

Value of Technology in the Power Sector and Beyond

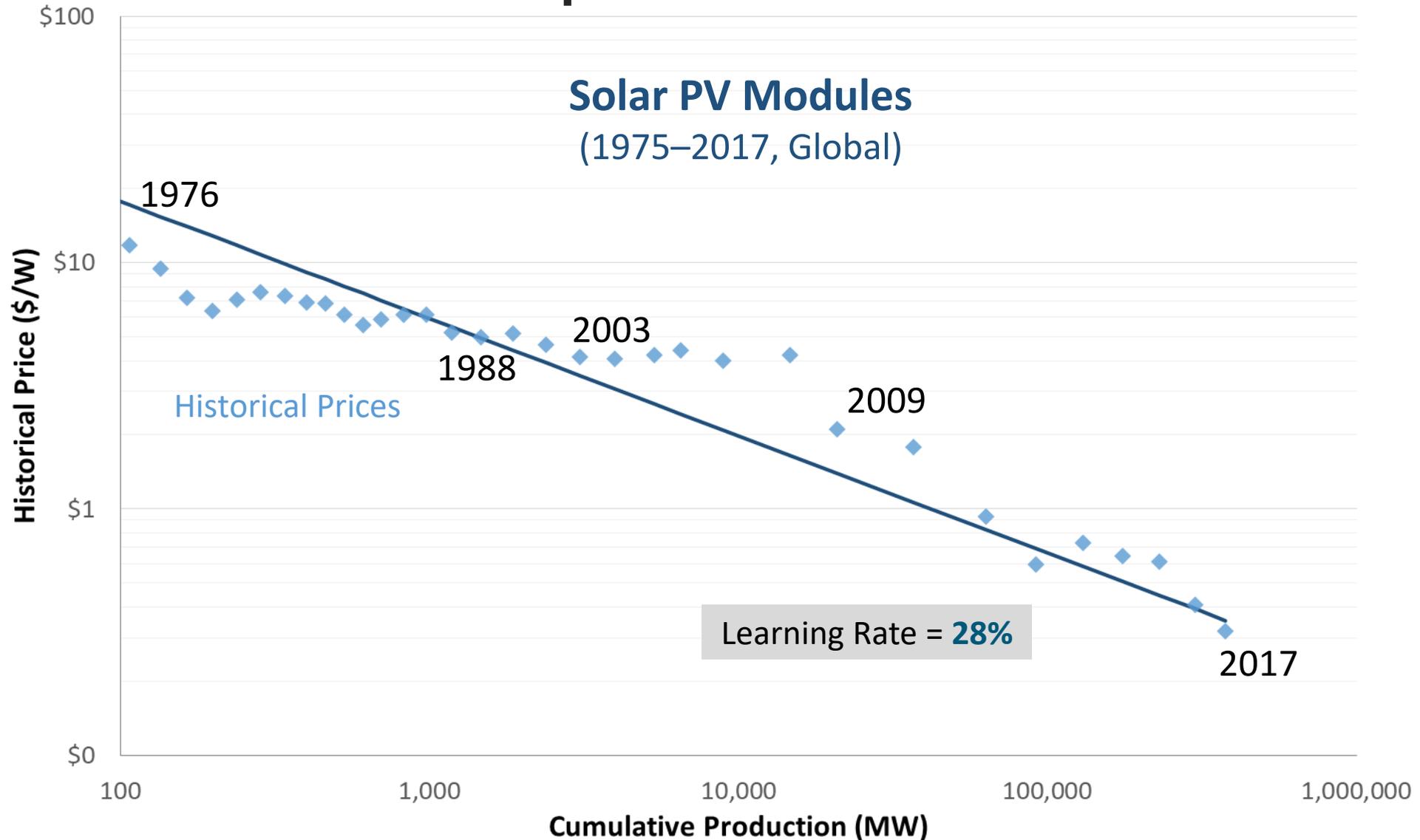
Four Questions for Decarbonization Research and Planning

