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California Energy Commission
Docket Unit, MS-4
715 P Street
Sacramento, CA
Via docket submission

Re: Docket No. 24-FDAS-03 – Request for Information (RFI) for Low-voltage Thermostat Flex Demand

Dear Vice Chair Gunda and Energy Commission Staff,

Generac Power Systems (Generac) submits this response to questions posed by CEC Staff in the RFI for Low-voltage Thermostat Flex Demand and hopes that Staff will find this information insightful and informative.

I. Introduction

Generac is a leading resiliency provider with over 65 years of experience manufacturing and deploying solutions for residential and commercial needs alike. With our full product offerings, Generac is leading in creating a cleaner, more resilient grid that is nimble in responding to real-time conditions and resilient in all circumstances. Generac provides batteries, smart thermostats, and software applications that can augment the existing asset base to work better together. Specific to this RFI, Generac is the manufacturer of ecobee smart thermostats.

The CEC is developing flexible demand standards for appliances to meet the requirements of Senate Bill 49 (Skinner, 2019), which authorized the CEC to pursue standards that enable appliances to schedule, shift, or curtail their operations with consumer consent. The expansion of flexible demand resources in California supports the alignment of electric demand with clean energy production to reduce greenhouse gas (GHG) emissions and enhance grid reliability. The CEC has established a goal for realizing at least 7000 MW of flexible load by 2030, with at least 3000 MW expected to be enabled by Load-Modifying or similar load flexibility standards.

II. Responses to Questions

1. Staff is considering the appliances in Table 1 as a baseline for the low-voltage thermostat rulemaking scope. Are there additional examples that might be considered in-scope or out-of-scope?
    a. N/A

2. Staff is considering the low-voltage thermostat market share from 2019 California Residential Appliance Saturation Study (RASS) in Table 2 as a baseline for the low-voltage thermostat scope. Are there additional data sources that might be considered?

a. Staff could consider the Statista survey on smart home device ownership at https://www.statista.com/statistics/1124290/smart-home-device-ownership-us/

3. Staff is considering using hourly HVAC energy use estimates from the Hourly Electric Load Model (HELM). What other HVAC load-shape data sources are currently available?
    a. Staff could consider the eco+ evaluation results at https://www.ecobee.com/en-us/ecoplusemv/
    b. Staff could consider using end-use load profiles from the National Renewable Energy Laboratory's (NREL's) ResStock model available at https://www.nrel.gov/buildings/end-use-load-profiles.html as a source.

4. Staff assumes a 10-year lifetime for a low-voltage thermostat. Are there alternative assumptions for product lifetime that staff should consider? Please reference the sources of those alternative assumptions.
    a. No other suggestion

5. Staff has identified a range of typical flexible demand functions associated with low-voltage thermostats. Staff may consider using Joint Appendix JA5 Technical Specifications For Occupant Controlled Smart Thermostats as a baseline standard for functions in low-voltage thermostats. Provide a current market share and likely incremental cost of including the following capabilities:
    a. In general, section JA5.2.6(b) of the Joint Appendix JA5 is too prescriptive with respect to default setpoints. In comments previously filed with the CEC,[1] ecobee provided that smart thermostat vendors have unique access to data points regarding a home's thermodynamic properties. They can design algorithms that account for how long an individual home takes to heat up or cool down (how leaky it is), in order to personalize optimizations in a way that maximizes comfort and grid impacts. They also have historical and real-time occupancy data as well as comfort/savings preferences for each home to additionally maximize grid impacts without impacting comfort. With this in mind, we recommend guidance on default setpoints from CEC be directional and not prescriptive.

    Responses on Specific capabilities:
    b. Bi-directional communications.
        i. 21% for all thermostats (i.e. smart thermostats per the 2019 RASS).
        ii. All ecobee thermostats have bi-directional communication capability.
    c. Hourly scheduling capability.
        i. 78% for all thermostats (i.e. smart and programmable thermostats per the 2019 RASS).
        ii. All ecobee thermostats are capable of hourly scheduling.
    d. Device software optimization for GHG.

[1] https://efiling.energy.ca.gov/GetDocument.aspx?tn=240206&DocumentContentId=73664

i. 21% for all thermostats (i.e. smart thermostats per the 2019 RASS).
ii. ~94% of all ecobee thermostats can optimize against static GHG schedules through ecobee's eco+ TOU feature and/or respond to agreed upon GHG dispatch signals that are initiated by an integrated entity through ecobee's eco+ demand response feature. However, if the function being asked for is a dynamic optimization against a real-time feed of GHG inputs—that is a complex software product that'd require incremental investment costs on the order of several million dollars and several years of development.

e. Device software optimization for hourly electricity pricing rates.
   i. 21% for all thermostats (i.e. smart thermostats per the 2019 RASS).
   ii. ~94% of all ecobee thermostats can optimize against static electricity pricing rate schedules through ecobee's eco+ TOU feature and/or respond to agreed upon price-based dispatch signals that are initiated by an integrated entity through ecobee's eco+ demand response feature. However, if the function being asked for is a dynamic optimization against a real-time feed of pricing inputs—that is a complex software product that'd require incremental investment costs on the order of several million dollars and several years of development.

f. Cybersecurity.
   i. Uncertain for all thermostats, though likely limited to smart thermostats (i.e. 21% per the 2019 RASS).
   ii. All ecobee thermostats adhere to cybersecurity requirements.

