ELECTRIC POWER RESEARCH INSTITUTE

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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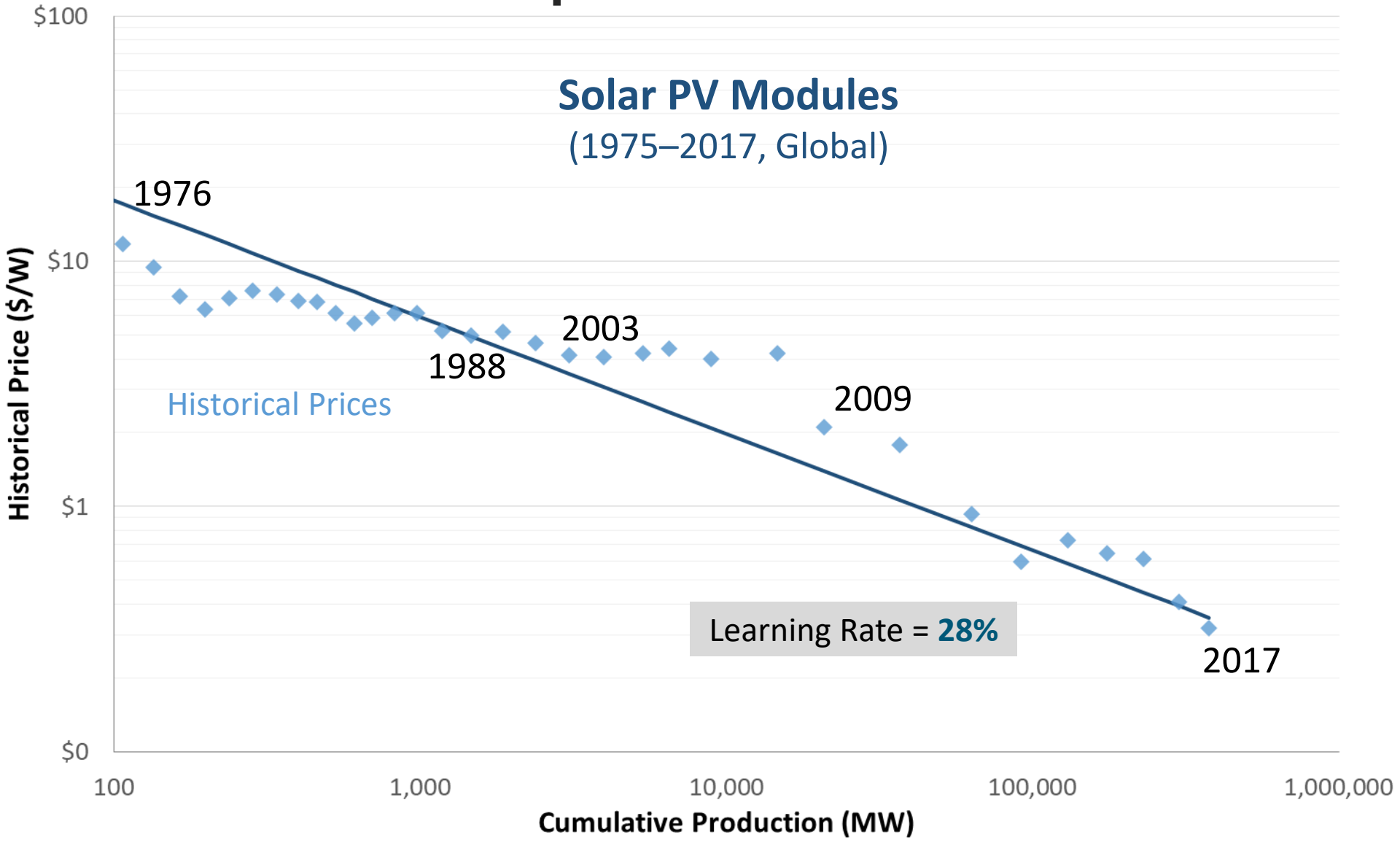
