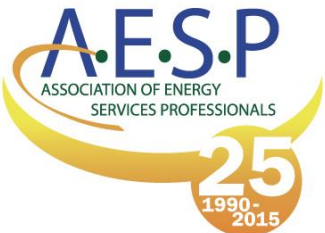


Nest Learning Thermostat: Can You Teach an Old Thermostat New Tricks?

Carlyn Aarish
February 11, 2015

CADMUS



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Evolution of Thermostats



Manual

User manually adjusts setpoints



Programmable

User programs setpoint schedule



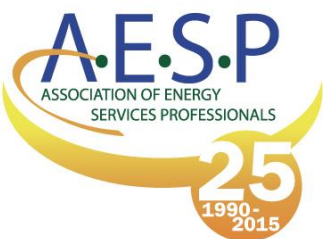
Wi-Fi Connected

User adjusts/programs setpoints remotely



Smart

Thermostat adjusts/programs setpoints



Objectives



Gas saved on heating
(Gas furnaces)



Electricity saved on cooling
(Central AC)

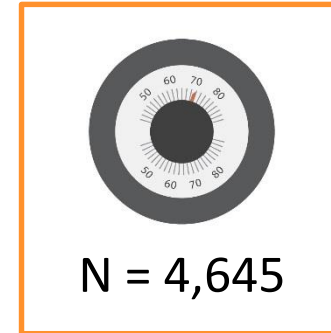
Program Design

Test

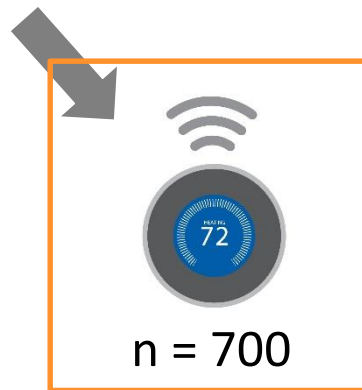
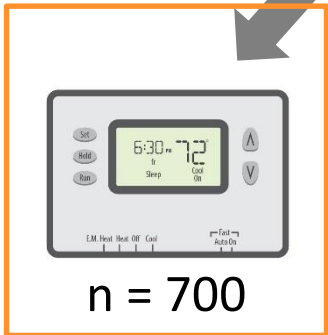


N = 1,400

Control



N = 4,645



Methods

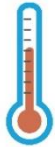


Pre/Post billing analysis

Methods



Pre/Post billing analysis



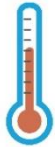
Indoor temperature metering



Methods



Pre/Post billing analysis



Indoor temperature metering



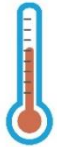
AC run time metering



Methods



Pre/Post billing analysis



Indoor temperature metering



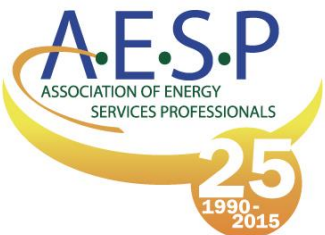
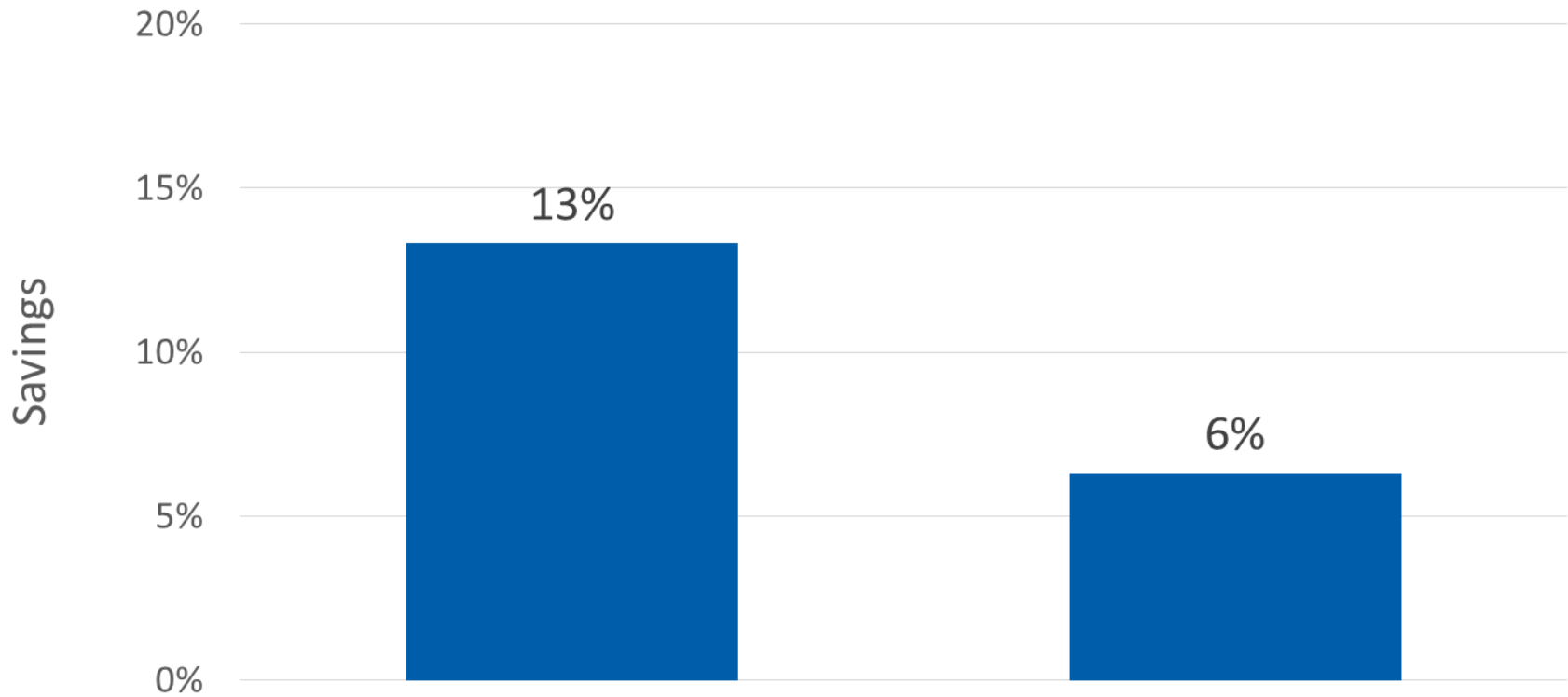
AC run time metering



