Racing to the Starting Line

Opportunities for a carbon-free grid in 2030 to unlock cost savings, resilience, and deep decarbonization

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Sacramento Municipal Utility District

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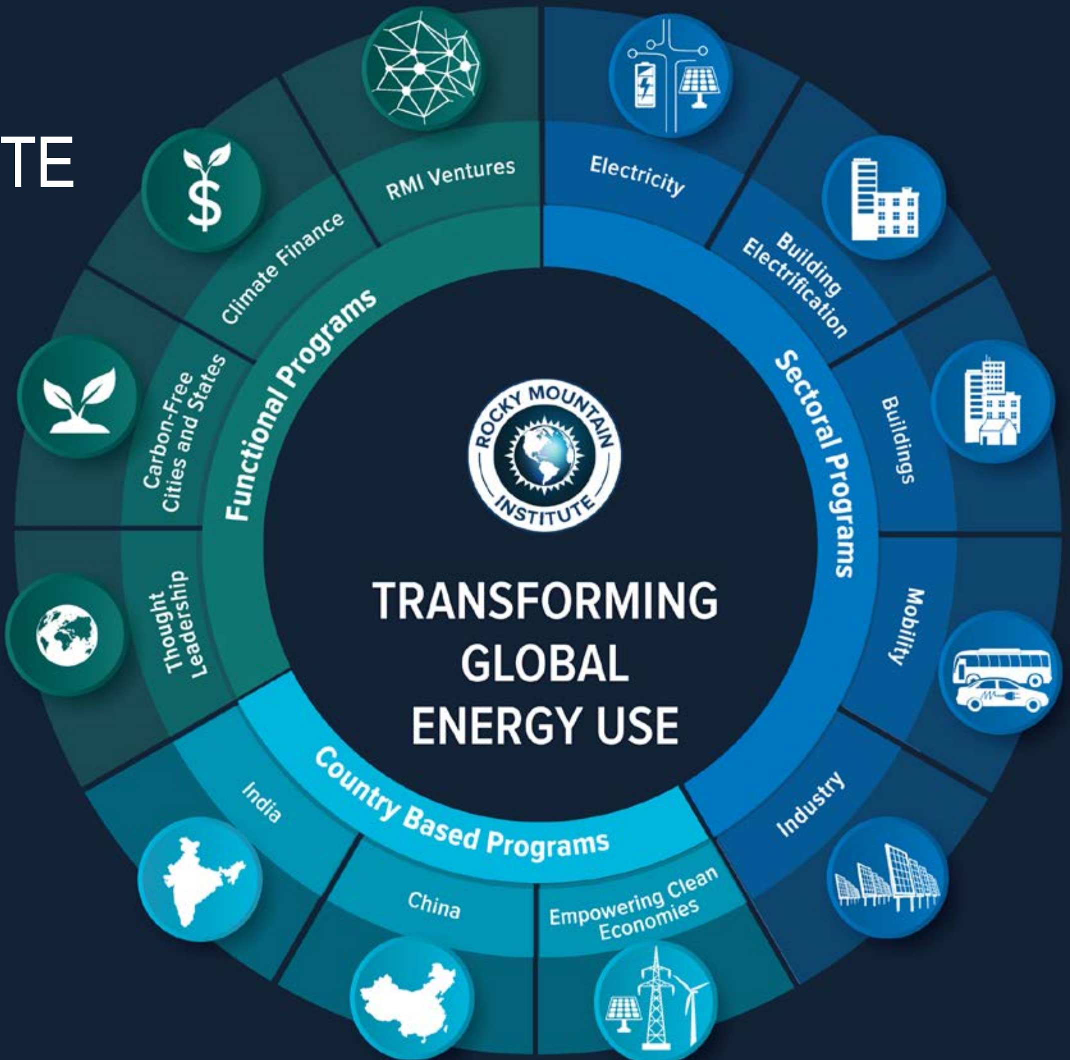
ABOUT
ROCKY MOUNTAIN INSTITUTE

- Nonprofit, nonpartisan, independent, research & collaboration firm
- Founded 1982 in Colorado
- Global scope
- 250+ staff (CO, NY, DC, CA, Beijing, Delhi)
- Focus: Market-based approaches to clean energy



Summary of key messages

With its 2030 goal, SMUD can lead the way to the starting line of a much longer race

- SMUD's ambition to decarbonize electricity sales by 2030 can set the stage for the broader, industry-wide challenge of efficient and carbon-free electrification of large parts of the economy.
- This transition need not impose significant costs on SMUD customers, and will provide tangible health benefits.

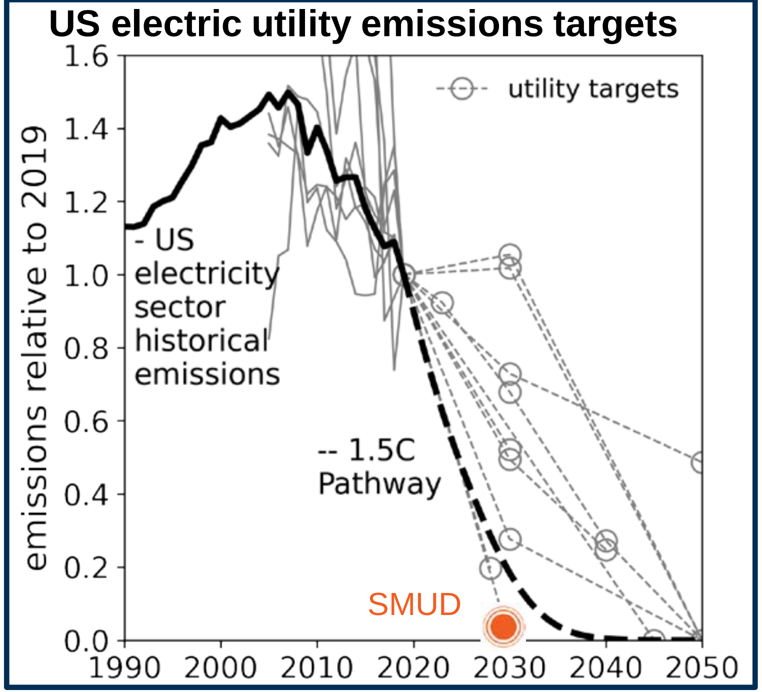
Addressing a set of emergent challenges in this decade will pay dividends for SMUD's customers for generations to come

- Strategies to decarbonize electricity quickly can also minimize long-term costs while addressing other climate-related challenges:

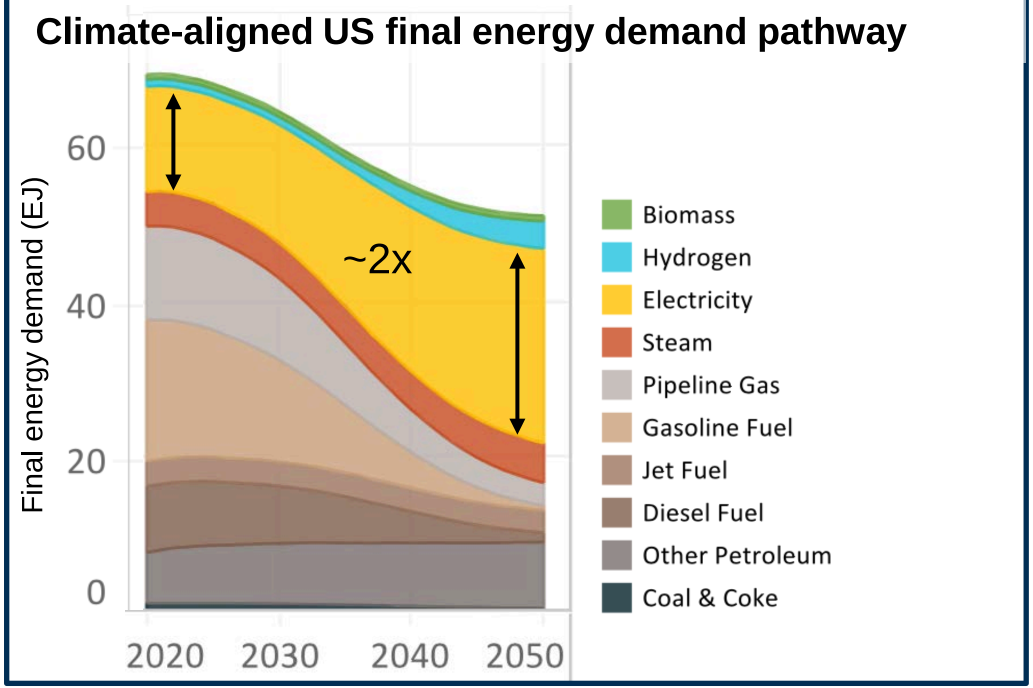
1. **Focus on total energy burden**: Customers can pay less for energy services even as electricity bills rise, with carefully planned electrification strategies.
2. **Leverage customer resources**: Distributed energy resources, properly integrated into planning, can be the building blocks of a decarbonized grid.
3. **Plan for resilience**: In the face of climate-driven risks, grid resource planning should be linked with resilience-focused investments to minimize total costs.

SMUD's 2030 goal will lead the industry to the starting line of a much longer race: economy-wide decarbonization

SMUD will join a small club of leading utilities setting a new bar for the industry…

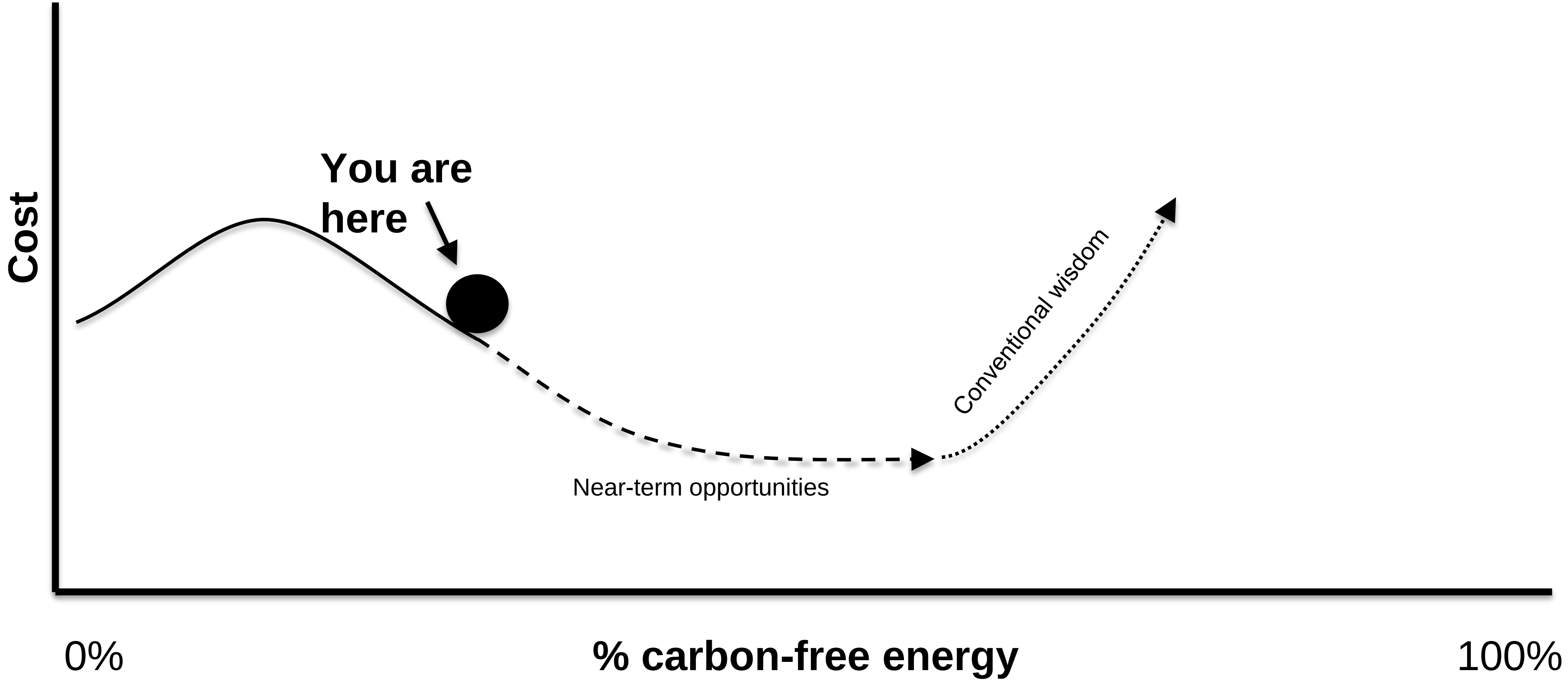


… and unlocking the potential to power an energy-efficient economy with carbon-free electricity



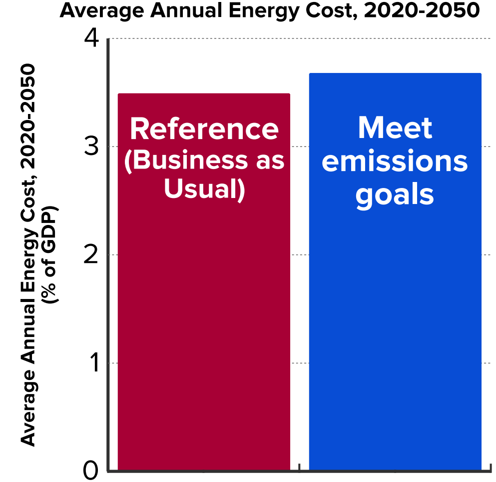
Source: [L] RMI analysis of US electric utilities' public targets and filings; [R] Evolved Energy Research / SDSN 2020