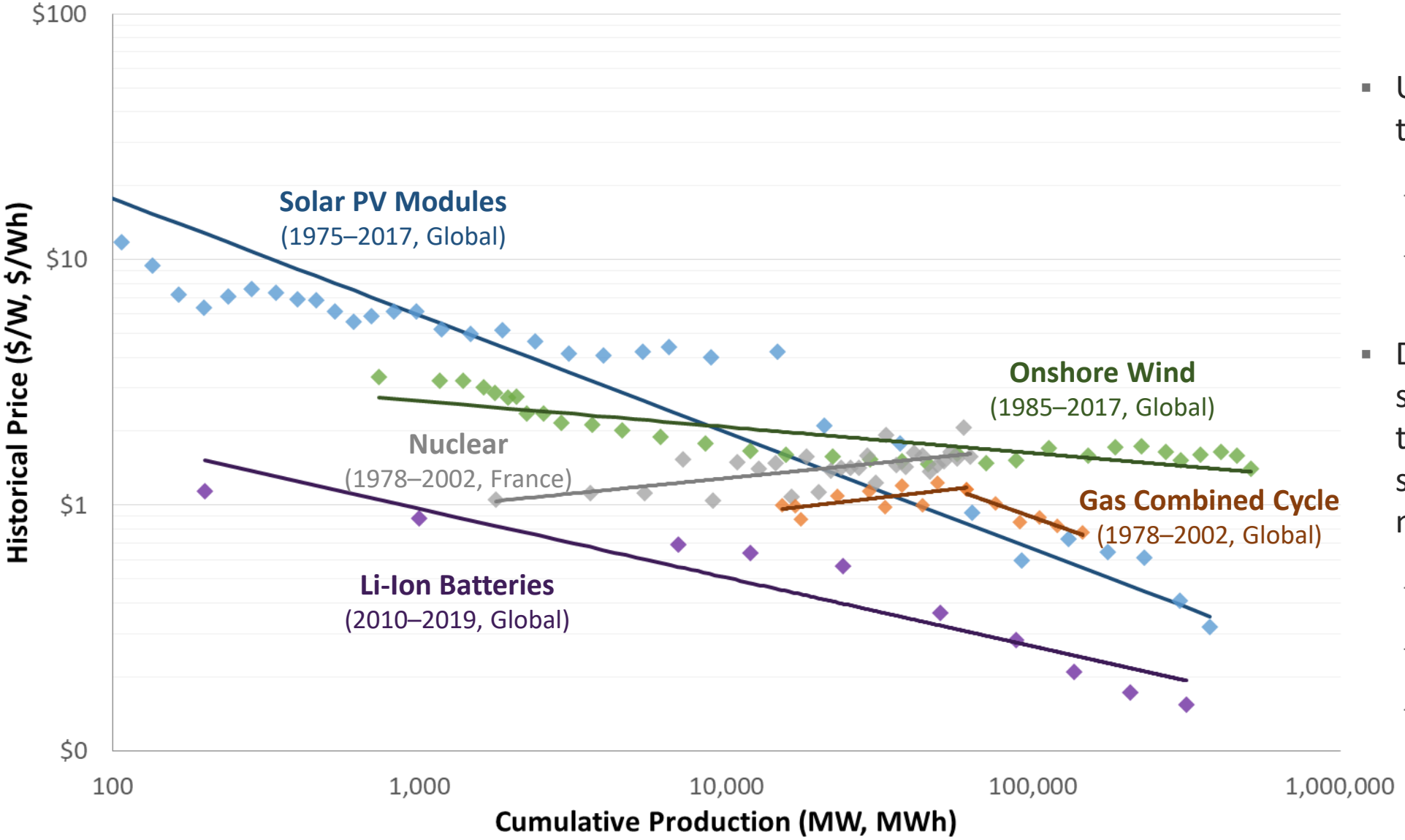
1. What can past technological change teach us about future emissions and innovation policies?



