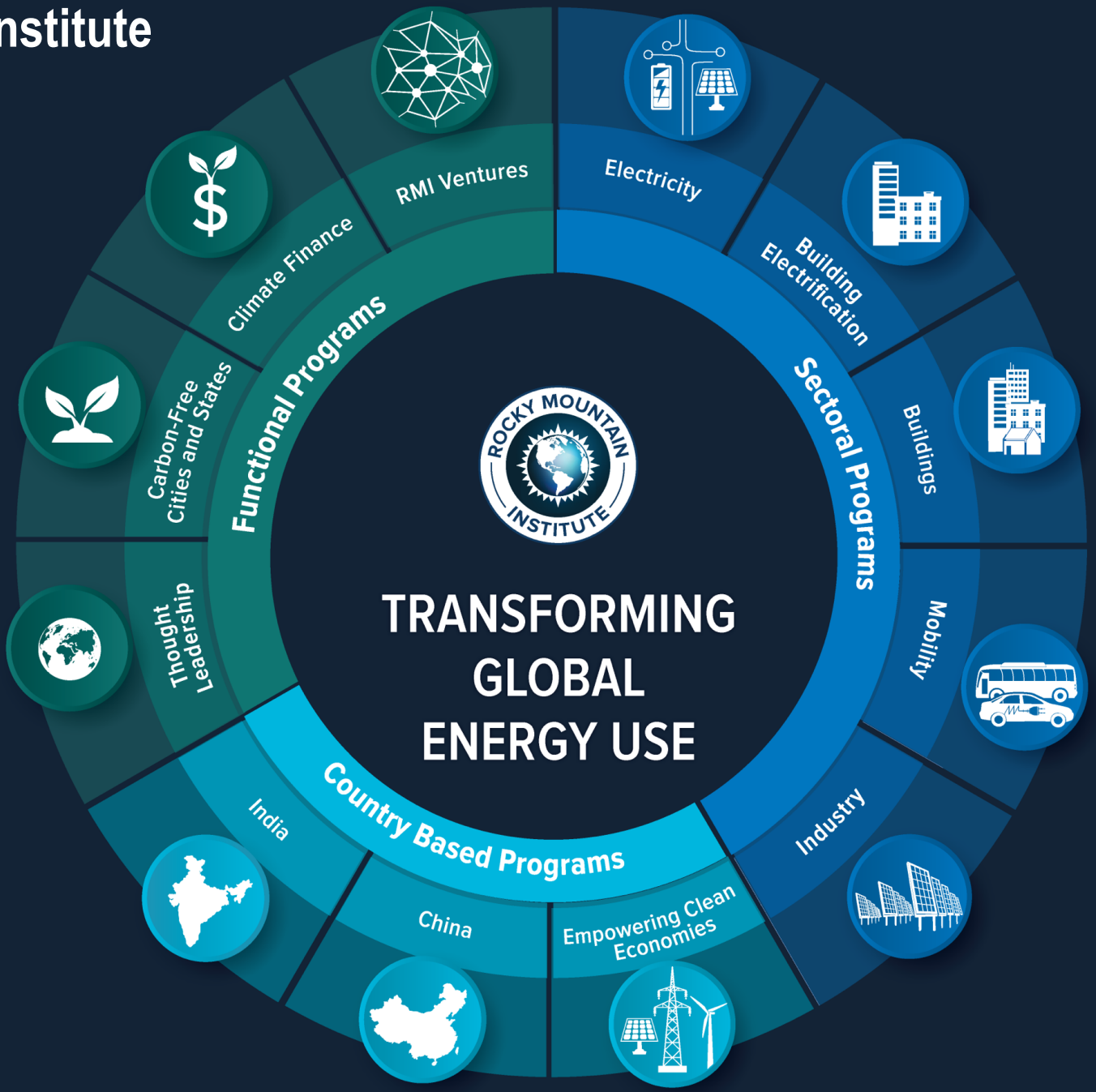
Reinventing the Grid with Customer-Side Resources

Leia Guccione

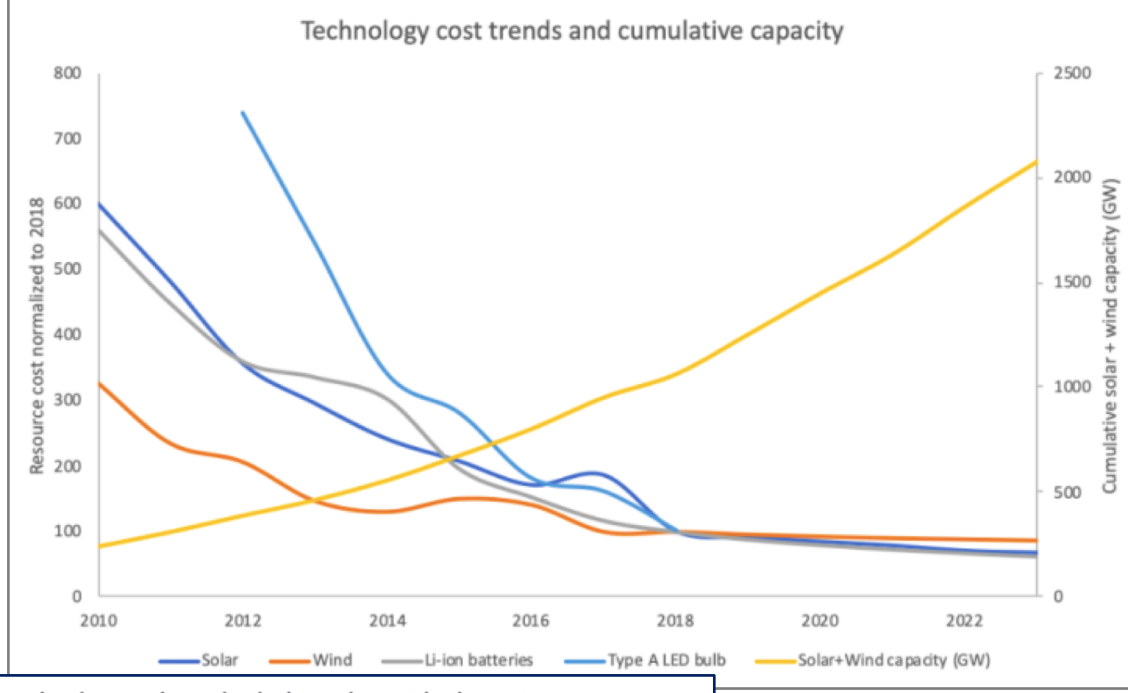
NWEC Clean & Affordable Energy Conference
Seattle, WA
December 2nd, 2019

