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Beneficial Electrification: Gateway to a 21st Century Power Grid

Amping Up: Strategic Electrification Benefits, Barriers & Concerns
2018 Midwest Energy Solutions Conference

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Power Sector is Changing

- Consumer Choice
- Tech Advances
 - Renewable Energy/Distributed Resources
 - Storage
 - Information Technology
- Grids
 - Designed for 1-way power flows
 - Now home to thousands of DERs
- Formerly-predictable supply/demand relationship is being disrupted

Beneficial Electrification (BE)

Isn't this really just about *more* load?

Isn't *all* electrification *beneficial*?

No – Not all Electrification is Created Equal

BE Defined

- Electrification is beneficial if it meets one or more of three conditions, without adversely affecting the other two:
 - Saves consumers money over the long run;
 - Reduces environmental impacts; and
 - Enables better grid management.

What sort of load are we talking about?

- ***Load from more efficient end uses***
 - Heat pump water heaters *move* heat instead of generating it – 1.5 - 3X more efficient
 - EVs vs. gasoline passenger cars (60% vs. 20%)

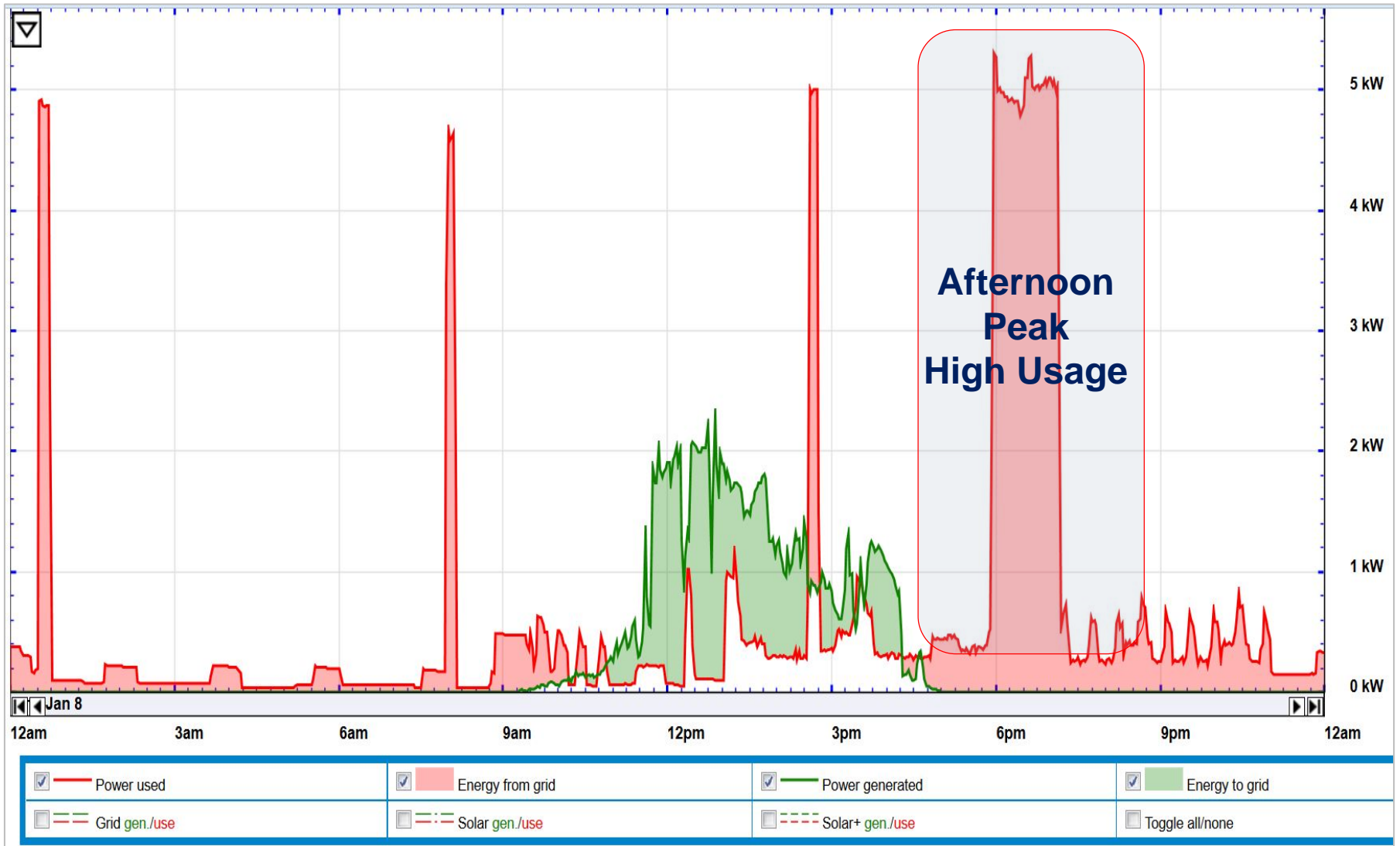
What sort of load are we talking about?