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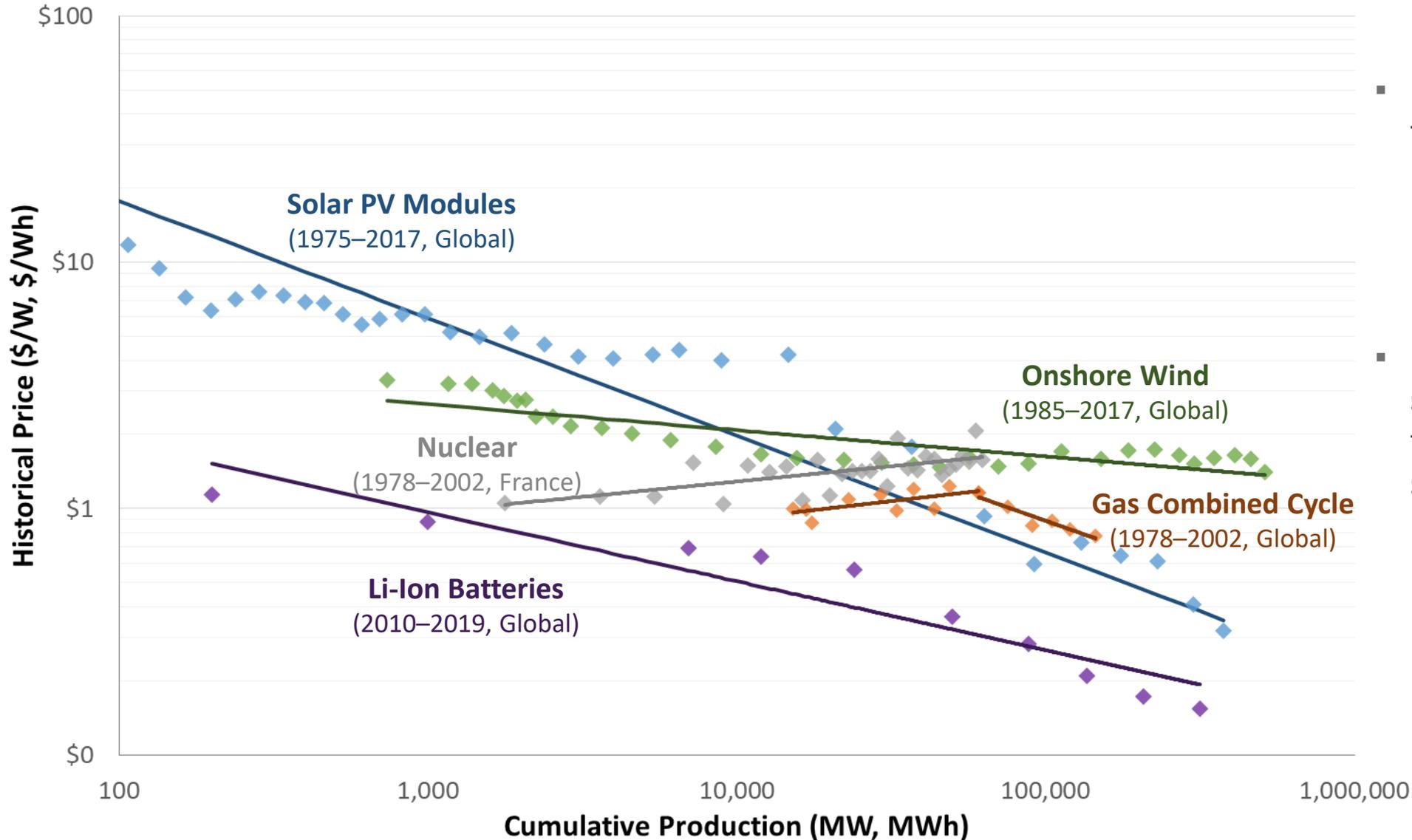
Energy/Climate Research Seminar – Washington, DC
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1. What can past technological change teach us about future emissions and innovation policies?