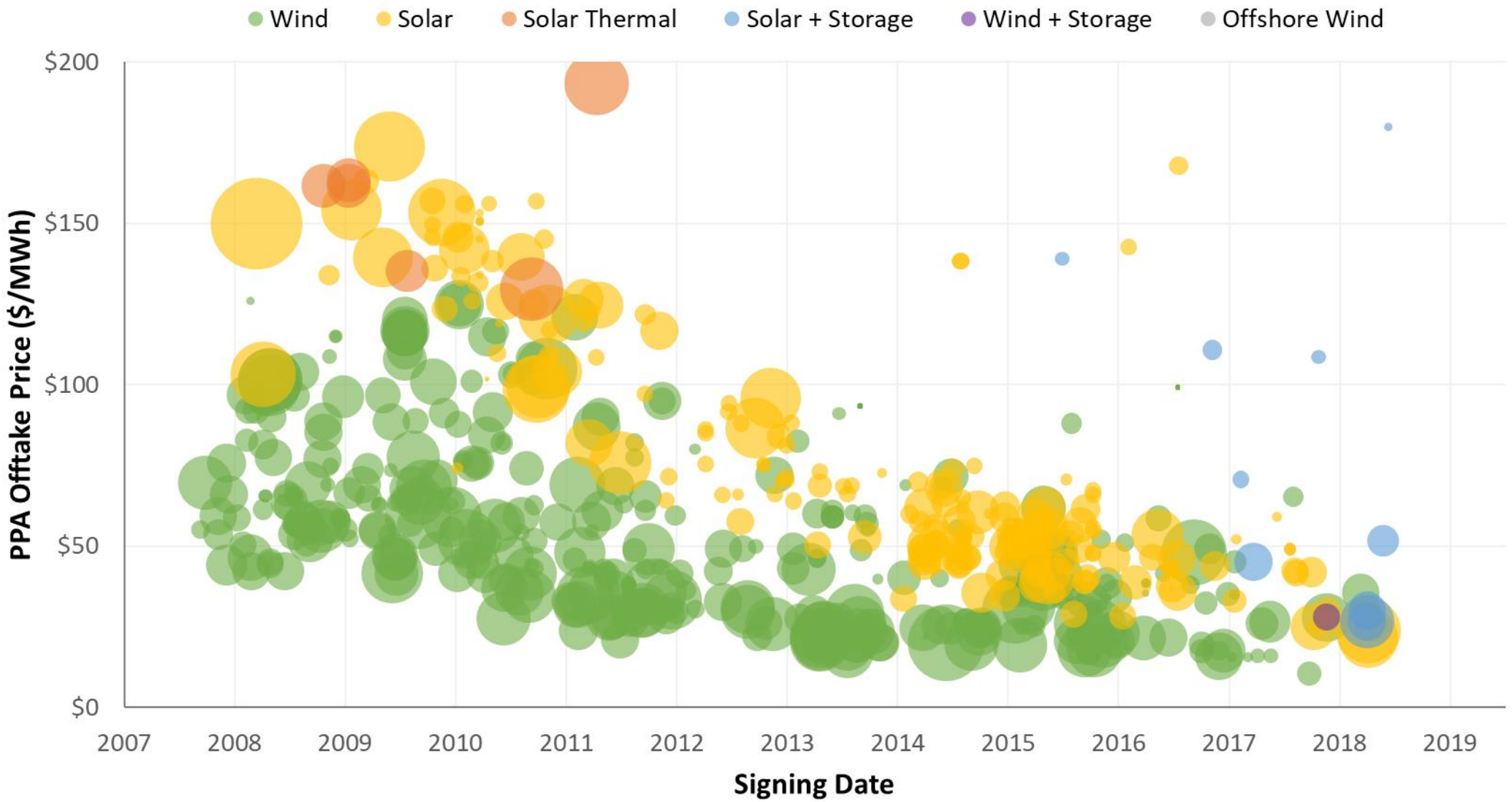
1. What can past technological change teach us?



- 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)

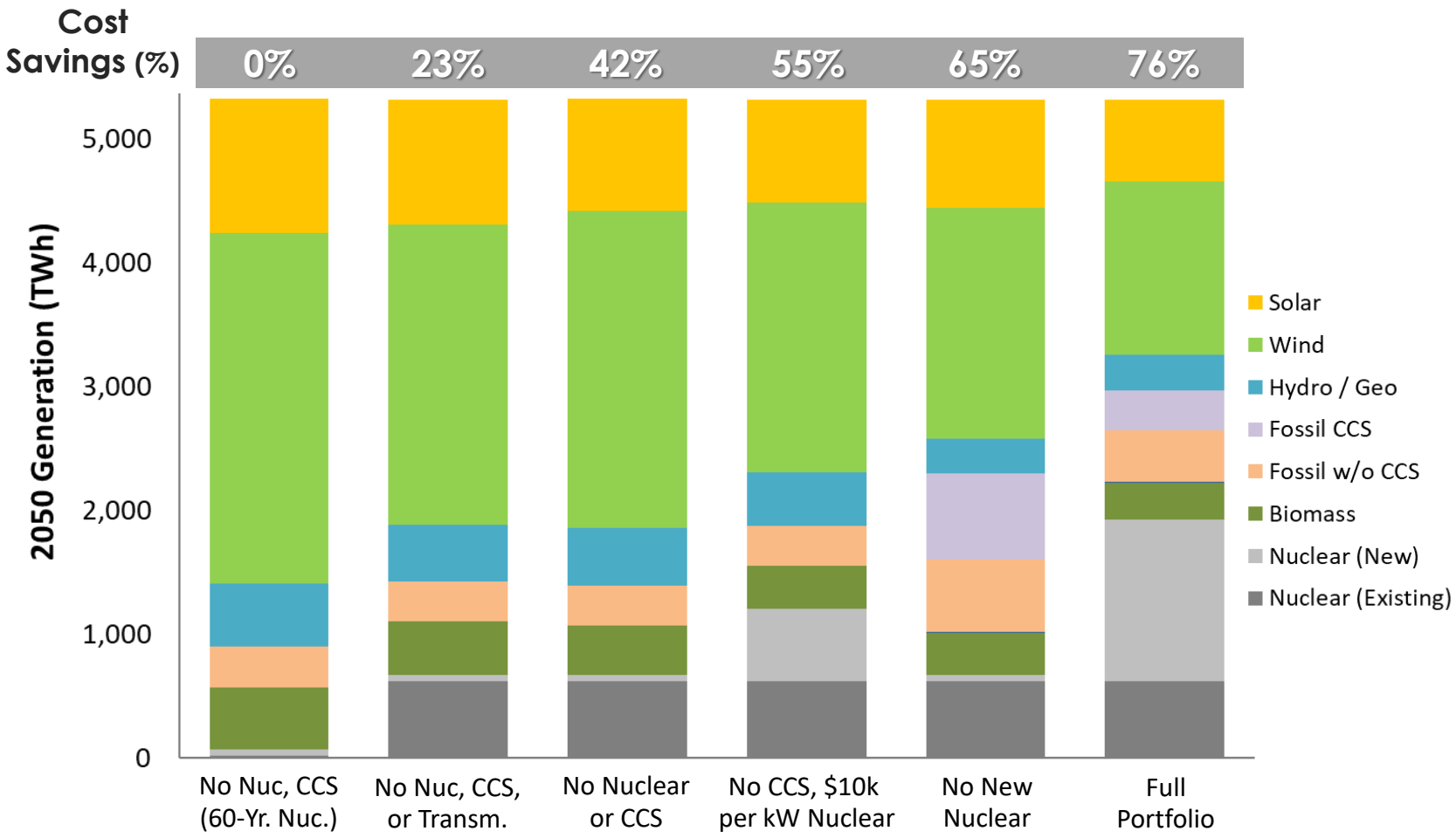