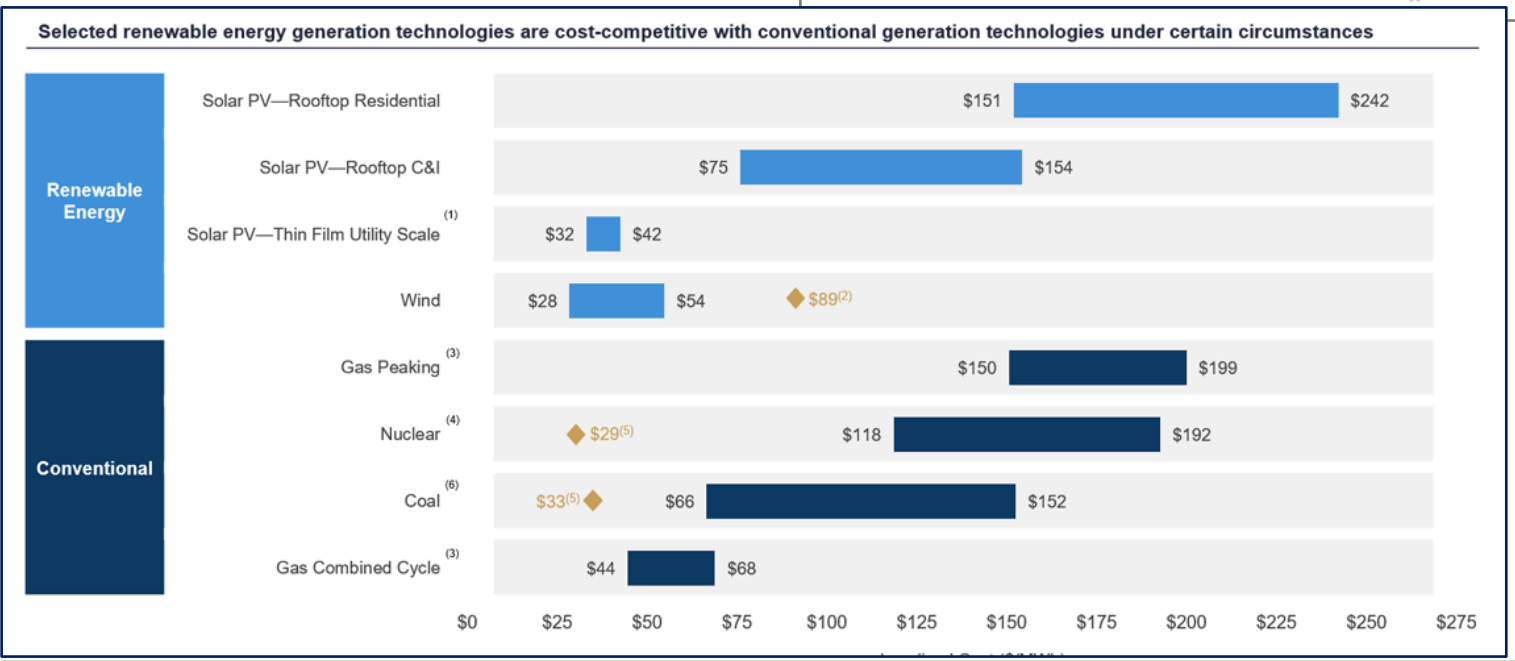
Rocky Mountain Institute

- Nonprofit, nonpartisan, independent, research & collaboration firm
- Founded 1982 in Old Snowmass, Colorado
- Offices in Basalt and Boulder CO, Washington DC, New York, Oakland, Beijing, Delhi
- ~225 staff
- Focus: Market-based approaches to clean energy



The declining cost of renewables and distributed resources continue to create opportunities to reinvent the grid

