

**ELECTRIC RATES WHEN ENERGY IS (ALMOST) FREE**



# THE NIMBLE® GRID EDGE FLEXIBILITY PLATFORM

## MARKETPLACE & ECOSYSTEM

### FLEXIBILITY SELLERS



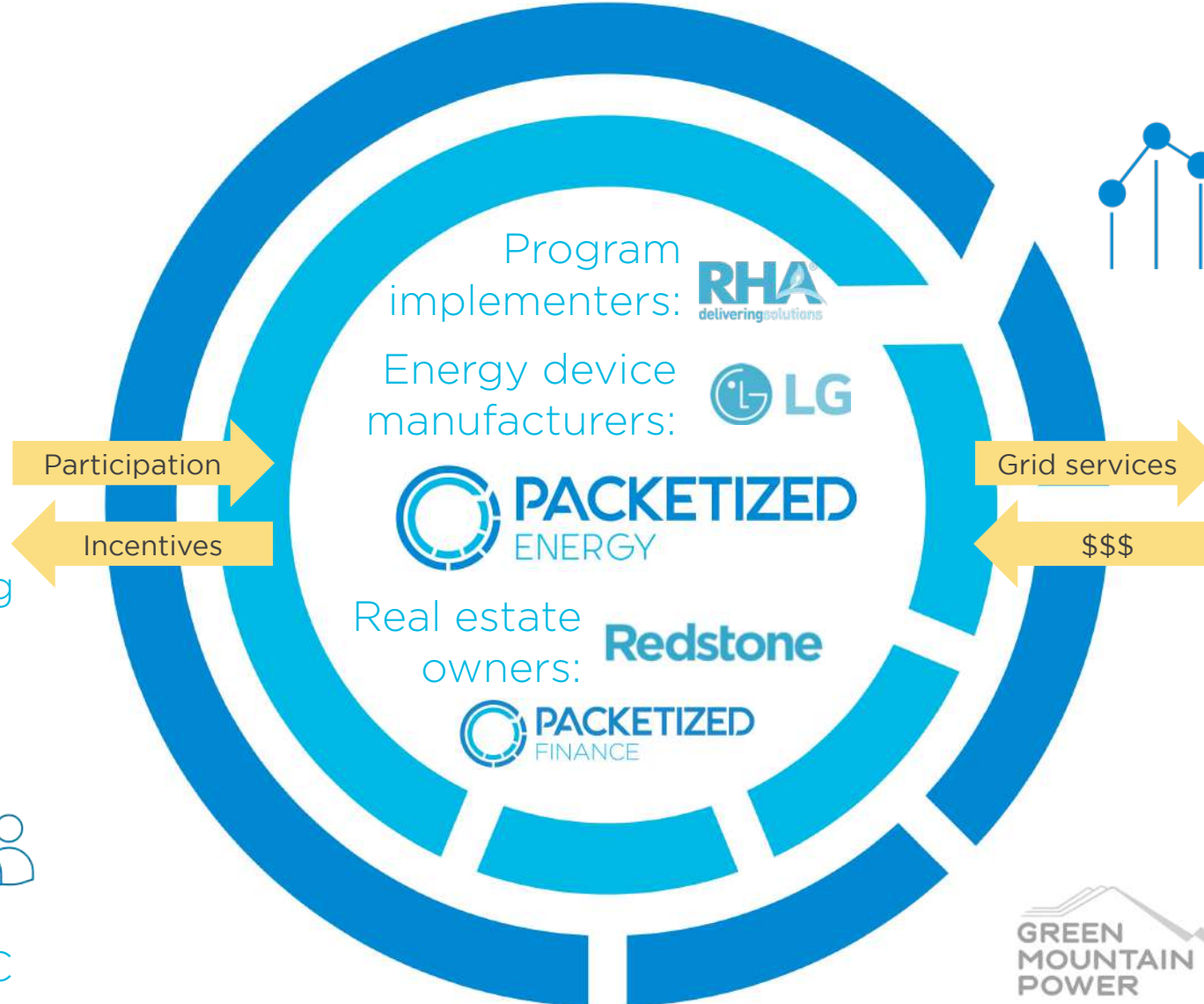
Batteries, EVs



Water heating



Distributed PV, HVAC



### FLEXIBILITY BUYERS



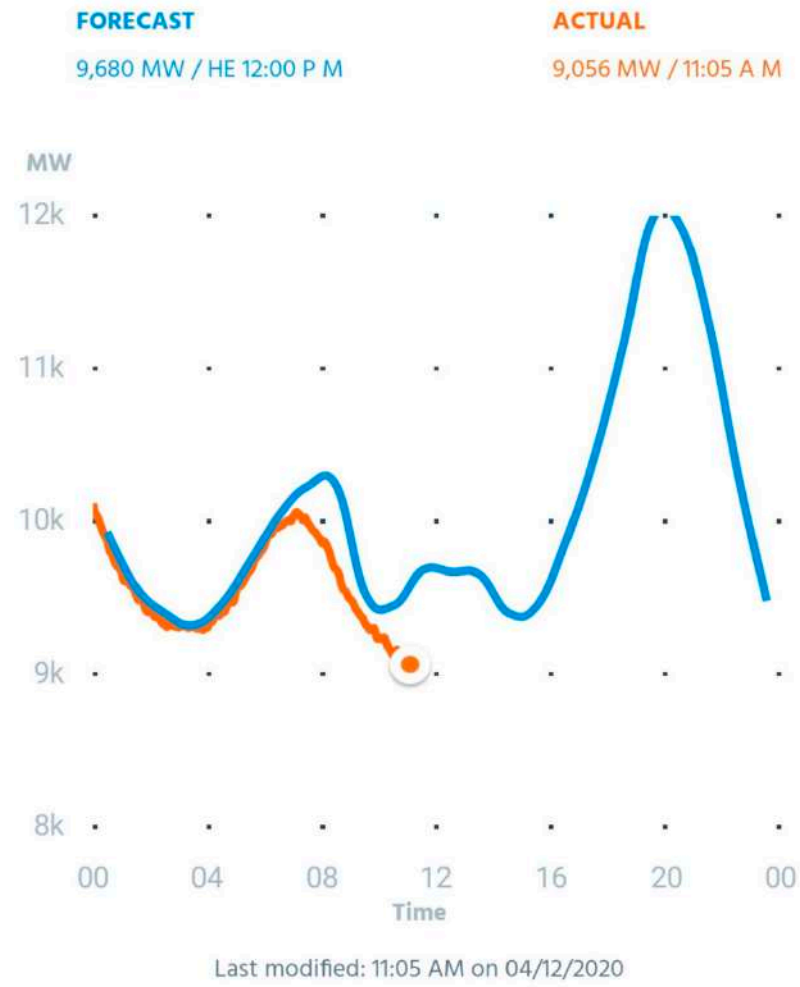