1. What can past technological change teach us?



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?

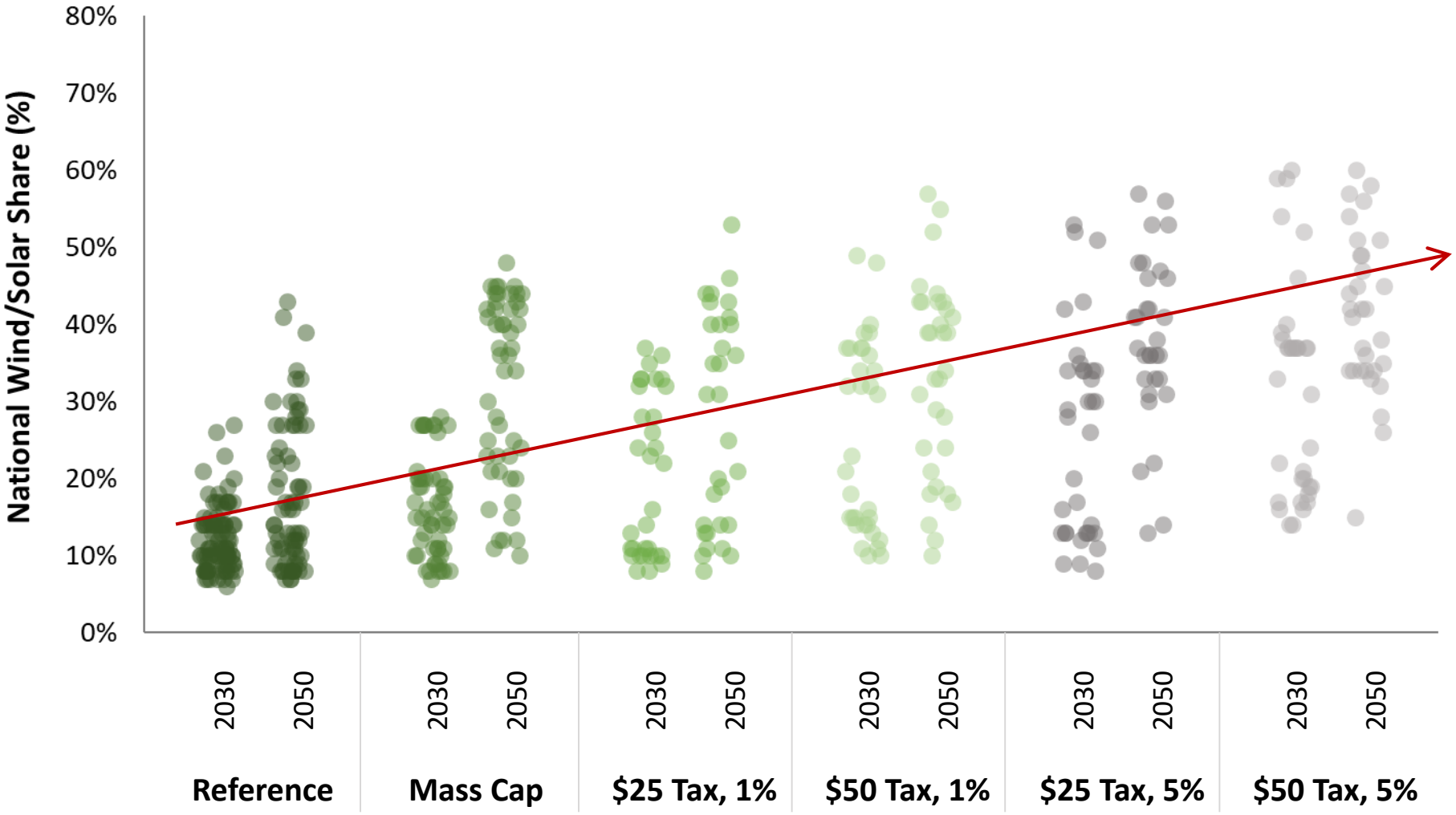
95% Cap on U.S. Power Sector CO_2 by 2050 (Results from EPRI's US-REGEN Model)



