Abigail Daken
Douglas Frazee
Alan Meier

Abigail, Doug and Alan:

Thanks for allow EcoFactor to participate in the webinar last week. Per your request for comments, we would like to submit the following thoughts regarding the proposed specification.

EcoFactor wholeheartedly supports the proposed Energy Star Climate Controller specification. In particular, we believe the communications requirements will lead to a sea change in the ways in which people interact with their systems, and will usher in powerful new ways of managing residential energy use. Indeed, we believe that the specification is likely to yield dramatic reductions in energy use not only by HVAC systems, which account for roughly half the energy consumed in the average U.S. home, but will also drive dramatic advances in the management of other loads. We think non-HVAC reductions will occur because, once the Web-enabled energy management of thermostats achieves critical mass, extending energy management to other energy uses in the home will become cost-effective.

You asked a series of questions in your presentation. On behalf of EcoFactor, I would like to offer comments on two of them.

Q 2: EPA requests comment on requirements for 3rd party access and use of open standards for communications. Are there alternate paths to achieve these goals?

EcoFactor believes that enabling 3rd party access and embracing open standards are both essential if the specification is to achieve its core goal of driving real energy savings. Consumers should always retain the ability to grant or withhold permission for 3rd parties to connect to devices such as climate controllers, but the devices should offer that capability.

We support the protocol-agnostic approach to communication taken by the specification.

Q 3: EPA welcomes input on data frequency, data transmission and remote control response. Are requirements reasonable? What system level throughput is being achieved in utility implementations?

We understand that some stakeholders have concerns about the quantity of data the specification requires that thermostats be capable of communicating. While we appreciate these concerns, we believe the following points mitigate them:

1) The cost to create a "field-upgradeable" device will be the same regardless of the frequency with which the device is capable of sending and receiving

signals. We therefore see no meaningful way in which this requirement affects the cost of base-configuration hardware.

2) The cost of the hardware required to build a communicating thermostat capable of exchanging messages with a network once per minute should be no different than the cost of hardware that can only communicate once every five minutes. Modern communications protocols and chips are optimized for communications orders of magnitude more frequent than the specification now requires. Thus there should be no implications for the cost of the hardware itself.
3) The fact that the specification requires that thermostats be *capable* of exchanging messages once per minute does not mean that they must always actually *do* so, or that the network to which they are attached must support that level of communication. Gigabit Ethernet routers can communicate at dial-up speeds; the reverse is not true.
4) Thermostats built to these standards will likely still be hanging on walls in American houses ten or even 20 years from now. Restricting the communications capabilities of these devices because one or more existing communications networks might not be capable of handling the network traffic they would create would be like specifying that …

We believe that the frequency of communication specified in the draft already represents a fair compromise between functionality and cost, and that further reducing the minimum capabilities of thermostats will significantly reduce the value these devices will be capable of delivering to consumers without any corresponding benefit to manufacturers. Temperature readings from a residential thermostat at the frequency of at least once per minute allow web-based services to work with the HVAC system on what is for most purposes a real-time basis; that translates into the ability to deliver a variety of energy-saving strategies. A sampling frequency of once every five minutes, for example, severely reduces the ability of any such service to accomplish these goals. We believe such a "compromise" will defeat the primary purpose of communicating with the thermostat in the first place.

We also wish to point out that utilities are building backhaul infrastructure intended to deliver a relatively narrow range of services related to energy information. Utilities are of course free to choose to operate such a system using a low-bandwidth infrastructure. We believe that consumers are likely to ask more of communicating thermostats and that this additional functionality is critical to both driving consumer acceptance and maximizing energy reduction. If utilities continue to deploy low-bandwidth architectures, more bandwidth-intensive applications will need to use a different means of communicating. We see no reason that the bandwidth and data rates of utility-focused systems should function as a ceiling on the quality of service that consumers can enjoy.

We believe that the same logic compels retention of the full complement of data points that the specification lists as minimum capacities in the draft specification. As the specification states, including the full complement will both "facilitate

interoperability between various EMS devices and increase rates of adoption." A significant benefit of the draft specification is the many yet-unimagined future applications they will enable, but we do not need to rely on speculation to see their value. We know right now that each of the specific data points included in the draft specification has unambiguous value to the applications that EcoFactor has built, and that dropping even one of these data points, or lowering the resolution with which they are specified, creates real risk of yielding a "half a baby" result – one that doesn't satisfy critics of the communication requirement, but that makes it impossible to deliver the value proposition that justifies the expense of communicating with the device in the first place.

Finally, we would like to suggest two possible clarifications to the specification:

1. **Definition of "product"** – At lines 399-406, the specification states that "the product" must provide default and user-definable programmability. We note that the word "product" is undefined in the specification. We also wish to point out that a significant part of the cost of building a thermostat goes to the buttons, dials and display needed in order to allow a consumer to stand in the hallway and create or modify the programming schedule. But with a communicating thermostat, there are alternative user interfaces available that (a) offer much easier and richer user experiences, and (b) do not add to the cost of the thermostat. These interfaces include separate energy information displays, web browsers, smart phones, tablets, etc. While these are not quite ubiquitous yet, and thus appropriately not part of a mandatory pairing, we believe that these interfaces will quickly overtake the devices themselves as the preferred mode of interaction. And where there is already a richer UI available elsewhere, omitting the dials, buttons and display components from the thermostat itself can significantly reduce the cost of entry. Indeed, we understand that communicating thermostats that rely on external interfaces for programming are already being offered at effective retail prices around $50. The goal of making these capabilities available at the lowest possible cost should be a goal the specification embraces. We therefore think the specification should permit such limited-interface devices, when paired with other rich-UI devices, to deliver these functional requirements.

2. **Usability Testing** – The discussion of usability testing in the specification begins at line 499. We of course agree that usability is important, and that the standards are likely to help. Our comment here relates to the comment above: because communicating thermostats create the opportunity to use the thermostat by entirely bypassing the device's own hardware interface, we feel that usability should be demonstrable via a Web-enabled interface, and that thermostats that do not permit such programming directly at the device should still be eligible for Energy Star certification if they can pass such testing via these other interfaces.

I appreciate the opportunity to offer these comments, and will be happy to discuss them further with you.