Conventional wisdom suggests that decarbonization will be costly…



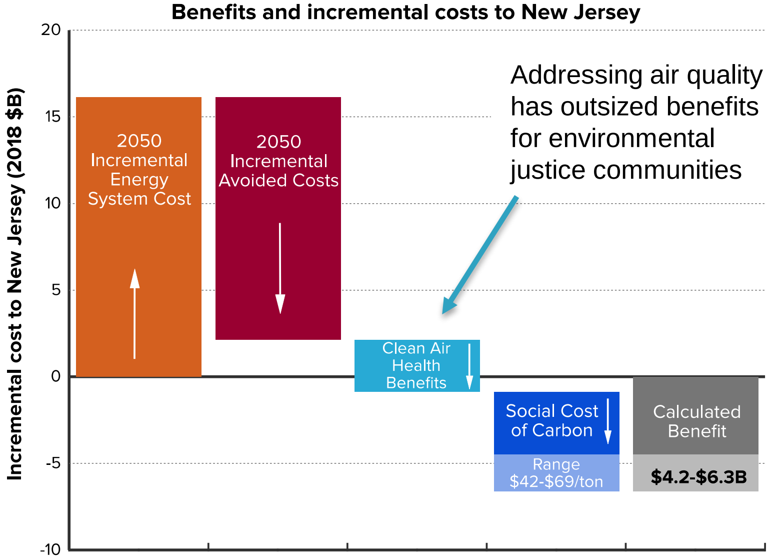
… but conventional wisdom is based on legacy thinking. In fact, decarbonization imposes low costs, more than offset by health benefits.

Example: Meeting emissions targets in NJ increases the average costs of the energy system by ~0.2% of GDP…



Modeled costs include annualized supply-side capital costs, incremental demand-side equipment, fuel costs, and O&M.

… but incremental costs of meeting emissions targets (beyond avoided fossil fuel costs) are offset by health benefits from reduced fossil fuel pollution



These cost results are consistent with other national and state-specific studies of decarbonization pathways

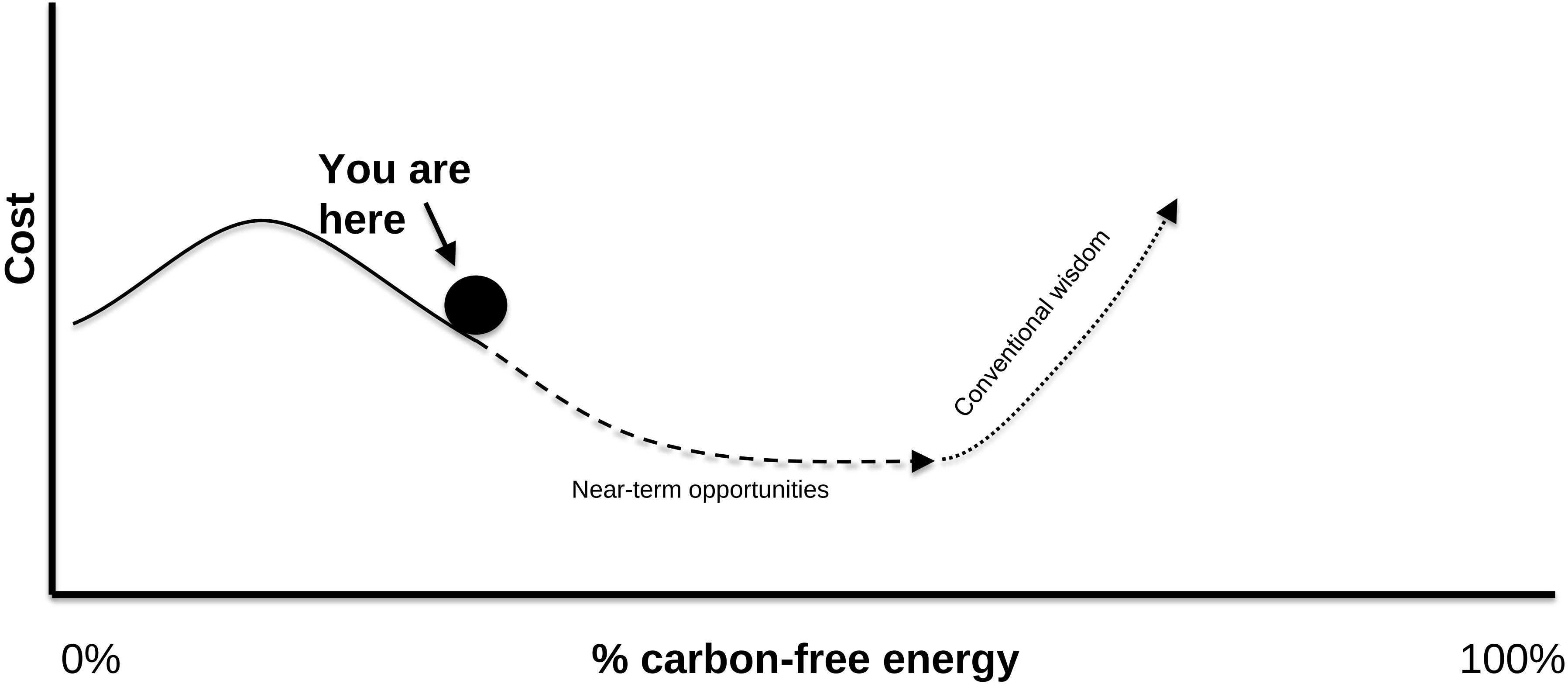
Source: NJPBU, RMI, Evolved Energy Research: 2019 New Jersey Energy Master Plan

Clean air benefits estimated from American Lung Association. SCC from U.S. Environmental Protection Agency (3% discount rate)

If a problem can’t be solved, enlarge it.

—attributed to Dwight Eisenhower

How can SMUD "enlarge the problem" to beat conventional wisdom and plan ahead for deep decarbonization?