Wholesale markets



Utilities

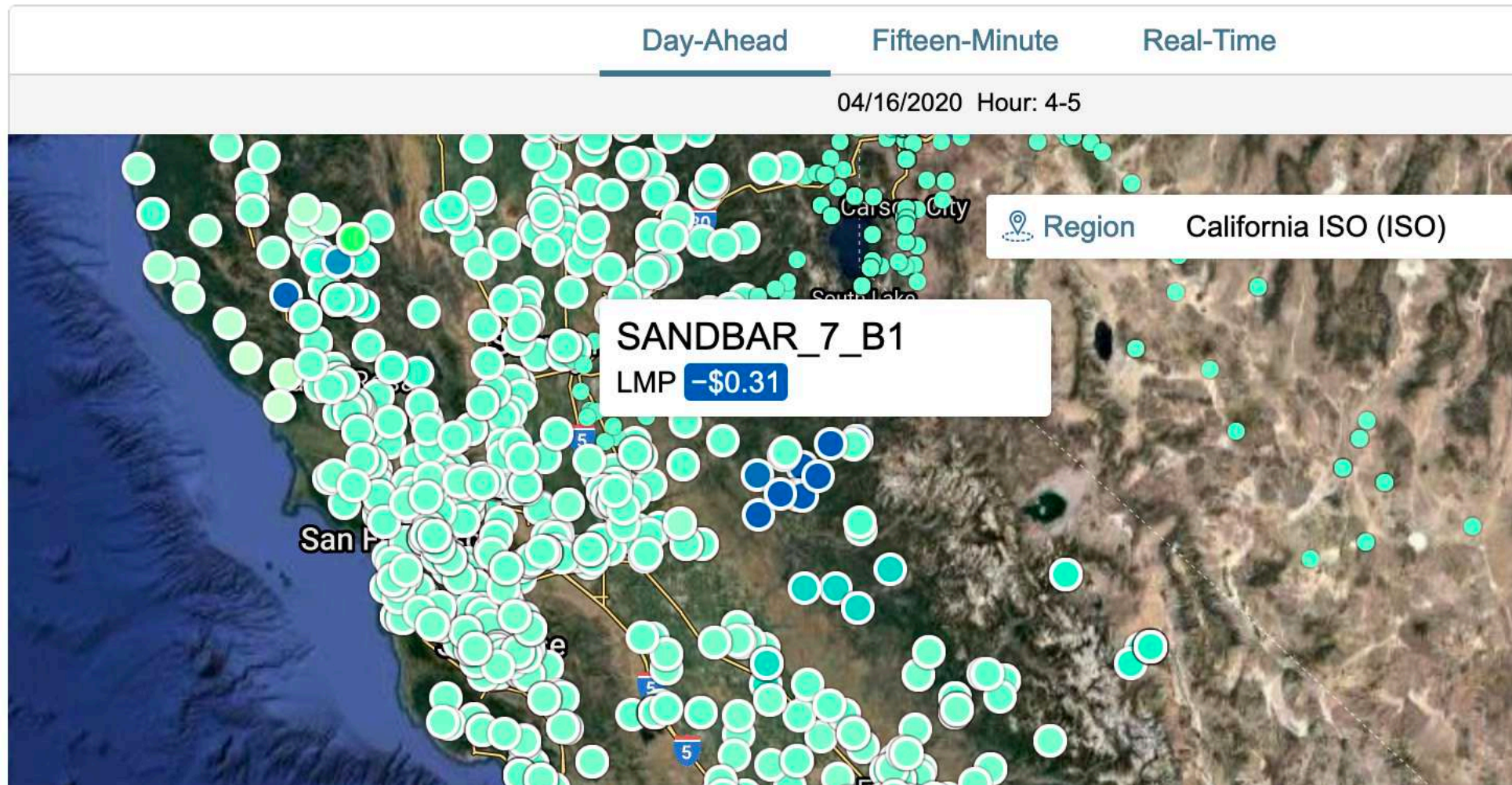


# AN EVENT THAT IS LIKELY TO BECOME INCREASINGLY COMMON





# ALMOST EVERY DAY IN CALIFORNIA



# CREDIT TO LO, BLUMSACK AND MEYN...

The Electricity Journal 32 (2019) 39–43



Contents lists available at ScienceDirect

## The Electricity Journal

journal homepage: [www.elsevier.com/locate/tej](http://www.elsevier.com/locate/tej)



## Electricity rates for the zero marginal cost grid

Helen Lo<sup>a,1</sup>, Seth Blumsack<sup>b</sup>, Paul Hines<sup>c,\*</sup>, Sean Meyn<sup>d</sup>

