



Energy Storage: (Batteries)... *AND EVERYTHING ELSE*

Keith Dennis, PE
Senior Principal
End-Use Solutions and Standards
Business and Technology



What is “Energy Storage”

- The Google says...

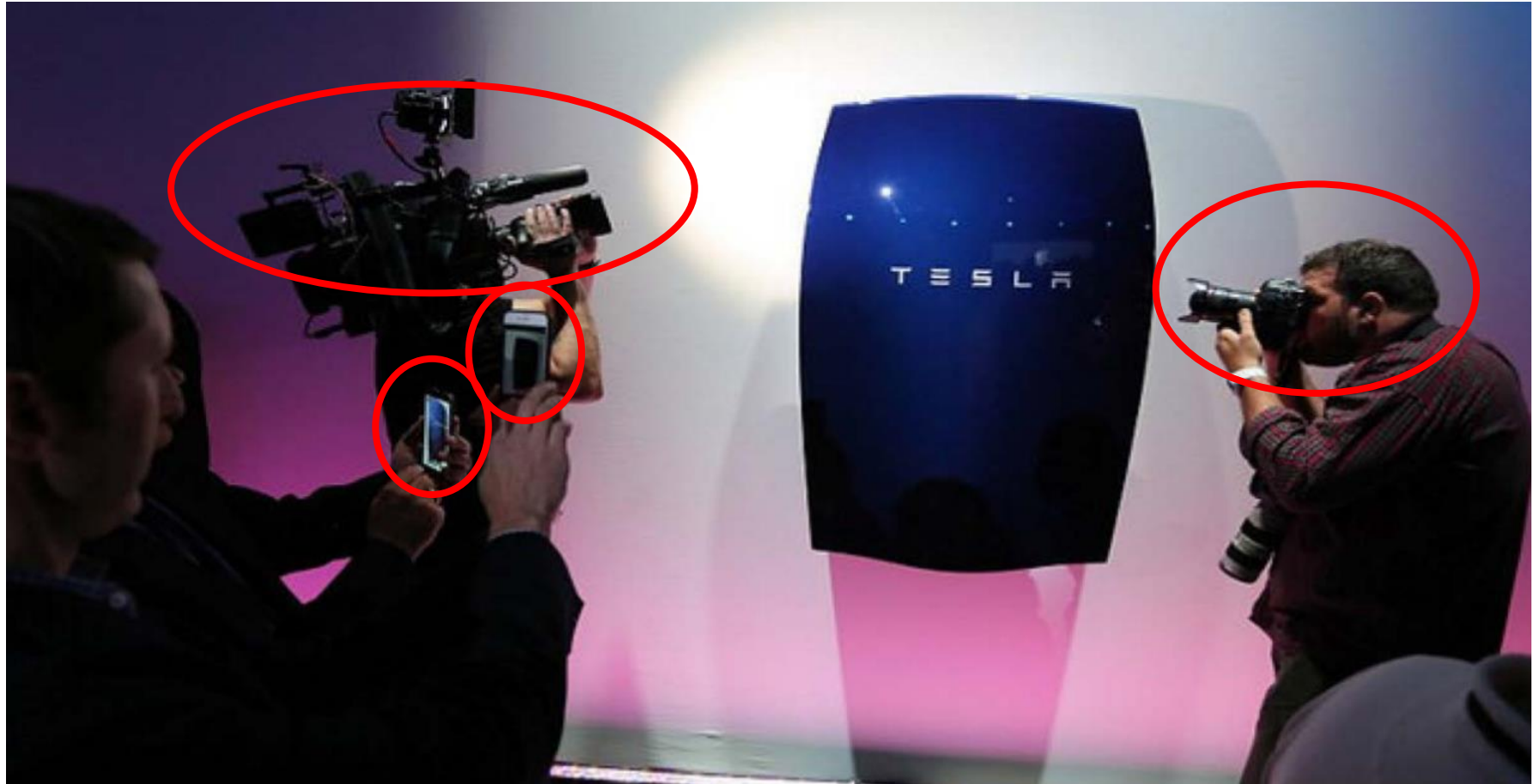
“Energy Storage is the capture of energy produced at one time for use at a later time”

-Wikipedia

What Does “Energy Storage” Make YOU Think Of?



Look at How Popular That Sexy Battery Thing Is!!!...



When You Hear “Energy Storage” You Think of...



