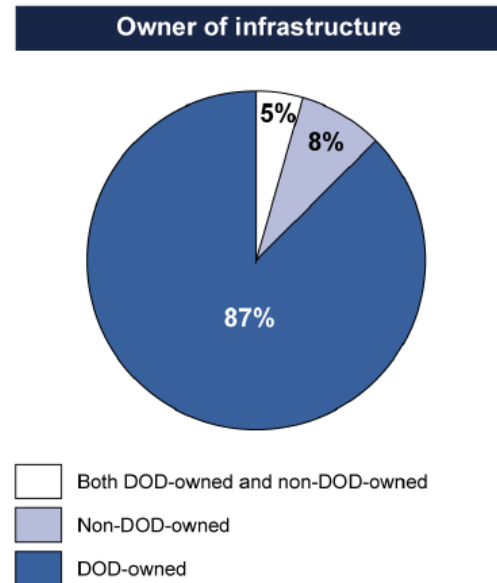
- ◆ Microgrids: Inherently inefficient.
- ◆ HVDC transmission: Inferior to AC buildout.
- ◆ Grid batteries: Not ready for prime time.
- ◆ Home batteries: Ditto.
- ◆ REV: "DER Value = LMP + D" has wrong sign for D as DERs *increase* distribution costs.
- ◆ Home solar: Costs 5X grid solar (yet California layers on a mandate).
- ◆ Offshore wind: Costs 2.5X onshore wind.
- ◆ Electric vehicles: More \$, CO2 and deaths.

More in the Don't Subsidize Category

- ◆ Generating plants that are:
 - Old.
 - Inefficient.
 - Unreliable.
 - Unneeded.
- ◆ New nuclear that makes no sense (even when half built).
- ◆ This doesn't mean coal and nuclear disappear
 - EIA projects 274 GWs ... in 2050.

Trump-Perry Bailout

- ◆ Fact: Grid outages are a minor (8%) cause of significant DOD facility outages (GAO data).



- ◆ And generation resource inadequacy is a minor cause of the 8% grid outages.

Trump-Perry Bailout (cont.)

- ◆ Retiring units are three times less reliable than new units (14.56% v. 4.42% EFORd) :

Drop in Weighted Average EFORd
Projected for 2021 is due to:

- Large amount of deactivations with high EFORd (**7,150 MW** with **14.56%** Weighted Average EFORd).
- Large amount of additions with low EFORd (**16,980 MW** with **4.42%** Weighted Average EFORd). Additions include only those queue projects that have executed an Interconnection Service Agreement.

