

## Comments by Trane/Ingersoll-Rand on the US-EPA

### ENERGY STAR® Program Requirements for Residential Climate Controls

Line	Comment
54	It is paradoxical that EPA appears to expect that manufacturers will provide user manuals, but EPA has indicated that use of such manuals will not be permitted during usability testing.
70	It is assumed that qualification is a one-time event for any given climate control model. Is this correct? If not, what is the intended re-qualification frequency?
96-141	This whole section is rather vague and nebulous. For example, how many of these measures are required to qualify for "Special Distinction"? How does one assess whether one has adequately "considered" the measures in lines 104-105?
154	<p>A conventional air conditioner cannot "regulate" humidity in the strict sense of the word regulate. The humidity in the controlled space is dependent on many factors that are not under the control of the climate controls or the HVAC system.</p> <p>To be able to regulate humidity of the conditioned space, the HVAC system would have to be able to add or remove humidity regardless of the sensible heating or cooling load. In cooling, a reheat system is used for this purpose, but it requires additional energy.</p> <p>Furthermore, the document is not clear on whether humidity measurement is even required. What is not measured cannot be controlled.</p> <p>Having said all this, a properly designed and installed conventional air conditioner will tend to control the humidity in the conditioned space within reasonable bounds.</p>
156 & 486	<p>Provision should be made to accept an energy price signal and respond with a user-discretionary decision whether to change the set point set-point or suspend/restore operation.</p> <p>Likewise, consideration needs to be given to accommodating load shedding and restoration [or load reduction/increase with modulated systems] in response to signals from the utility.</p>
160	Throughout, there is a need to clarify the communication end-points or nodes to which the communication under discussion refers. For example, there are those who have advocated the use of RF to communicate between a thermostat [climate control] and the controlled equipment [furnace and/or air conditioner]. While such links are clearly not intended here, that degree of clarity does not exist throughout.
162	For clarity, insert the word "may" between "sources" and "include".
171-173	Line voltage thermostats are most unlikely to be applied to directly operate an air conditioner.
176	It is not clear here what is the sense of the word "applied".
179-183	The subjects being defined are processes. Algorithms are not processes.
179	The phrase "Adaptive Recovery" is associated with one particular manufacturer. Therefore, its use here is prejudicial to other manufacturers. "Anticipating" or "comfort" might be better modifiers; or even "Comfort Restoration" without the word recovery at all.
227	"[F]ully customizable" is totally ambiguous. Presumably the required degree of customizability is defined in tables 2 and 3 and the associated text. If further customizability is required, EPA must define the requirements explicitly.
241	<p>Thermostats do not directly control room temperature. In response to room temperature [and its variations] they control the HVAC equipment. The room temperature differential depends on many factors, only one of which is the deadband of the thermostat.</p> <p>Section 4.5.2, of NEMA DC 3-2008 does not provide performance specifications. Nor does it involve test of the performance in a <b>room</b>. The thermostat is tested in a chamber of approximately 55 cubic feet [the volume of a cube of 3.8 feet on a side].</p>

