



Smart Enough to Reprogram Itself: Results from Thermostat Setpoint Optimization Programs



Jon Koliner, Apex Analytics
Jesse Smith, Demand Side Analytics
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Demand Side Analytics

DATA DRIVEN RESEARCH AND INSIGHTS

APEX ANALYTICS

Setpoint Optimization Programs



- Connected thermostats facilitate behavioral tune-ups!
- One program researched: Tendril's Orchestrated Energy across 5 utility territories



APEX ANALYTICS



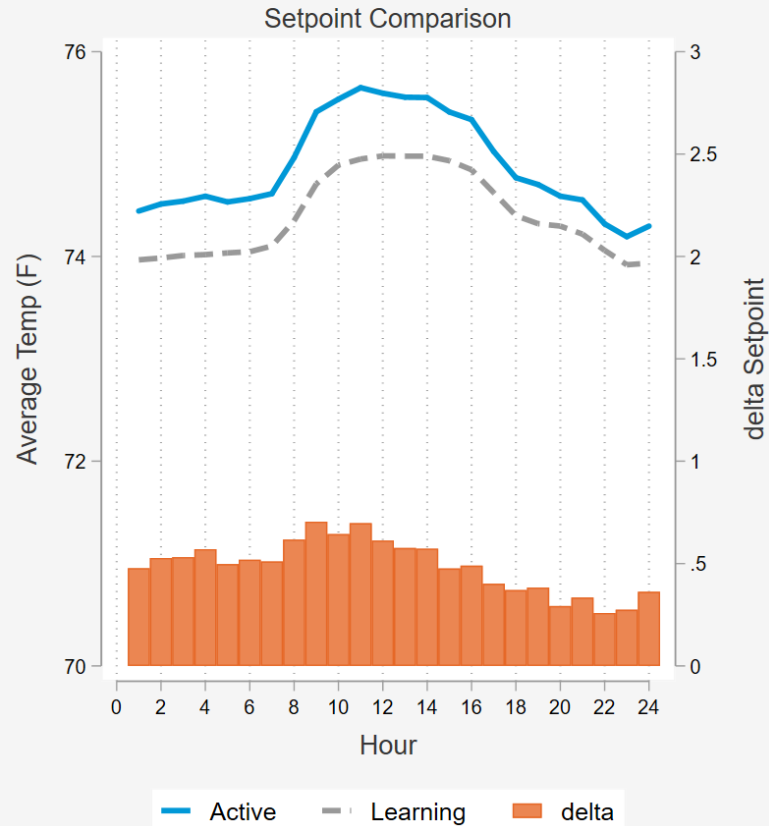
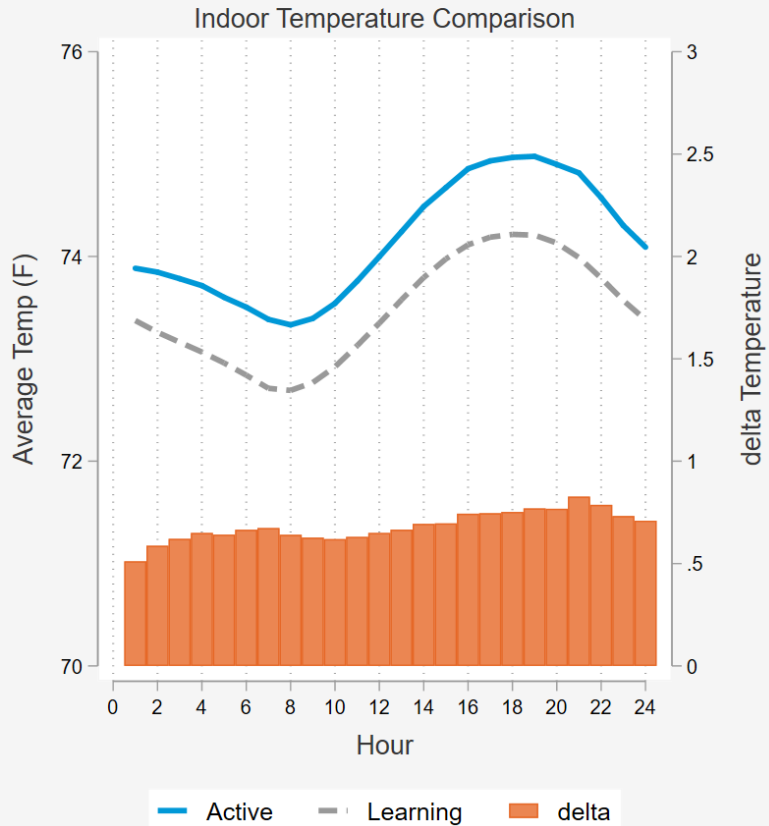
“Weighted coin flip” for within-subjects designation of control days (alternating treatment design)

