



ENERGY STAR® Program Requirements for Residential Climate Controls

Version 1.0 Partner Commitments DRAFT 2

Commitment

The following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacturing of ENERGY STAR qualified Climate Controls. The ENERGY STAR Partner must adhere to the following program requirements:

- comply with current ENERGY STAR Eligibility Criteria, defining the performance criteria that must be met for use of the ENERGY STAR certification mark on Climate Controls and specifying the testing criteria for Climate Controls. EPA may, at its discretion, conduct tests on products that are referred to as ENERGY STAR qualified. These products may be obtained on the open market, or voluntarily supplied by Partner at EPA's request;
- comply with current ENERGY STAR Identity Guidelines, describing how the ENERGY STAR marks, name, and educational graphic may be used. Partner is responsible for adhering to these guidelines and for ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance;
- participate in consumer education activities which may include, but is not limited to, any of the following tactics:
 - Providing educational content (e.g., consumer brochure, takeaways, etc.) for use in retail stores
 - Using the ENERGY STAR education graphic in product literature (i.e., user manuals, spec sheets, marketing materials, etc.) and on the manufacturer's Internet site
 - Consistently using approved messaging on product packaging/literature, Web site, trade articles, training for retail employees, and other channels
 - Providing educational content to distributors/dealers for use with their customers
 - Providing brochures, signage, etc. to distributors/dealers for their store, as appropriate
 - Providing messaging to the distributors/dealers to use in their advertising and promotions
- qualify at least one ENERGY STAR Climate Control model *within six months of activating the Climate Controls portion of the agreement*. When Partner qualifies the product, it must meet the specification in effect at that time;
- **Note: EPA will consider all partners as provisional until they have qualified a product under this specification. Once a partner has qualified a Climate Control model, their organization will be listed on the ENERGY STAR Web site and will be given access to the ENERGY STAR certification and partner logos.**

Note: As mentioned in the Draft 1 specification, this partner commitments section will be expanded in the Final specification to include the new ENERGY STAR testing requirements and other program changes proposed in the Enhanced Program Plan for ENERGY STAR products. The above language is expected to change as a result of this enhancement effort. EPA is currently working with interested stakeholders to develop these new requirements. Stakeholders can review EPA's latest proposals at www.energystar.gov/mou.

- provide clear and consistent labeling of ENERGY STAR qualified Climate Controls. The ENERGY STAR mark must be clearly displayed on the front of the product, in product literature (i.e., user manuals, spec sheets, etc.), on product packaging, and on the manufacturer's Internet site where information about ENERGY STAR qualified models is displayed;

Note: Effective March 30, 2010, products may no longer be labeled by manufacturers (including product packaging, product literature, Web sites, etc.) until qualifying product information, including a lab report, is submitted to and approved by EPA.

- provide to EPA, on an annual basis, an updated list of ENERGY STAR qualifying Climate Control models. Once the Partner submits its first list of ENERGY STAR qualified Climate Control models, the Partner will be listed as an ENERGY STAR Partner. Partner must provide annual updates in order to remain on the list of participating product manufacturers;
- provide to EPA, on an annual basis, unit shipment data or other market indicators to assist in determining the market penetration of ENERGY STAR. Specifically, Partner must submit the total number of ENERGY STAR qualified Climate Controls shipped (in units by model) or an equivalent measurement as agreed to in advance by EPA and Partner. Partner is also encouraged to provide ENERGY STAR qualified unit shipment data segmented by meaningful product characteristics (e.g., capacity, size, speed, or other as relevant), total unit shipments for each model in its product line, and percent of total unit shipments that qualify as ENERGY STAR. The data for each calendar year should be submitted to EPA, preferably in electronic format, no later than the following March and may be provided directly from the Partner or through a third party. The data will be used by EPA only for program evaluation purposes and will be closely controlled. Any information used will be masked by EPA so as to protect the confidentiality of the Partner; and
- notify EPA of a change in the designated responsible party or contacts for Climate Controls within 30 days.