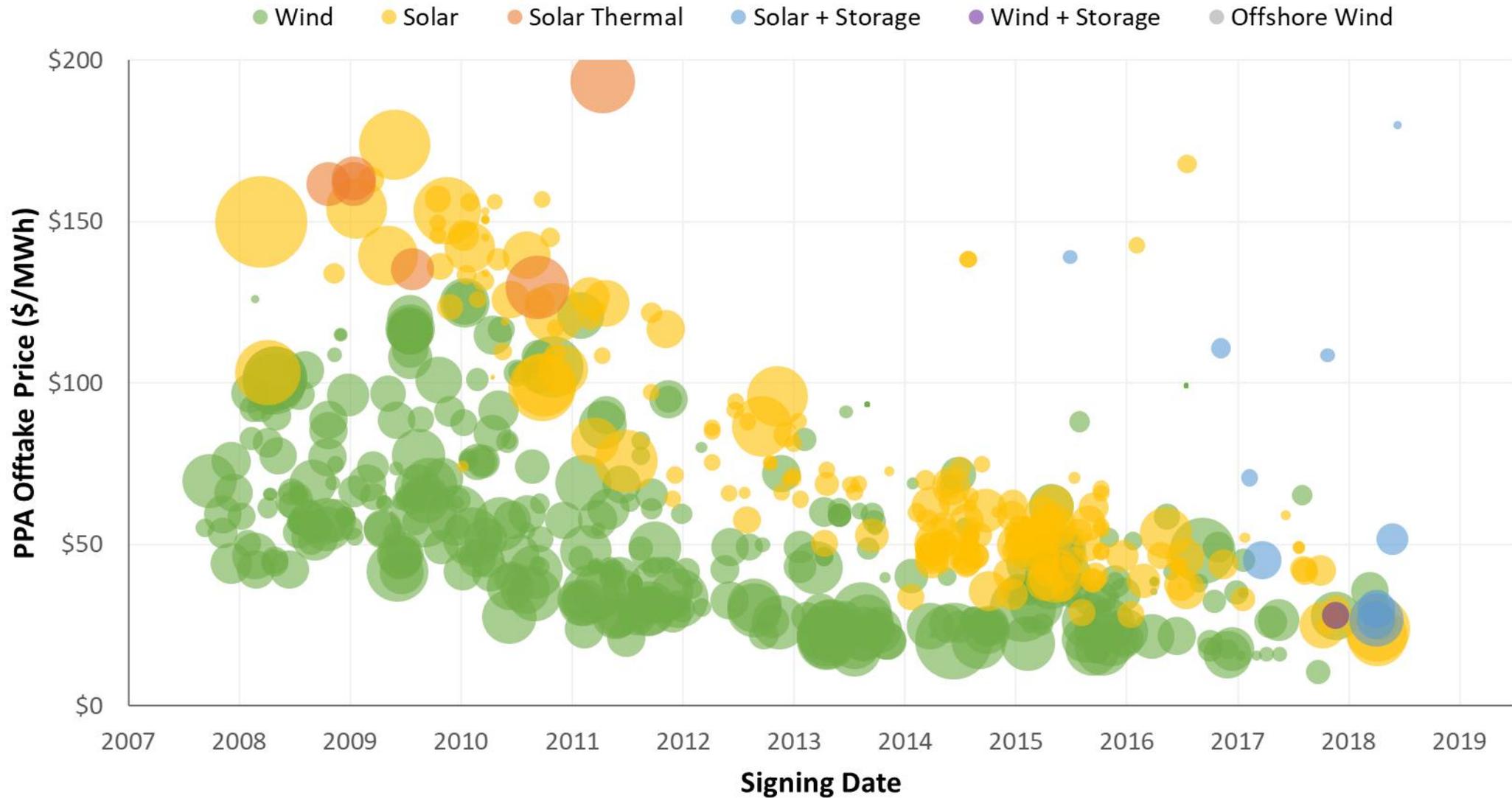
1. What can past technological change teach us?



- Uncertainty about future technological change
 - Drivers of historical change?
 - Appropriate analogues for nascent technologies?
- Decarbonization in the power sector will be increasingly tied to strategies in other sectors and global markets moving forward
 - Spillovers?
 - R&D needs?
 - Technology-specific deployment incentives?