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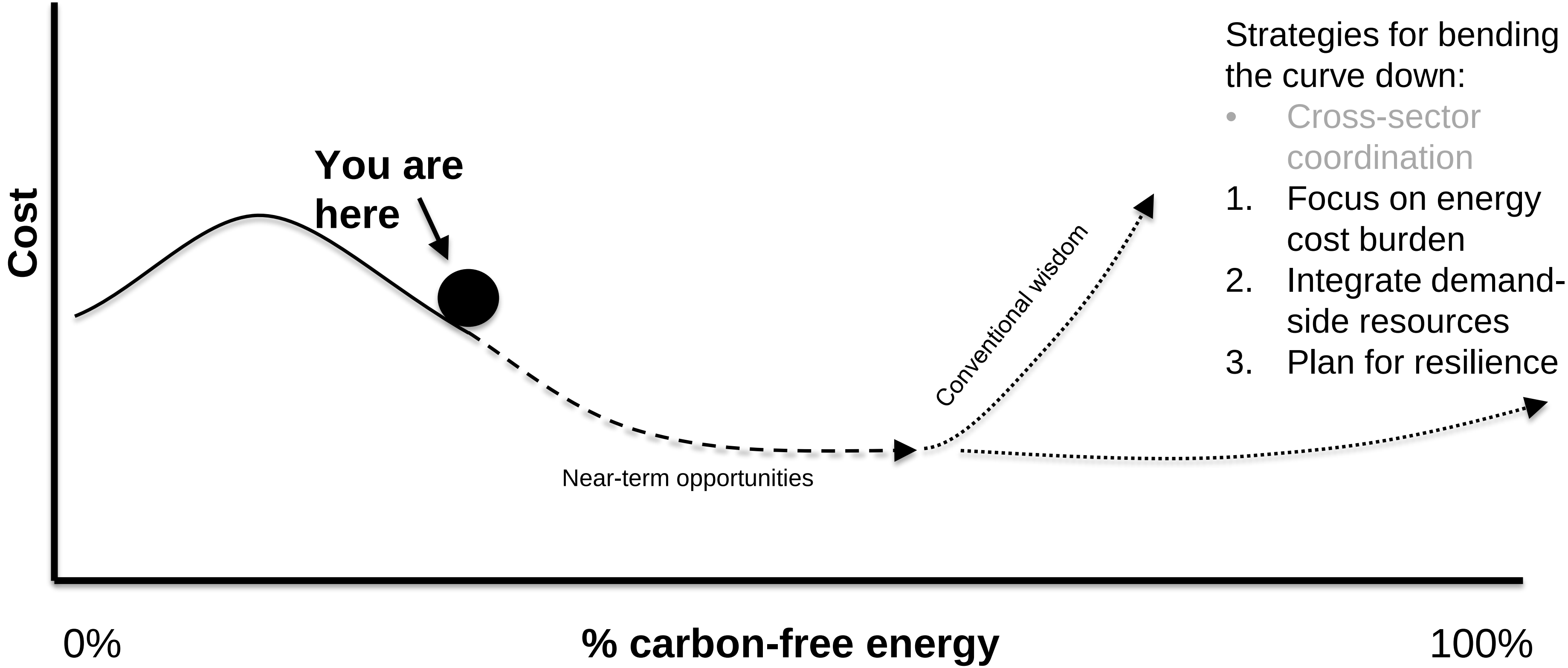


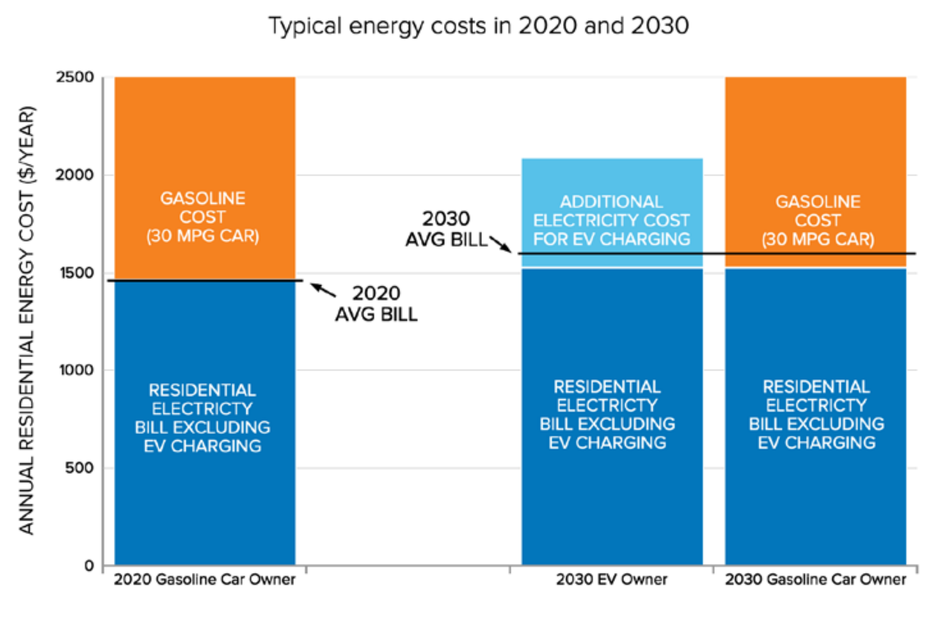
Strategies for bending the curve down:

- Cross-sector coordination

1. Focus on energy cost burden
2. Integrate demand-side resources
3. Plan for resilience

1. Energy cost burden: Electrification will increase electricity bills, but decrease total energy cost burden for customers

Example: 2020 vs. 2030 energy costs for EV customers and non-EV customers in a climate-aligned scenario for NJ