- Load from end uses that can be *less expensive to operate*
- With the right rate design, less expensive to “fuel”

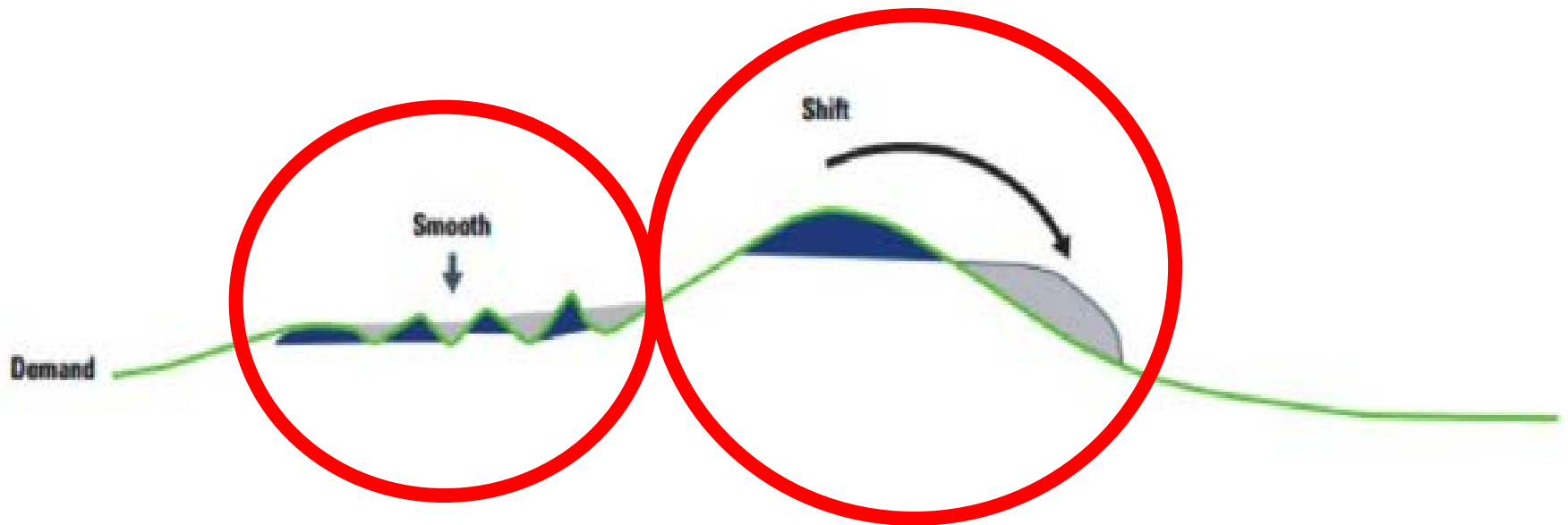
What sort of load are we talking about?