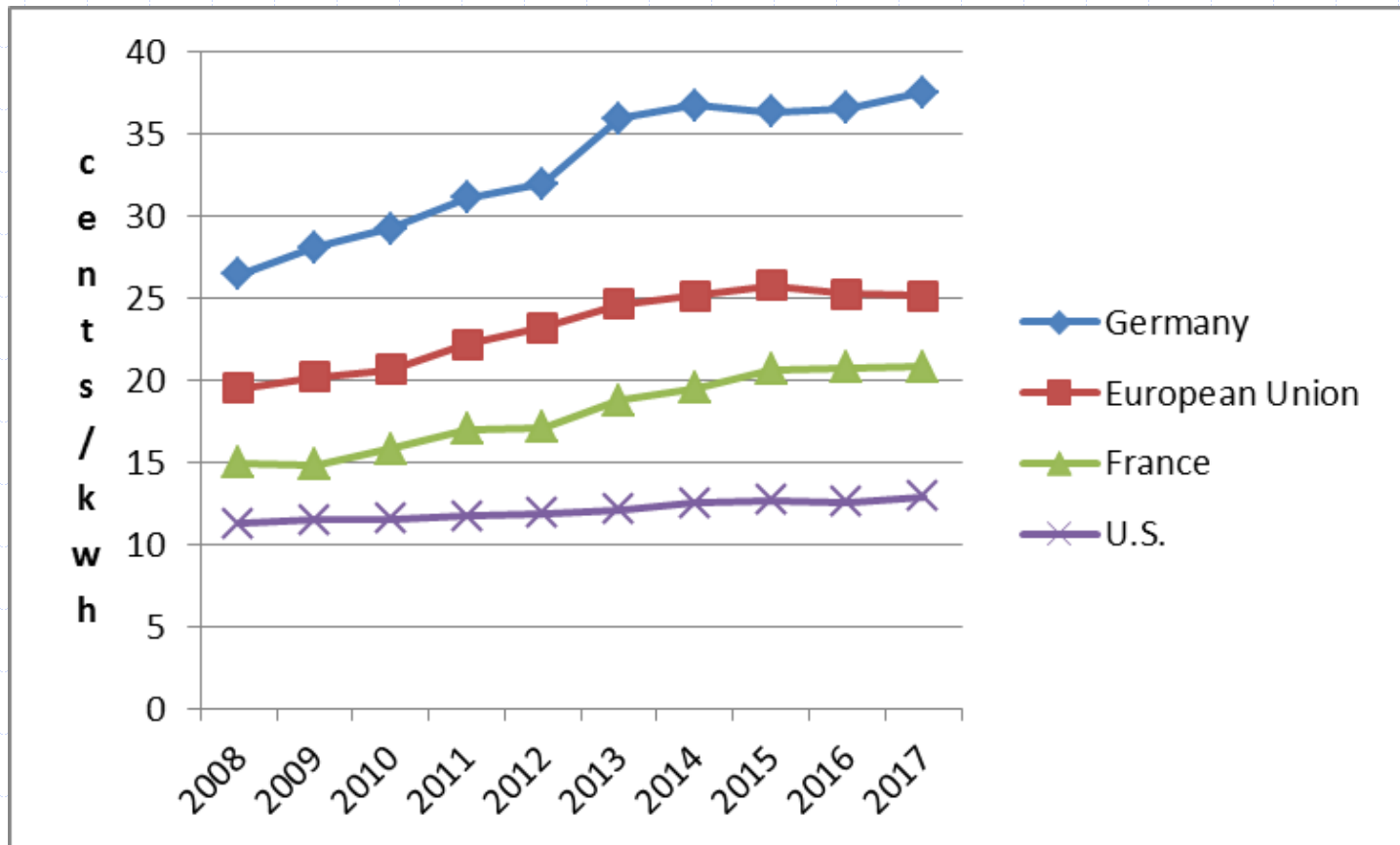
- ◆ So by keeping clunkers a Trump-Perry bailout would *reduce* grid reliability.

How the Worm Might Turn

- ◆ If Trump-Perry can mandate coal/nuclear purchases with a faux national security claim, imagine what the next President could do with a national security claim based on global warming.
- ◆ *E.g.*, mandate purchase of all existing and future wind and solar generation.
- ◆ Squeezing out coal generation.
- ◆ Ironic.