- 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?



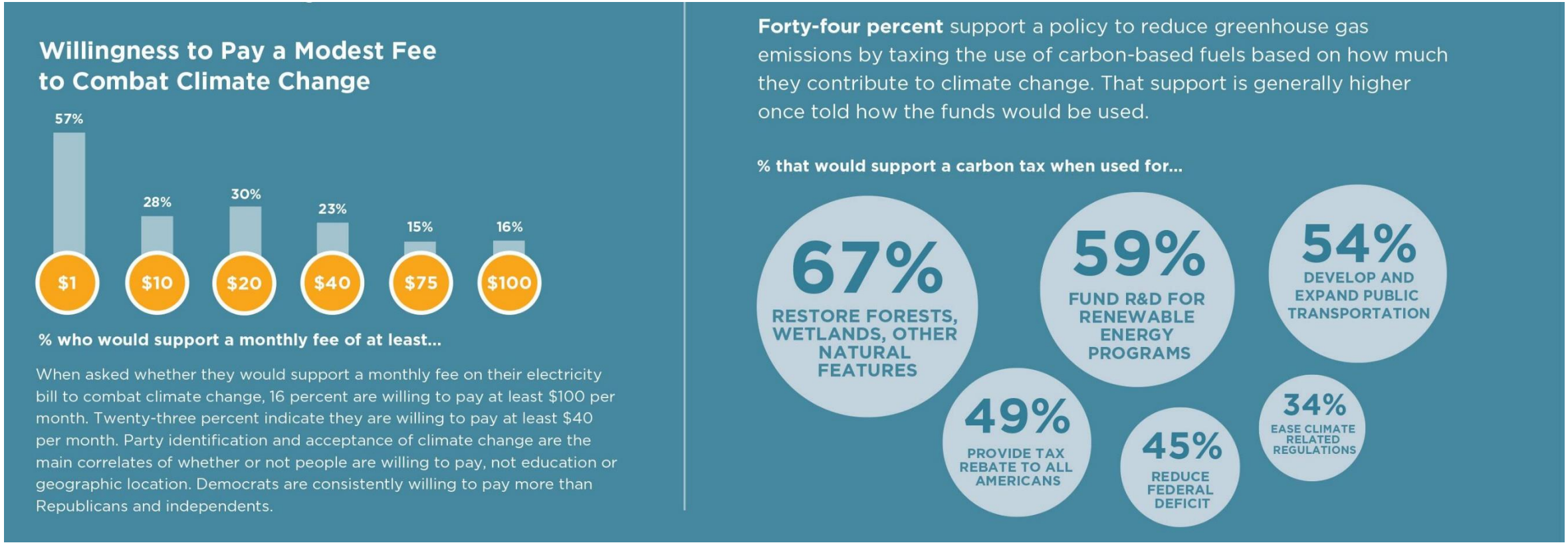
Wind and solar shares rise with higher CO_2 price

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 CO_2 price**

