



January 27, 2011

Abigail Daken  
 United States Environmental Protection Agency  
 Climate Protection Partnerships Division  
 ENERGY STAR Program  
 Washington, DC

Via Electronic Mail

**RE: COMMENTS OF ENERGYHUB, INC. ON THE ENERGY STAR PROGRAM PERFORMANCE-BASED USABILITY REQUIREMENTS FOR RESIDENTIAL CLIMATE CONTROLS OF 11/30/2010**

Dear Ms. Daken:

EnergyHub, Inc. (EnergyHub) respectfully submits the following comments in response to the United States Environmental Protection Agency's (EPA) request for stakeholder comments on the Energy Star Program Performance-Based Usability Requirements for Residential Climate Controls dated November 30, 2011 (sic) and related documents. EnergyHub is a manufacturer and distributor of Home Energy Management Systems, Programmable Communicating Thermostats, and other HAN peripherals and equipment.

**General Feedback**

Line(s)	Comments
General Feedback	<p>Having been an active participant in the development of the RCC requirements as well as the usability requirements, EnergyHub now recommends that <u>all candidate residential climate controls undergo the performance-based usability test.</u></p> <p>We are here today developing these new standards because residential climate controls have not achieved their energy-savings potential. Formal research and anecdotal evidence point to usability issues as a primary cause for this failure. Since it is a usability problem, any potential solution (including new ENERGY STAR requirements) requires usability testing to verify that each device performs sufficiently well to achieve its energy-savings potential when in the hands of American consumers.</p> <p>If the performance-based usability test remains optional, EnergyHub is concerned that the high cost and other added burdens of the performance-based path will lead more device manufacturers to choose the prescriptive path, meaning that those devices will not have even been qualified at the basic usability level provided for in the performance-based usability requirements.</p> <p><b>The only way to ensure that all approved devices will be sufficiently usable is to subject all devices to the performance-based path.</b> This approach will also level the playing field for usability development and testing costs across manufacturers, and the volume of testing may provide efficiencies that reduce per-device testing costs.</p> <p>Should the EPA decide to proceed with the existing two paths, EnergyHub recommends that a selection of the prescriptive path devices be subjected to the performance-based tests (paid for by the EPA) to ensure that devices that are being approved by the prescriptive path are at the same high level of usability as those whose usability performance has satisfied the performance-based path.</p>



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### Performance-Based Usability Requirements

Line(s)	Comments
Requirement C.5	<p>For consistency with other RCC ENERGY STAR documentation, “Long Term Hold” should be unhyphenated.</p> <p>The HVAC modes listed in b) and the Fan modes listed in c) should be indicated as non-limiting, as they do not include other HVAC modes such as “Emergency Heat” and “Southern Away” and Fan modes such as “Circulate.”</p>
Requirement C.8	<p>EnergyHub continues to oppose the requirement for Electricity Price Tier Indication on the climate control. Please refer to EnergyHub’s previous submissions for a litany of reasons.</p> <p>In addition:</p> <p>According to EIA data from 2005, 64% of U.S. households use natural gas, oil, kerosene, or LPG for heating.<sup>1</sup> During the heating season, the residential climate controls in those homes have a minimal effect on the <i>electricity</i> bill and consumption for those households. Thus, having an “Off Peak” indicator on the thermostat may cause those households to mistakenly believe it is an inexpensive period for heating their houses.</p> <p>Should the EPA choose to insist on tier price indicators appearing on the thermostat, the EPA should require or suggest which indicator(s) (if any) should be displayed for the vast majority of Americans who are not billed according to time-of-use electricity rates.</p>

### Test Method - Usability

Line(s)	Comments
General Feedback	<p>During the stakeholders’ meeting in December, the only estimated price offered for a testing panel such as this was \$20,000-40,000. That amount is excessive, especially when compared to other certifications for devices in the space, such as ZigBee Smart Energy Profile certification, which typically costs less than \$5,000.</p> <p>The EPA should alter the test design and work with test labs to make the test more affordable, or else more and more manufacturers will choose the prescriptive path (see comments above).</p>
23-38	<p>EnergyHub recommends that the demographics of the test panel be adjusted to match the demographics of people living in homes where the heating and/or cooling is actually controlled by a thermostat or thermostat-like device. This would exclude individuals who don’t manage their own heating and cooling (e.g., their landlord controls it) or have window/wall air conditioners and/or electric space heaters.</p>

<sup>1</sup> Energy Information Administration. 2005 Residential Energy Consumption Survey: Energy Consumption and Expenditures Tables. Table SH6. “Total Households by Main Space Heating Fuel Used, 2005.”  
<http://www.eia.doe.gov/emeu/recs/recs2005/c&e/spaceheating/pdf/alltables1-13.pdf>