6. Staff estimates the total incremental cost to consumers (the difference in purchase price between a flexible-demand low-voltage thermostat and a nonflexible-demand low-voltage thermostat) to be $25. Staff is seeking input on whether this estimate is reasonable.
   a. This estimate is low. Looking at average price differences between smart and programmable thermostats (~$50-150) would be a better indicator.

7. Staff may consider using Title 20, California Code of Regulations, Section 1692(c) General Requirements as a baseline standard for cybersecurity in low-voltage thermostats. Are there any additional cybersecurity requirements to be considered?
   a. We have previously commented on cybersecurity requirements in FDAS RFIs.[2] In general, ecobee supports the National Institute of Standards and Technology Cybersecurity Framework Version 1.1. Further, manufacturers who sell products in California must already comply with California SB-327 Ch. 886 Information privacy: connected devices.

8. Provide information on any demand response programs currently used in California or other locations for HVAC loads that use the thermostat for load control, including the following.

[2] https://efiling.energy.ca.gov/GetDocument.aspx?tn=240206&DocumentContentId=73664

a. How many low-voltage thermostats are used in these demand response programs?
    i. Hundreds of thousands of ecobee smart thermostats participate in demand response programs across North America today.
b. How much energy load in kW is each low-voltage thermostat shifting?
    i. The kW energy load shift per thermostat can vary depending on which flexible demand capability is being leveraged. For demand response, a typical kW energy load shift per thermostat can be anywhere between 0.5 - 1.2 kW/thermostat[3].
c. What is the time shift duration?
    i. For demand response, a typical time shift duration can be anywhere between 2 – 4 hours.
d. What are the participation rates with an opt-in and opt-out framework?
    i. Opt-in frameworks typically result in very a low footprint (~3-20%) of devices.
    ii. Opt-out frameworks reach a much larger footprint of devices (> 55%).

9. Is there anything like a common communications protocol or platform with significant market share, and/or which could facilitate aggregation of HVAC
    a. Orchestration of HVAC aggregation is typically facilitated by a Distributed Energy Management System (DERMS). As we've noted in previous comments[4] there are different models that would suffice, such as receiving signals through a vendor's cloud via OpenADR or standard PUSH API, as long as the vendor maintains the control of its product to allow for an effective, customer-oriented interface. If a future iteration of the standard includes any language regarding OpenADR for thermostats, we recommend clarifying that OpenADR-based communication should take place as a "cloud-to-cloud" integration between a DRMS/DERMS provider as the "Virtual Top Node" and a DER manufacturer as the "Virtual End Node."

10. Please discuss strategies for low-voltage thermostats to best utilize the CEC's Market Informed Demand Automation Server (MIDAS), which provides access to utilities' time-varying rates, GHG emission signals, and California Independent System Operator (California ISO) Flex Alerts.
    a. Smart thermostat vendors could connect to the MIDAS database via API and innovate flexible demand solutions/offerings (especially with respect to customer interfaces) using the indicators accessible through MIDAS (*i.e.* the utility time varying rates, GHG emission signals, and CAISO Flex Alerts). However, doing so would not only precipitate integration costs, but could also precipitate significant investment costs and time depending on the flexible demand solution/offering. See responses in section 5 for more detail.

[3] For climate specific load reduction, see Figures 5 & 8 in ecobee's eco+ evaluation results: https://competitiveenergy.org/consumer-tools/state-by-state-links/

[4] https://efiling.energy.ca.gov/GetDocument.aspx?tn=240206&DocumentContentId=73664

11. What percentage of low-voltage thermostats sold in California have an ability to respond to data originated from MIDAS to alter the HVAC operating schedule? Describe whether low-voltage thermostats can respond to MIDAS's price, GHG, or flex Alert.
    a. 21% for all thermostats (i.e. smart thermostats per the 2019 RASS).
    b. ~94% of all ecobee thermostats could respond to any signal (price, GHG, Flex Alert) originating from MIDAS to alter HVAC operating schedule were an integration with MIDAS to exist and the signals to be event based. However, integration requires significant investment costs and depending on the type of response to data, incremental investment costs on the order of several million dollars and several years of development could be required.

III. Conclusion

Generac appreciates the CEC Staff seeking industry input on the topics contained in the RFI for Low-voltage Thermostat Flex Demand. We hope that Staff will find this information insightful and informative. Please do not hesitate to contact me at Meredith.Roberts@generac.com with any questions about our recommendations.

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Via electronic submission.