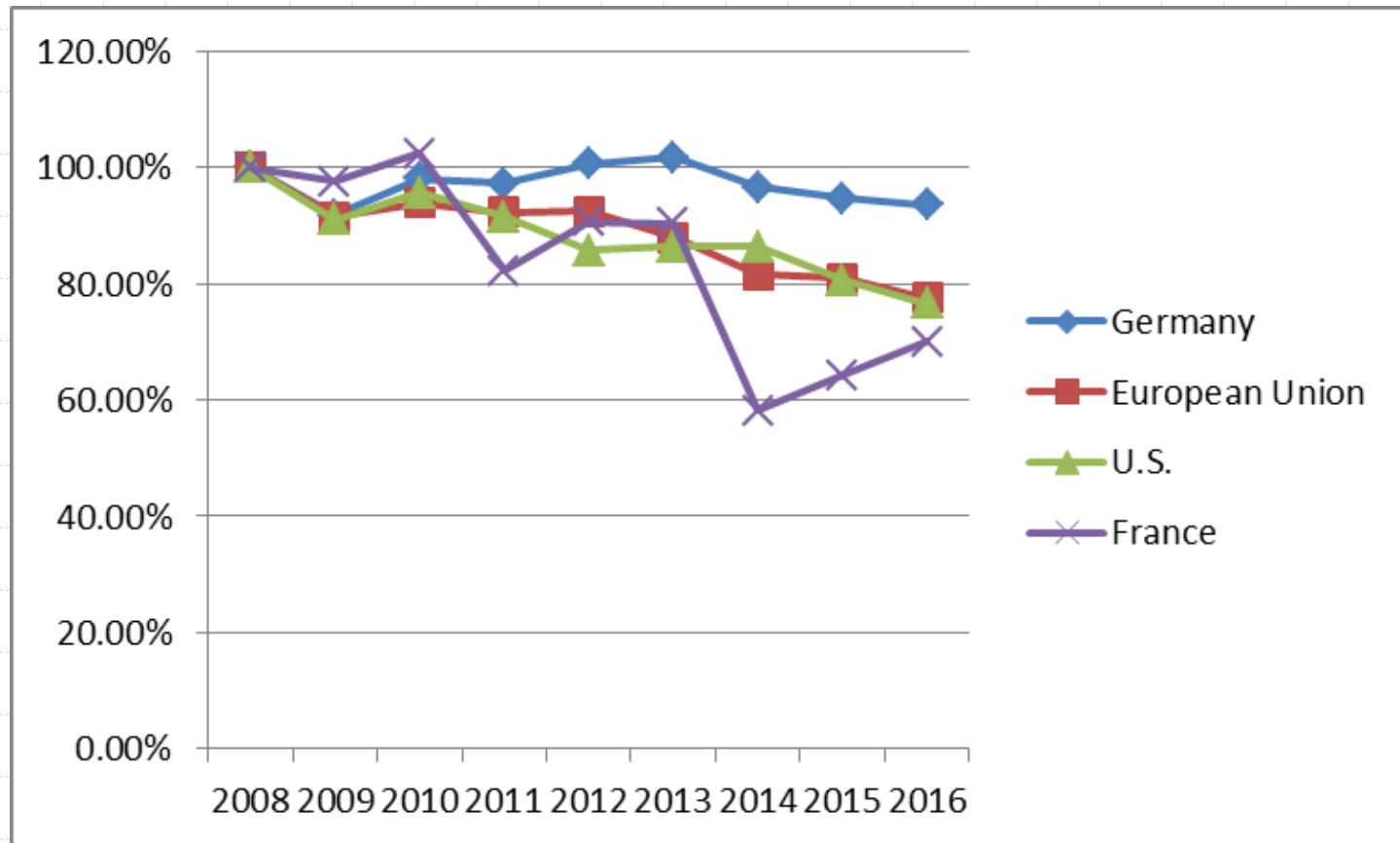
A Different Blunder: Energiewende

German Residential Rate Now 3X U.S.



No Gain from the Pain

German CO₂ Emissions Unresponsive



What To Look Forward To



- ◆ Onshore wind.
- ◆ Grid solar.
- ◆ Hybrid vehicles.
- ◆ Demand response, ideally real-time pricing.
- ◆ Energy efficiency (CO₂ emission reduction from LED lighting is 3X that of home solar).
- ◆ Gas-fired generation.
- ◆ Carbon tax.
- ◆ Markets and competition.

And, Of Course, HEPG

Thank you!

Documentation and data for statements in this presentation are in articles published in *RTO Insider* and *Fortnightly* and available here, <http://www.energy-counsel.com/recent-publications.html>.

Prof. Dick Pierce's articles are available at 9 Energy Law Journal 1 (1988) and 15 Energy Law Journal 323 (1994).

Solar and wind levelized costs are from latest Lazard Levelized Cost of Energy report here, <https://www.lazard.com/media/450337/lazard-levelized-cost-of-energy-version-110.pdf>.

Contact: huntoon@energy-counsel.com.