***“The Secret Power of
Your Most Boring
Home Appliance”***


-Washington Post, 2/24/2016

How About...




These technologies capture of energy produced at one time for use at a later time – to drive, take hot showers, cool buildings, lift things.

Time to Implement! – The “Community Storage Initiative”



Five blue water droplets are positioned above the text.

Your electric storage water heater is a thermal battery that can help integrate renewable energy into the grid.



America's Electric Cooperatives



More to come?....

The “Community Storage Initiative”

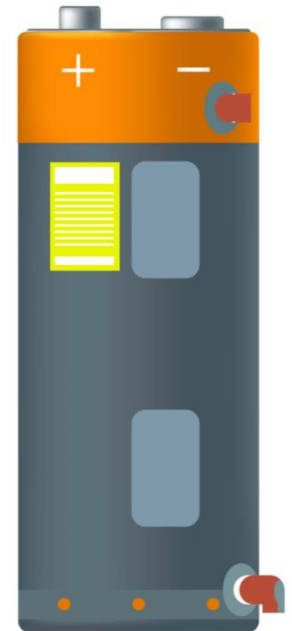
- Other technologies throughout the community can store energy and provide benefits to energy users and the grid
- As battery interests and need for renewables take off, more opportunities will be available for consumers
- This can build on traditional DR programs and incentives, including off-peak rates and avoiding demand charges.
- Take energy when price is low and not when it is high.

Community Storage Initiative Founding Supporters



The “Community Storage” Concept

Storage Technology	Utility	Incentive
<i>Electric Water Heater</i>	<i>Steele-Waseca</i>	<i>Free water heater, discounted community solar panels</i>
<i>Electric Vehicle</i>	<i>Great River Energy</i>	<i>Free wind power upgrade, discounted charging station</i>
<i>Tesla Powerwall Battery</i>	<i>Green Mountain Power</i>	<i>Discounted energy services, Powerwall battery and/or installation</i>



- Consumer-centric programs in cooperation with utility for shared benefit

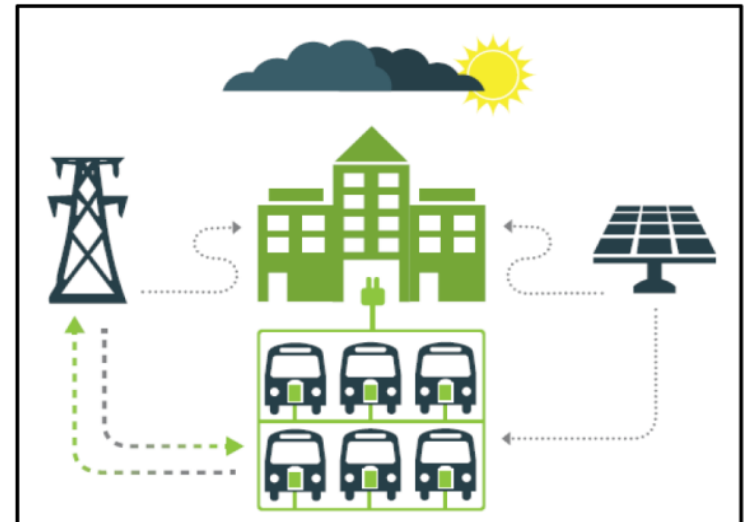
Supporting Community Storage Initiative

COMMUNITY STORAGE INITIATIVE

We ask you to follow the principles of the initiative:

1. Voluntary Participation (by the utility, home, business or individual)
2. Education & Training (information resources, program templates, quick-start guides, etc.)
3. Market Acceptance (locally, regionally and nationally)
4. Economic Equity (shared investments/shared benefits, multi-sided win-win)
5. Renewables Integration & Environmental Stewardship
6. Community Vitality (Community is the key!)

