

DOCKETED	
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Project Title:	Load Management Rulemaking
TN #:	231532
Document Title:	Presentation - Real Time Marginal Emissions Signals
Description:	Presentation by Gavin McCormick describing WattTime's real-time signaling system, which encourages reduced electricity consumption during hours of high GHG emissions
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REAL-TIME MARGINAL EMISSIONS SIGNALS

January 2019



WattTime

“Giving people the power to choose cleaner electricity”

Who We Are

- High-tech nonprofit dedicated to accelerating the development & spread of new sustainability techniques
- Built by 200+ volunteers from Google, MIT, Climate Corp, DOE, and more
- Joined forces with Rocky Mountain Institute in 2017

What We Do

- Research, education, and technical assistance to organizations seeking to reduce emissions through real-time marginal emissions optimization
- Now serving marginal GHG emissions data every 5 minutes for over 100 grid regions in 14 countries

 greentechmedia:

 Clean Technica

 Chicago Tribune

 Forbes

 FAST
COMPANY

 Co.EXIST

 theguardian

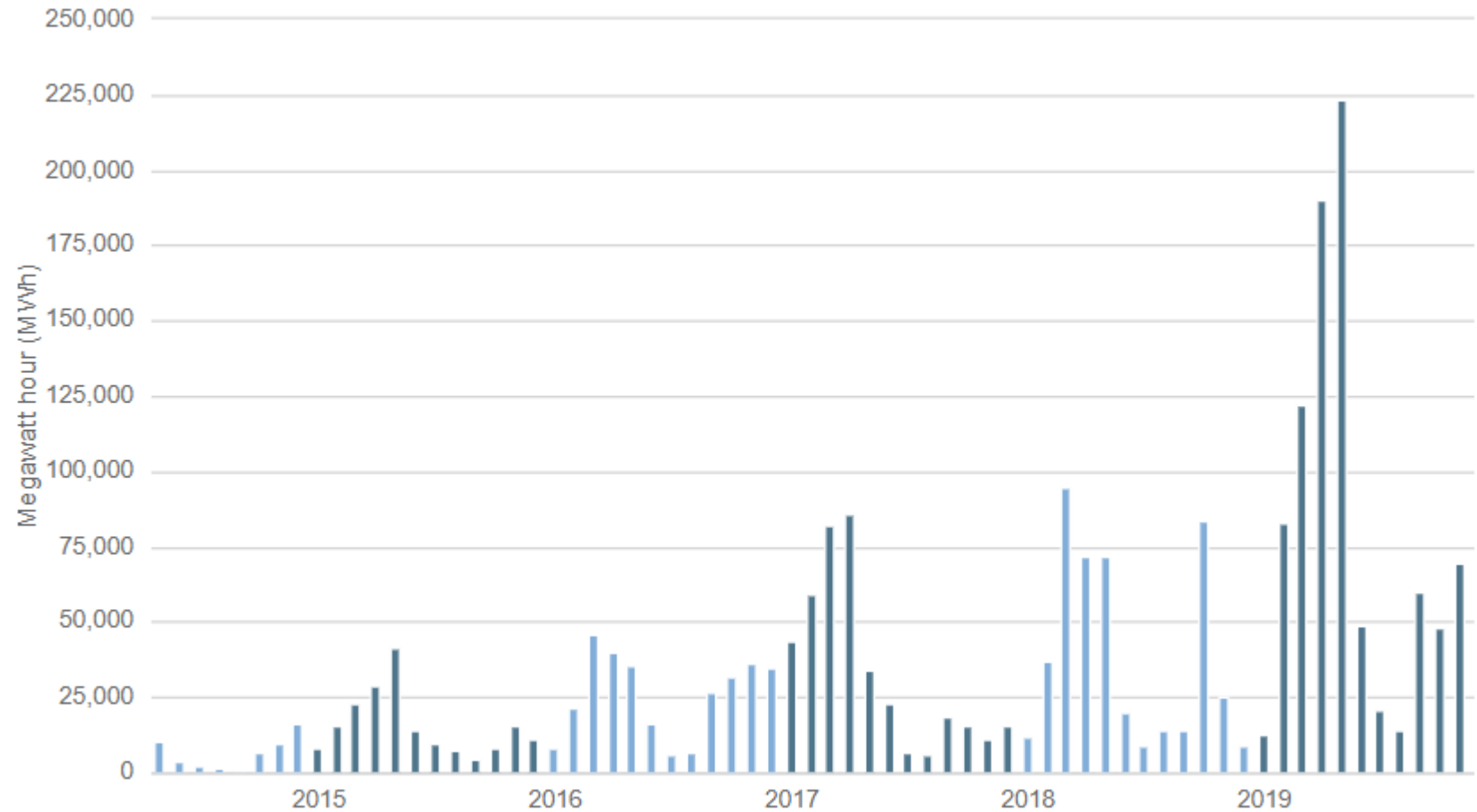
 ENERGY INSTITUTE
AT HAAS

 Union of
Concerned
Scientists

 echoing
GREEN

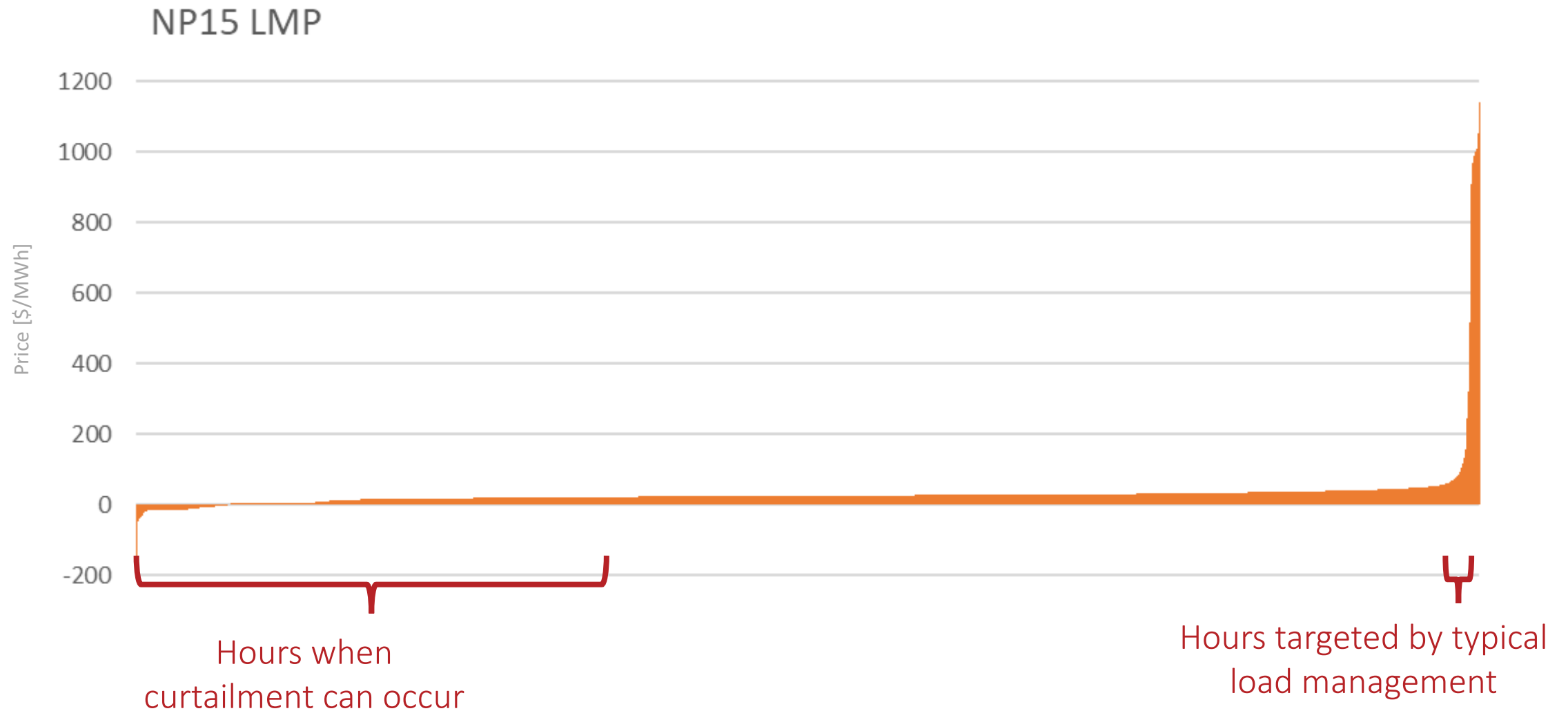
Growing Curtailment of California Renewables

- California now throws away gigawatts of electricity every year
- Yet gas plants keep operating during these times
- Why? Mismatch with the time and place of energy consumption