Participant surveys

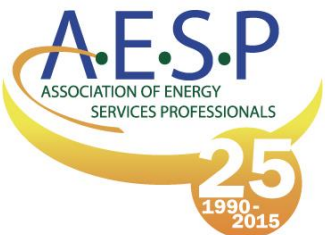
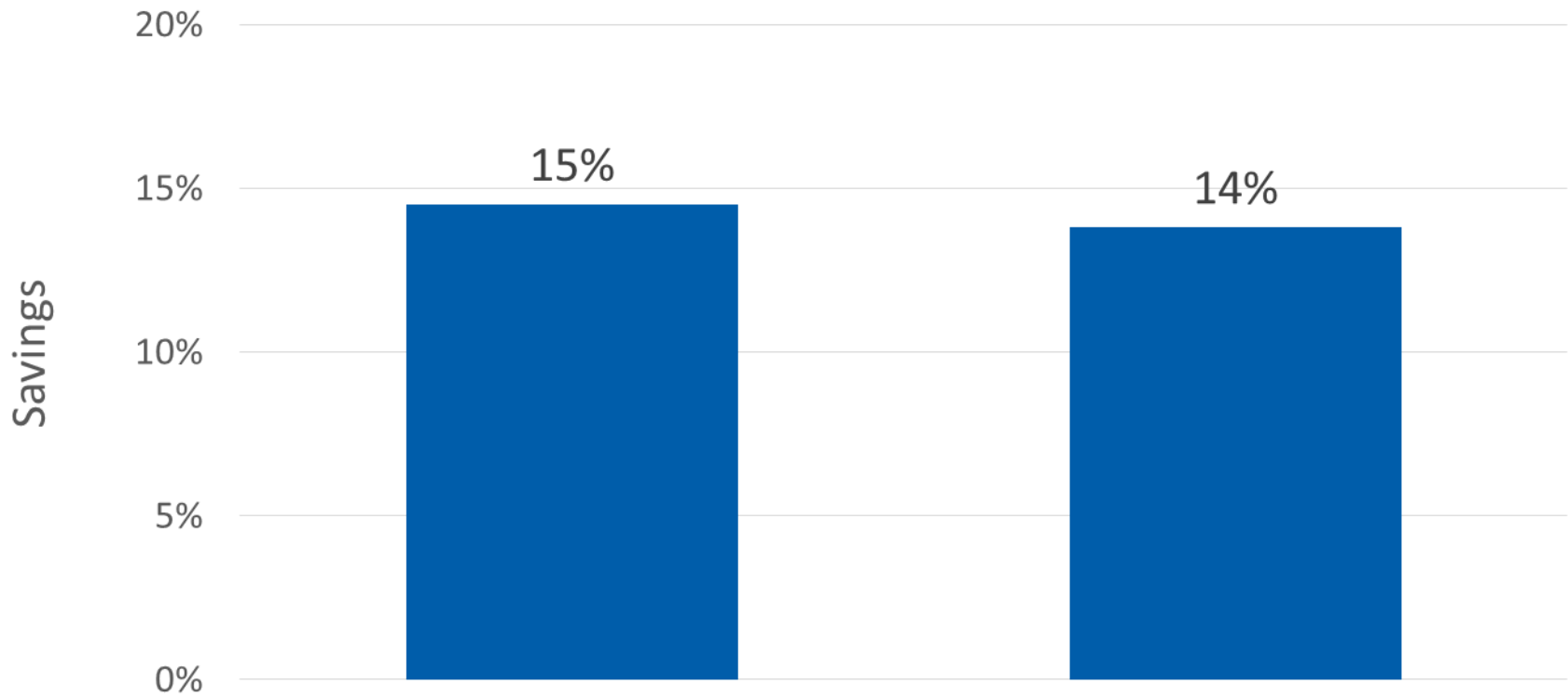