Data: BloombergNEF (2019); Rangel, et al. (2015); Colpier, et al. (2002)

1. What can past technological change teach us?

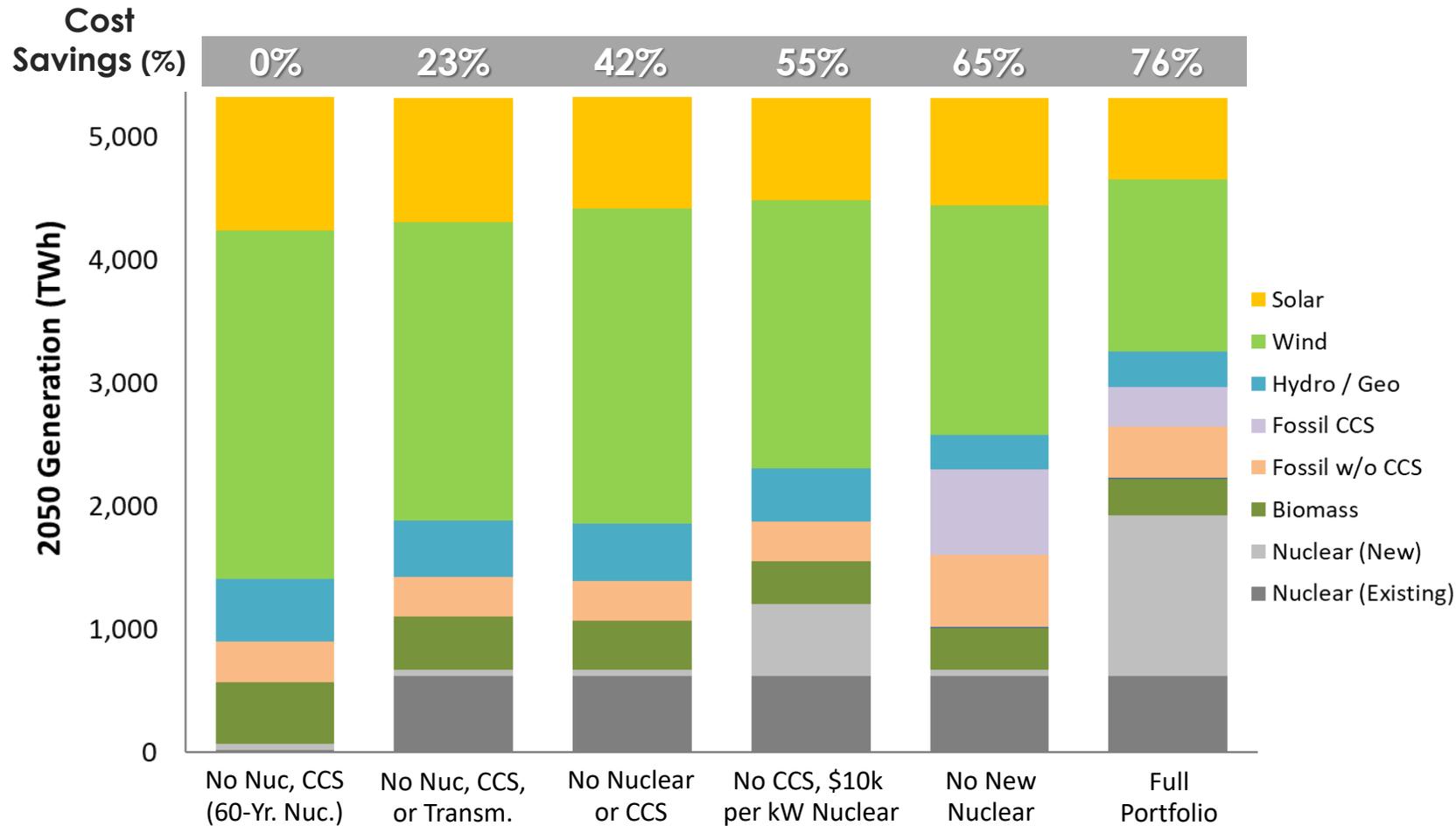


Data from BloombergNEF, FERC, and DOE

Note: Prices in nominal U.S. dollars; bubbles are proportional to contract capacity