<http://www.caiso.com/informed/Pages/ManagingOversupply.aspx>

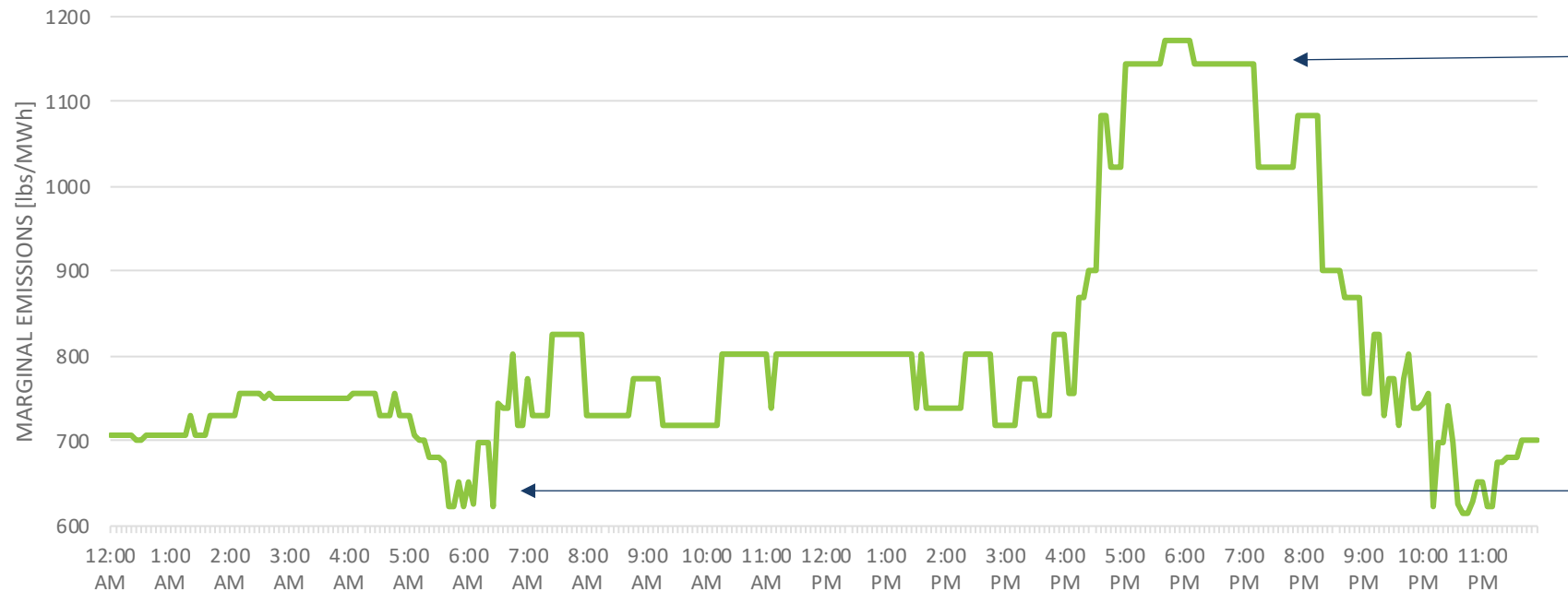
Traditional Load Management Won't Solve This



Marginal Grid Emissions Vary Every 5 Minutes

WattTime monitors which power plant responds when any appliance draws power, and how clean that plant is at that moment.

ISONE MARGINAL EMISSIONS - JANUARY 5, 2017

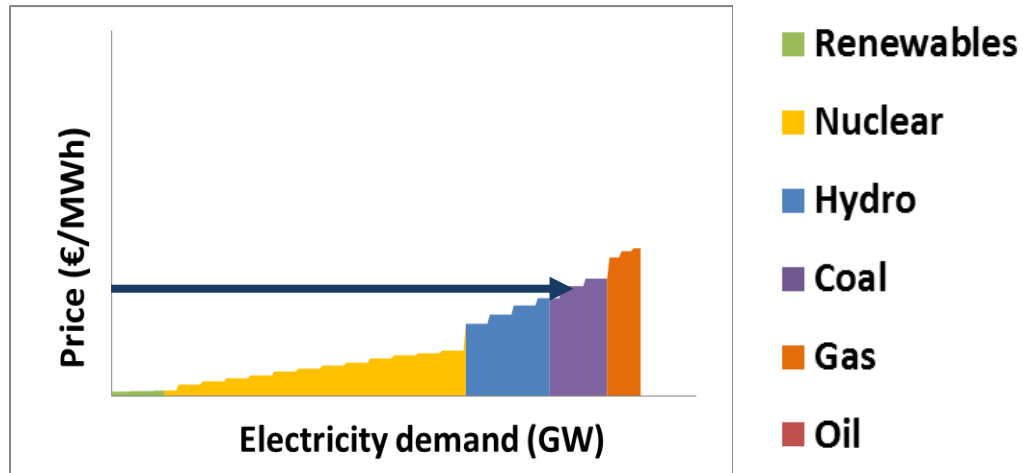


A dirty time on the grid. Using electricity at this time causes more carbon emissions.

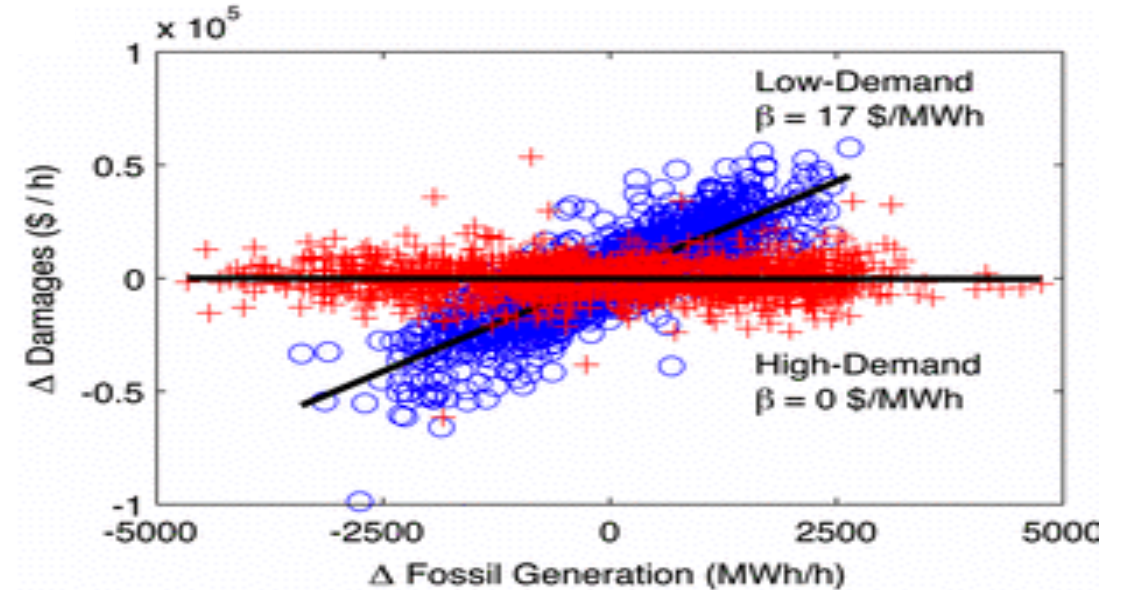
A clean time on the grid. Using electricity at this time causes fewer carbon emissions.