<sup>a</sup> Sacramento Municipal Utility District, United States

<sup>b</sup> Pennsylvania State University, United States

<sup>c</sup> University of Vermont and Packetized Energy, United States

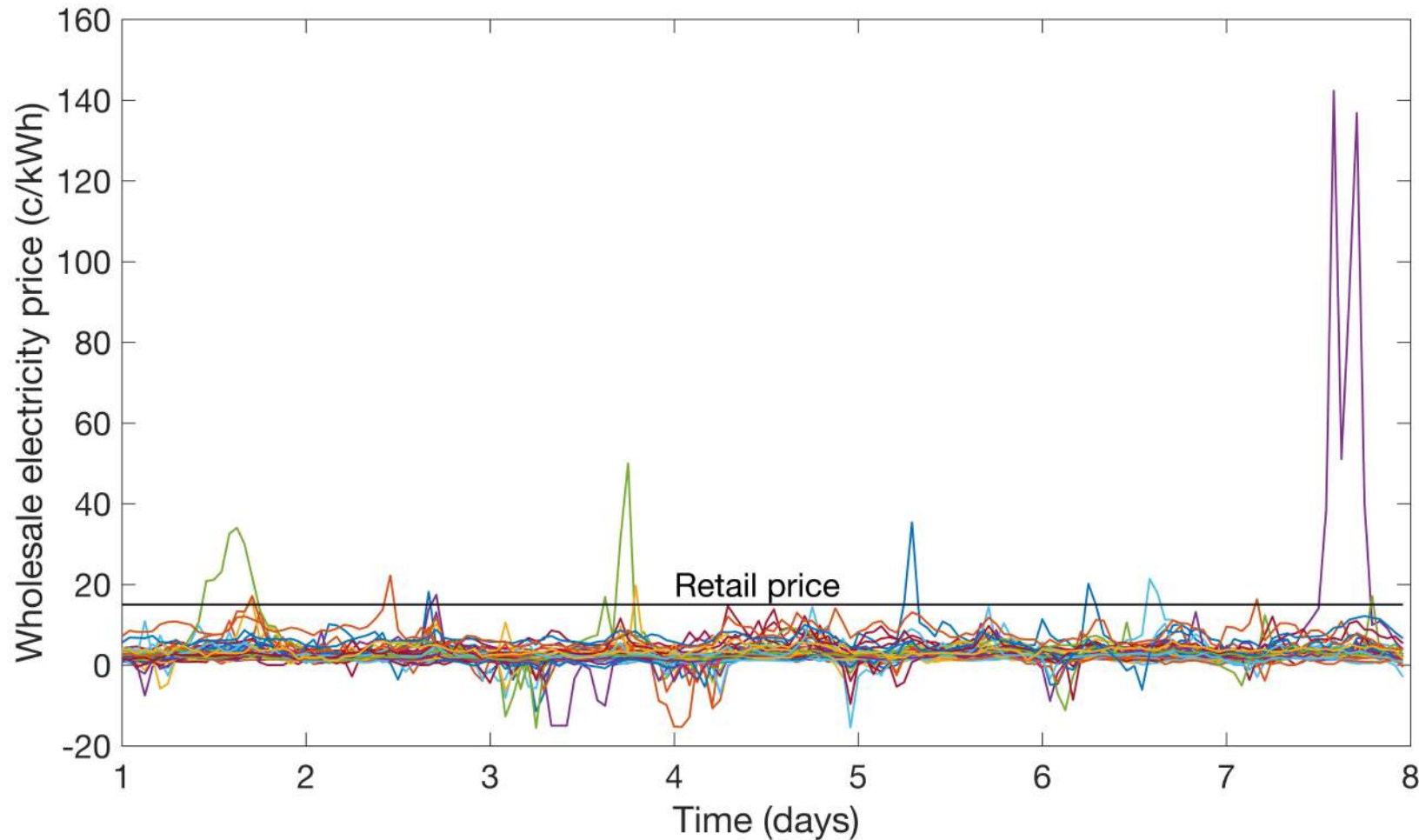
<sup>d</sup> University of Florida, United States



