Energy Policy Forum: Summary

Clean Energy Innovation Forum

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Aspen Institute, Aspen, CO
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Energy Infrastructure Represents Significant Costs

- Power Sector Replacement Cost: $5T
- Power Sector Depreciated Value: $2T

Source: Dr. Josh Rhodes, The Conversation, March 16, 2017

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Coal, Nuclear and Hydro Plants Are Highly Depreciated

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Coal
- Mean Age: 43 YR
- Capacity: 302 GW

Nuclear
- Mean Age: 35 YR
- Capacity: 104 GW

Hydro
- Mean Age: 58 YR
- Capacity: 99 GW

Natural Gas
- Mean Age: 24 YR
- Capacity: 494 GW

Wind
- Mean Age: 7 YR
- Capacity: 73 GW

Solar
- Mean Age: 3 YR
- Capacity: 14 GW

Other
- Mean Age: 35 YR
- Capacity: 65 GW

Power Lines
- Mean Age: 28 YR
- Capacity: 57 GW

Transformers
- Mean Age: 28 YR
- Capacity: 351 GW

Dr. Josh Rhodes, The Conversation, March 16, 2017

Value ($Billion)

Replacement Value ($4.8T Total)
Depreciated Value ($2.0T Total)
Our larger power plants are concentrated in the east and they are also the oldest.
Cheap Solar, Wind and Natural Gas Are Beating New Construction & Conventional, Legacy Thermal Assets

• Coal plants are retiring
• Nuclear plants are announcing early retirements
• Even relatively new natural gas combined cycle power plants are going bankrupt
  – Panda Power, TX
  – La Paloma, CA
The Power Sector Is Facing Several Challenges

• Bad news:
  – Deep decarbonization will be difficult (but easier than for transport)
    • Existing nukes are shutting down
    • New nuclear and coal w/ carbon capture is expensive, slow, over-budget
  – Environmental controls (mercury, acid rain, etc.) are still looming
  – Business models are changing quickly, regulators are changing slowly
  – Demand for electricity is flat/dropping
  – (For producers): Wholesale electricity prices are declining in real terms

• Good news:
  – (For consumers): Retail electricity prices are declining in real terms
  – Shallow decarbonization is easy: Power emits less CO₂ than transportation
  – Growing demand from EVs, pot-growing operations, and data centers
N. American Integration Is An Ongoing Desire and Concern

• N. American integration has important implications
  – Reliability
  – Decarbonization
• Bilateral efforts to connect grids have been underway for years
• Trilateral effort (U.S./Mexico/Canada) is newer
• These efforts are expected to continue with Trump Administration
Power Sector Can’t Agree On Language Such As “Baseload”

- Baseload = lowest demand over course of year
- Baseload = paid-off capacity that offers intangible value & must be saved
- Baseload = power plants that ramp slowly
- Baseload = coal, nuclear
- Baseload = resource w/ least levelized long-run marginal cost
- Baseload = resource w/ least short-run marginal (dispatch) cost

• Conclusion: the word “baseload” is now obsolete and possibly even damaging
• Action item: switch to a supply-following mindset rather than a load-following mindset
The Duck Curve Is On People’s Minds

Net load - March 31

- Overgeneration risk
- Ramp need ~13,000 MW in three hours

Source: CA ISO

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The Duck Curve Is On People’s Minds

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Net load - March 31

Megawatts

12am 3am 6am 9am 12pm 3pm 6pm 9pm

Hour

Source: CA ISO

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In Texas We Call It The Dead Armadillo Curve

Net load - March 31

Source: CA ISO

ramp need
~13,000 MW
in three hours

overgeneration risk
Renewables Aren’t That Big of A Problem; Distributed Generation is

• Grid management costs went DOWN in TX despite rise in wind
  – Market design improvements
  – Better wind forecasting
  – Geographic dispersion
  – Availability of fast-ramping natgas generators

• Utility-scale solar is probably harder than wind to accommodate

• Distributed generation (rooftop solar, fuel cells, diesel gensets,...) is mysterious because it’s behind-the-meter
  – Maybe DER (distributed energy resources) become baseload/primary and the grid moves to the margin
What to do? Mixed signals...

• Consider new market signals to reward cleanliness and reliability
  – Put a price on carbon (helps nuclear...)
  – ZECs (Zero Emission Credits) (helps nuclear...)
  – Capacity payments, etc. (helps nuclear, coal...)

• Re-regulate the markets
  – After decades of calls to de-regulate power markets to achieve efficiency and cost-savings, power sector now openly ponders re-regulation as a way to avoid stranded assets and to achieve deep decarbonization
  – “Cash for Coal Plant Clunkers”, etc.

• Conclusion: markets, technology and policy are required
  – No single dimension gets us all the way there in an elegant fashion
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