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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
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

NP15 LMP

Price [$/MWh]

Hours when curtailment can occur

Hours targeted by typical load management
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.

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

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

- smart buildings
- power grid
- electric vehicles
- cloud software from WattTime and partners
- smart homes
- sustainability managers
- EV owners
- families
- sustainability managers
- appliances
- electric vehicles
- EV drivers
- cloud-based software algorithms
- data
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
EVSE Operation with WattTime on 2-22-2019

Power (Watts)

Marginal Emissions Intensity (CO2/MWh)

- Emissions
- Power (Switch ON)
- Power (Switch OFF)

Sample Company Using AER (electric vehicles)

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

- 1 +
Sample Company Using AER (smart thermostats)
Consumers *Want* Automated Emissions Reduction

**Studies**

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

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

Gavin McCormick
Executive Director
gavin@WattTime.org
www.WattTime.org