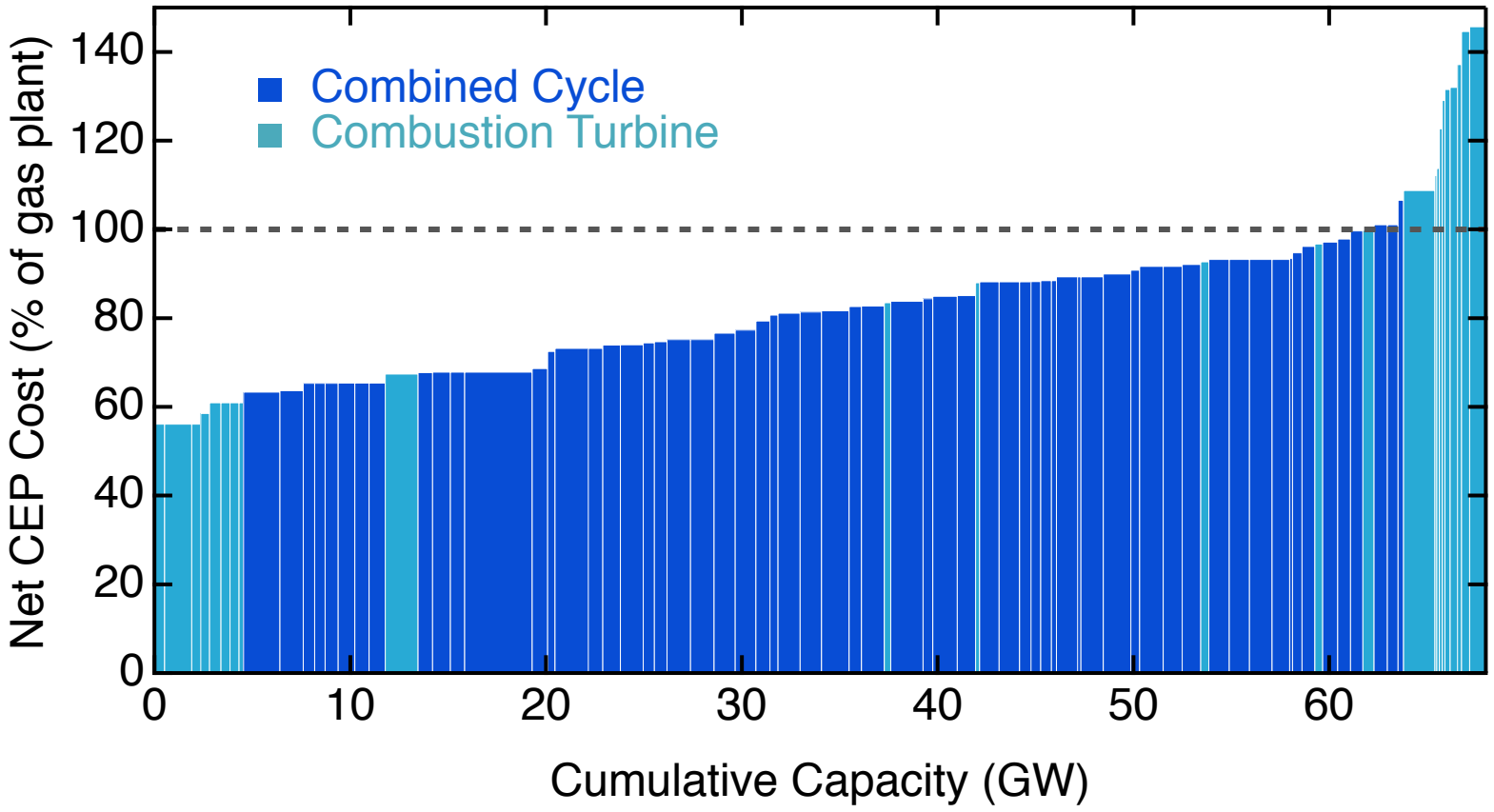




Source: RMI Analysis, Greentech Media, Lazard

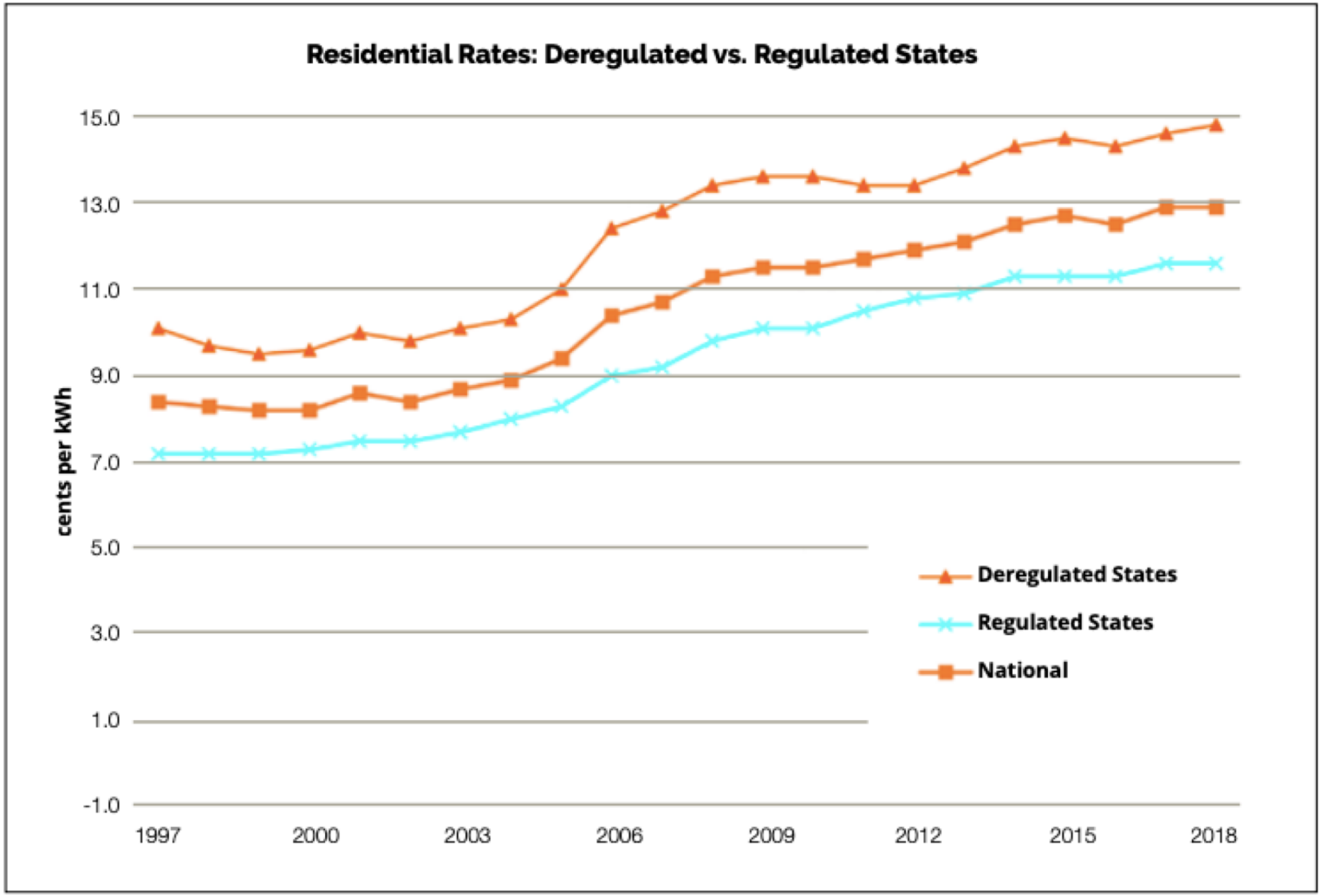
Continued technology improvements are creating opportunities for 'Clean Energy Portfolios' to defer or replace Gas Plants

Recent RMI analysis shows that Clean Energy Portfolios—combinations of renewables, storage, energy efficiency and demand response—are less expensive than 90% of all proposed new gas plants in the United States.