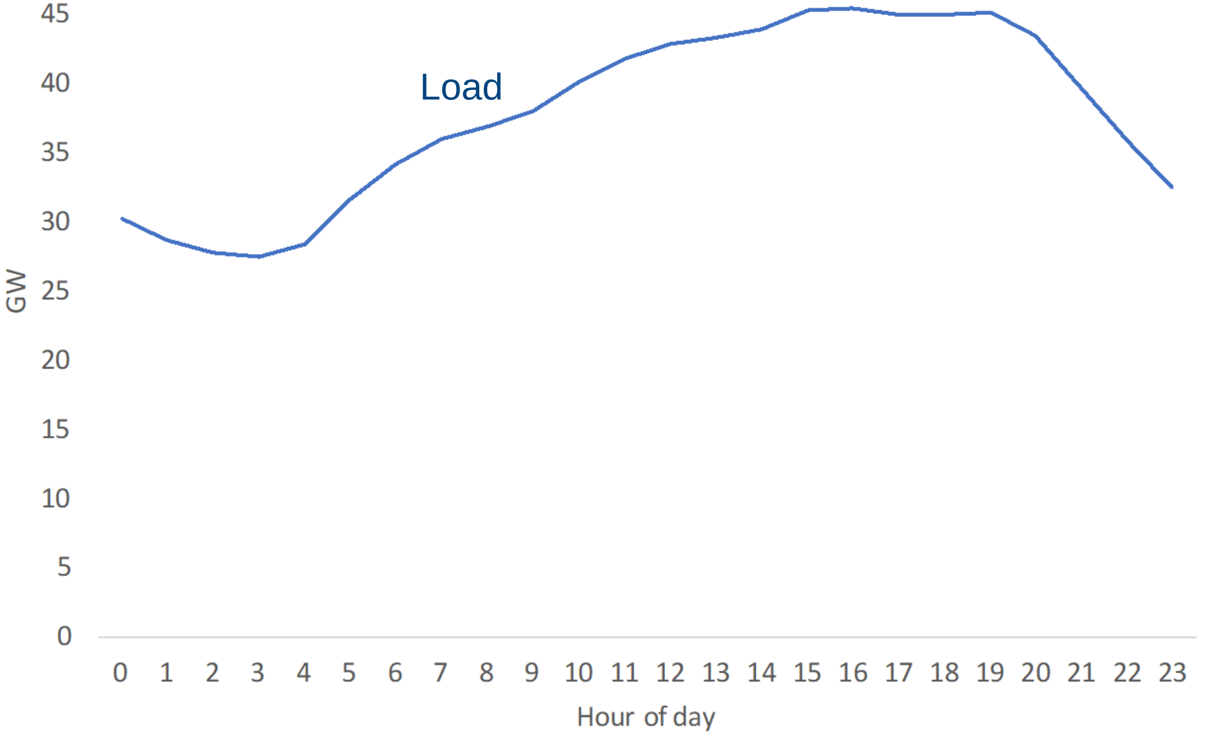


- Vehicle and building electrification will increase electricity bills, but can reduce energy burden given low operating costs of EVs and heat pumps
- Participating (i.e., electrifying) customers will save the most, but non-participating customers can also enjoy lower rates as fixed costs are spread over growing load
- Coordination of utility strategy with other driving forces (e.g., air quality regulation, building codes, and low-income assistance programs) can help align timing and reduce first-cost barriers to cost-effective retrofits

Source: RMI analysis for the NJ BPU 2019 Energy Master Plan

2. *Customer resources:* Demand flexibility and other DERs can be the building blocks of a dynamic, reliable, cost-effective grid

Example: Impact of demand flexibility on renewable energy integration



- The most efficient networks dynamically manage supply and demand

- Planning must capture the potential for demand flexibility, *especially* from newly electrified loads like heat pumps and EVs, to lower the cost of a decarbonizing grid

Source: RMI, “Demand Flexibility: The Key To Enabling A Low-cost, Low-carbon Grid"

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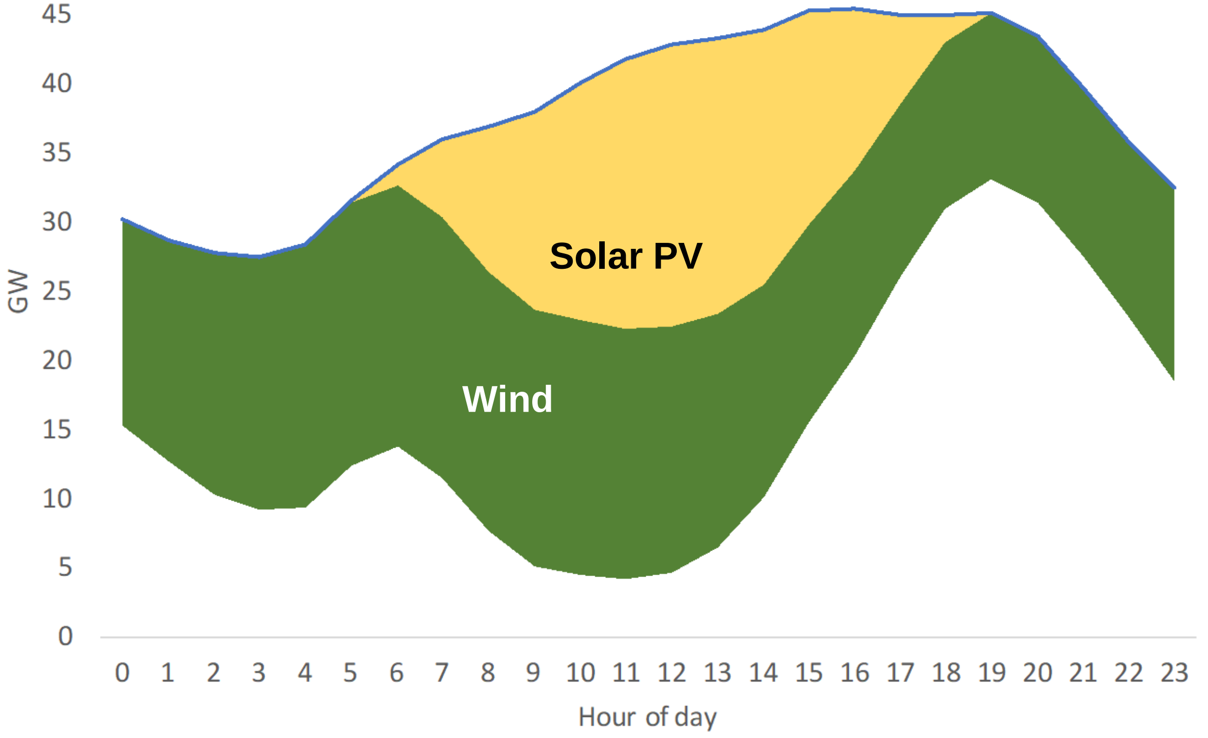