Heating Season Gas Savings



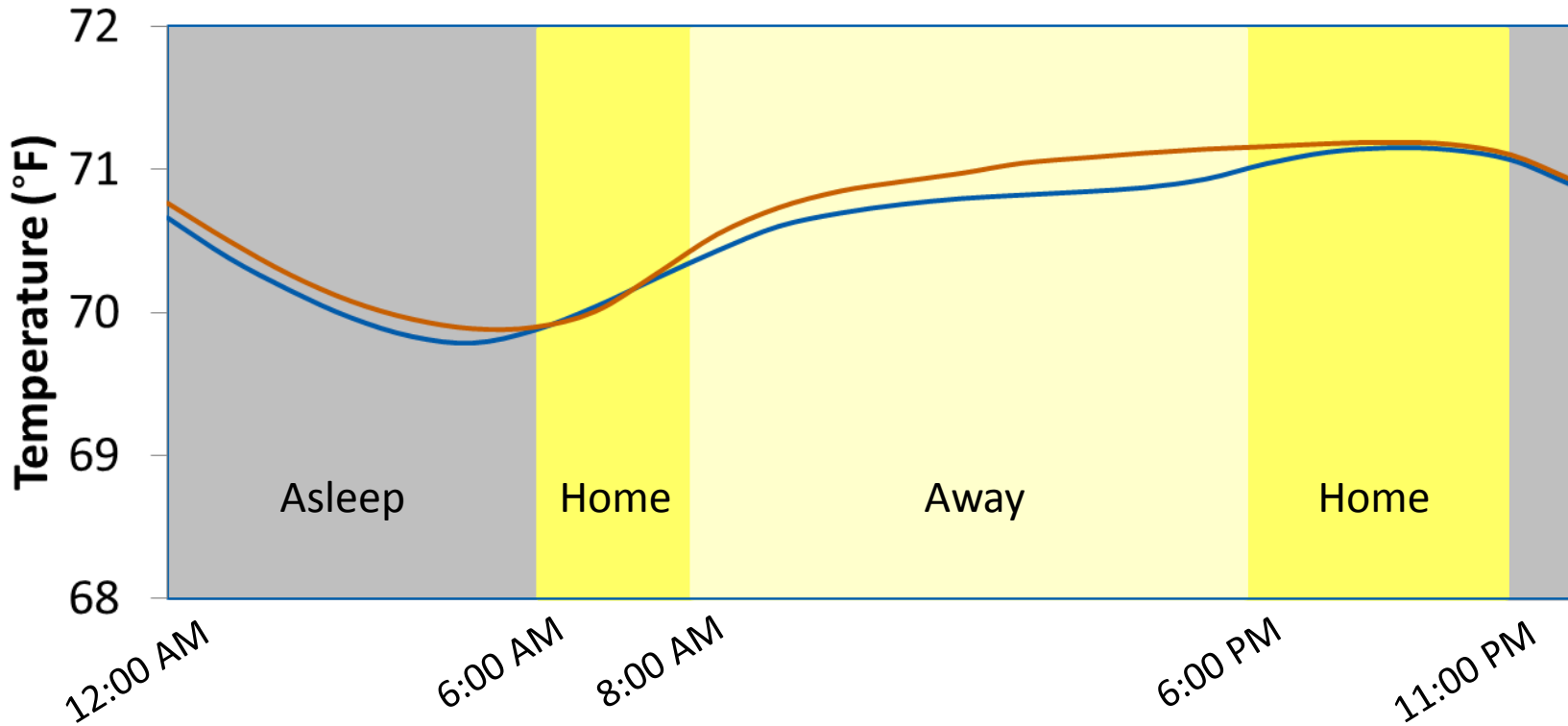


Cooling Season Electric Savings





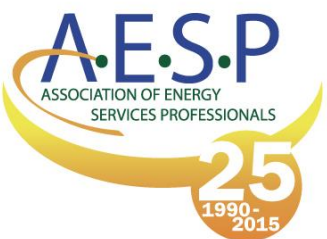
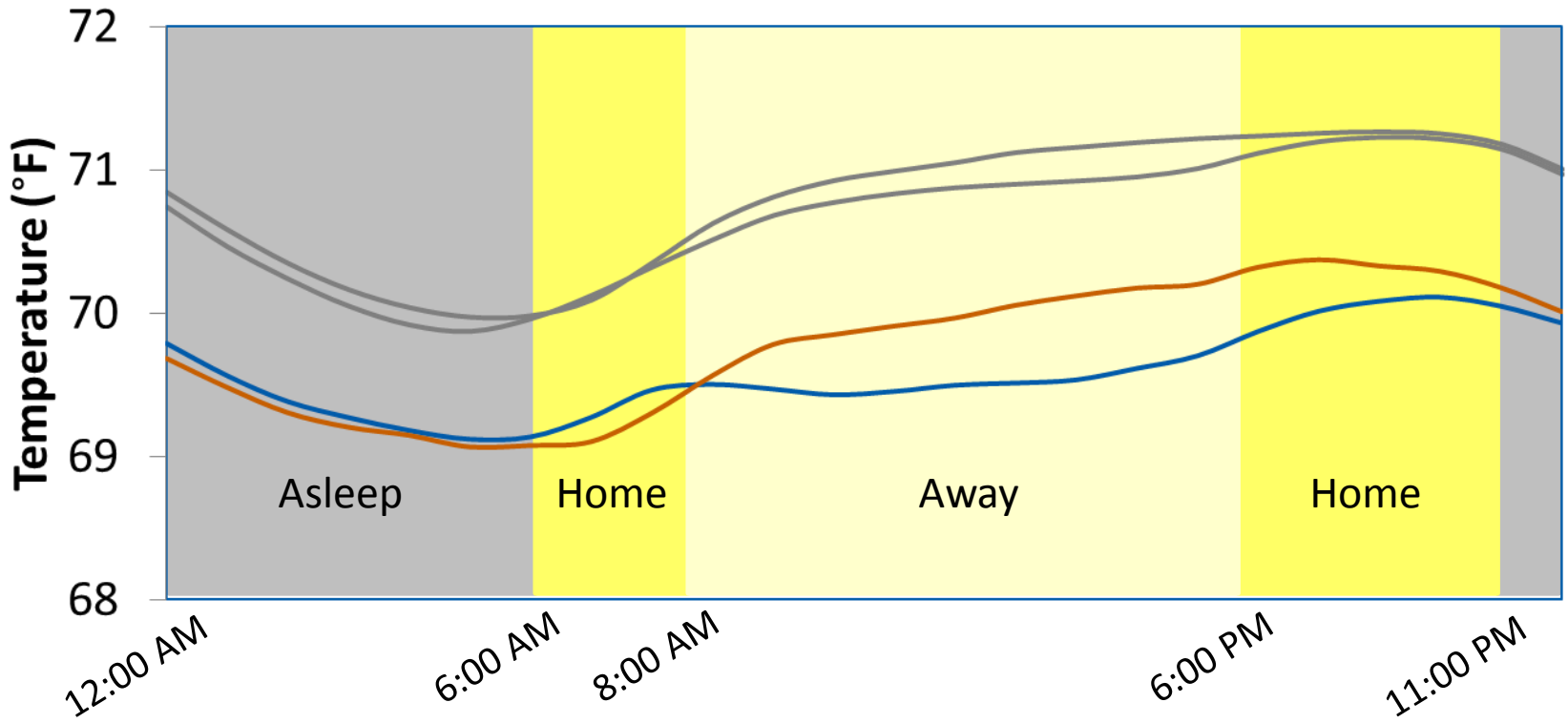
Heating Season Temp Profile