Source: RMI Analysis, BNEF

But despite declining costs for generation, retail rates are rising across the nation



Source: American Public Power Association, EIA Form 861

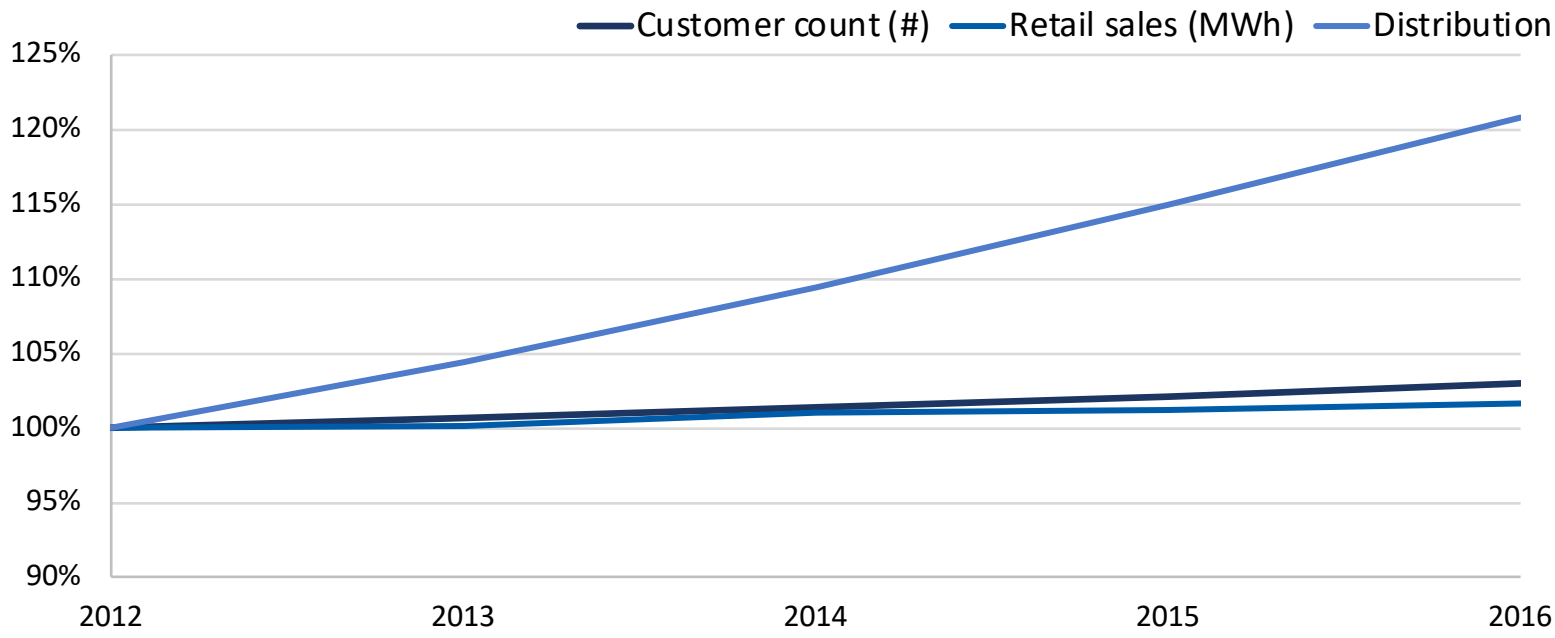
The Electricity System is evolving but more innovation is needed, particularly in grid operations and infrastructure

While generation costs have been declining steadily due to innovation and competition, transmission and distribution (T&D) costs and spending are rising

Source: RMI Analysis, BNEF

With distribution spending increasing across the United States, there is tremendous room for customer-side innovation

Customer count, sales, and distribution assets for US investor-owned utilities, 2012-2016



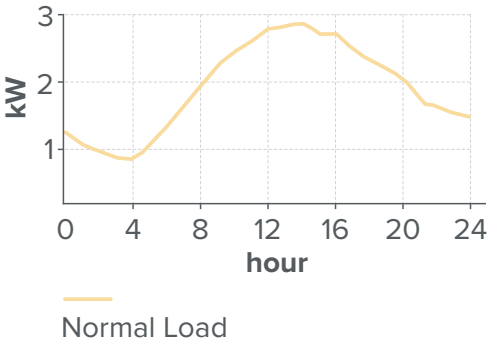
Source: RMI analysis of S&P Global data

Improvements and innovation in technology have greatly expanded what we can expect from customer-side resources

Distributed Generation, combined with Efficiency, and Smart Electric Loads are an emerging resource for grid operators that offer many benefits to customers as well

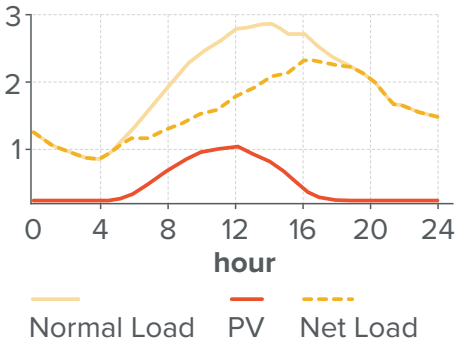
Grid Purchases

Buy kWh from the grid as and when needed.



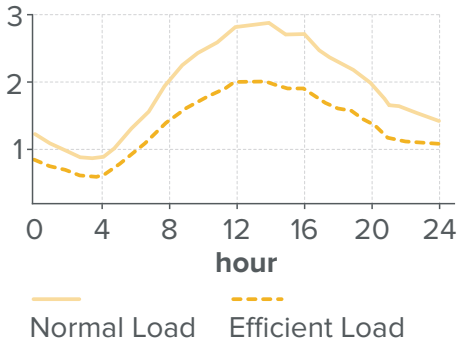
Distributed Generation

Generate electricity, changing the profile of net grid demand while reducing total grid demand.



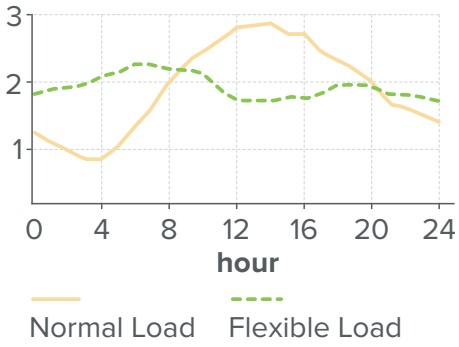
Energy Efficiency

Reduce demand whenever load is operated, thus lowering the daily load curve.



Demand Flexibility

Shift eligible loads across the hours of a day to lower-cost times, reshaping the daily load curve.