2. What are technical/economic impacts of limited portfolios?

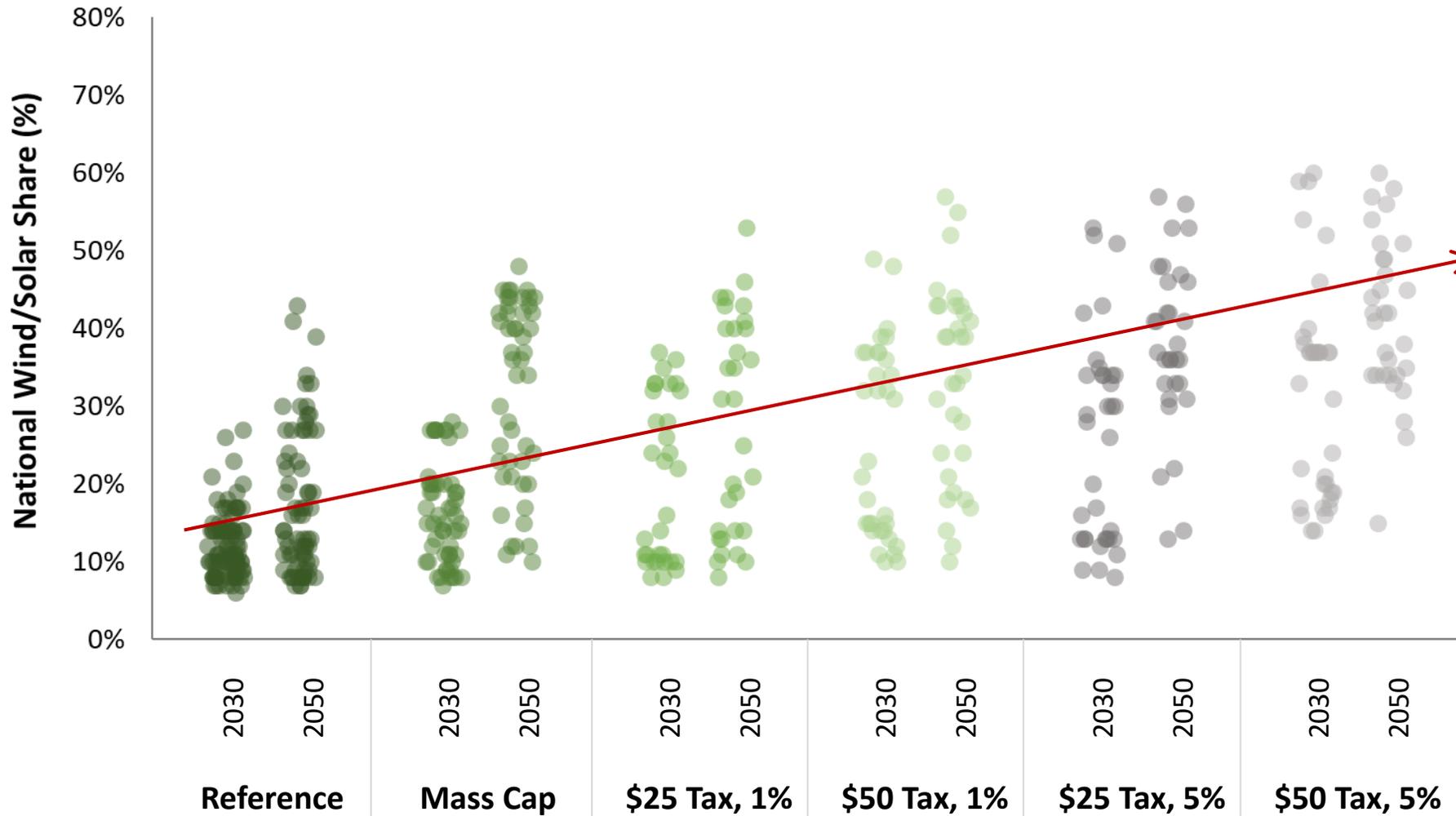
95% Cap on U.S. Power Sector CO₂ by 2050 (Results from EPRI's US-REGEN Model)