39-55	<p>If cost were not a factor, EnergyHub would recommend that the test described be used. However, if a reference device would lead to an equally accurate and cheaper test, EnergyHub strongly opposes an <u>industry-designed</u> virtual reference device for the following reasons:</p> <ul style="list-style-type: none"> <li>• Participating manufacturers will have a bias and incentive to make the virtual reference device similar to the devices manufactured by their companies</li> <li>• Unlike technical standards, interaction design and visual design tend not to function effectively by committee</li> </ul>
60-62	<p>While it is important that ENERGY STAR products serve the vast majority of Americans, including individuals who speak English “less than very well” in the panel would represent a bias against manufacturers pursuing the performance-based path, as the prescriptive path has no requirements to support the needs of individuals who speak English “less than very well.”</p>
72	<p>EPA should specify as well “No conflicts of interest with the third party performing the test.</p>
75	<p>EnergyHub recommends the following additional criteria by included in the panel qualification:</p> <ul style="list-style-type: none"> <li>• Vision</li> <li>• Hearing</li> <li>• Manual dexterity</li> <li>• Literacy</li> <li>• Speech</li> </ul> <p>Given the nature of the test, it is critical that the panelists be able to see, hear, and manipulate objects at a normal ability level. Since the manual will be available for review and since the test requires reading values from the UUT aloud, panelists’ literacy and speech should also be at a normal ability level.</p>
105-106	<p>Having an administrator with a stopwatch may put more pressure on the participants than they would face in their own homes, leading to unnecessary errors. EnergyHub recommends that one administrator should play the role of facilitator by reading directions, setting up the UUT, etc., and a second individual should record notes and keep time.</p>
110 131-133	<p>EnergyHub requests that the EPA clarify the UUT configuration section to indicate that RCC units that are sold/shipped separately but cannot function apart from some other product or system, such as a thermostat designed to work with a particular residential energy management system, should be tested in conjunction with that product or system. In addition, the full set of manuals from the product or system should be available for the panelist to reference in such cases.</p> <p>Devices that are not intended to function in the absence of other products or systems will not function if tested outside those products or systems and thus should not be tested without them.</p> <p>In addition, EnergyHub recommends that the EPA explore the option of using multiple user interfaces (website, mobile phone application, etc.) for interacting with the UUT during the test</p>



	when the manufacturer provides multiple user interfaces. The manufacturer could be allowed to specify what user interface(s) may be used for each task, and the panelist would be free to choose the user interface(s) of his/her choice while performing the task.
112-114	Since this is a timed test, EPA should specify a particular wrong date/time, such as January 1, 2010 at 6:00AM or 1 year, 6 months, and 5 days before today, to ensure a somewhat consistent result. The results will still vary based on test date and time though, so the EPA should consider having the panelist set the UUT to a particular fixed date/time (as opposed to the current date and time) as well.
120-124	Manufacturers of multi-piece thermostats, such as where one device switches the relays on the HVAC system and a second device serves as the user interface, should be able to specify the location of the various pieces during the test, such as putting the user interface device on a table if it is designed to be a tabletop device.
131-136	EnergyHub supports the user documentation-related instructions as written. Previous usability research has indicated that approximately 25% of individuals choose to consult the manual in situations such as that of this test.
172	Does it matter which Morning/Day/Evening/Night periods are set for the Saturday schedule, or is any schedule that contains only those two times/setpoints sufficient to pass?
173-176	Given that most systems that read the rate tier get it from either an electricity meter or the Internet, additional equipment, such as a Wi-Fi Internet connection and a ZigBee meter simulator, may be required in the testing environment.
182	The EPA should do some preliminary testing with highly usable RCCs to come up with benchmark times for the various tasks, as the initial list was developed without any user testing, and it appeared to be too aggressive based on the stakeholder meeting test results for individuals who are presumably <u>RCC experts</u> .

### Usability Test Script

Line(s)	Comments
79-80	Change first sentence to read "When I say Begin, please read aloud the current room temperature and the set temperature, also called the active setpoint or target temperature."  It is important to include the label "target temperature," as that term is used by a number of devices currently available on the market to refer to the active setpoint.
84	Administrator should inform the panelist that the UUT has been placed in Cooling mode, as the unannounced change from Heating in Task 3 to Cooling in Task 4 may confuse some users.
99	Administrator should inform the panelist that the UUT has been placed in Heating mode, as the unannounced change from Cooling in Task 4 to Heating in Task 5 may confuse some users.
100-102	The Draft2 RCC Program Requirements do not outline a default weekend schedule. The only schedule that is listed is a four-period schedule. EnergyHub recommends a default two-period schedule for weekends as part of the overall RCC requirements, as that will best match most users' needs. However, the user should be able to use the at least four periods on the



	<p>weekends as well.</p> <p>Either way, the EPA should advise as to what the administrator should set for Task 5.</p>
116-117	<p>If the EPA insists that rate/price info be part of the RCC requirements and part of the task (see comments above and in previous EnergyHub submissions), EnergyHub recommends that the administrator give a brief introduction to the concept of rates and price tiers, as panelists who do not have time-of-use rates (like the vast majority of Americans) or don't pay close attention to their utility bills may have no idea what these directions mean.</p>

### Version 1.0 DRAFT 2 Eligibility Criteria

Line(s)	Comments
543-551	<p>The EPA should remove the requirement that "Recovery, Adaptive" be the default algorithm.</p> <p>Seeing the impressive presentation from ADT at the December stakeholder meeting and learning that devices like it do not support "Recovery, Adaptive" imply that "Recovery, Adaptive" should not be mandated as the default algorithm.</p> <p>Advanced multi-platform HVAC control tools such as ADT's represent an excellent opportunity to get consumers to pay more attention to their HVAC systems and their corresponding energy use. Because the thermostat is just a slave device in such systems, it relies on a controller to send the setpoint data at the appropriate time. As such, it may be impossible to implement "Recovery, Adaptive" for those systems, which should not disqualify those systems from achieving the ENERGY STAR qualification.</p> <p>Additionally, whereas "Recovery, Heat Pump with Auxiliary Heat" definitely uses less energy than the alternative, "Recovery, Adaptive" may actually use more energy than its alternative ("Recovery, Conventional"), because the HVAC system may turn on earlier in order to pre-heat or pre-cool the conditioned space.</p> <p>As such the EPA should remove the requirement for "Recovery, Adaptive" for both non-heat pump and heat pump installations.</p> <p>NOTE: "Recovery, Heat Pump with Auxiliary Heat" should still be mandated for heat pump installations.</p>



Respectfully submitted,

A handwritten signature in blue ink that reads "Andrew Martin". The signature is written in a cursive style with a long horizontal flourish at the end.

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