FOR MORE INFORMATION GO TO: communitystorageinitiative.com



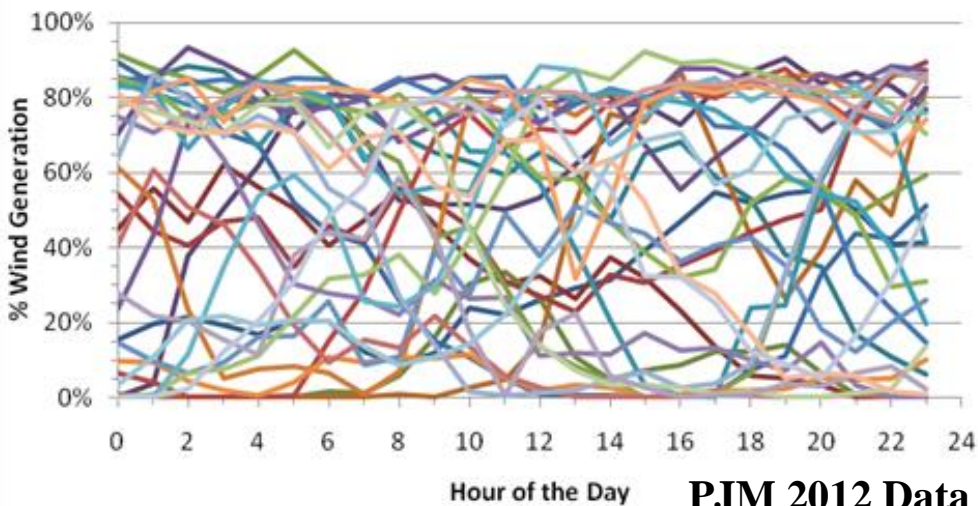
Electric School buses serving as a grid resource, supporting renewable energy generation and V2B through energy storage.

- We should not lose sight of storage options (or overlook them) as batteries gain attention and capital

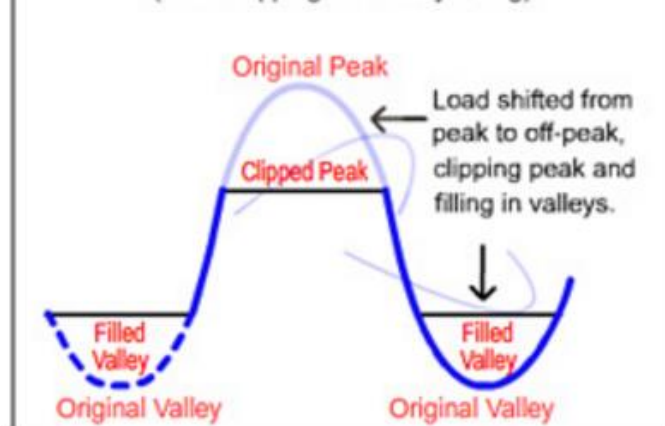
Storage Vs. DR / Load Control

- Some DR cuts load when energy use is high or supply is low.
- Thermal or community storage can make use of energy when it is available and stores it for later – ***can cut use or add it: perfect for renewable integration.***
- Grid Interactivity can take it even further, with storage proving frequency response and acting like a peaker plant.

One Month of Wind Output by Hour



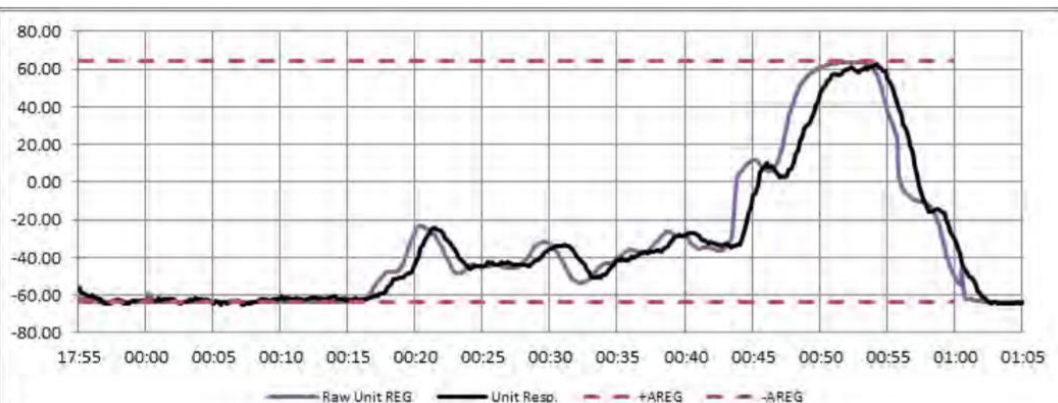
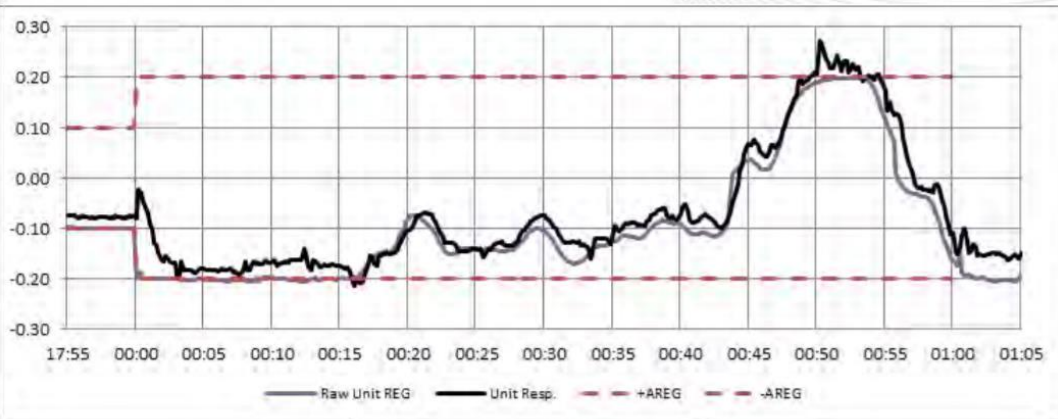
Demand Curve - Load Shifting
(Peak Clipping and Valley Filling)