- More ***Flexible*** Load:
 - Traditionally, generation followed load for virtually immediate consumption
 - Today, because it can be *stored* (thermally or electrically) some load can follow generation
 - Flex load **valuable**

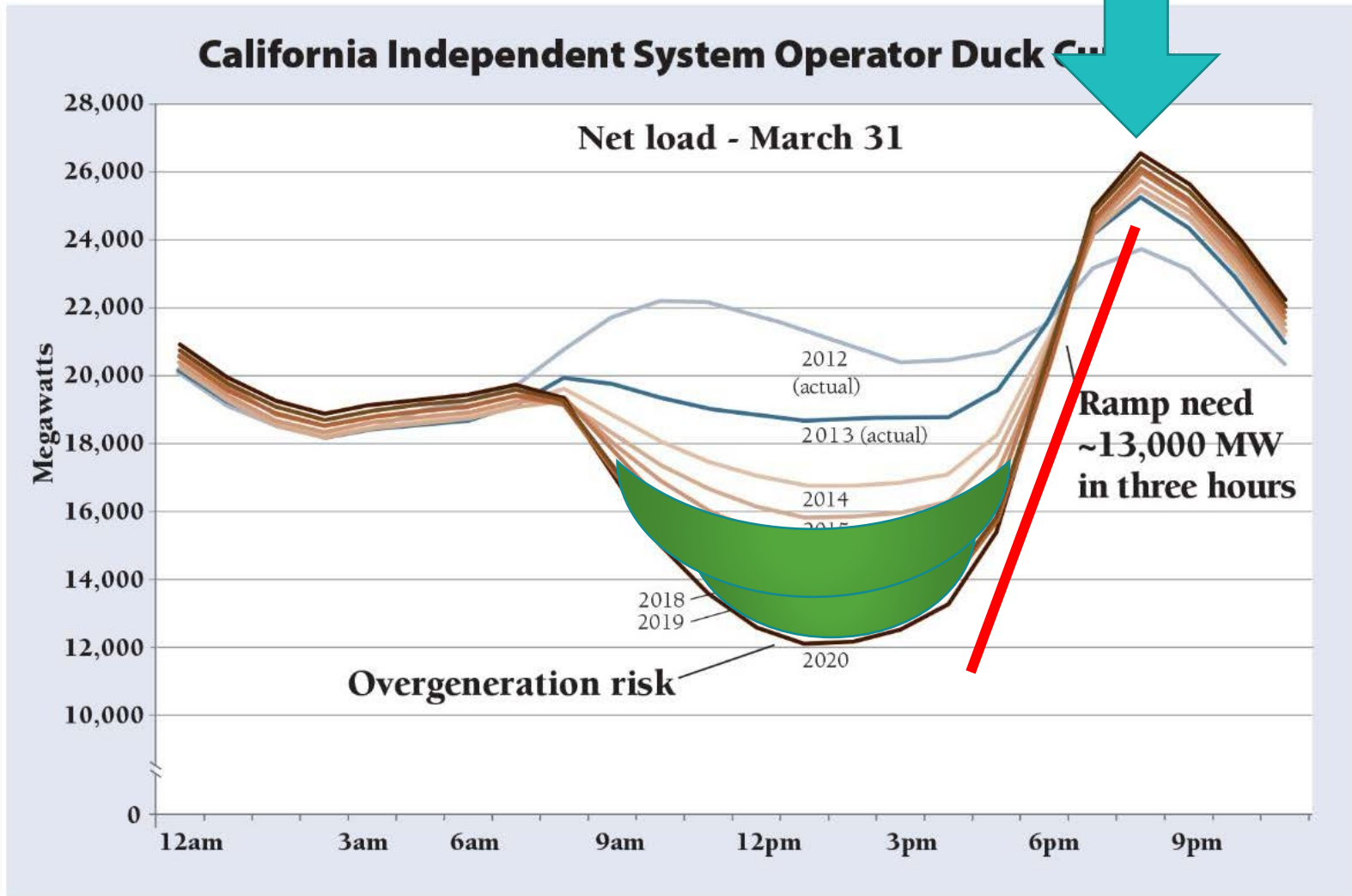
Unlike this *Inflexible* Load



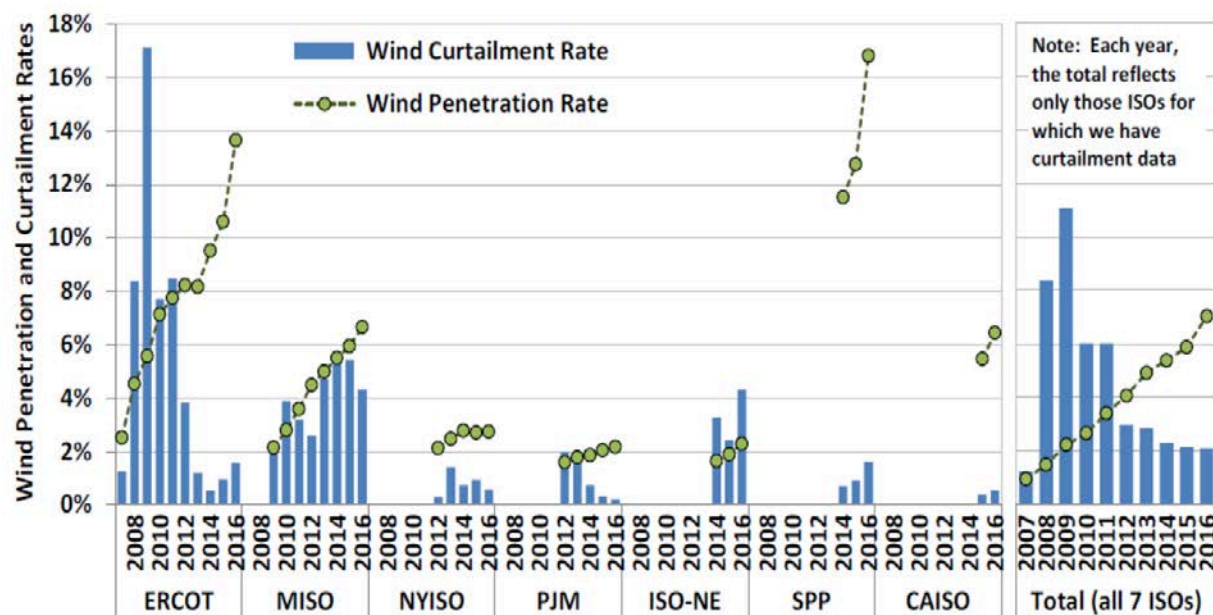