**LET'S PRETEND THAT WE ARE NORMAL BUSINESS  
PEOPLE**

**WHAT DO WE DO IF OUR PRODUCT HAS  
NEARLY ZERO MARGINAL COST?**

## BUT CAPACITY IS EXPENSIVE, AND VOLATILITY IS REAL



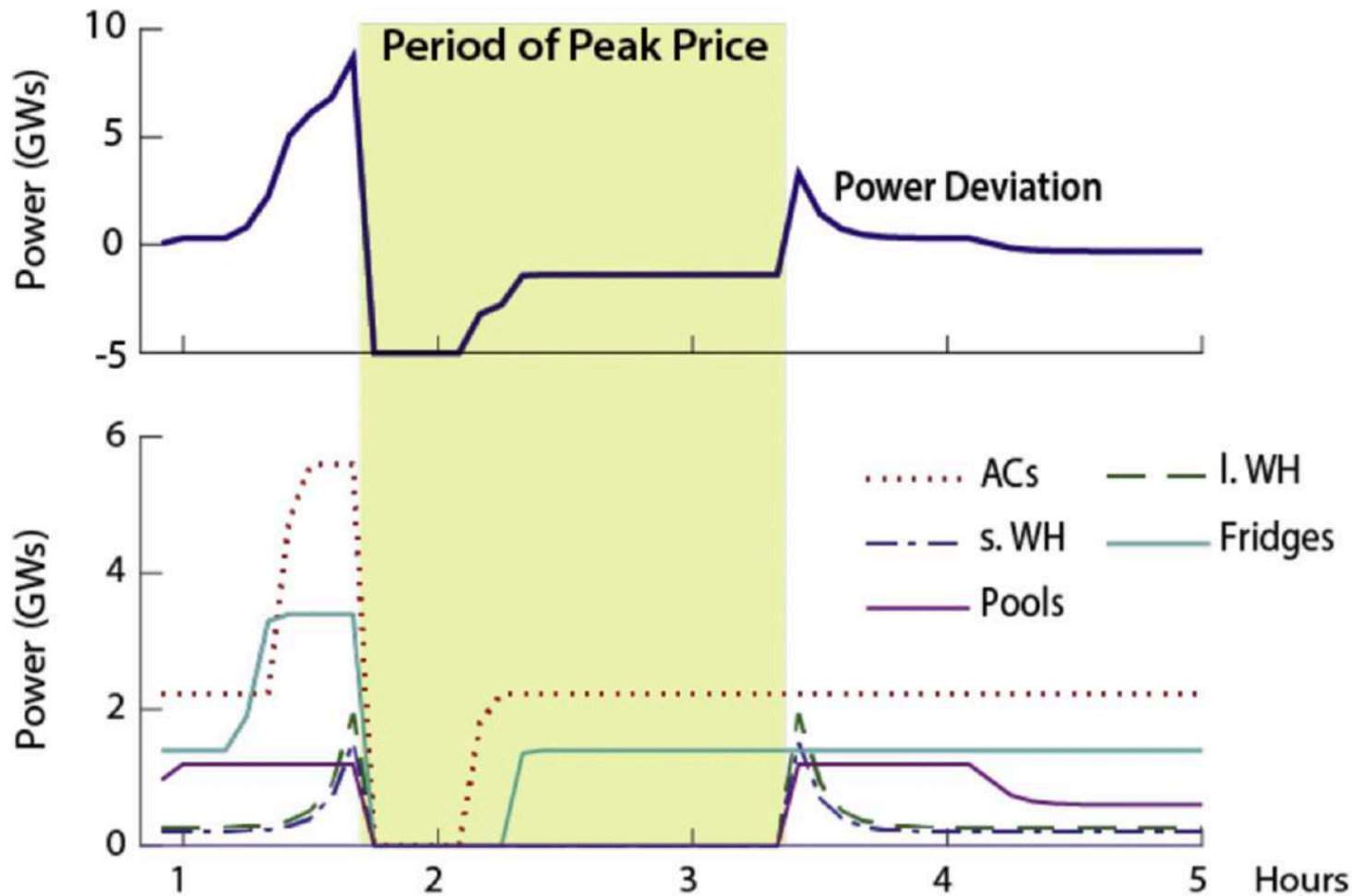
Monthly peak  
+1,000 c/kWh

Annual peak  
+10,000 c/kWh

When a XFMR is  
overloaded?  
+100,000 c/kWh



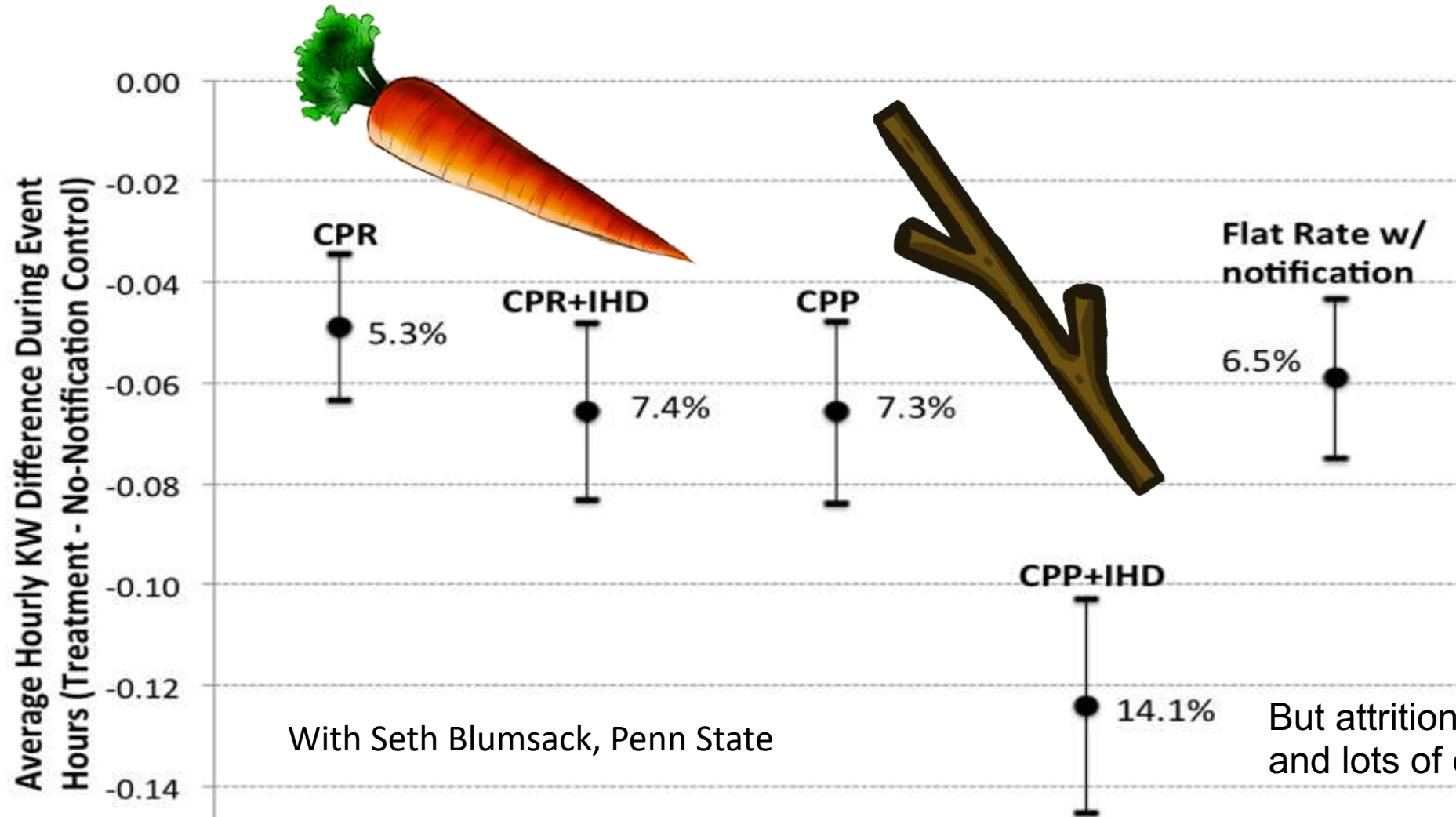
# TOU OR CPP TO THE RESCUE?



Optimal response of millions of air air conditioners, water heaters, refrigerators and pool pumps to a 90-minute increase in price.  
–Sean Meyn



# GMP/DOE Consumer Behavior Study



# WHAT DO OTHER INDUSTRIES DO?



Get more when you mix, match and save.

How many lines do you need?

−

4

+

Prices include \$10/mo savings per line, when you sign up for paper-free billing and Auto Pay. ⓘ

Start Unlimited

Get all the basics with unlimited talk, text and data. And never worry about overage charges again.

\$35

Per line per month. Plus taxes & fees.

Play More Unlimited

Our best for music and video streaming, with millions of songs, HD and premium data—all included.

\$45

Per line per month. Plus taxes & fees.

Do More Unlimited

When productivity is your top priority, get it all done with premium data and a discount on a connected device plan.