Distributed Energy Resources (DERs) and Non-Wires Solutions present competitive alternatives to help control T&D costs

Non-wires solutions rely on DERs to defer or avoid traditional T&D investments; the market is small but growing

Definitions

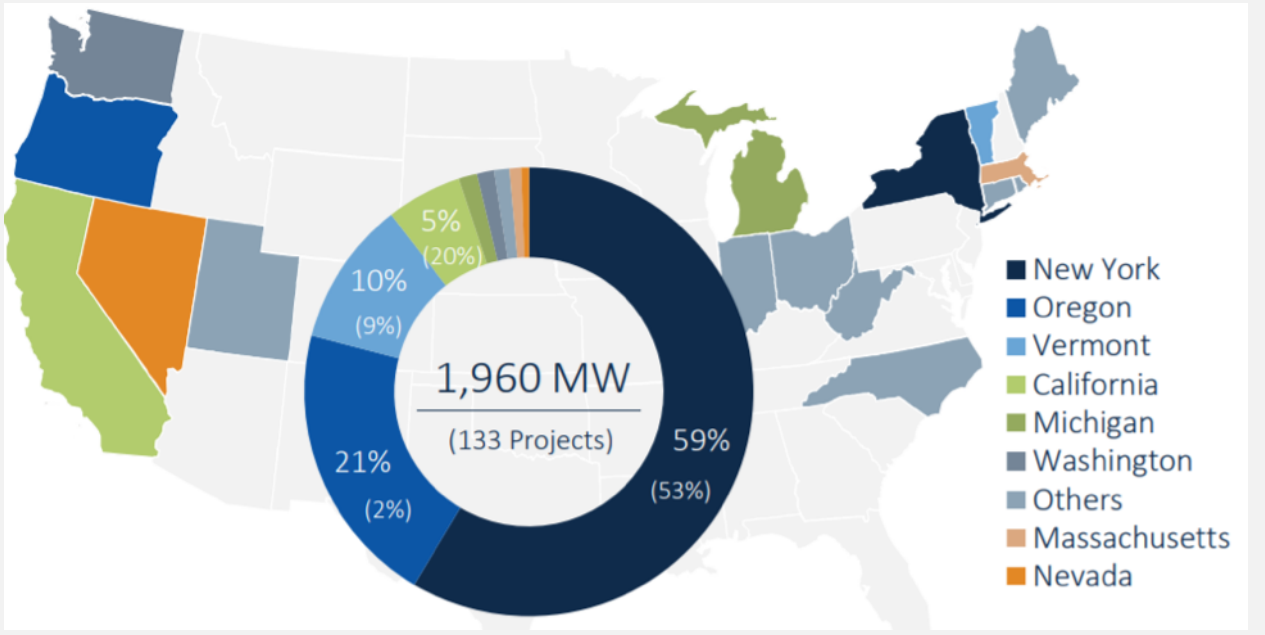
Non-wires solutions (NWS)

- Portfolios of DERs deployed to address a grid need
- Preferred to NWA which suggests “alternative”

Distributed energy resources (DERs) include:

- Distributed generation (DG)
- Distributed storage
- Demand-side management (DSM)

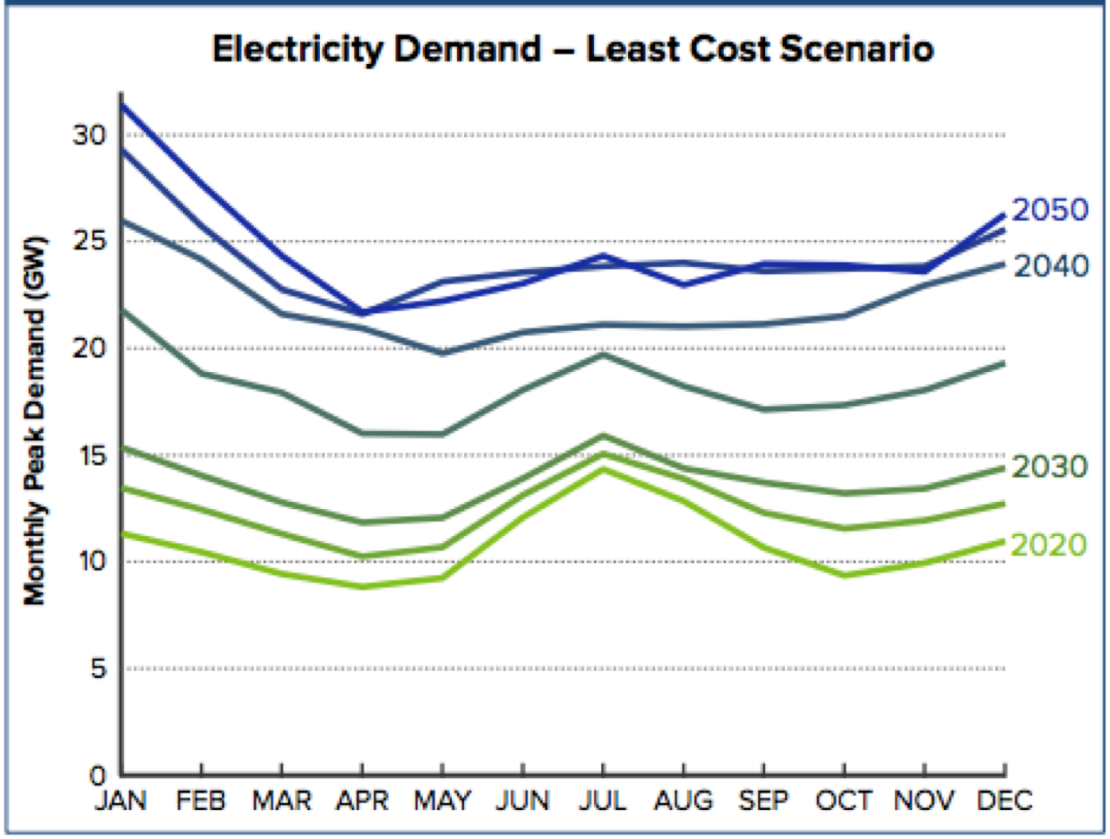
Current market size and concentration



Source: RMI; Wood Mackenzie Power & Renewables (2017 Markey Survey)

Changes in other industries and parts of the economy will Require us to further optimize customer-side resources

Electric vehicles and electrified heating steadily increase electricity demand, and shift peak periods to winter months