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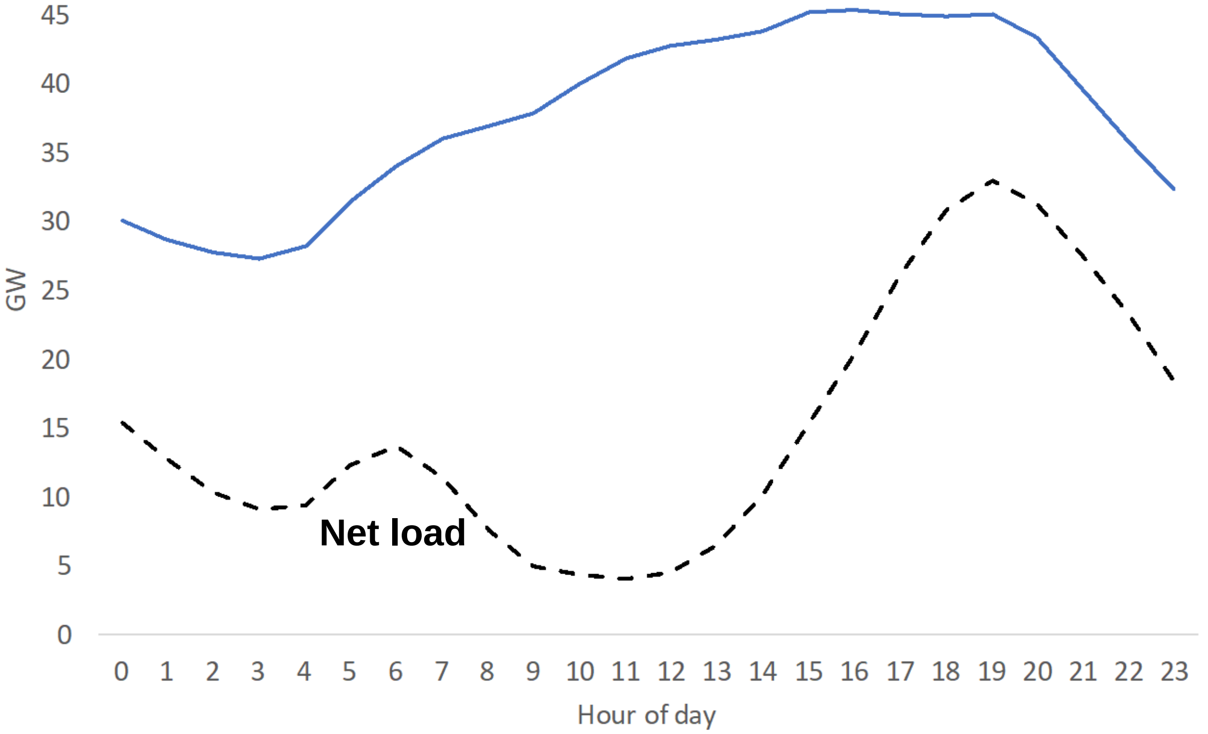

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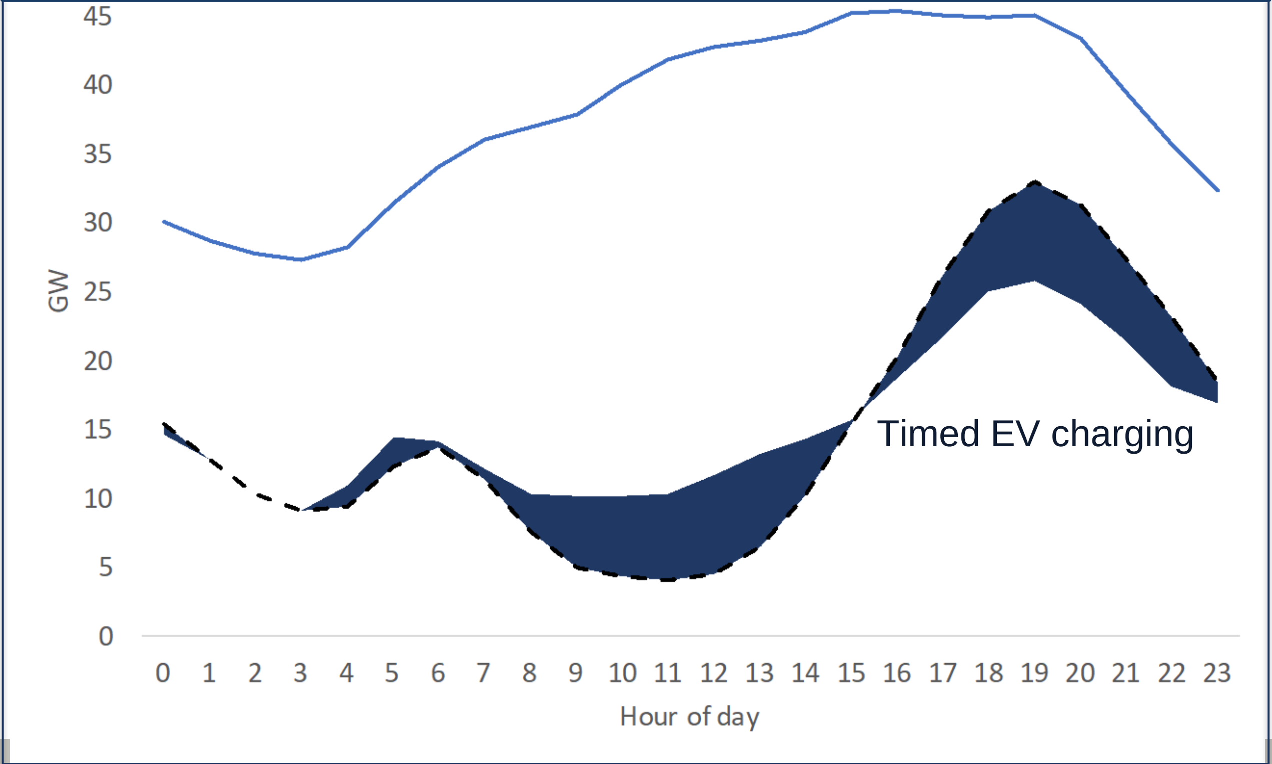

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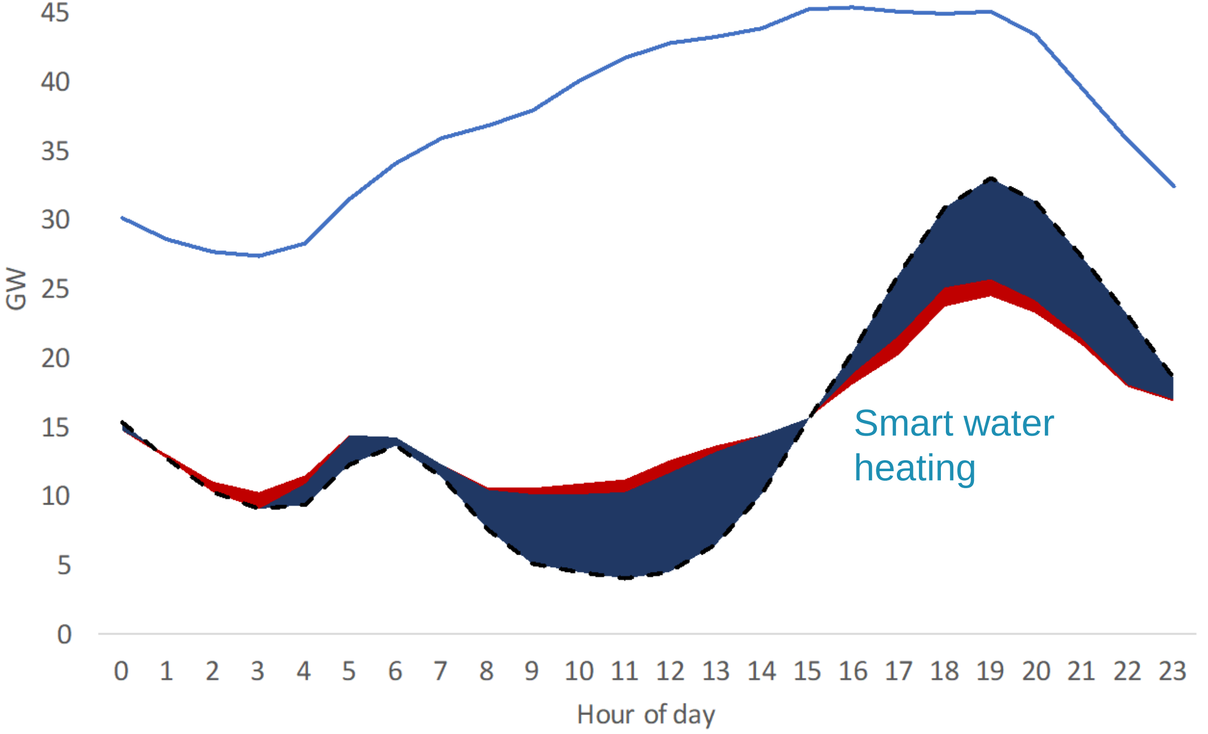