— Weekday — Weekend



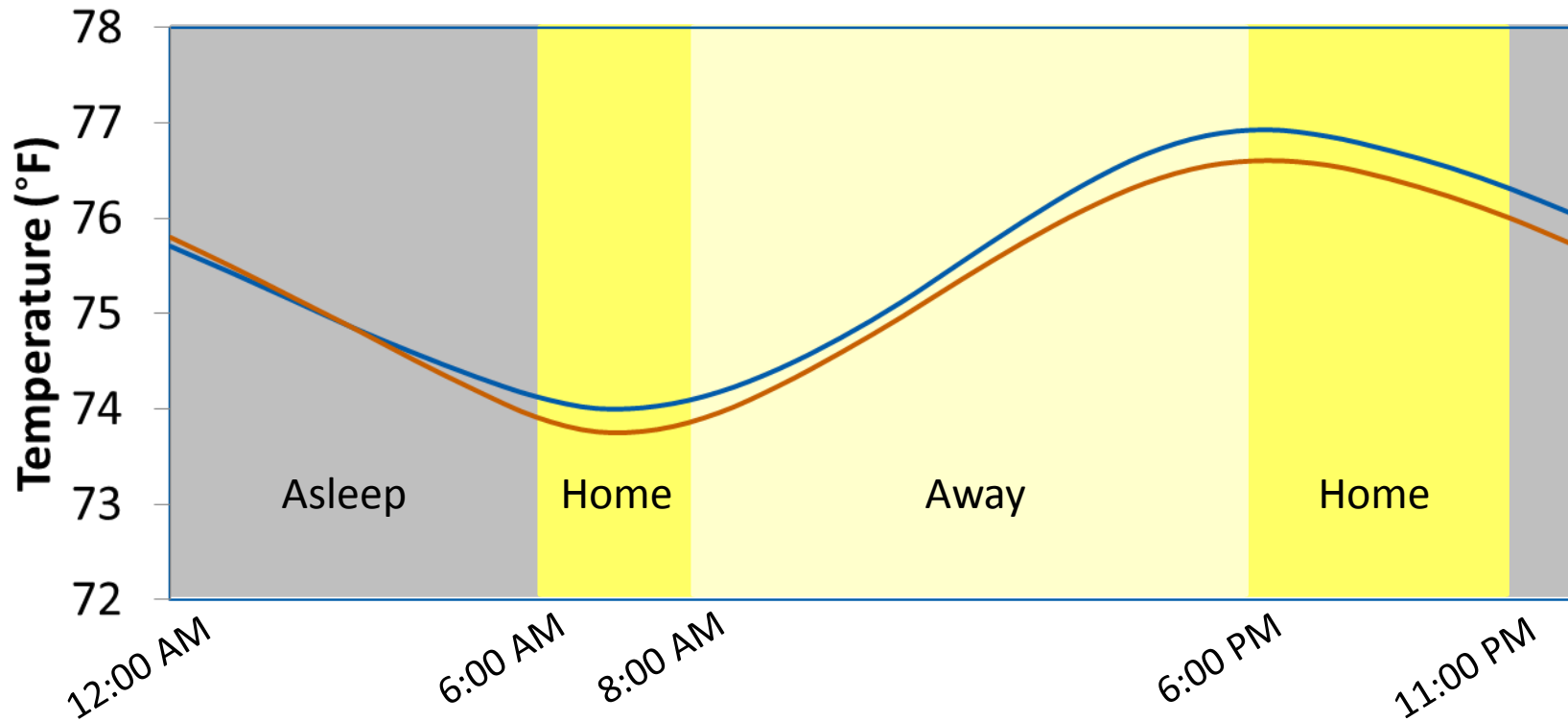
Heating Season Temp Profile



— Weekday — Weekend



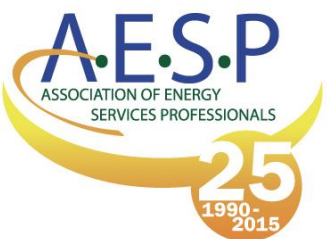
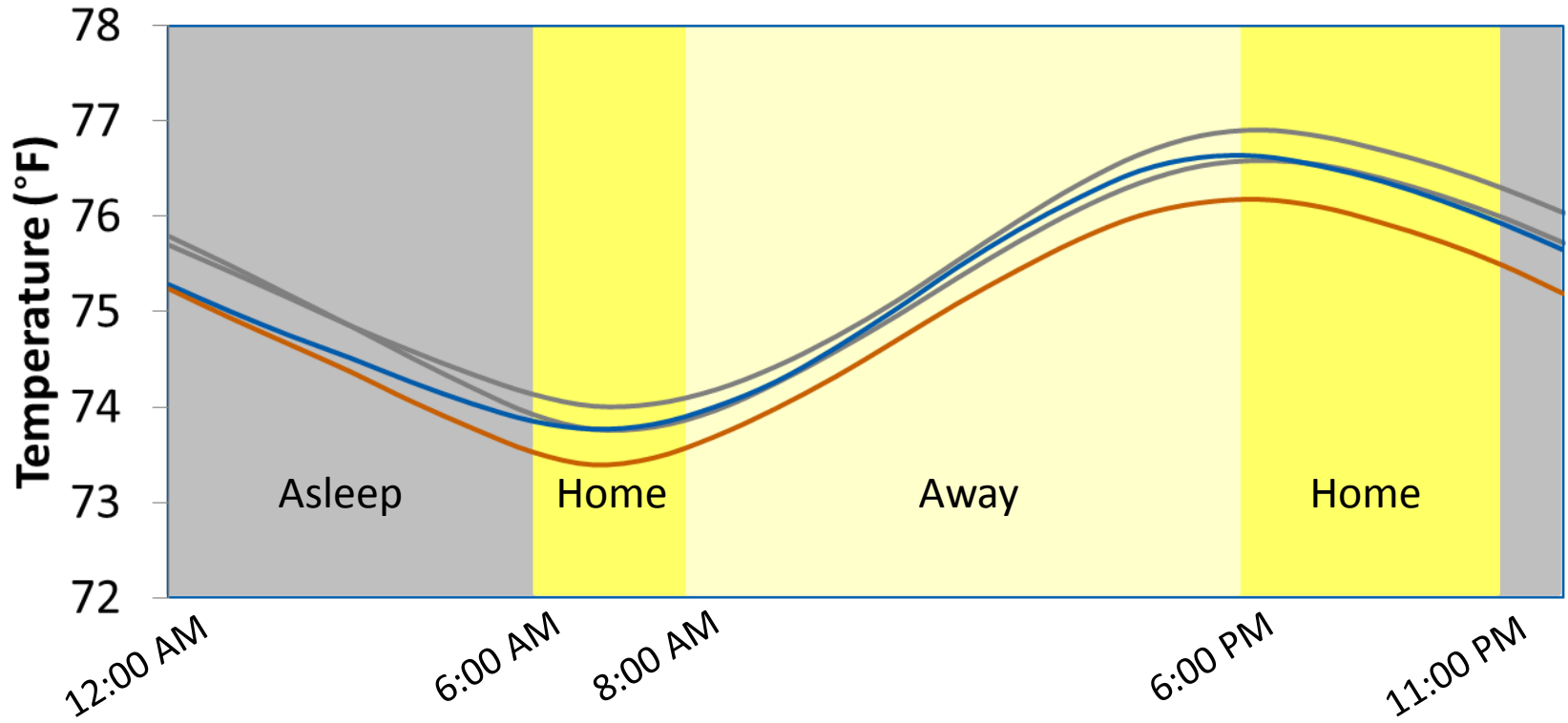
Cooling Season Temp Profile