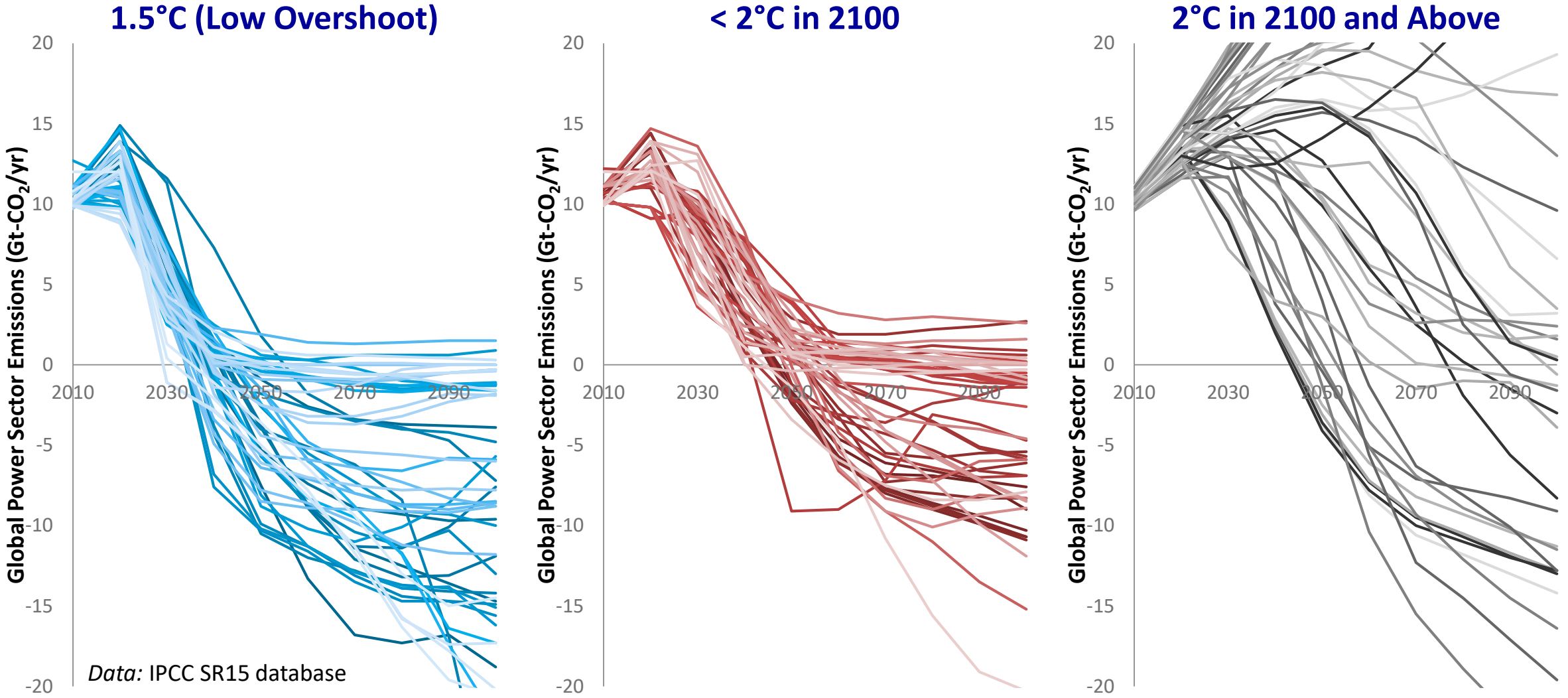
3. How much are consumers willing to pay to not know how much they're paying?



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