BE Load Can Fill Valleys and Shave Peaks



A Natural Tool for Grid Management



Valuable for Reducing Curtailments

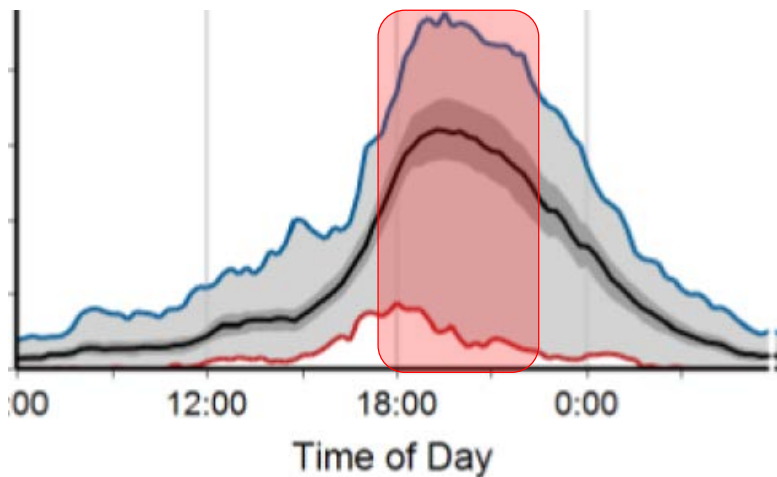


Note: All curtailment percentages shown in the figure represent both forced and economic curtailment. PJM's 2012 curtailment estimate is for June through December only.