Day:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Day Type	Coupled Learning Days		Active Days					Coupled Learning Days		Active Days					
			Chance of Learning Day Increasing							Chance of Learning Day Increasing					

- Fixed effects model

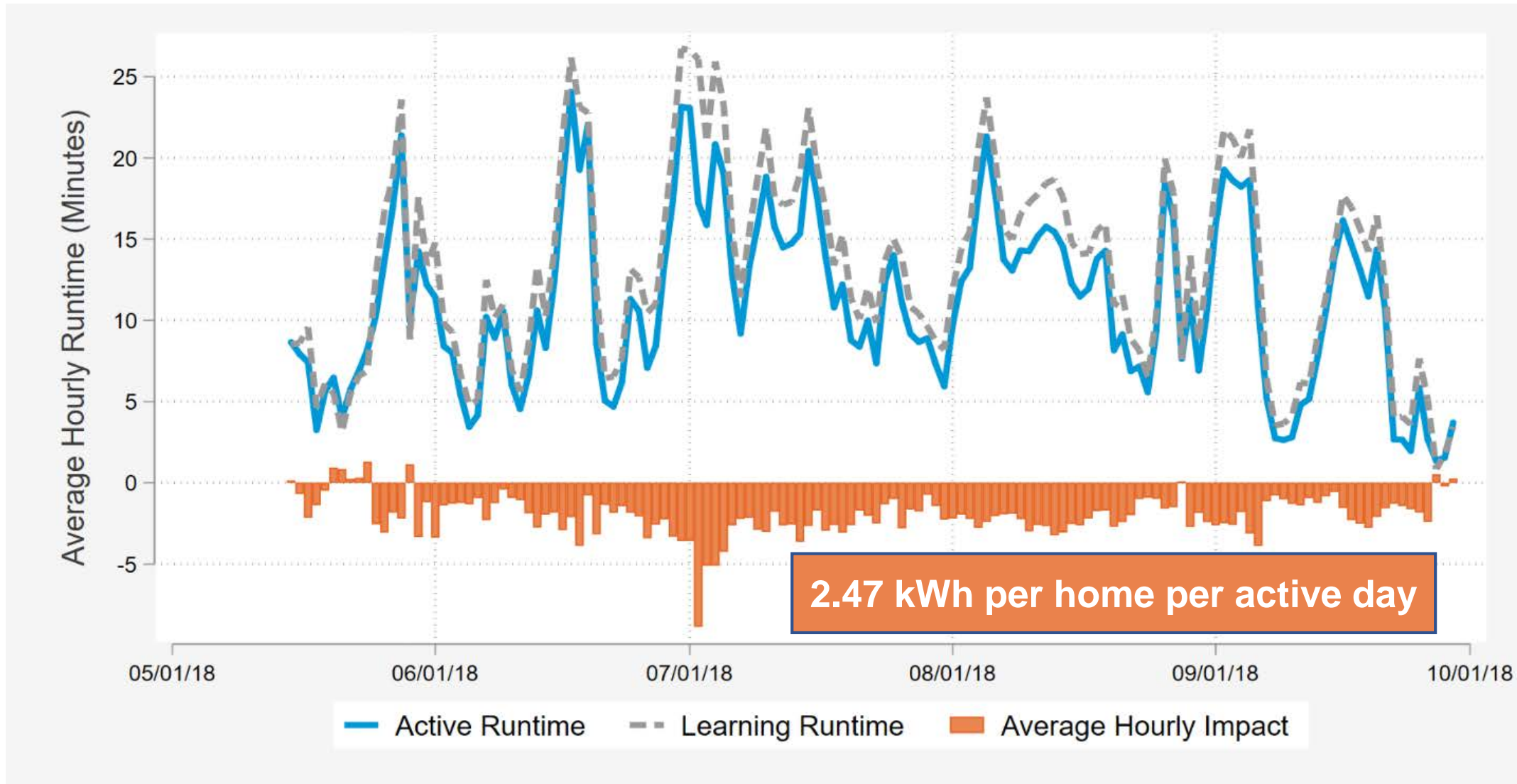
$$\begin{aligned}
 RT_{h,p} &= \alpha_p + \beta_{CDH} \cdot CDH_{h,p} + \beta_{ToD} \cdot ToD_h + \beta_{wknd} \cdot Weekend_h \\
 &+ \beta_{actv} \cdot Active_{h,p} + \beta_{actvCDH} \cdot Active_{h,p} \cdot CDH_{h,p}
 \end{aligned}$$