\$45

Per line per month. Plus taxes & fees.

Get More Unlimited

The very best of our Unlimited plans gives you our ultimate in performance with extra features.

\$55

Per line per month. Plus taxes & fees.

Unlimited 4G LTE Data ⓘ

480p DVD-Quality Streaming

Apple MUSIC Free for 6 mos.

Unlimited 4G LTE (+25 GB premium data)

Unlimited Mobile Hotspot (15 GB of 4G LTE)

720p HD-Quality Streaming

Apple MUSIC Included

5G access included with a 5G phone. A \$10/mo value. ▼

Unlimited 4G LTE (+50 GB premium data)

Unlimited Mobile Hotspot (15 GB of 4G LTE)

480p DVD-Quality Streaming

Apple MUSIC Free for 6 mos.

5G access included with a 5G phone. A \$10/mo value. ▼

Unlimited 4G LTE (+75 GB premium data)

Unlimited Mobile Hotspot (30 GB at 4G LTE)

720p HD-Quality Streaming

Apple MUSIC Included



\$20

Auto-Refill Available

Service 30 Days

Minutes Unlimited

Texts Unlimited

Data 1.0 GB

More Info

ADD

# PRICES TO DEVICES

- Shifts responsibility to manage volatility/capacity costs to customers, who may not have the tools (or interest) to do so.
- To mitigate annoyance & complexity, need to develop regular schedules, losing the ability to adapt load to real-time conditions.
- Potential for boom/bust cycles, creating new grid problems.