- Tradeoff between cost and technological preferences
- Declining marginal value and increasing system costs make very high renewables systems more costly
- Important role of dispatchable low-carbon power
 - Options: Existing nuclear and hydropower, gas (without/with carbon capture), new nuclear, biomass, geothermal
 - Region-specific solutions

Source: Bistline and Blanford (2018), "Value of Technology in the Electric Power Sector" (EPRI Report #3002012171)

2. What are technical/economic impacts of limited portfolios?



Wind and solar shares rise with higher CO₂ price

Notes

- Results from the Energy Modeling Forum 32 study of U.S. climate policy and technological change (Bistline, et al., 2018)
- Each dot is a different model (16 in the study) and technology sensitivity (8 in study)

- Wind and solar penetration increase even without policy
- Penetration well below 100% even with low wind/solar costs and high CO₂ price

3. How much are consumers willing to pay to not know how much they're paying?

Willingness to Pay a Modest Fee to Combat Climate Change

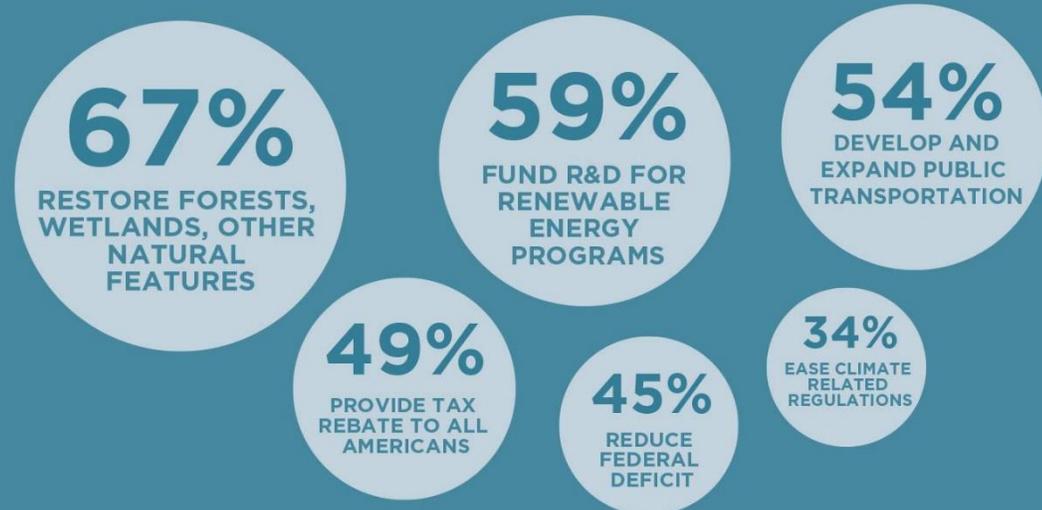


% who would support a monthly fee of at least...

When asked whether they would support a monthly fee on their electricity bill to combat climate change, 16 percent are willing to pay at least \$100 per month. Twenty-three percent indicate they are willing to pay at least \$40 per month. Party identification and acceptance of climate change are the main correlates of whether or not people are willing to pay, not education or geographic location. Democrats are consistently willing to pay more than Republicans and independents.

Forty-four percent support a policy to reduce greenhouse gas emissions by taxing the use of carbon-based fuels based on how much they contribute to climate change. That support is generally higher once told how the funds would be used.