PJM Signal Following of Thermal Storage



Ancillary Services

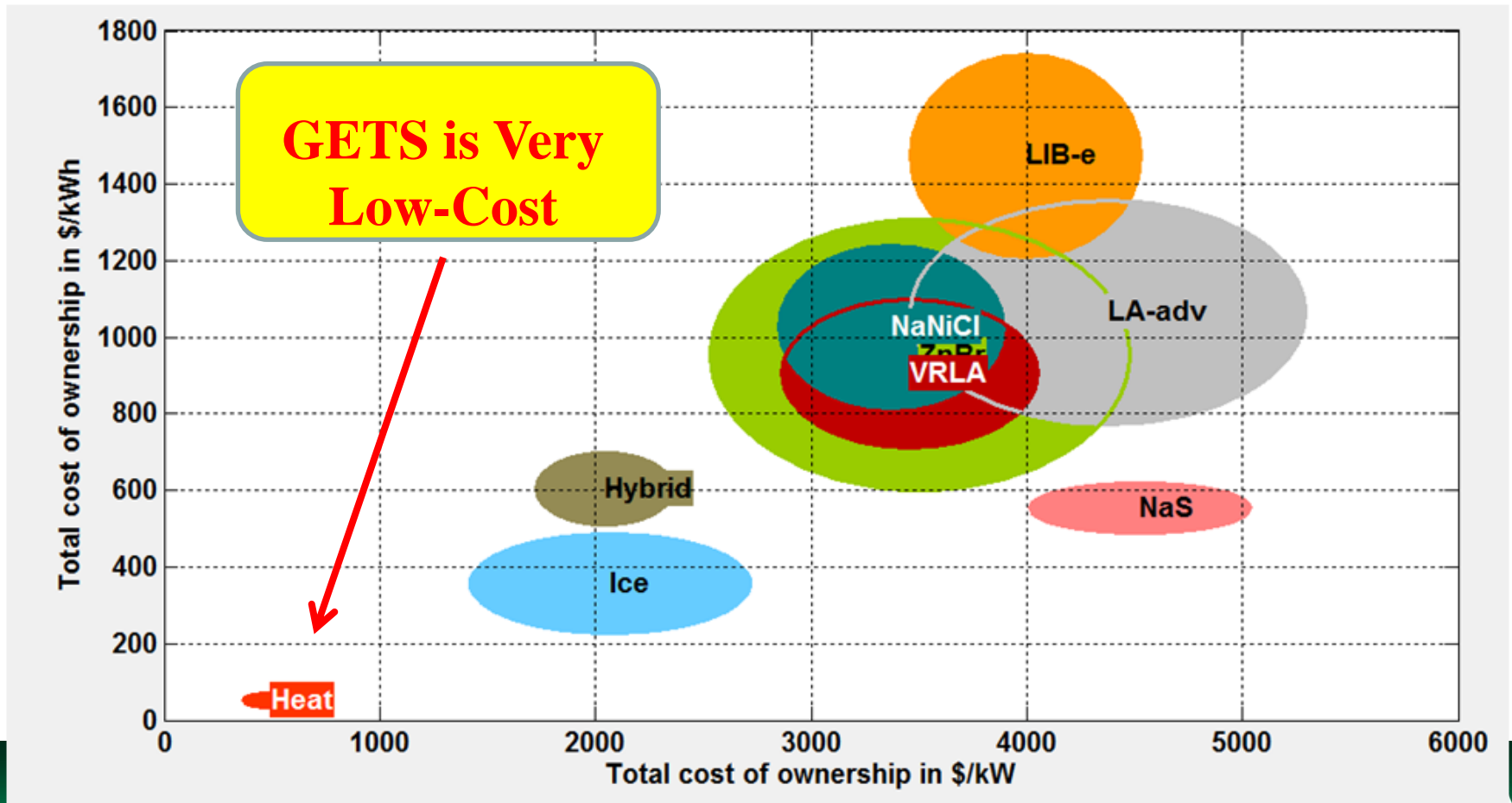


- Aggregated Thermal Storage
- Natural Gas Combined Cycle Plant

Thermal Storage

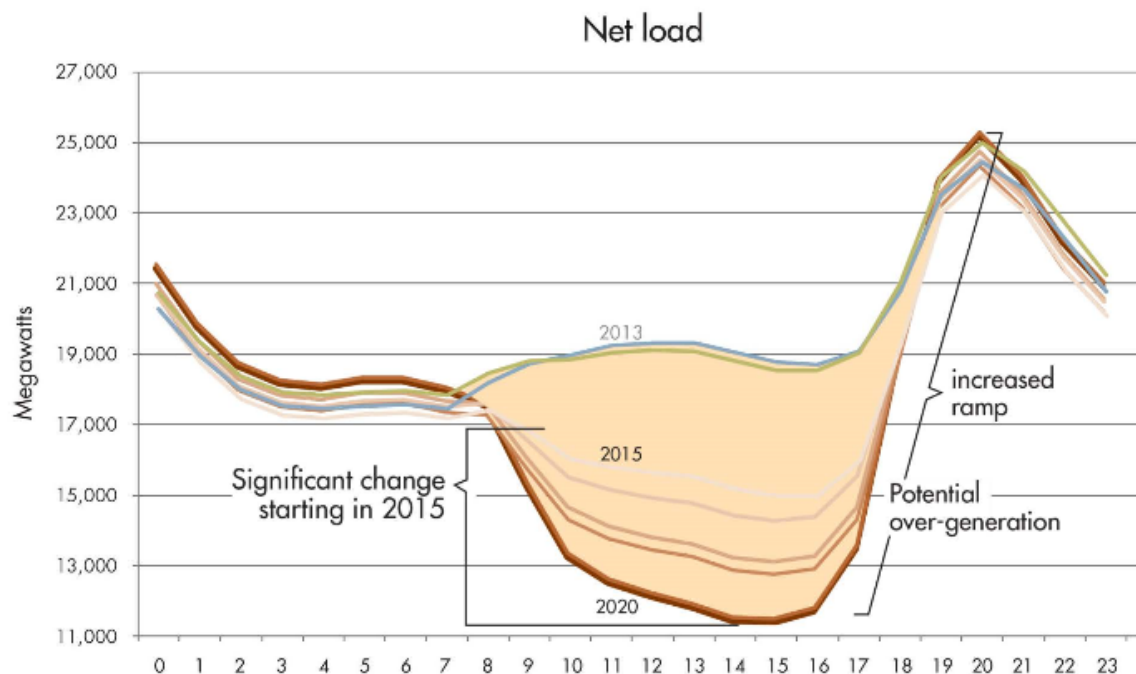
The Most Cost-Effective Storage

- Not flashy, but has been reliable for decades and is cheapest solution available, and is HERE!!!!



Using Devices You Already Use to Teach CA's the "Duck to Fly"