# CONTRACTS TO DEVICES

- Pay for capacity with a fixed fee that is indexed to flexibility.  
“Whenever-you-want-it” electricity is expensive. Flexible electricity is closer to marginal cost.
- Incentivizes fuel switching.
- Utility provides the technology needed to enable flexibility.
- Flexibility strategies can adapt easily to changing market conditions.

# EXISTING CREATIVE RATES

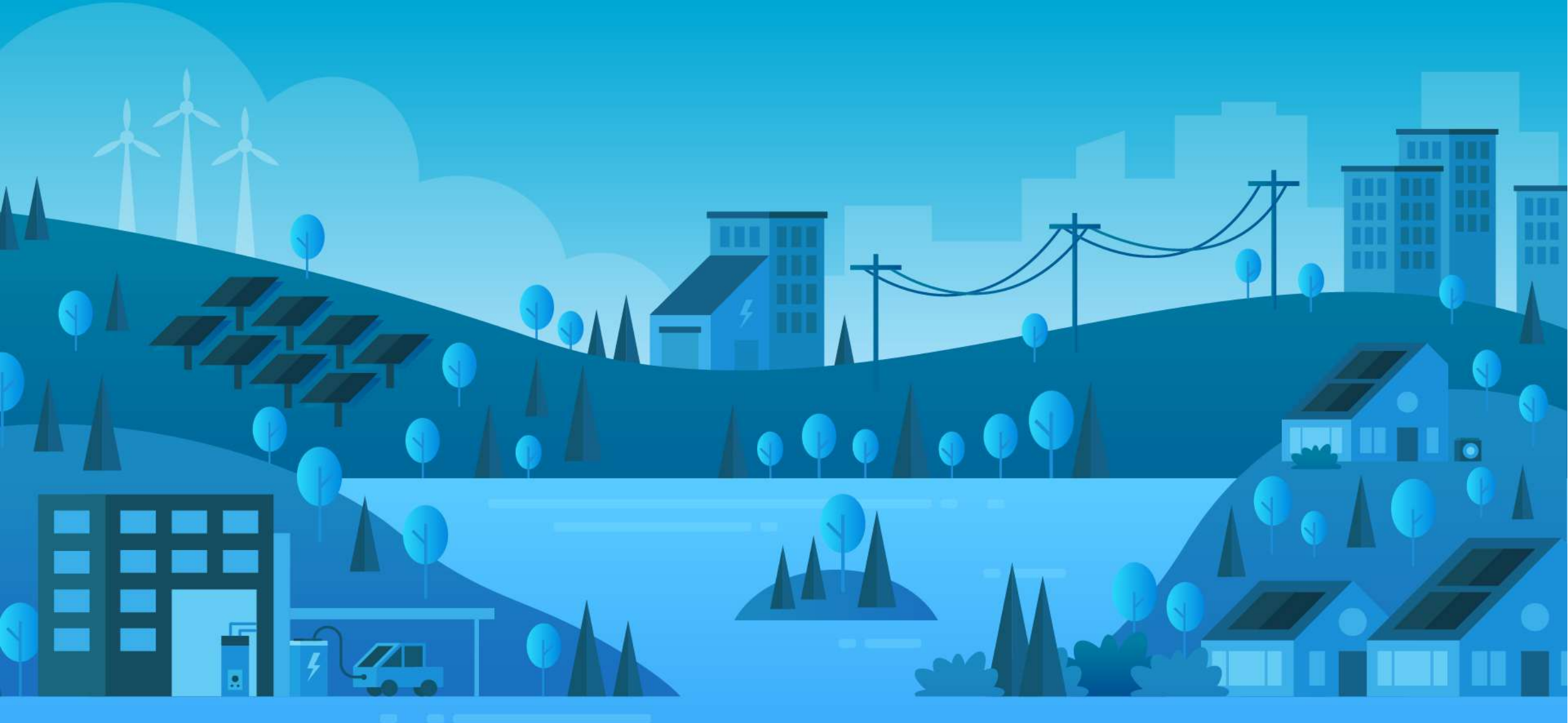
## BED EV Rate

~8c/kWh, so long as your charging is flexible/off peak

## GMP EV RATE

\$29.99/mo flat fee for off-peak EV charging.





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