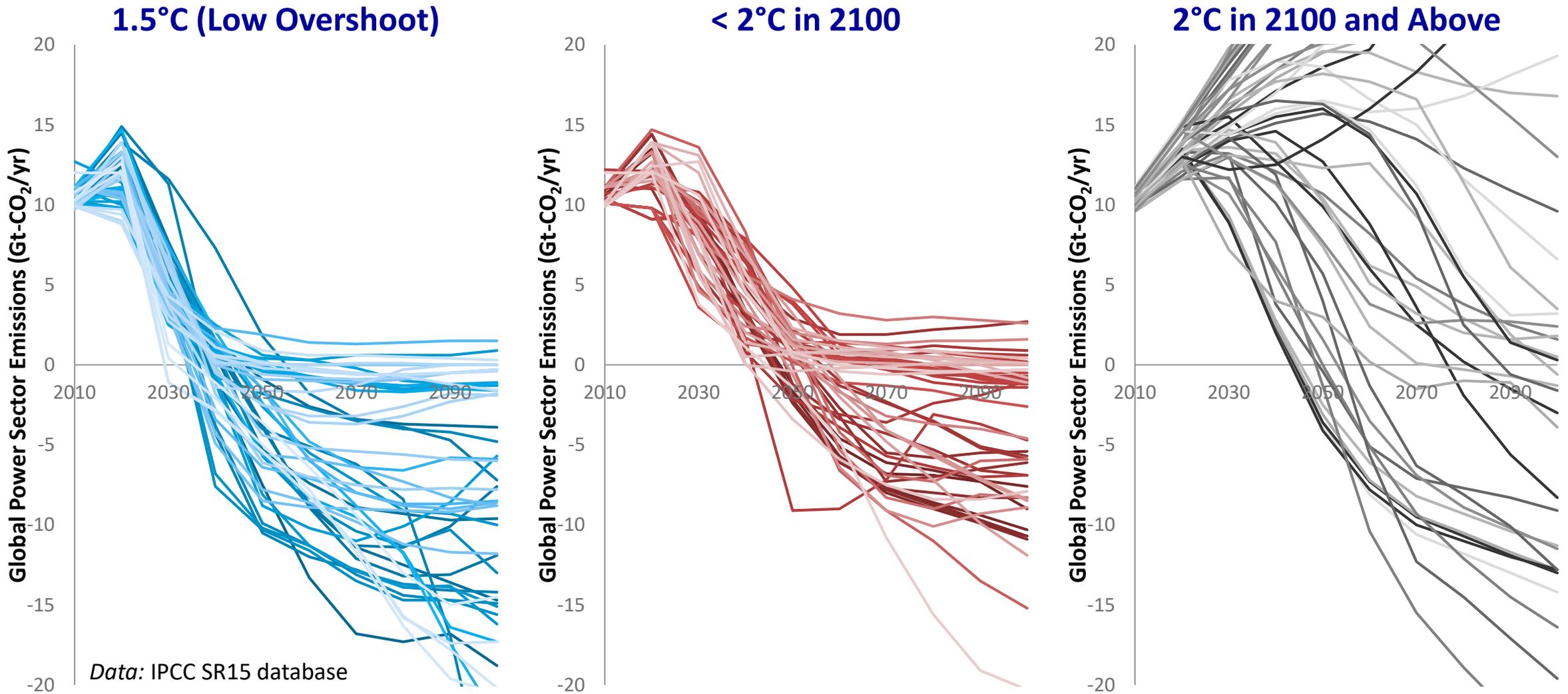
% that would support a carbon tax when used for...



Source: University of Chicago (Energy Policy Institute) and Associated Press (NORC Center) 2019 survey

Many support action to address climate change, but willingness to pay is low (43% unwilling to pay \$1/month)

4. How does the value of technology depend on policy goals?



Ambition and/or delay shift the importance of deployment and R&D portfolios (e.g., negative emissions technologies)