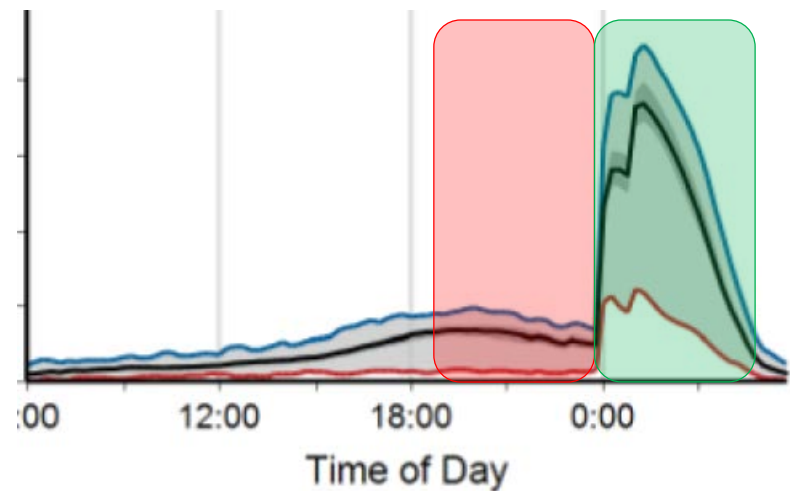
Source: ERCOT, MISO, CAISO, NYISO, PJM, ISO-NE, SPP

➤ [2016 Wind Technologies Market Report](#), Ryan Wisser and Mark Bolinger, Lawrence Berkeley National Laboratory

Rates Can Influence *When We Charge*



Dallas/Ft Worth
(standard rates)



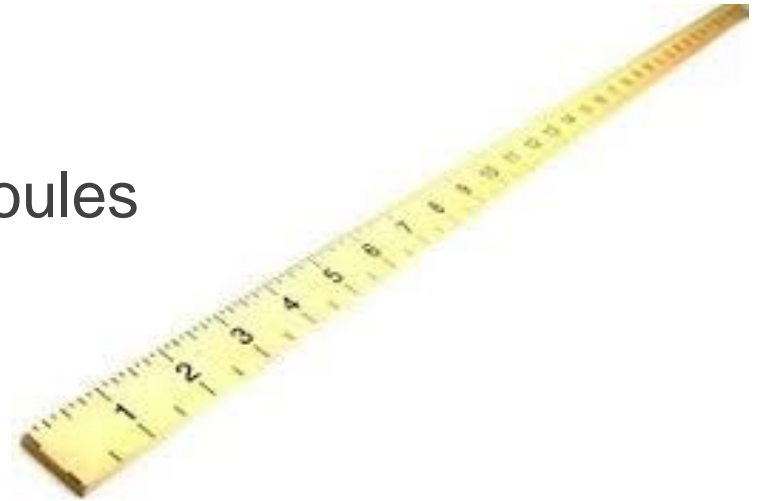
San Diego
(time-of-use rates)

Source: MJ Bradley, 2017

What About Efficiency?