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251-252	This says in line 251 that “EPA will not require the climate control to display relative humidity.” Yet line 154 seems to require that it be regulated and lines 351 and 358 that It be reported and subject to remote control. This is inconsistent.
266-270	<p>The climate control should be self-contained and provide all the necessary control, display and reporting functions. The control function should be capable of autonomous operation in response to settings and be locally or remotely settable or programmable. The capability to be remotely programmed, as in supervisory control, does not override the need to be locally programmable, and the remote instructions shall be capable of being overridden locally.</p> <p>Remote interfaces [RIs] should be optional accessories. Portable RIs are susceptible to being misplaced, lost, stolen and broken. They should not be required for the basic function set.</p> <p>Several other concerns could be raised about permitting RIs in place of, instead of in addition to, local display and control. One of the obvious imbalances is that the whole matter of power management is severely distorted among various configurations.</p>
272-275	There is a significant imbalance here between fully integrated climate controls and those with remote interfaces. To illustrate the imbalance with an extreme example, if an RI is excluded from the power consumption specification, the RI might be a desk-top computer drawing at least an order of magnitude more power than these numbers.
276-277	There should be no need for battery-powered products to be exempt. If they were to draw this much power, the batteries would have to be replaced far too frequently.
278	<p>The distinction between these two products is not clear. What is meant by “connected”? Connected to what, the HVAC?</p> <p>Here and elsewhere, use the word “time” or “times” where “x” is being used.</p>
291-293	<p>To accommodate individual metabolic and health differences, the user should have full control over all set points.</p> <p>Absolute limits should be considered to offer protection of the contents of the conditioned space. In no case should the heating setpoint be below 55°F nor should the cooling setpoint be above 85°F. In very humid climates even these limits are too far apart for humidity control in temperate weather [such as Spring in Miami or most of the year in Seattle].</p> <p>The mandatory temperature limits prescribed here are so extreme, that many [most?] users will override them.</p> <p>The extreme heating night limit and day cooling limit can lead to significant humidity problems in weather that is mild, but not so mild as to obviate the need for some cooling or heating.</p>
295	<p>The API should include only the minimum set of code required to access and control the minimum set of prescribed measures of performance. Manufacturers may choose to incorporate additional features employing proprietary code for which there is no legitimate need by others.</p> <p>There is a vast difference between using a widely accepted, standardized communication protocol on the one hand and, on the other, providing competitors with the full code that tells how the information exchanged via the communication protocol is employed in or by the climate control and the hardware controlled thereby. Control algorithms themselves, for example, may be proprietary, and the use of those algorithms usually is proprietary.</p>
336-364	These lists of data reporting and remote management functions need to be carefully reviewed with the goal of deleting those that are not central to the HVAC performance for the benefit of the customer.

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	<p>A distinction needs to be drawn between those reporting and command response functions that involve interface with the owner, the utility, the government, and some 4<sup>th</sup> party researcher. Those that involve interface with the owner should be specified. Those for the benefit of the utility [e.g., any form of remote management of the HVAC by the utility] should be subject to prior written consent by the rate payer. Those for the benefit of any other party should be deleted.</p> <p>Feedback of whether the HVAC system did what it was instructed to do can be misleading. For example, a short-cycle timer should override all commands; and a minimum run time timer would also do so. The result would be that the system would not assume the commanded state until after the time-out of the associated timer was complete.</p> <p>See also the comment on line 423.</p>
337	Remote monitoring of settings by anyone other than the owner/occupant is unreasonably intrusive.
341	Resolution of +/- 1.0°F [0.5°C] is more common and certainly all that is really useful to the occupant.
343-344	The commanded state is readily determined. Determination of the actual state would require additional sensors for that purpose alone.
345-345	Same as 343-344
349-350	This is redundant, except for the schedule which serves no useful non-intrusive purpose.
351	This appears to be mandatory in apparent conflict with line 252.
352-364	It is important to identify the purpose for these commands. Are they for user control or for remote control by a utility or third party? In the latter case, the list is unnecessarily long and does not include the communication needed to enable the user to respond in a cost avoidance manner. That is, there is no indication of a price signal or impending price change, nor of a request to shed load.
358	<p>See comment on line 351.</p> <p>As noted earlier, the overwhelming majority of residential HVAC systems do not have a separate explicit control function for humidity.</p>
373	The instructions can only be expected to cover the “supported HVAC systems” that have been designed to be compatible with the interface of NEMA DC 3-2008, Table 5-1.
386-388	The classification of “hazardous” requires elaboration. Wikipedia reports that California treats all batteries as hazardous. <a href="http://en.wikipedia.org/wiki/Alkaline_battery">http://en.wikipedia.org/wiki/Alkaline_battery</a> . On the other hand Energizer <a href="http://data.energizer.com/PDFs/CZn%20Alkaline_disp.pdf">http://data.energizer.com/PDFs/CZn%20Alkaline_disp.pdf</a> indicates that alkaline batteries are not [with caveats].
387-388	The basis for the waiver for rechargeable batteries is not evident.
389-391	The basis for the waiver for rechargeable batteries is not evident.
403/405	The use of “RI” raises the point that there should be a list of acronyms in the document.
416	In path three, there should be a clear indication that one can use the upper path <b>OR</b> the lower path.
423	Since the communication link is initially optional, all requirements that depend on such a link must also be optional.
423	Add text at the beginning to indicate that this function is dependent upon a continuous interconnection to the internet or to a time reference such as WWV.
430	Ease of access is totally subjective.
432-433	<p>This is the first mention of these temperature limits. They should have been mentioned earlier since they are not expected to be introduced under “ease of use criteria”. They are severe enough to discourage use of setback and setup.</p> <p>If the system were to remain in the Energy Saving mode for extended periods in moderately temperate weather, that could inhibit cooling or heating for several days, resulting in indoor environmental conditions favorable to mold growth.</p>
433	Cool “setback” should be cool “setup” here and elsewhere.