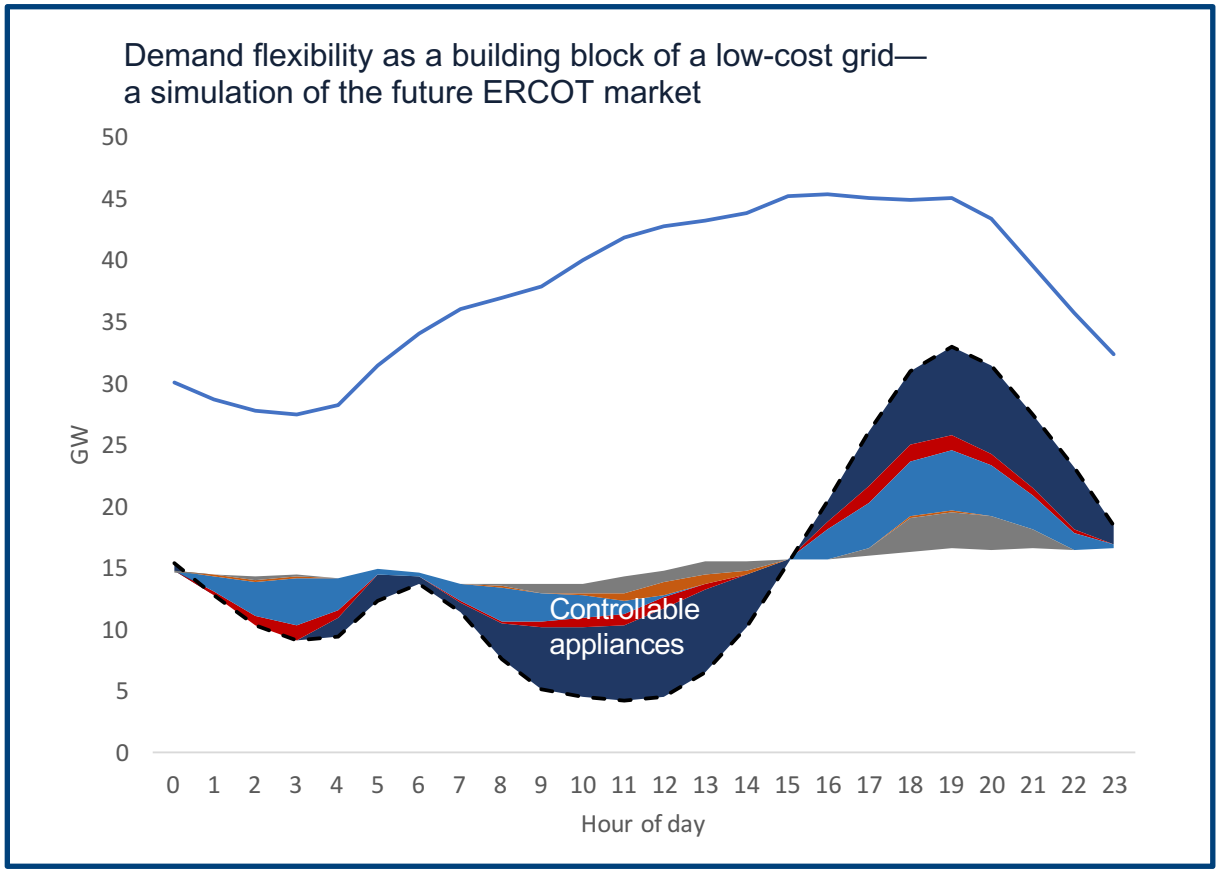


Electrification of transportation and space heating will place change what we demand from the grid

Source: RMI and Evolved Energy Research analysis for New Jersey BPU

Smart Electrification has the potential to help us manage a grid with higher shares of renewable energy and electrification

New approaches to load control, flexibility, and reliability can help us managing the evolving demands of the grid



System-level value:

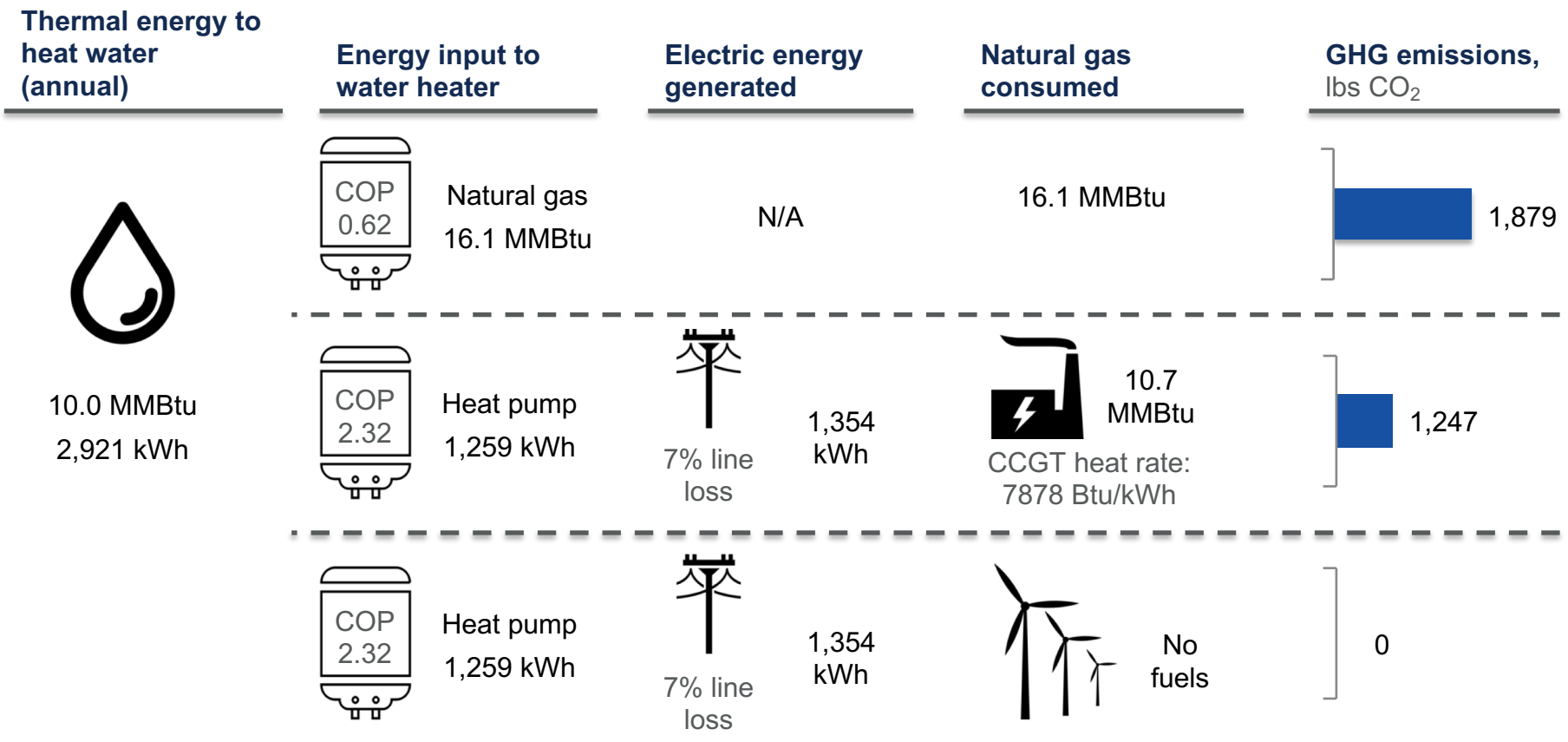
- Lower net peak by 24%
- Lower curtailment by 40%
- Lower load ramps by 56%
- Increase value of renewables by 36%