Augmented by Emissions Efficiency

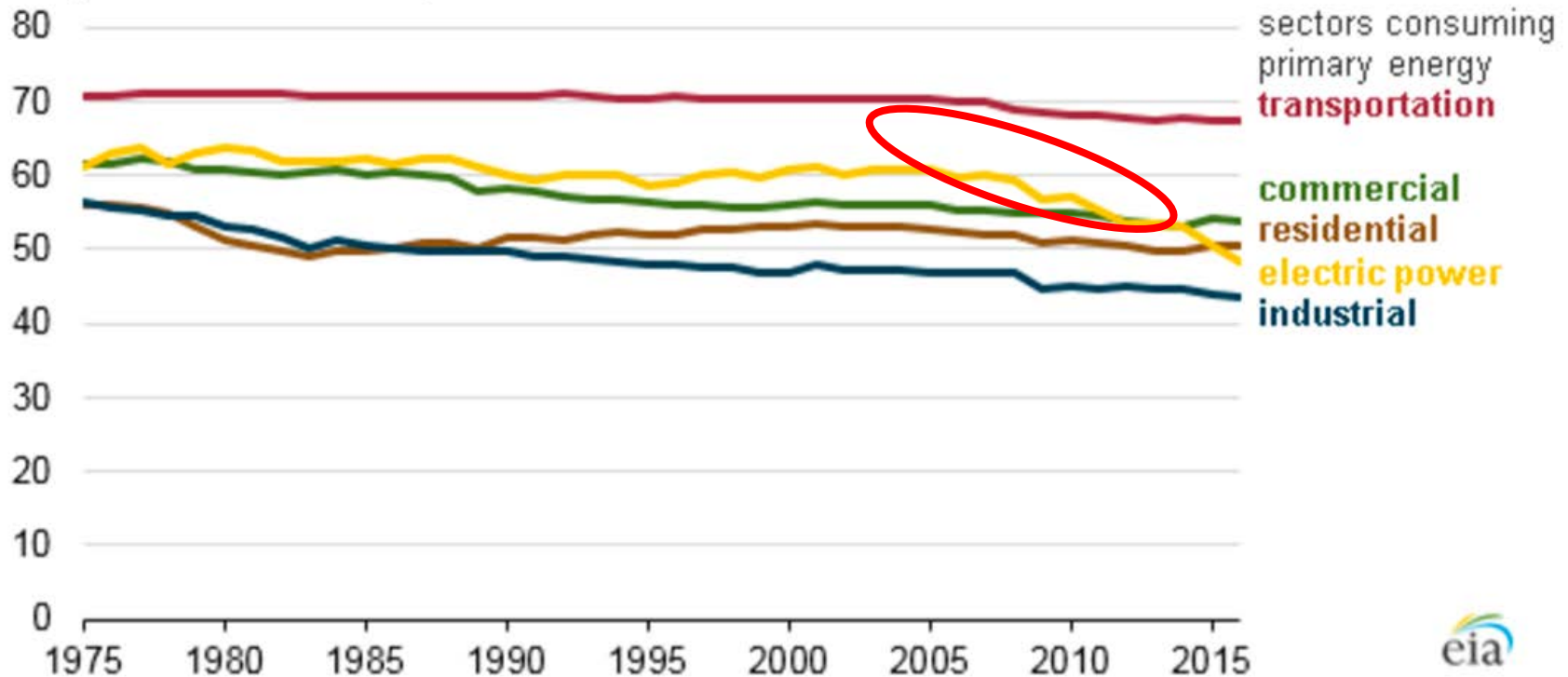
- Efficiency Measures kWhs
- Emissions Efficiency Measures Joules



Load Served from a Cleaner Power Sector

U.S. carbon intensity of energy use by sector (1975-2016)