Together...Shaping the Future of Electricity

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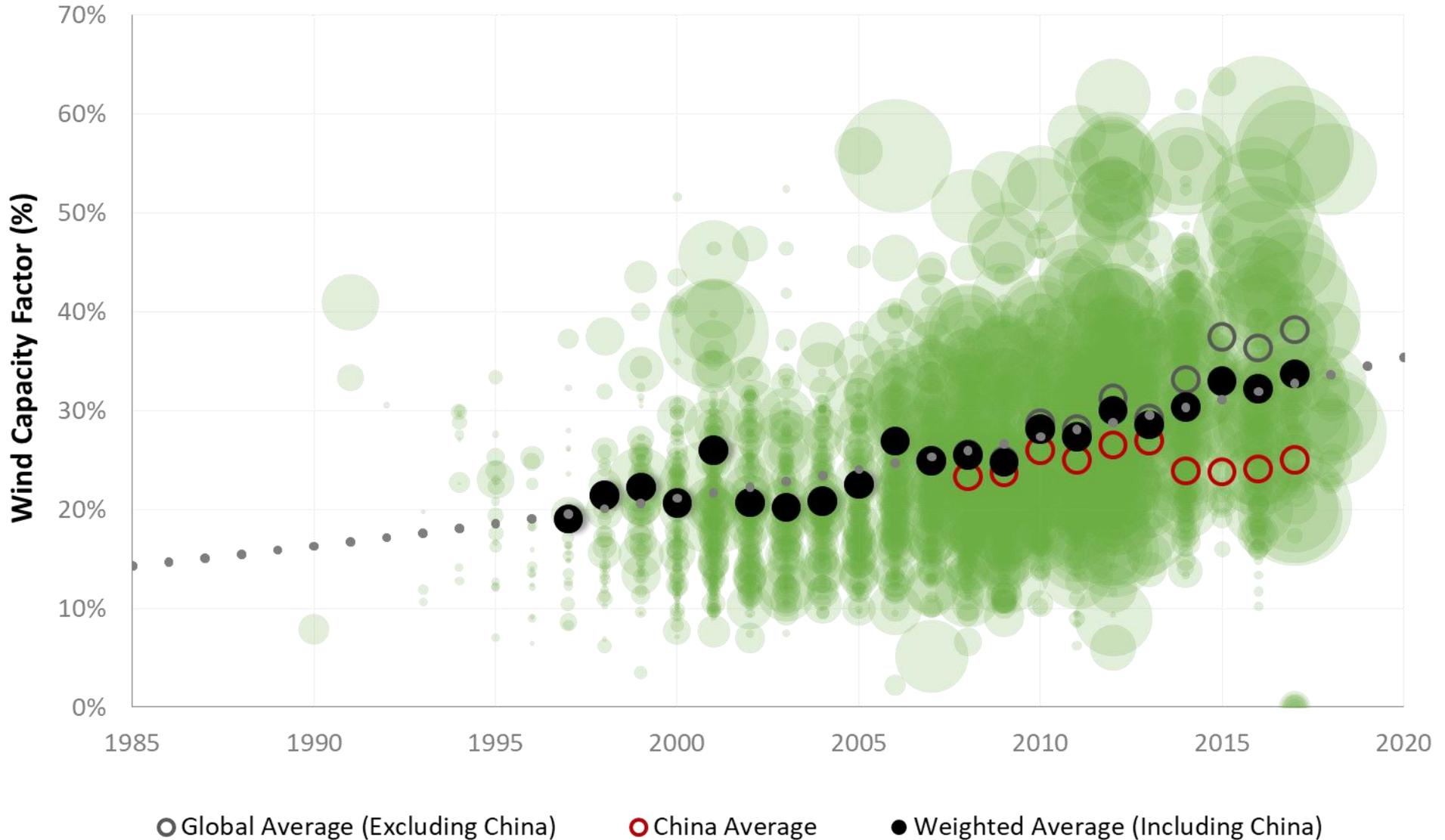
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Additional Resources

- Bistline and Blanford (2018), Value of Technology in the Electric Power Sector: Modeling and Insights in US-REGEN, EPRI Report 3002012171 ([link](#))
- Bistline, et al. (2018), “Electric Sector Policy, Technological Change, and U.S. Emissions Reductions Goals,” *Energy Economics* 73
- BloombergNEF (2019), “1H 2019 LCOE Update”
- Colpier, et al. (2002), “The Economics of the Combined Cycle Gas Turbine—An Experience Curve Analysis,” *Energy Policy* 30(4)
- Energy Policy Institute and NORC Center (2019) survey ([link](#))
- Rangel, et al. (2015), “Revisiting the Cost Escalation Curse of Nuclear Power: New Lessons from the French Experience,” *Economics of Energy & Environmental Policy*

For more information, see our website at <http://eea.epri.com>

Wind Cost Reduction Driver: Higher Capacity Factors



Source: Based on data from BloombergNEF