— Weekday — Weekend



Cooling Season Temp Profile



— Weekday — Weekend

Reasons for Low Cooling Season Savings Potential



Reasons for Low Cooling Season Savings Potential

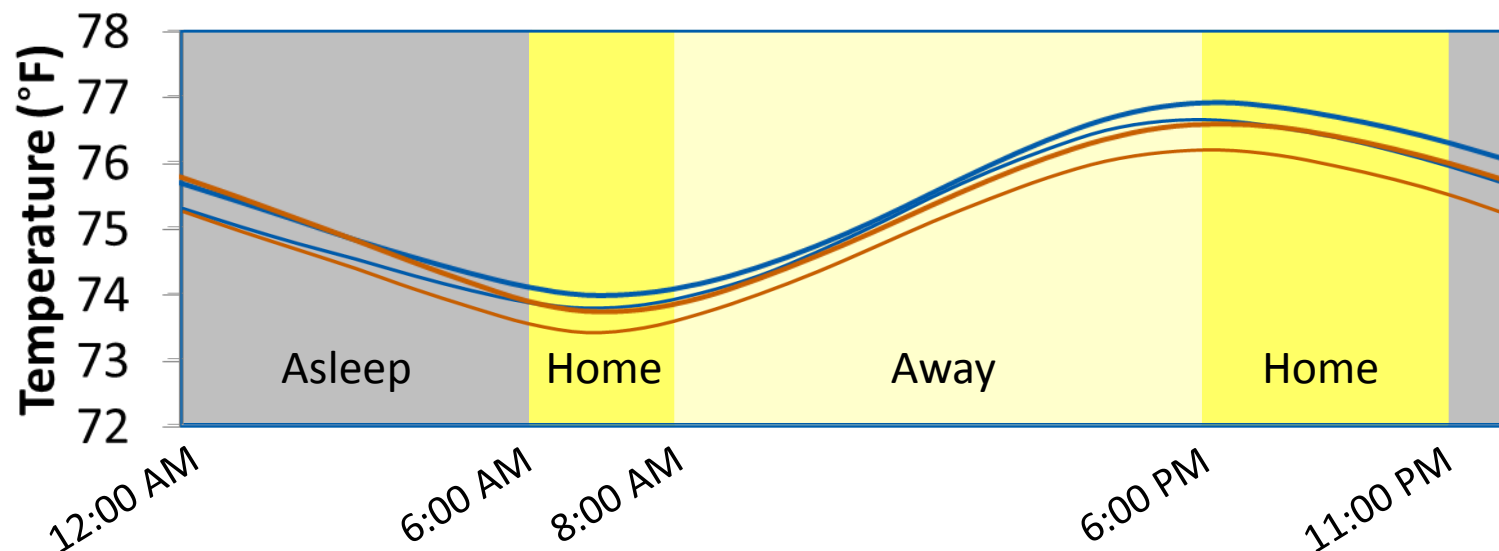
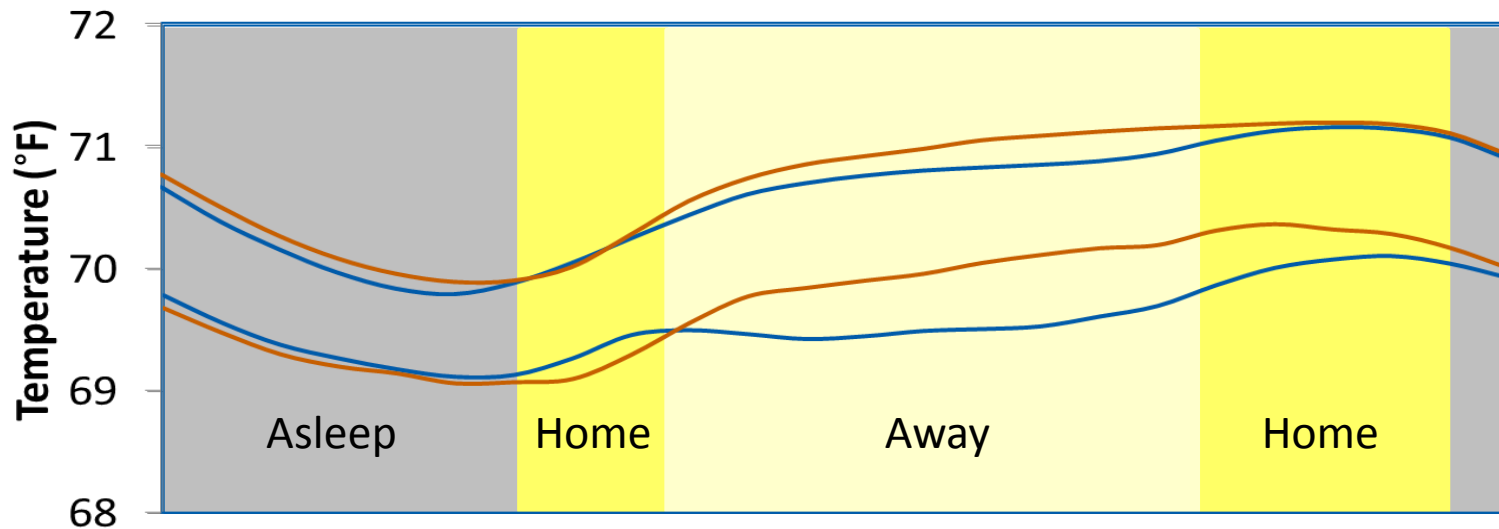
1. Children out of school