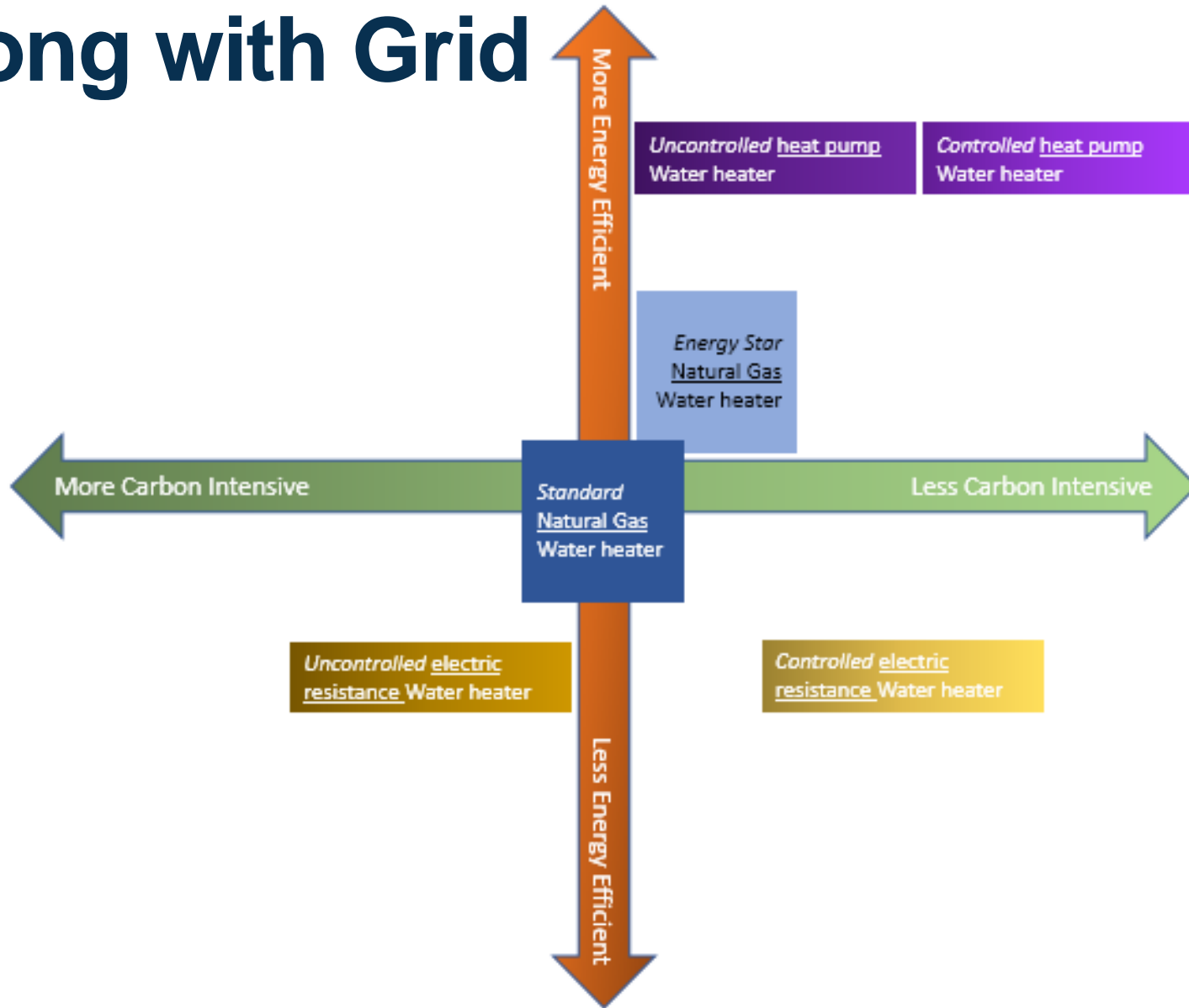
kilograms carbon dioxide per million British thermal units



Source: U.S. Energy Information Administration, [Monthly Energy Review](#)

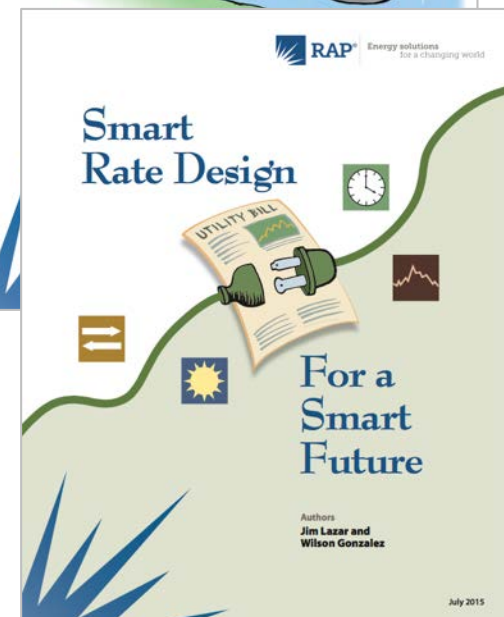
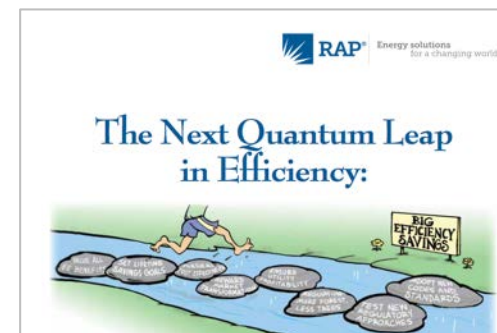