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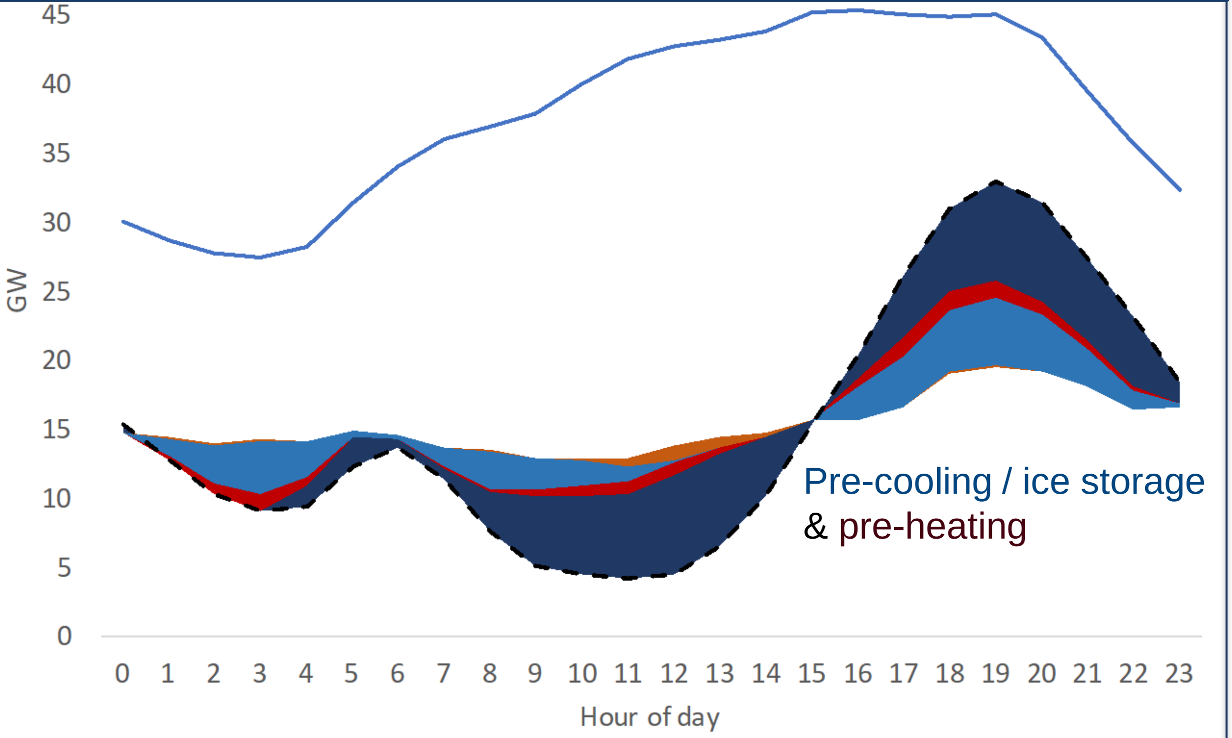

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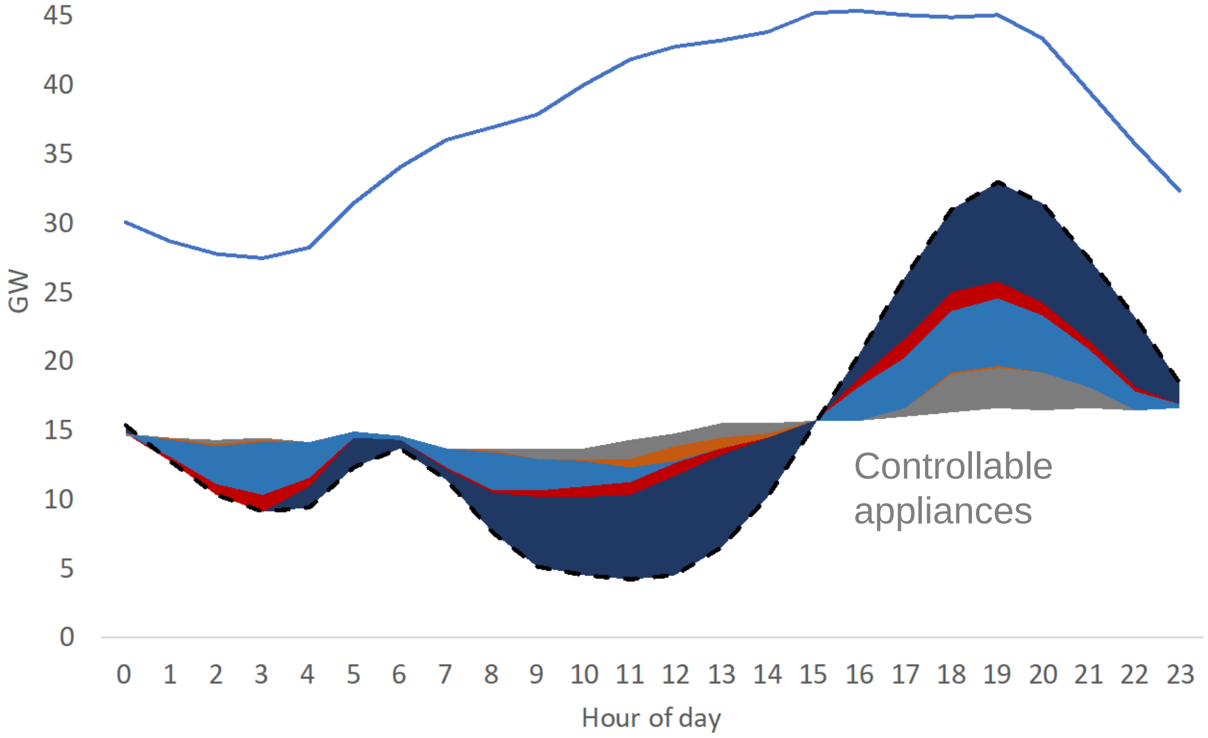