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436-438	<p>The wording here has the potential to be misinterpreted since, for example, one month is less than two months and could be read as fully satisfying the “at least”. This can be resolved by using “not later than”.</p> <p>Rechargeable batteries get a waiver here again. What is the minimum charge holding period for these batteries under load?</p>
442	<p>Since these apply only to the “prescriptive path” they seem to be optional prescriptive requirements. However, several of these requirements would seem to be equally applicable to all controls regardless of the ease of use demonstration path chosen.</p>
451-453	<p>This seems to force the user to accept setup or set back during part of every 24 hour period. That, in itself, will discourage the sale of these products or customer satisfaction.</p>
459	<p>It is not clear what is intended here.</p>
460-461	<p>The display should indicate the commanded state, not the actual state [which will almost always be the same as the commanded state]. Determination of actual state would require additional sensors. Since sensors are normally the least reliable part of a system, this would be ill-advised.</p>
478-481	<p>This is not clear. What are primary and secondary characters? The parenthetical expression indicates that numbers are secondary characters [“i.e.” is “that is”]. However, the last line says that temperature [a number] is to be displayed in primary characters.</p>
482-483	<p>This calls for a resolution of the display of 1°F, while line 341 calls for the reported resolution to have a resolution of 0.1°F. It should probably be 0.5°F for both.</p> <p>The issue of “minimum” arises here again. The resolution is to use wording such as “with a resolution of 0.5°F or less”.</p>
515	<p>Alloys are not homogeneous, as pointed out in line 519, and most metals used in products are some form of an alloy.</p>
Appendices A & B	<p>With the uncertainty, subjectivity and complexity of the performance-based test methods, the usability should be based on “path 1” exclusively.</p>
Appendix C	<p>If the climate control has no display other than a separable “remote interface”, then apparently the remote interface can be separated from the main control for power consumption tests removing from the test the principal contributor to power consumption.</p>
1040	<p>Use of IEC 62301 is excessive* for this application and, at the same time, incomplete. This latter point is illustrated by careful examination of the attachment hereto which shows that application of the IEC 62301 is dependent upon a separately referenced product-specific standard; and such a separate standard for climate controls or thermostats is not listed.</p> <div data-bbox="423 1346 529 1451" data-label="Image"> </div> <p><b>Info on IEC 62301 on standby power.pdf</b></p> <p>* Considering that the target level of power consumption is 1 to 2 watts, and the operating power consumption of the controlled equipment is on the order of one kilowatt for heating and several kilowatts for cooling, minor measurement imperfections [say due to power factor] are not of practical consequence, even when considering the duty cycle of the controlled equipment.</p>