Performance for Special Distinction

In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures and should keep EPA informed on the progress of these efforts:

- consider energy efficiency improvements in company facilities and pursue the ENERGY STAR mark for buildings;
- purchase ENERGY STAR qualified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product information to employees for use when purchasing products for their homes;
- ensure the power management feature is enabled on all ENERGY STAR qualified monitors in use in company facilities, particularly upon installation and after service is performed;

- provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR qualified product models;
- feature the ENERGY STAR mark(s) on Partner Web site and in other promotional materials. If information concerning ENERGY STAR is provided on the Partner Web site as specified by the ENERGY STAR Web Linking Policy (this document can be found in the Partner Resources section on the ENERGY STAR Web site at www.energystar.gov), EPA may provide links where appropriate to the Partner Web site;
- provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, EPA may be able to coordinate, communicate, and/or promote Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR Web pages, etc. The plan may be as simple as providing a list of planned activities or planned milestones that Partner would like EPA to be aware of. For example, activities may include: (1) increase the availability of ENERGY STAR qualified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrate the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) provide information to users (via the Web site and user's manual) about energy-saving features and operating characteristics of ENERGY STAR qualified products, and (4) build awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event;
- provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and its message;
- join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. SmartWay Transport works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit www.epa.gov/smartway;
- join EPA's Climate Leaders Partnership to inventory and reduce greenhouse gas emissions. Through participation, companies create a credible record of their accomplishments and receive EPA recognition as corporate environmental leaders. For more information on Climate Leaders, visit www.epa.gov/climateleaders; and
- join EPA's Green Power partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities, visit www.epa.gov/grnpower.



ENERGY STAR® Program Requirements for Residential Climate Controls

Version 1.0 Eligibility Criteria Draft 2

Below is the **Draft 2** Version 1.0 product specification for ENERGY STAR qualified Residential Climate Controls. A product must meet all of the identified criteria if it is to earn the ENERGY STAR.

Note: This Draft 2 Version 1.0 Residential Climate Controls Specification includes revisions based on stakeholder comments on the previous Draft 1 document. The majority of detailed comments were received on the following areas: TOU pricing indication; power consumption limit; and communications and usability requirements. In response to these comments, EPA is proposing revised requirements indicated in **red font**. Explanatory text associated with proposed specification changes is provided in note boxes found throughout the document.

This draft also adds Tier 2 communication requirements for adherence to NIST Smart Grid Interoperability Standards Project recommendations and for bidirectional digital communications between the Climate Control and controlled HVAC equipment.

Stakeholders are encouraged to also review the Draft 1 Version 1.0 Residential Climate Controls Comment Response document, which provides summaries of key stakeholder comments and EPA responses. This document can be found on the ENERGY STAR Web site at www.energystar.gov/newspeccs (click on "Climate Controls").

Stakeholders are encouraged to provide feedback on this latest proposal by July 30, 2010. EPA will host a stakeholder webinar on Wednesday July 14, 2010 from 12 - 2 p.m. EDT to discuss the recently released Draft 1 Version 1.0 ENERGY STAR® Residential Climate Controls specification. If you would like to participate in this discussion, please RSVP to ClimateControls@energystar.gov by COB Monday, July 12th, 2010. Conference call and log-in information will be provided to attendees prior to the meeting.

1) Definitions

A. Climate Controls

1. Climate Control: A device that controls heating, ventilation, and air-conditioning (HVAC) equipment to regulate the temperature and humidity of the room or space in which it is installed. A Climate Control enables the customer to schedule comfort and energy-saving periods; for when the occupant is home and away or asleep, respectively. An energy-saving setpoint is automatically initiated during energy-saving periods and a comfort setpoint during occupied periods. Climate Controls may be capable of controlling one or more zones of a conditioned space. The following Climate Controls are covered by this specification:
2. Communicating Climate Control: A Climate Control with the ability to communicate with sources external to the HVAC system for purposes of energy management and remote control. External sources include but are not limited to: (1) customer signals from home computer or mobile device, (2) utility price signals and display messages, and, (3) home energy management device signals. Examples of capabilities provided by such systems include: Internet-enabled scheduling, remote Heating, Ventilating, and Air Conditioning (HVAC) control; messaging and energy rate alert display. The communication link may be wired or wireless. Where Open Standards exist, they must be used.