Customer- and utility-level value:

- Lower service costs (e.g., beneficial electrification)
- Increased control & visibility (e.g., smart appliances, distribution monitoring)
- Resilience benefits (e.g., through distributed generation + batteries)

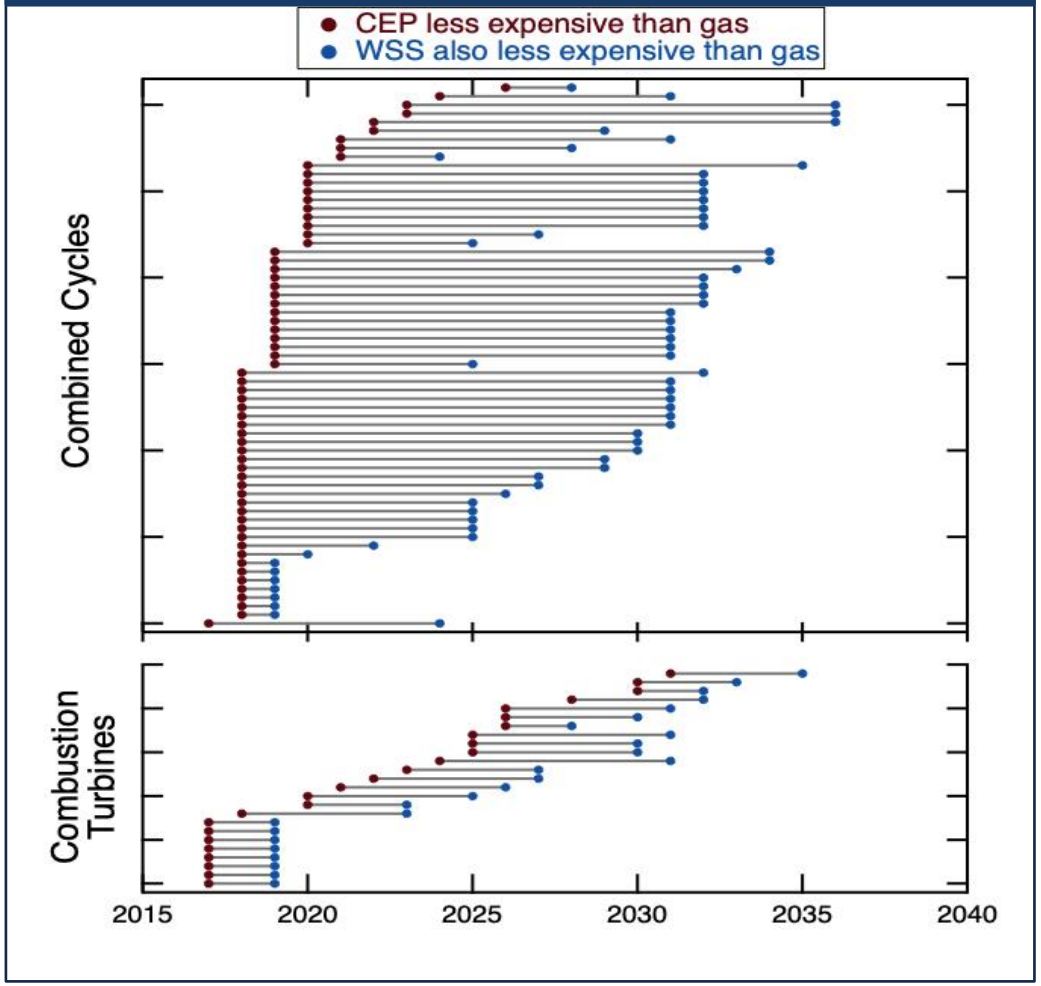
Even without a fully decarbonized grid, heat pumps reduce carbon compared to burning gas in the home

An air source heat pump powered by natural gas electricity consumes half as much energy as an efficient natural gas furnace – even when accounting for upstream electricity generation and transmission losses



Ignoring energy efficiency and demand flexibility shrinks and delays the clean energy market for everyone