Reasons for Low Cooling Season Savings Potential

1. Children out of school
- 2. Cooling season shorter than heating season**

Reasons for Low Cooling Season Savings Potential

1. Children out of school
2. Cooling season shorter than heating season
- 3. HVAC run times shorter in summer**



12:00 AM

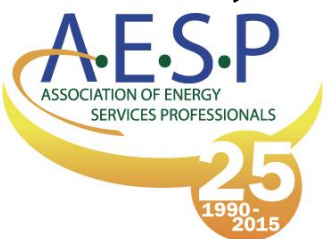
6:00 AM

8:00 AM

6:00 PM

11:00 PM

— Weekday — Weekend



How I Think I Look

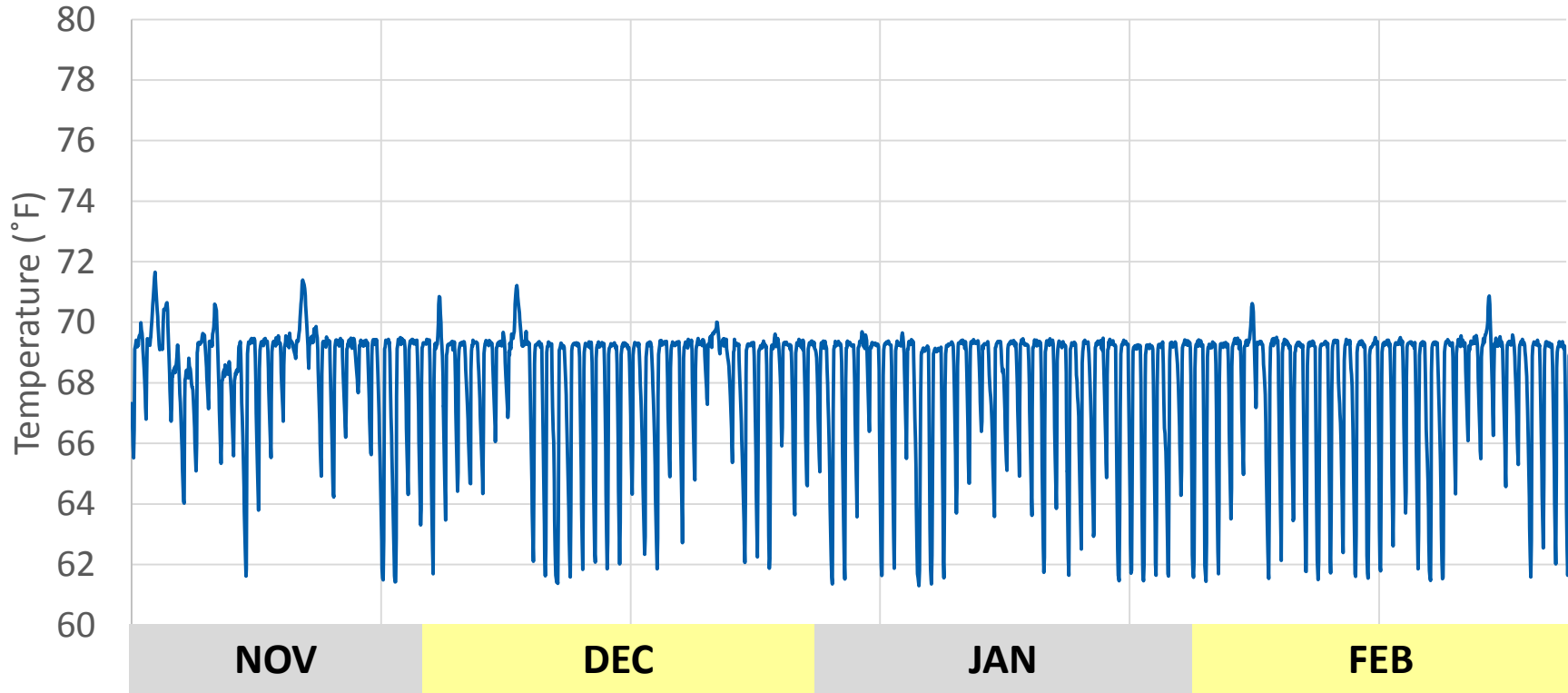


How I Actually Look



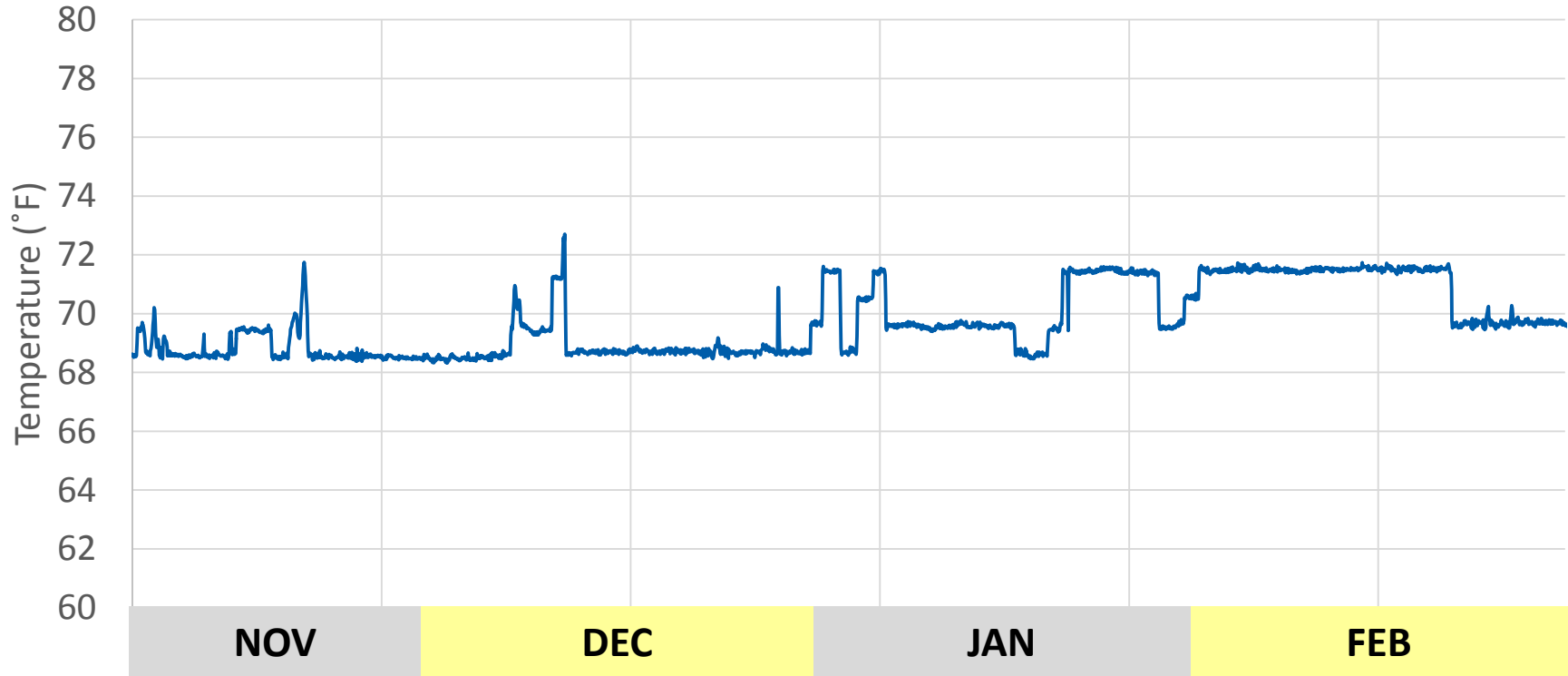


Ideal



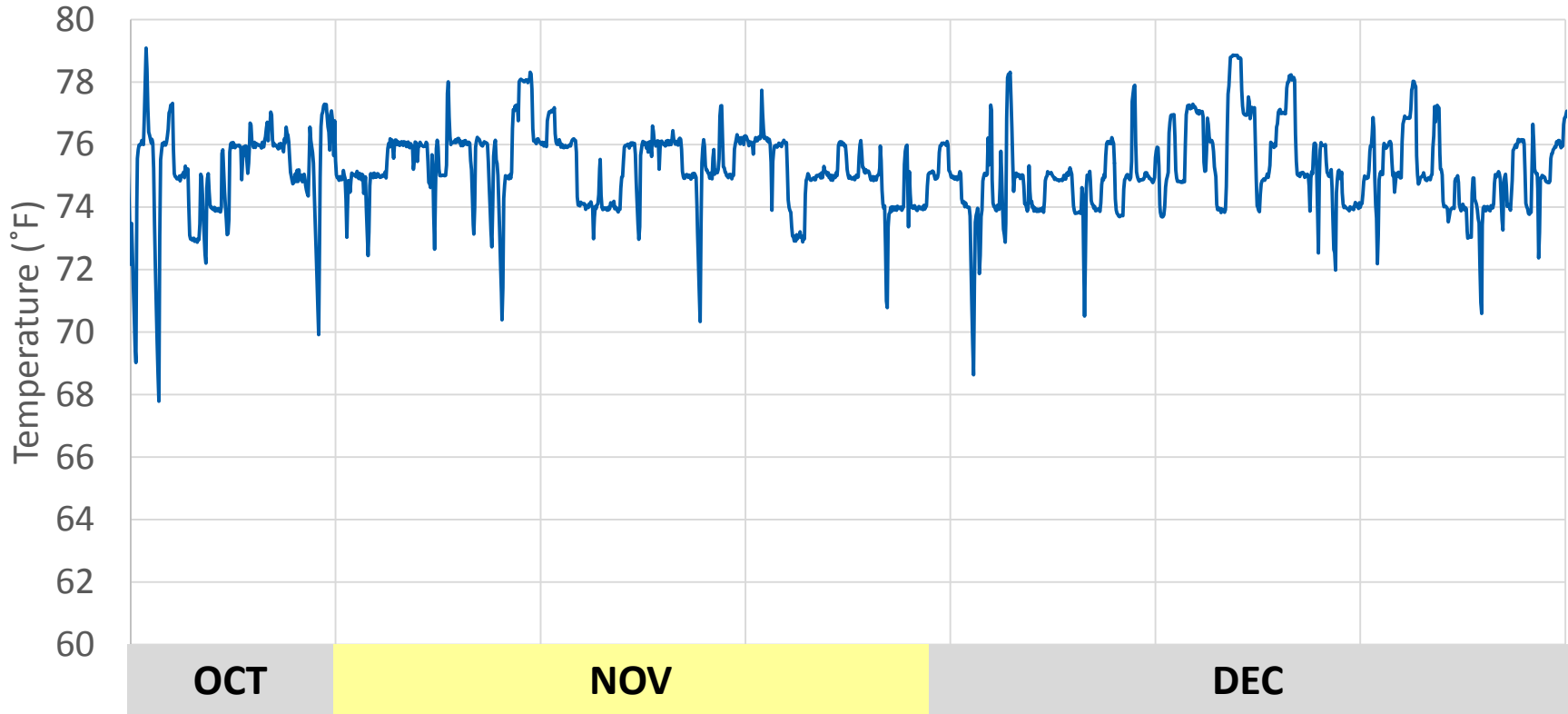


Actual



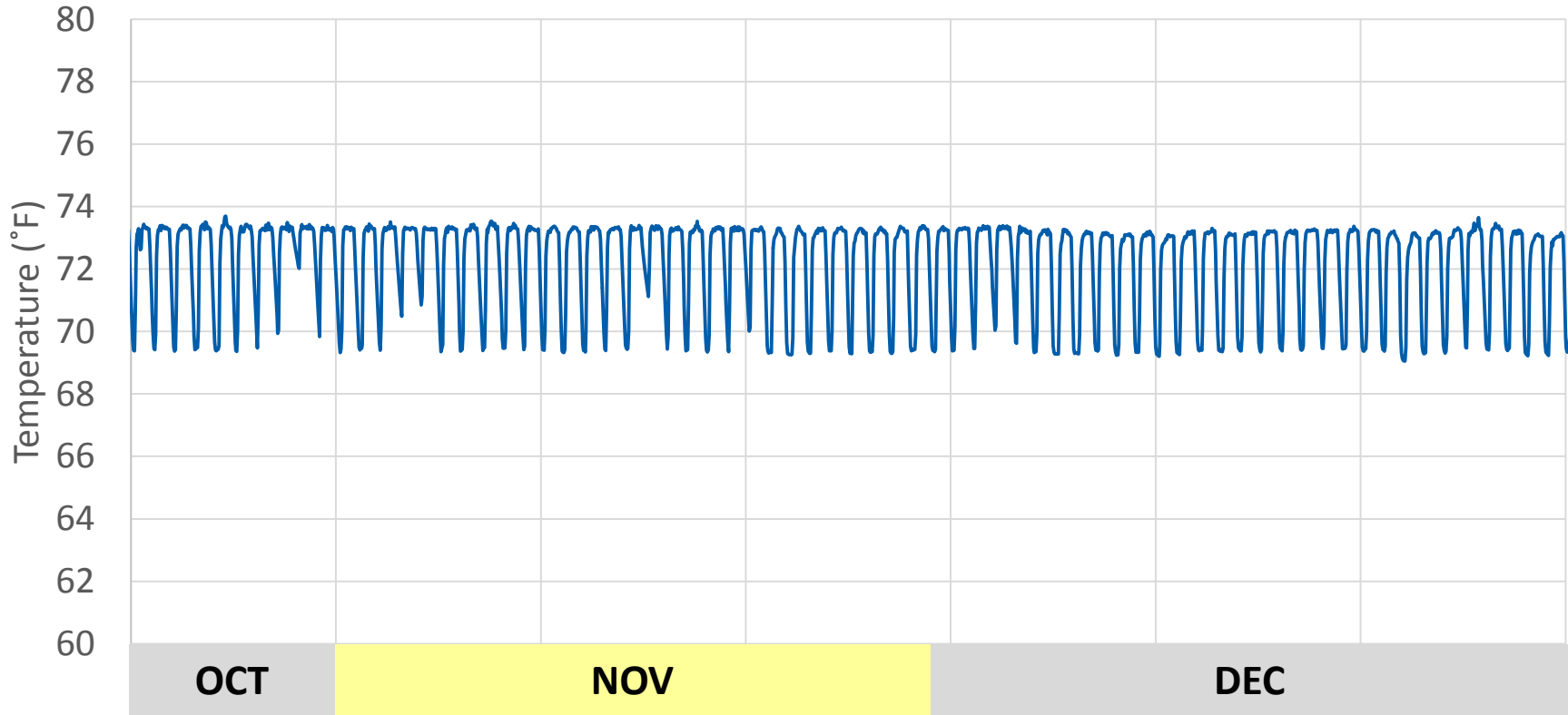


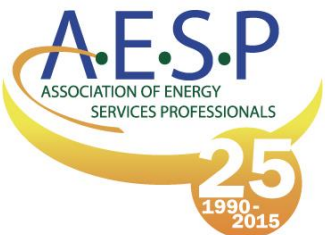
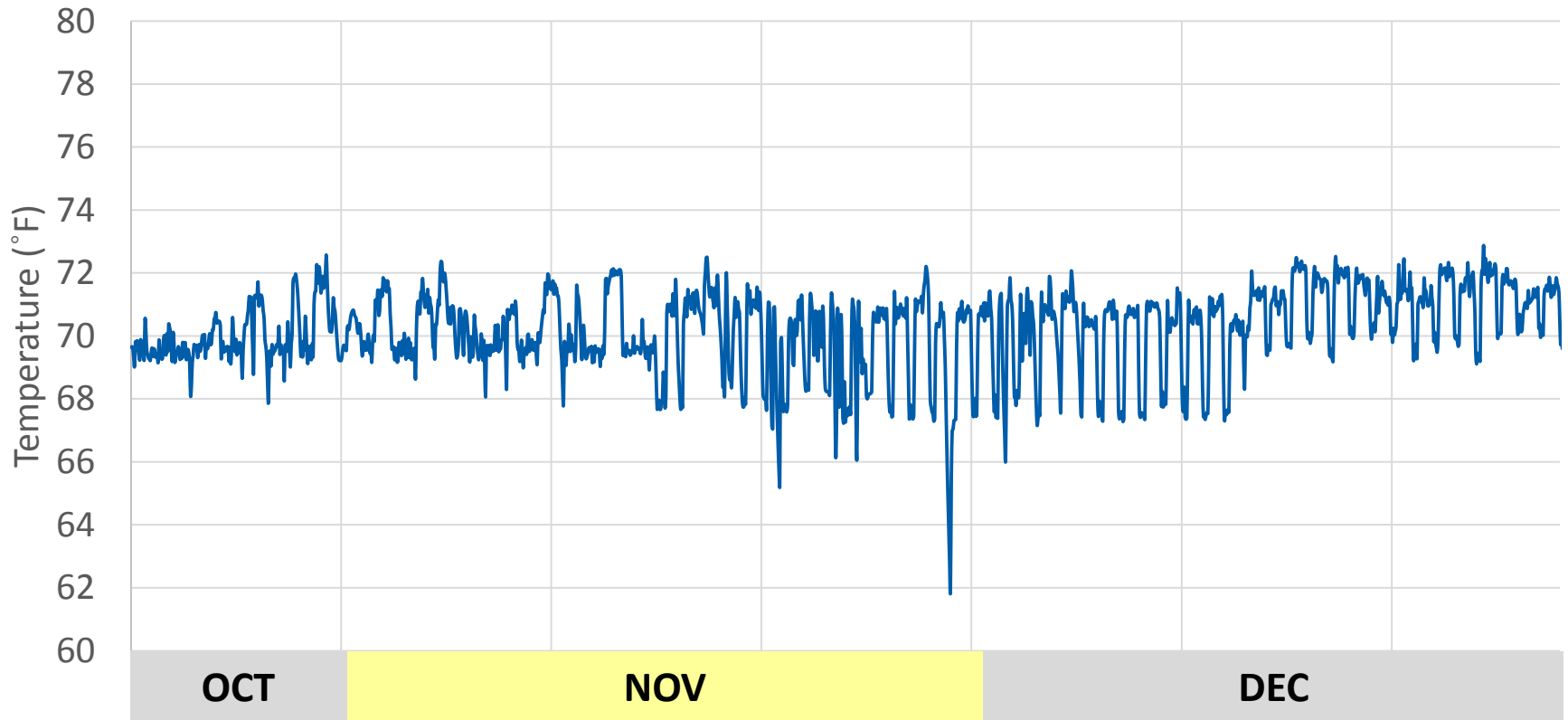
Actual