How We Calculate Marginal Emissions Every 5 Mins

Theory



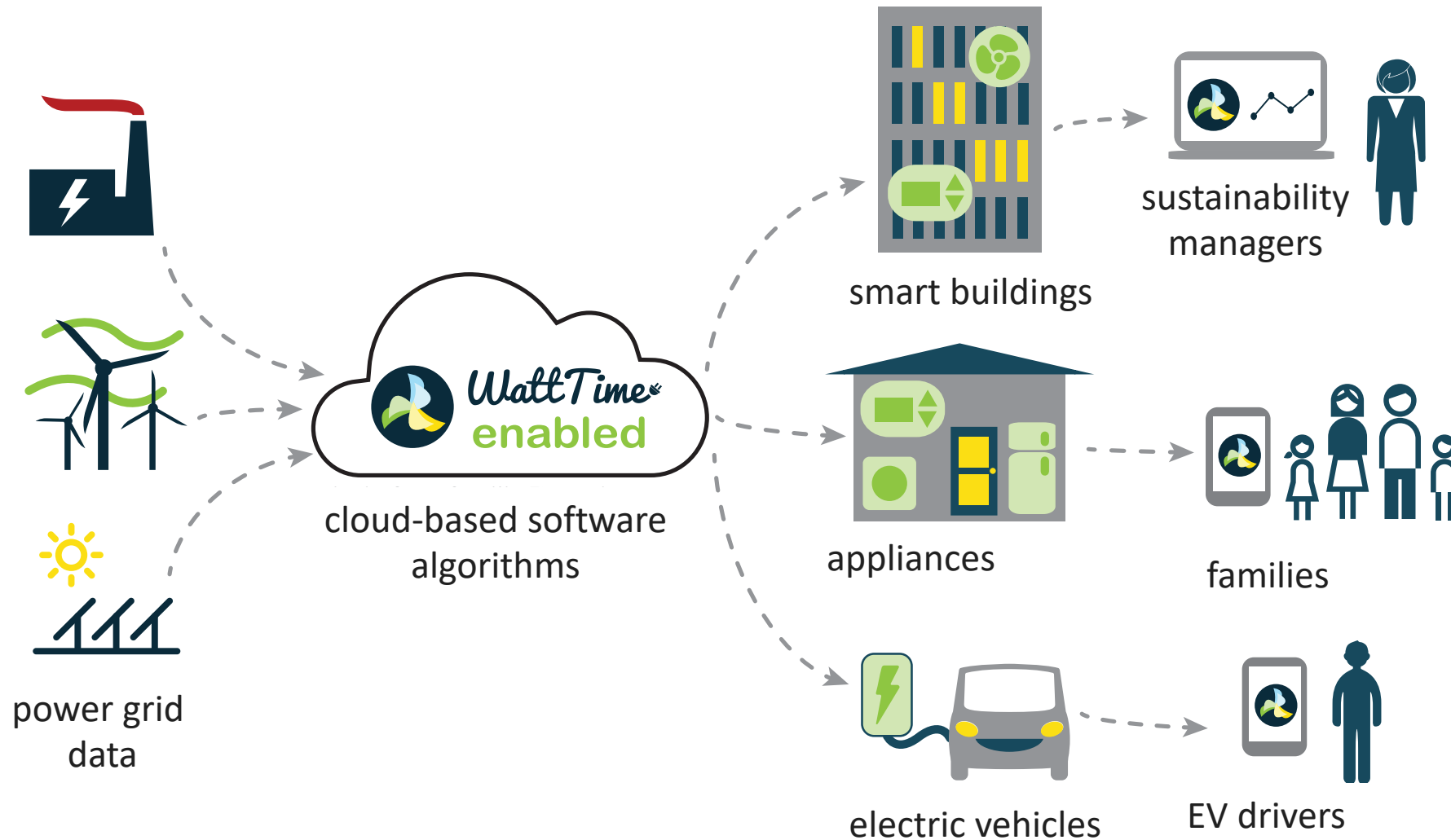
Empirical



Data sources:

- ISO electricity prices, load, transmission, ramping, etc data (OASIS)
- Historical actual emissions from power plants (EPA)
- Weather, cost, reservoir level, etc data (various)
- Statistics (e.g. Siler-Evans et al 2013)

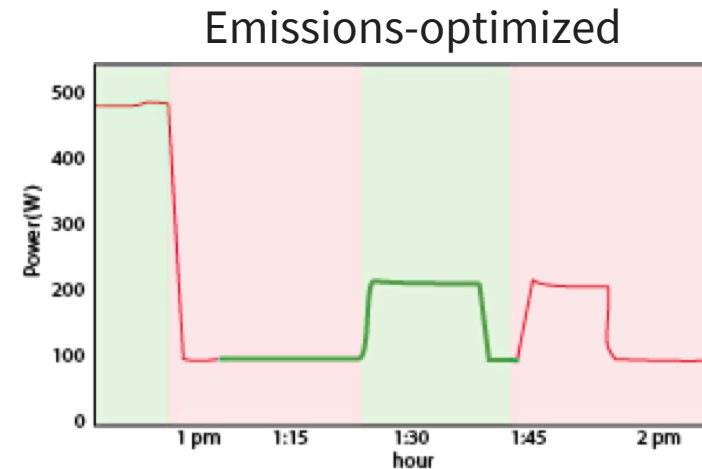
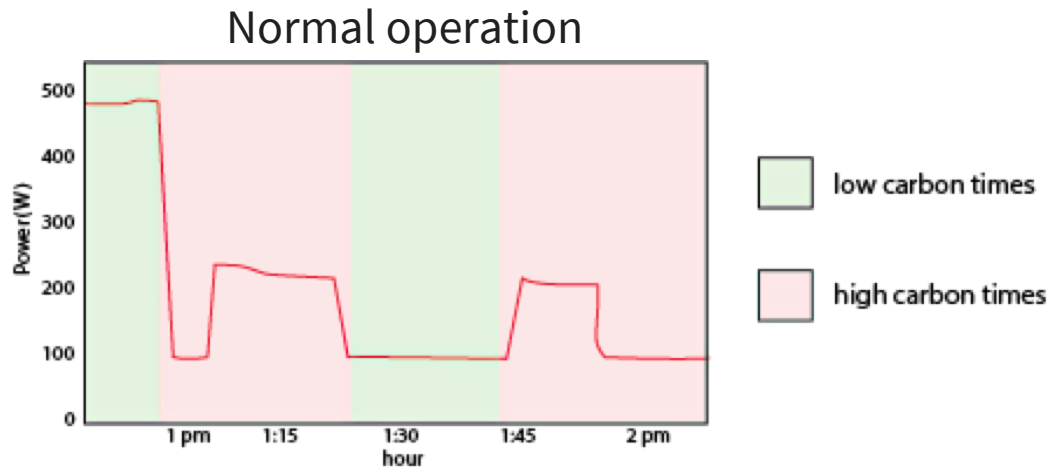
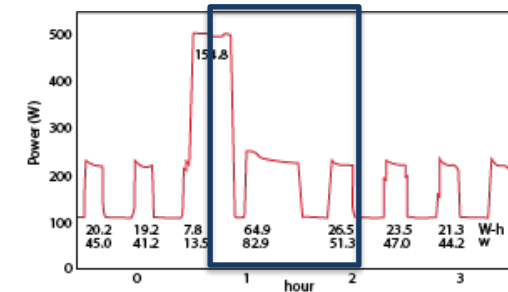
Automated Emissions Reduction (AER) Platform