Algorithm Alters Thermostat Schedule

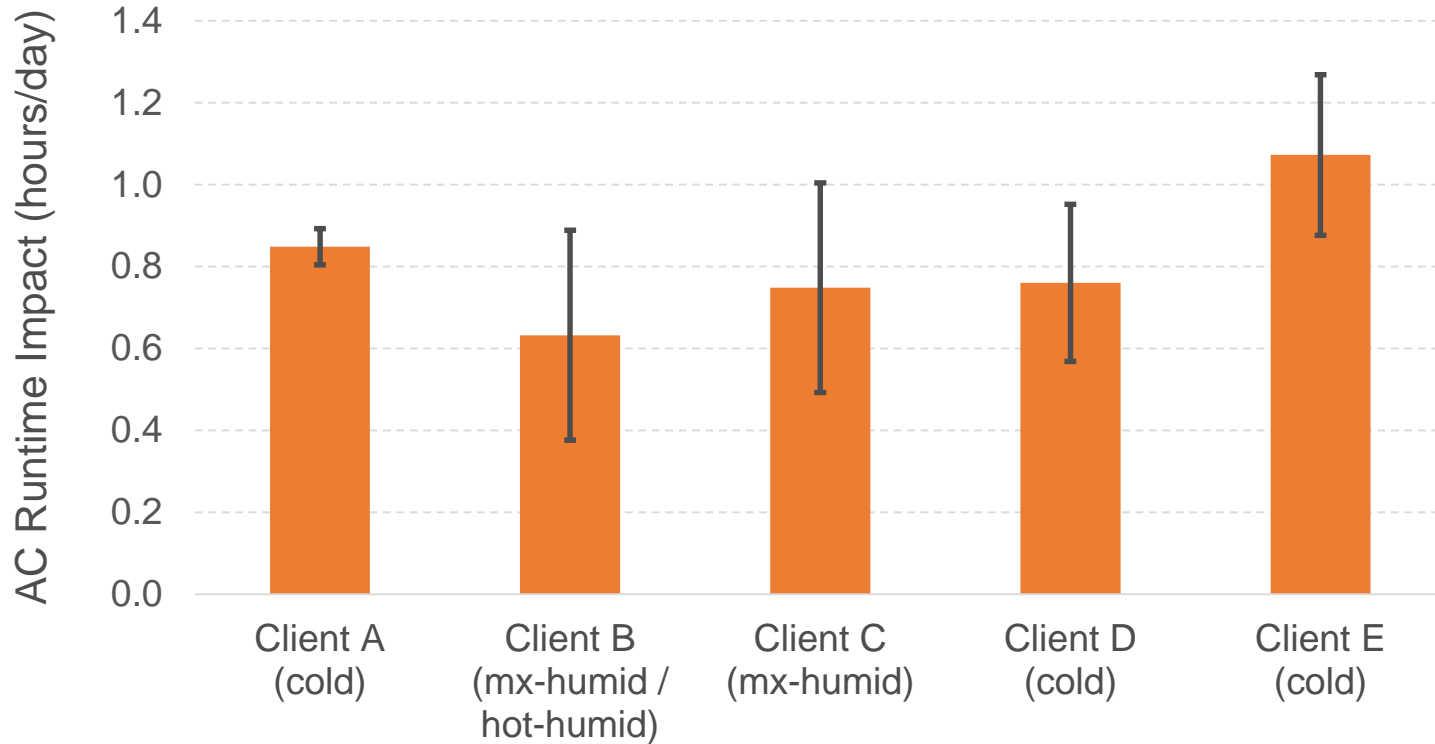
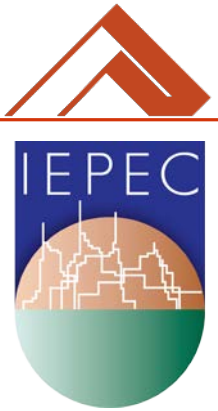