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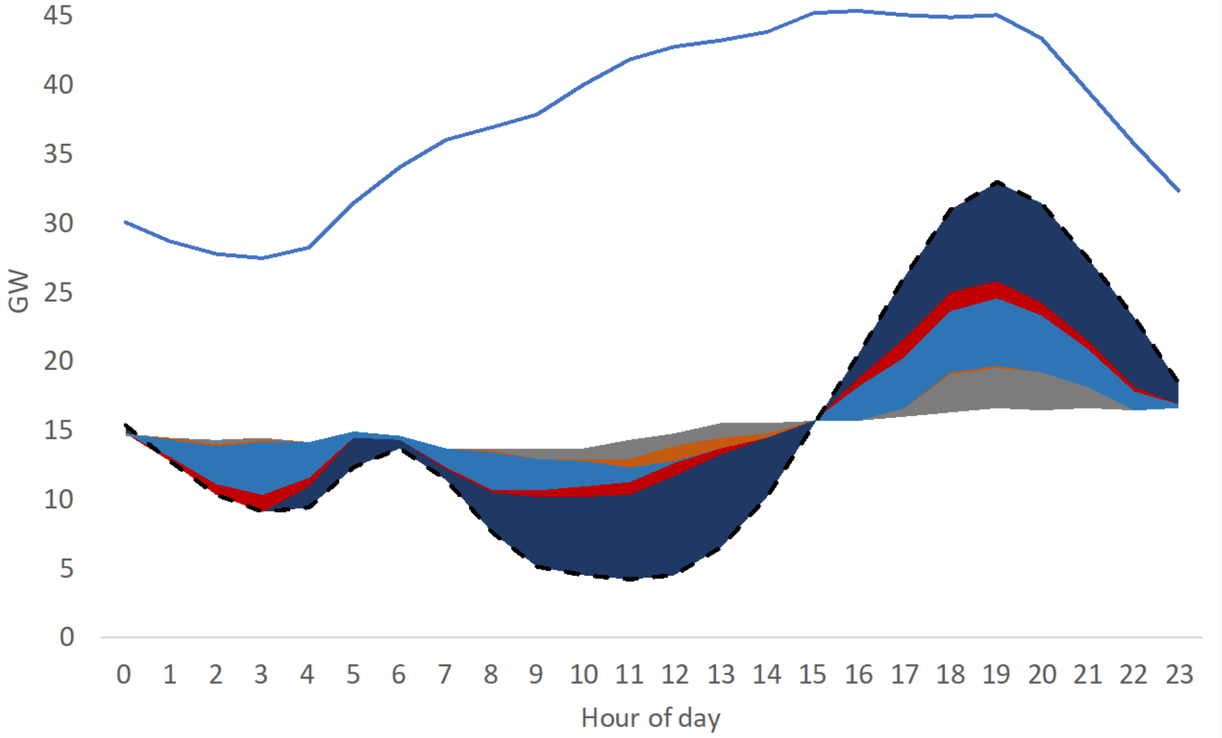

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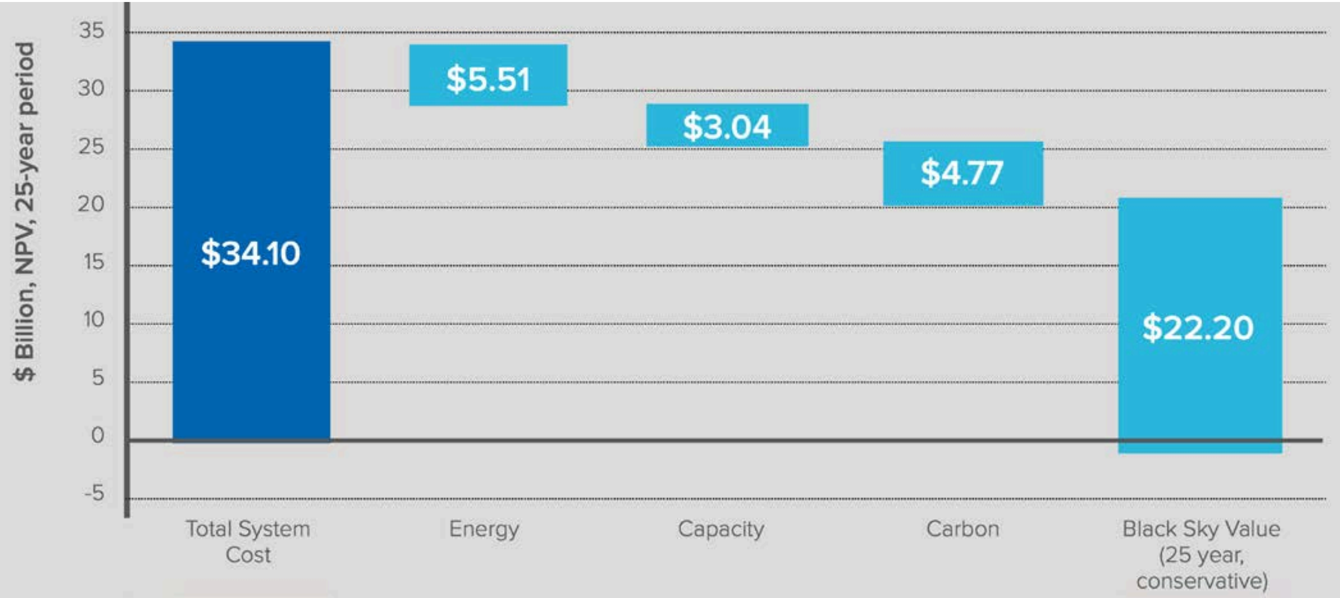
3. *Resilience*: Integrated planning for resilience can unlock new value from carbon-free, customer-sited resources

Example: Distributed solar + storage can minimize costs of power shutoffs

Net present value costs and benefits of ~1 million PV+storage systems in CA that can mitigate economic losses from PSPS events



- Threats to reliable electricity delivery are growing, from climate change and otherwise.
- Customer storage for resilience alone is costly for customers and society.
- But PV+storage, enabled to provide grid services, generates positive NPV.
- Integrated planning can build in resilience from the ground up, instead of forcing a future costly investment as climate change intensifies.

Source: RMI, *Reimagining Grid Resilience* (2020); analysis shows NPV of ~1 million distributed PV+storage systems, sized to meet critical load during PSPS for a mix of resi and C&I accounts while providing grid services during normal system conditions

Thank you

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