How Automated Emissions Reduction Works

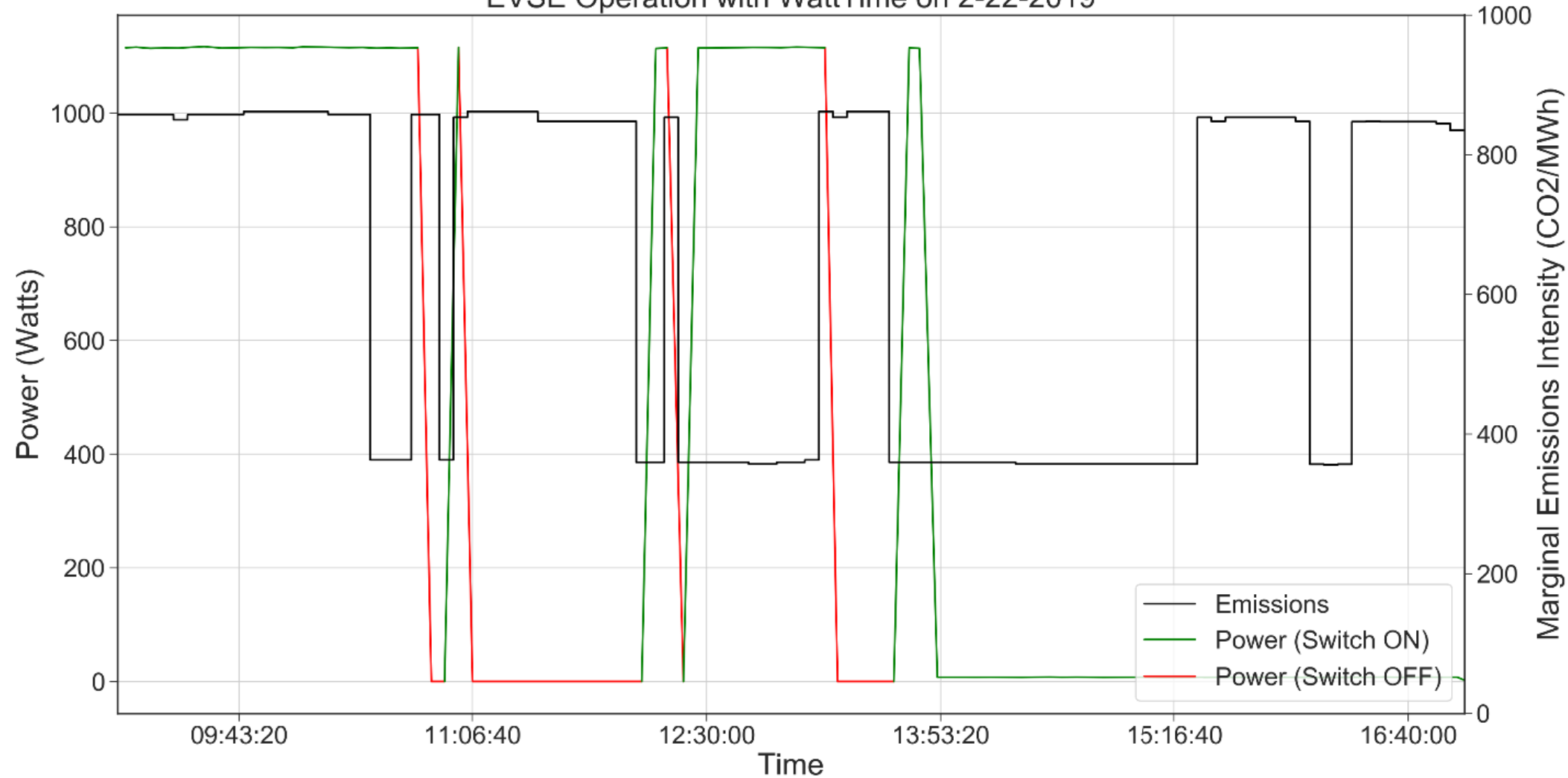
- With real-time emissions data, devices can shift flexible energy use to times of cleaner energy, reducing emissions & cutting curtailment
- Unlike traditional load management, AER focuses on no-regrets *shifting*
- 70% of U.S. electrical load potentially compatible

Example: fridge cycles




PG&E DRET Load Management Lab Test

EVSE Operation with WattTime on 2-22-2019



Sample Company Using AER (electric vehicles)



Store

Residential


Commercial


Utilities


Partners

News

Contact







Emission-Minimizing EV Charging Feature (software upgrade)

- Synchronizes with grid generation sources
- Enables you to charge your EV when the cleanest energy is available on the grid
- Reduces carbon emissions impact of EV charging

\$50.00


+ FREE shipping

ADD TO CART


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1


+



Support

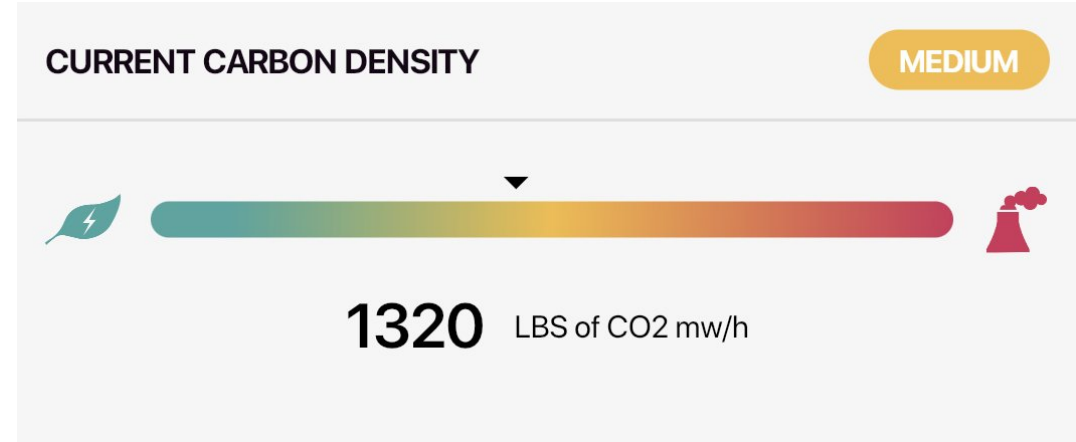
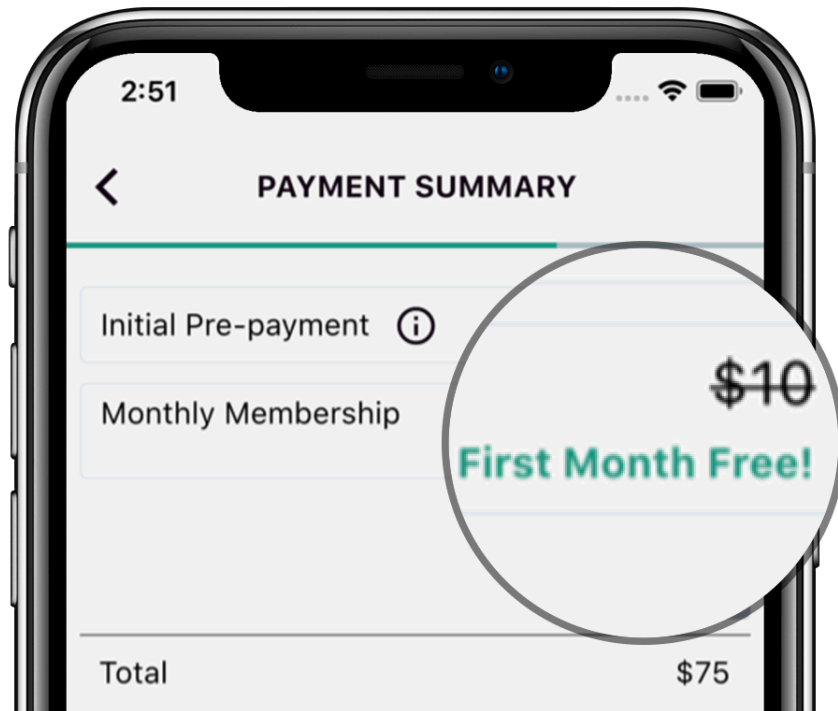