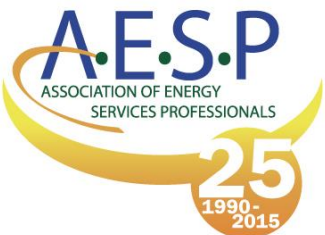
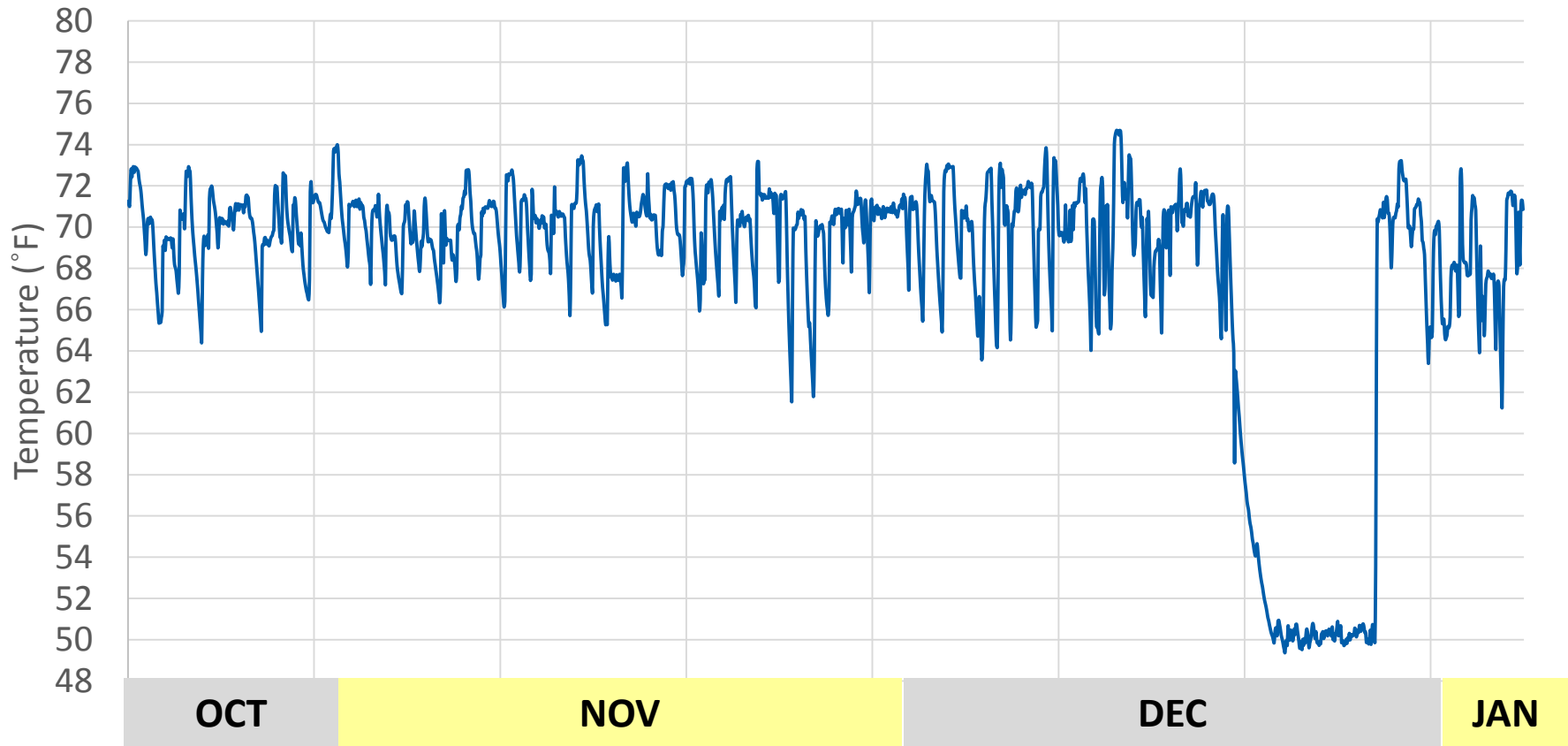




Actual







Taking Analysis Further



Taking Analysis Further

- **What are impacts on utility peak demand?**

Taking Analysis Further

- What are impacts on utility peak demand?
- **What are impacts if paired with DR program?**

Taking Analysis Further

- What are impacts on utility peak demand?
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- **Do savings persist over time?**

Taking Analysis Further

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Taking Analysis Further

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Taking Analysis Further

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- Do savings persist over time?
- How do other smart thermostats compare?
- What are impacts in different climate regions?
- **What are impacts on different HVAC equipment?**

Taking Analysis Further

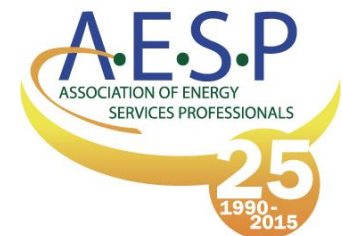
- What are impacts on utility peak demand?
- What are impacts if paired with DR program?
- Do savings persist over time?
- How do other smart thermostats compare?
- What are impacts in different climate regions?
- What are impacts on different HVAC equipment?
- **What areas would YOU examine?**

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carlyn.aarish@cadmusgroup.com

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AESP's Spring Conference
Portland, OR

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Niagara Falls, ON

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Phoenix, AZ

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