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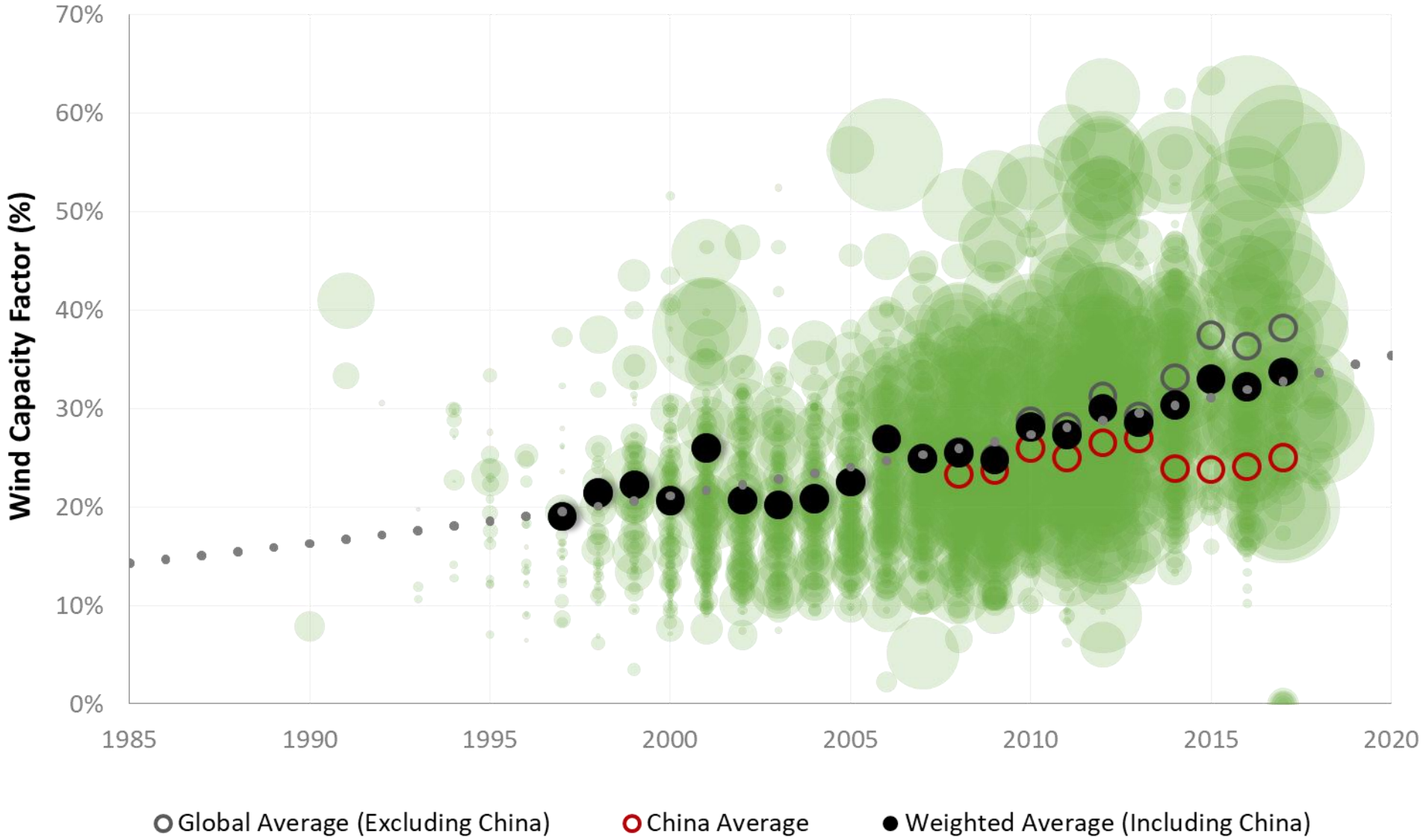
Additional Resources

- 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