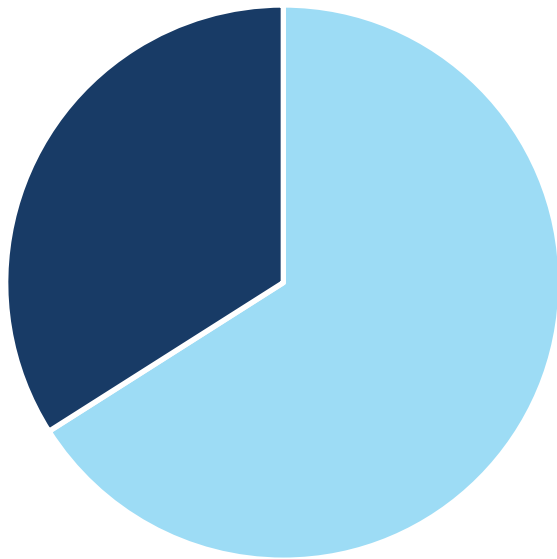
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Sample Company Using AER (smart thermostats)



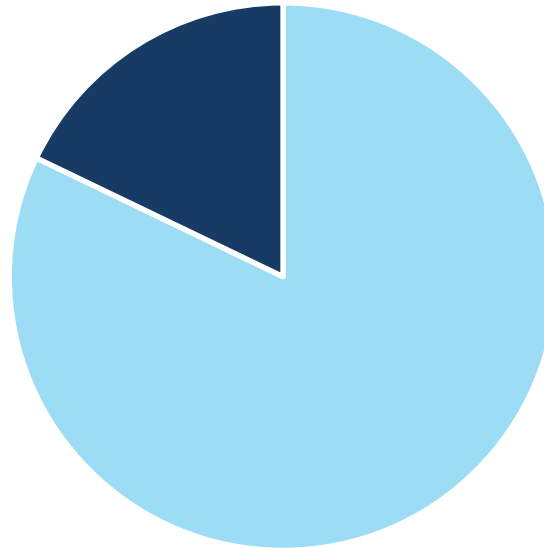
Consumers *Want* Automated Emissions Reduction

Studies



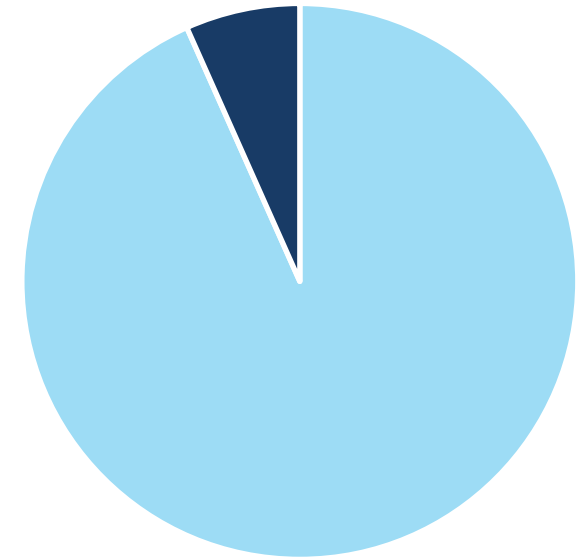
■ Chose device with AER
■ Chose normal device

Delta Institute: 67% of customers selected a device with AER over an otherwise identical device without it