- Average setpoint increased
- Average indoor temperature increased

Runtime Reduction across the Summer



Runtime savings across all territories



Savings robust across territories

Runtime savings more consistent as minutes than as percentage

Single Day: Active Day vs. its Counterfactual

Unadjusted: Active Days compared to all usage

Adjusted: As above, Learning converted to Active Days

Savings vary by provider



nest

uplight

resideo

@ECO FACTOR

32 kWh

111 kWh

207 kWh

475 kWh

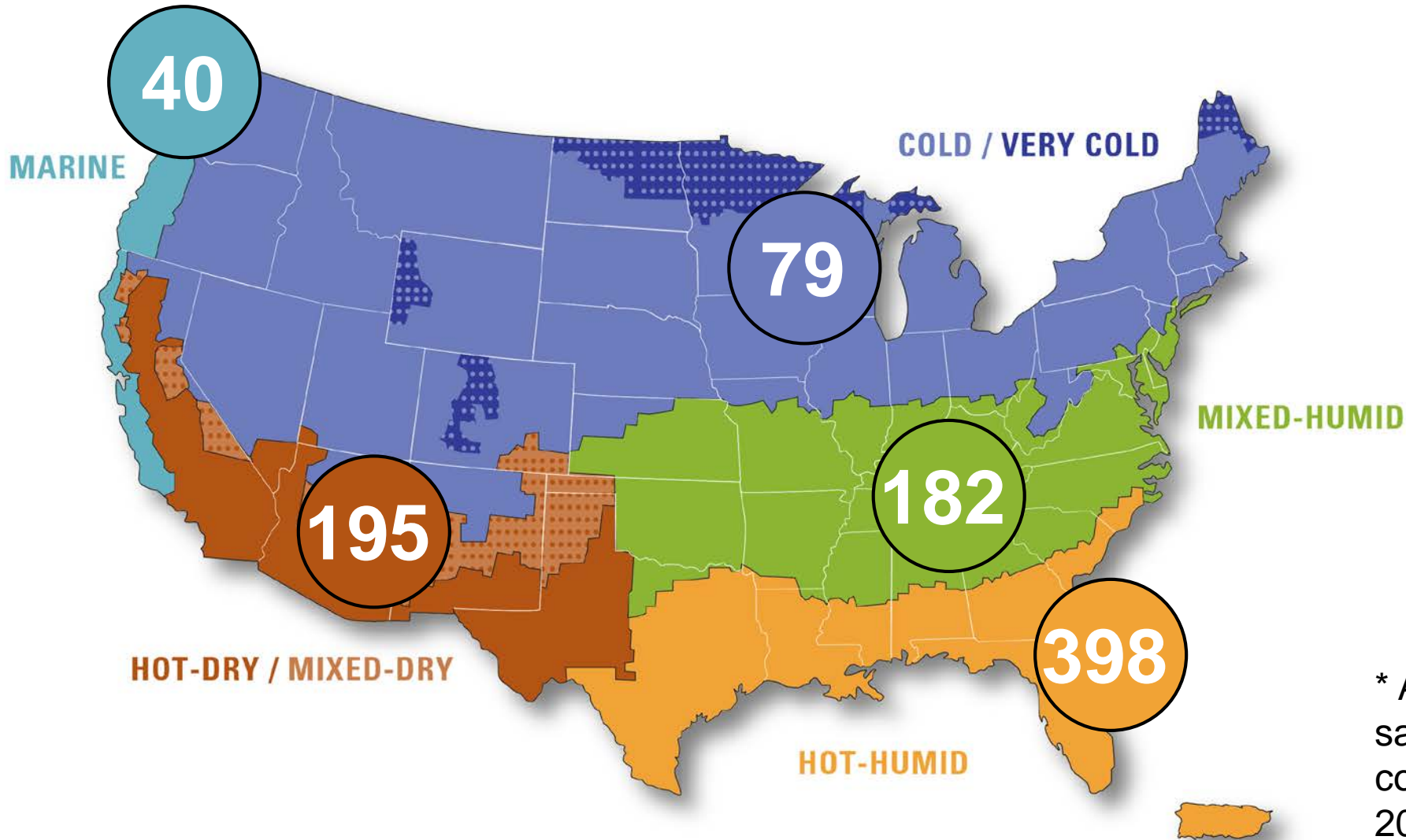
4.6%

9.1%

15.0%

13.5%

≈ 1 TWh Achievable Potential across the United States



kWh per
HH per
summer
*

* Assuming 9% cooling energy savings per household, and consumption based on RECS 2015 by region



Questions?

Jon Koller

jonk@apexanalyticsllc.com



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