Growing need for flexibility starting 2015

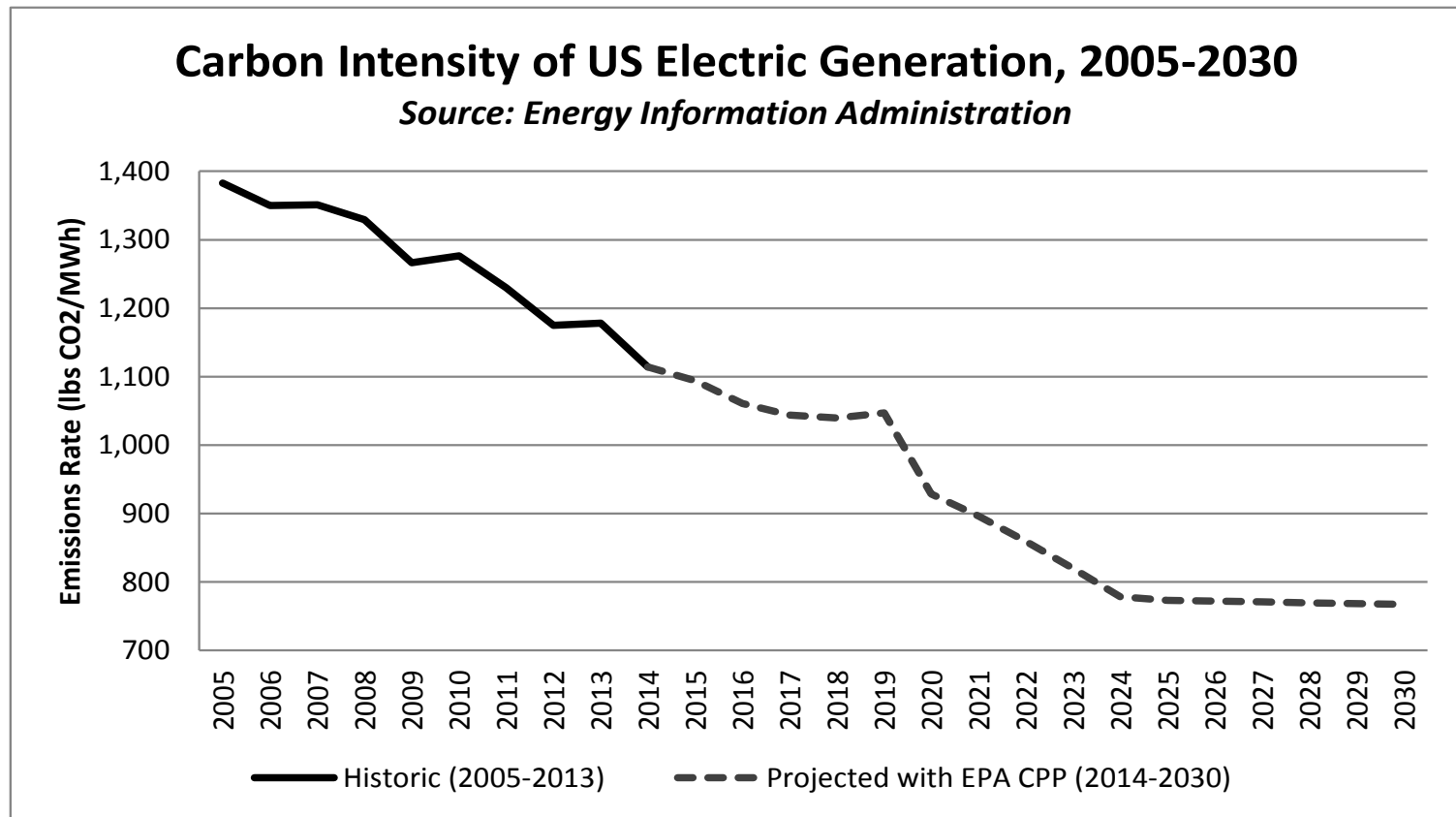


“1 million electric water heaters means that up to 4,000MW of load could be dispatched as needed, and that up to 10,000MWh per day could be shifted as needed.” – Regulatory Assistance Project

What Can You Do?

1st – Go Electric!

- Electricity is increasingly the environmental choice



Growing Consensus for Environmentally Beneficial Electrification

Lawrence Berkeley National Lab finds:

The key to meeting GHG goals is “*widespread electrification of passenger vehicles, building heating, and industry heating.*”

- United Nations, E3, Acadia Center, Stanford and Columbia Universities, California Pathways Project, DOE’s QER, Bill Nye the Science Guy and many more are all adding to the chorus.
- ***Consensus on benefits of renewed electrification - this could result in more incentive to electrify***

These things Make ELECTRICITY

- And create the variability that creates the need for storage...



- You need to choose end-uses that use electricity to benefit from the evolving electric system.
- Variable generation may make your variable loads more valuable over time as the market for storage increases.



Keith Dennis

*Senior Principal, End-Use Solutions and Standards
Business and Technology Strategies*

Phone: (703) 907-5787

Keith.Dennis@nreca.coop