■ Paid extra for AER
■ Bought normal device

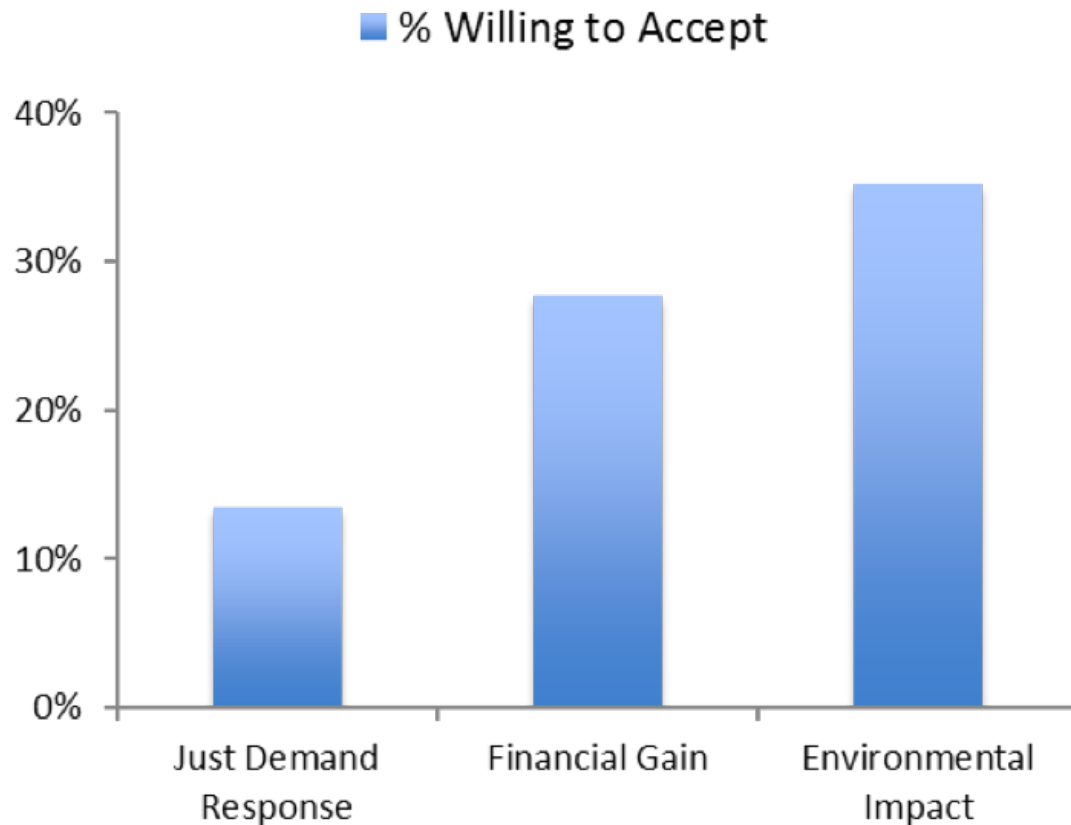
WattTime: 82% of customers voluntarily paid extra to purchase a device with AER



■ Chose AER ■ Declined AER

Delta Institute: 14 of 15 individuals chose to enable AER when it only required pressing a button

Demand Response Participation with AER



Study (WattTime):

- 300 randomly selected individuals across 30 U.S. states were asked if they would sign up for a hypothetical ADR program. Unbeknownst to these individuals, they were randomly assigned to different ADR program descriptions: a regular program, one that offered an unusually large financial incentive (\$600/month per thermostat), or one with AER.

Result:

- As expected, adding environmental impact to a DR program (by adding AER to it) increased signups. Contrary to researcher expectations, AER increased signups *even more* than financial gain did.

Key insights

Emissions Insights

- Emissions reductions by time-shifting are possible.
- Biggest savings achieved by shifting load between *low* price hours (because of curtailment).
- Thus, layering continuous emissions reduction on top of existing load management strategies can radically boost savings at no change in cost & performance
- If equipped with sensors and controls, devices accounting for ~70% of electrical load can reduce emissions at no loss in comfort/performance

Participation Insights

- While most load management strategies are unpopular, most U.S. customers actively *prefer* voluntary emissions-based optimization
- “Productization” is the key to customer preference
 - Customers strongly dislike programs with mandatory response
 - Convenient, desirable voluntary emissions reduction features dramatically outperform financial incentives
- For device companies, biggest barriers are complexity, not cost
 - Software engineers are typically the most constrained resource at device companies
 - Simple, ubiquitous standards dramatically increase uptake

Recommendations

Potential Actions

- 1) Integrate marginal emissions into rates, programs, or incentives
 - Particularly effective if focused on 24/7 continuous optimization
- 2) Don't underestimate the voluntary market
 - Rework DR baselining calcs and remove the perverse incentive to avoid voluntarily scheduling load for clean times
 - Define a single standard that makes it easier for appliance manufacturer to voluntarily optimize for emissions
- 3) Consider requiring smart appliances to come with emissions reduction compatibility using a standard like OpenADR

Thank You

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