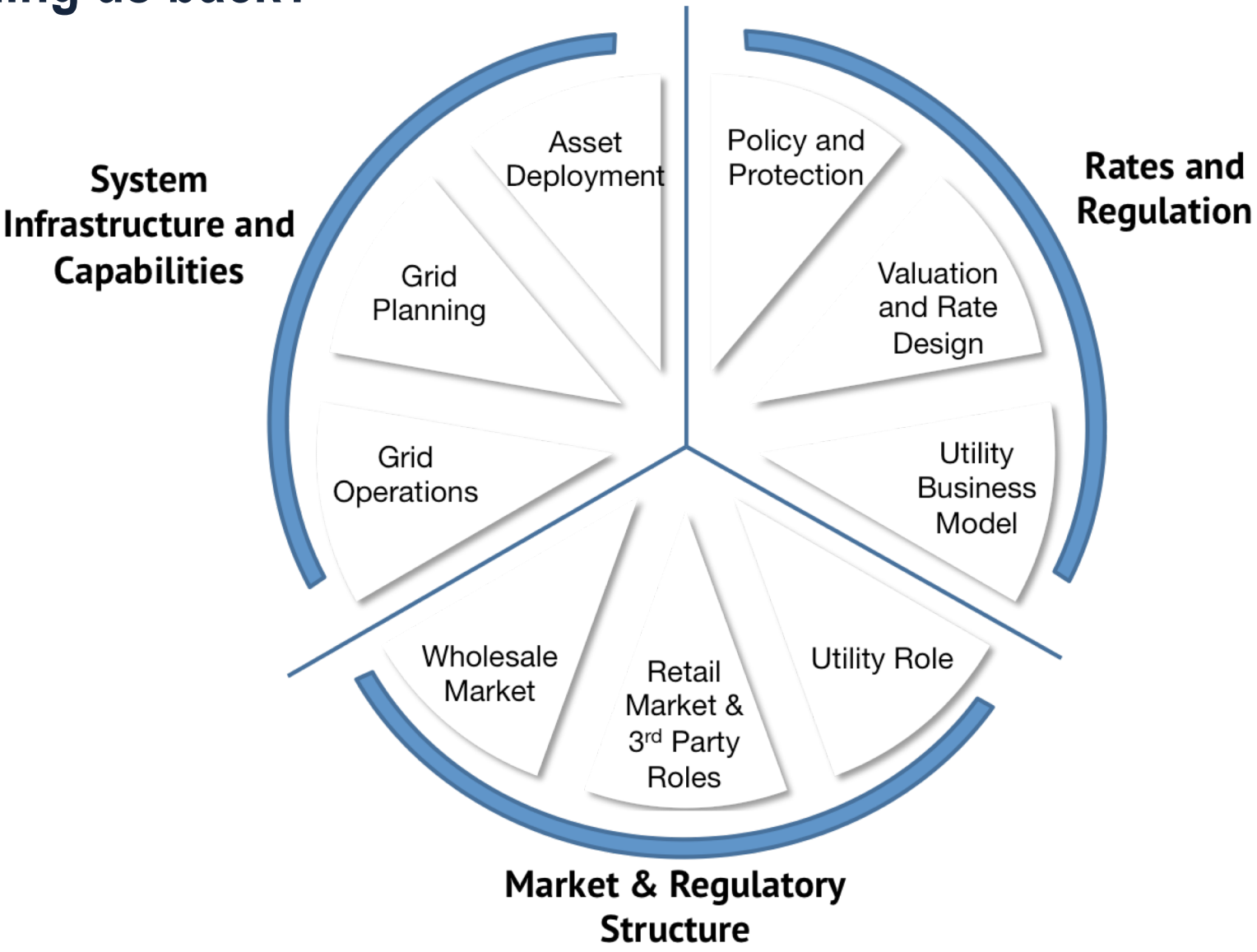
Timing of CEP cost-effectiveness



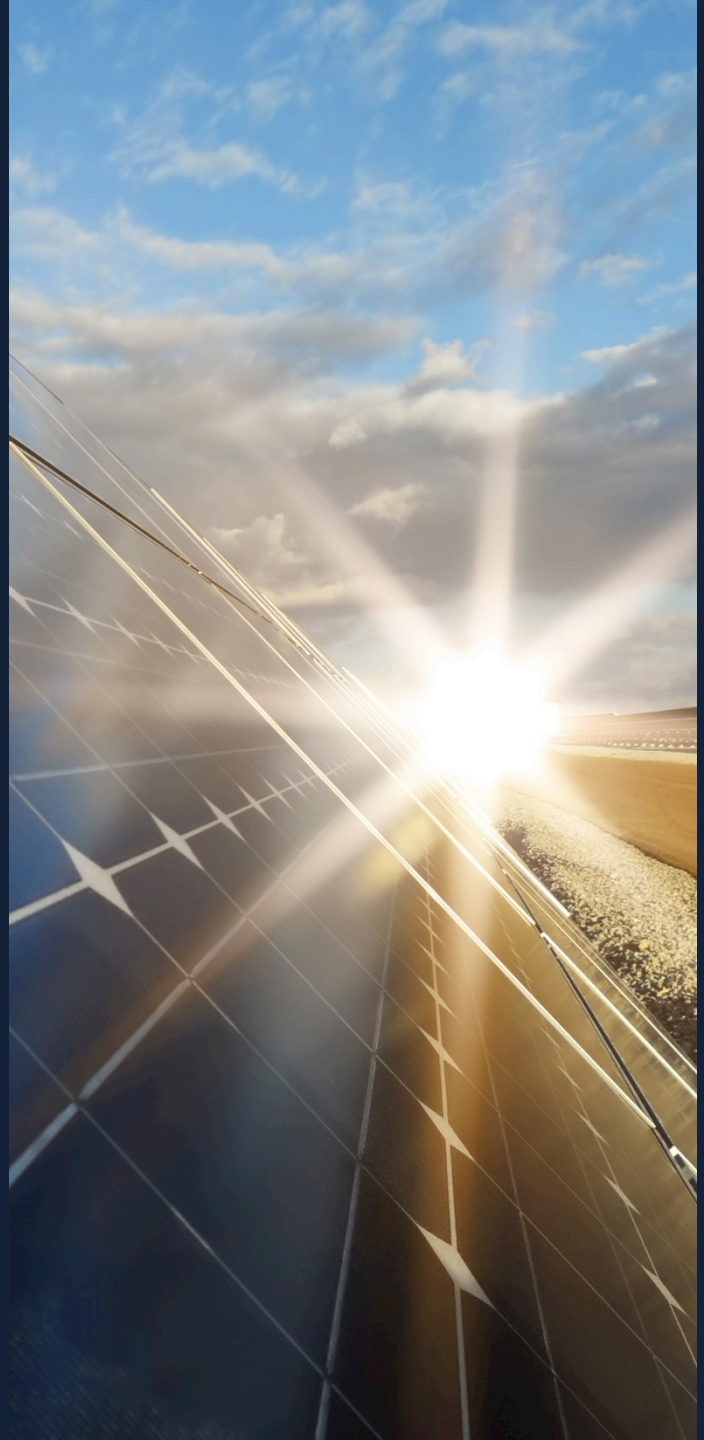
- Without allowing for EE and DR to play a role in providing grid services as part of CEPs, the economic market for CEPs to replace planned gas plants at proposed in-service dates shrinks by 90%.
- Shrinks net customer savings from $29 billion to $3.5 billion (NPV)
- On average, excluding EE and DR delays the year in which a CEP can beat a proposed gas plant by 8 years, leading to 77 million tons of CO_2 per year in emissions that could have been otherwise avoided.

Source: RMI *The Growing Market for Clean Energy Portfolios*

With so much to gain from customer-side resources, what's holding us back?



Source: RMI



Thank You

www.rmi.org

Leia Guccione, P.E.
lguccione@rmi.org
@leiaguccione