Electrified Devices “Get Cleaner” Along with Grid

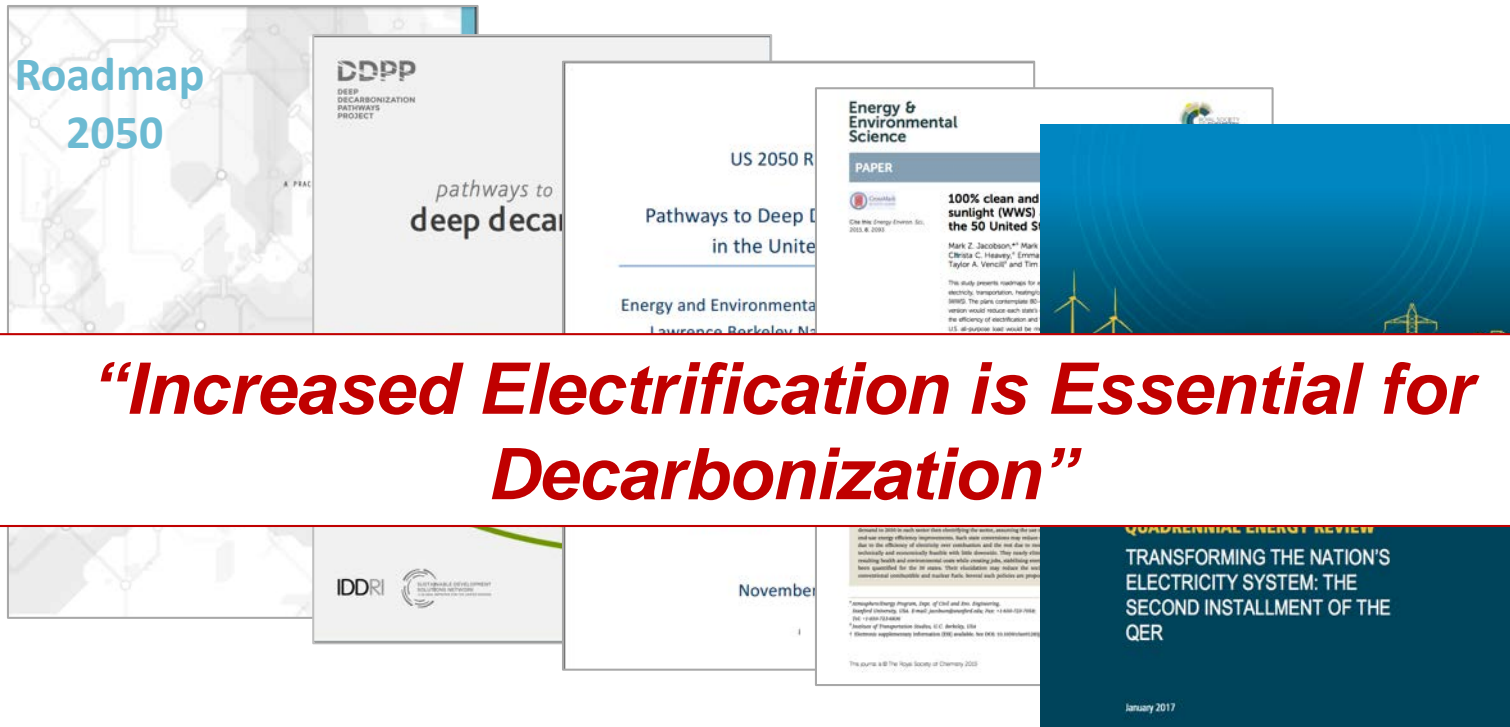


Electrification Offers Utilities a “Window of Opportunity”...

- **To get closer** to customer segments, outreach, new services
 - Re-focus on EE, DERs
- **To rethink** rate design
 - Reflect new tech and customer needs!
- **To get going** on distribution system planning, analytics, management of demand, transactive energy, etc.



Electrification is Critical for Sustainability



“Increased Electrification is Essential for Decarbonization”

Conclusions

- BE policy a gateway if it:
 - Reflects changes in tech, consumer interest, and value in the grid;
 - Enables consumers to help manage system peaks; and
 - Shares value with consumers.

Changes are happening quickly as in telecom sector – iPhone: Happy 10th



About RAP

The Regulatory Assistance Project (RAP)[®] is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org



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