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3. Residential (Communicating) Climate Control: A Climate Control intended for installation in homes and dwellings. This device includes fan modes and a default program schedule suitable for typical residential usage.
 4. Non-Residential (Communicating) Climate Control: A Climate Control intended for commercial installation in the workplace. This device differs from the Residential Climate Control in fan operation, HVAC control algorithms and includes default program schedule with occupied/away periods suitable for typical commercial usage.
 5. Line Voltage (Communicating) Climate Control: A device that controls HVAC equipment to regulate the temperature of the room or space in which it is installed by controlling the line-voltage HVAC electrical load directly or indirectly through a line-voltage operating circuit.
 6. Low Voltage (Communicating) Climate Control: A device that controls HVAC equipment to regulate the temperature of the room or space in which it is installed by controlling the applied energy in a National Electrical Code (NEC) Class 2 circuit.
 7. Setpoint: The temperature setting in degrees Fahrenheit or degrees Celsius for any given time period.
 8. Comfort Time: The time period during which the conditioned space is expected to be occupied (e.g., the early morning and evening hours for a residence).
 9. Comfort Setpoint: The temperature setting in degrees Fahrenheit or degrees Celsius for the time period during which the premises is expected to be occupied (e.g., the early morning and evening hours for a residence).
 10. Energy-Saving Setpoint: The temperature setting in degrees Fahrenheit or degrees Celsius for the time periods during which the premises is expected to be unoccupied or during which occupants are sleeping (e.g., the day and night hours for a residence).
 11. Set-Back Temperature: The setpoint for the energy-saving periods during the heating season, generally at night and during unoccupied hours. This is a lower setpoint than the comfort setpoint.
 12. Set-Up Temperature: The setpoint for the energy-saving periods during the cooling season, generally at night and during unoccupied hours. This is a higher setpoint than the comfort setpoint.
 13. Recovery, Conventional: A Climate Control algorithm that automatically initiates temperature recovery at the programmed time entered into the programming schedule.
 14. Recovery, Adaptive: A Climate Control algorithm that initiates recovery in advance of the programmed time to result in the room temperature reaching the comfort setpoint at or near the programmed time.
 15. Recovery, Heat Pump with Auxiliary Heat: A Climate Control algorithm that that minimizes the use of auxiliary heat to maximize energy savings.
 16. Short Term Hold: This mode temporarily overrides the program setpoint. Short Term Hold shall be active only until the next scheduled program event.
 17. Long Term Hold: This mode suspends the Climate Control program schedule until the long term hold mode is cancelled by the user.

- 250 18. Vacation Hold: This mode suspends the Climate Control program schedule until the user
251 specified date/time.
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- 253 19. Scheduled Hold: This mode allows the user to schedule a future hold event that suspends the
254 Climate Control program. The user configurable Scheduled Hold parameters include start
255 date/time, end date/time and setpoint.
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- 257 20. Timed Hold: This mode suspends the Climate Control program schedule for the user specified
258 time interval.
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260 B. Heating Ventilation and Air Conditioning (HVAC) System Definitions
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- 262 1. Heat Pump: A Heat Pump is a mechanical apparatus that normally consists of one or more
263 factory-made assemblies that include an indoor conditioning coil(s), compressor(s) and a
264 reversing mechanism to transfer heat to the premises from the outside air, ground or water in
265 heating mode and from the premises to the outside air, ground or water in cooling mode.
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- 267 2. Non Heat Pump HVAC: For the purpose of this specification, non-heat pump HVAC
268 encompasses all other HVAC equipment including, but not limited to fossil fuel heat, central air
269 conditioning, electric resistance heating and evaporative coolers.
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- 271 3. Dual Fuel Heat Pump: For the purpose of this specification, a Dual Fuel Heat Pump integrates
272 a heat pump with a fossil fuel furnace. To maximize efficiency of the system, the furnace is
273 utilized for cold outdoor temperatures and the heat pump for milder temperatures. The Climate
274 Control monitors outdoor temperature and selectively utilizes the two heat sources to optimize
275 energy efficiency.
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- 277 4. Auxiliary Heat: Electric resistance heat used to supplement the heat pump during periods of low
278 temperature or rapid recovery.
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- 280 C. Energy Management System (EMS): An EMS is comprised of interconnected devices, integrated
281 into a system designed to schedule, control, and monitor energy usage within a single dwelling.
282 A typical system includes a controller that forms a network and acts as a gateway to the Internet,
283 enabling secure web and mobile device remote access. The controller may incorporate
284 embedded energy management software or leverage software located on a local PC or remote
285 server. In addition to the controller, additional EMS devices may include in home displays (IHD),
286 Communicating Climate Controls, direct load control relays, addressable light switches, meters
287 and appliance modules. In general, each of these devices adds one or more of the following
288 intrinsic functions:

- 289 • Load Control
- 290 • Measurement/logging
- 291 • Display/User Interface

292 The EMS provides enhanced usability including web and mobile device remote access,
293 configuration and monitoring. It also aggregates energy usage data from interconnected devices
294 and empowers the resident with tools and information intended to encourage responsible and
295 reduced energy usage. The EMS may also help to identify low cost solutions that increase
296 energy efficiency within the residence and in some cases may be configured to take **automatic**
297 **action** to reduce consumption based on price signals, budget constraints and other triggering
298 criteria.
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- 300 D. Energy Services Interface (ESI): Provides security and, often, coordination functions that enable
301 secure interactions between on premises relevant devices and the Utility. Permits applications
302 such as remote load control, monitoring and control of distributed generation, in-home display of
303 customer usage, reading of non-energy meters, and integration with building management
304 systems. Also provides auditing/logging functions that record transactions to and from Home

Area Networking Devices.

- E. Advanced Metering Infrastructure (AMI): These systems are utility networks that measure, collect, and analyze metering data. AMI systems consist of hardware, software and communications. Typical implementations include advanced communicating energy meters, meter data management (MDM) systems and associated communications infrastructure. AMI systems may also include consumer energy displays and web portals for purposes of displaying energy usage data and facilitating remote control and energy use scheduling.
- F. Demand Response (DR): These systems are utility control networks capable of directly impacting energy usage in residential and commercial buildings. These systems are utilized to reduce overall consumption in response to market conditions or periods of critical peak demand. Since residential energy consumption is dominated by HVAC energy consumption, DR implementations typically provide mechanisms for shedding HVAC load as a fundamental tool to reduce energy load. Secondary targets for DR control include electric hot water heaters and pool pumps.
- G. Time of Use: Several power companies are offering Time of Use (TOU) pricing programs under which energy costs vary depending on the time of consumption and are assessed in accordance with a published schedule. The TOU schedule will have two or more schedule periods. Three tier TOU plans include tiers entitled Off-Peak, Mid-Peak and On-Peak, or similar, and are defined as the following:
1. Off-Peak: This pricing period has the least expensive energy rates and is normally scheduled for the night **and weekend periods**.
 2. Mid-Peak: Energy rates for this pricing period are positioned higher than Off-Peak, but lower than On-Peak prices. Mid-Peak rates are typically scheduled for the morning and evening periods during the Summer cooling season and during the afternoon and late evening for the Winter heating season.
 3. On-Peak: This pricing period has the costliest energy rates and is normally scheduled for the afternoon period during the Summer cooling season and during the morning and early evening for the Winter heating season.

Note: Time of Use (TOU) and associated TOU plan tier definitions remain largely unchanged in this draft. However, in response to stakeholder comment, the Off-Peak definition is revised to indicate that weekend periods are typically classified as Off Peak.

2) Qualifying Products

ENERGY STAR qualified Residential Climate Controls must meet the following requirements:

- A. The product must enable 7-day program scheduling with a minimum of four possible schedule periods each day (i.e., morning, day, evening, and night).
- B. The product must provide a default, pre-programmed schedule with consistent settings for each weekday and differing settings for the weekend period. Detailed requirements for this schedule are provided in Section 3, Tables 1 and 2, below.

- C. The product packaging and installation instructions must include the following statement:

“Residential Climate Control – This product is designed only for use in homes and other dwellings.”

Note: Stakeholder comments recommended elimination of mandatory support of 5/2-day and 5/1/1-day programmability, since 7-day, 4+ period per day programmability is a superset of 5/2-day and 5/1/1-day programmability. EPA concurs and has revised the above qualifying product requirements to no longer require, separate 5/2-day and 5/1/1-day schedules.

- D. The product packaging and installation instructions must clearly indicate the types of HVAC systems it supports. For Low-voltage Climate Controls, this information shall include the number of controlled heating and cooling stages.
- E. The product must either be (1) a Communicating Climate Control, as defined in Section 1.A above, or be (2) field upgradeable to a Communicating Climate Control by installation of a communication module. **Simultaneous availability of compatible communication modules is not required. Manufacturers are free to offer communications modules at a later date, for example when warranted by market conditions.**

Note: In response to stakeholder comments, the above qualifying product requirement is clarified to indicate that market availability of compatible communication modules is not a requirement for qualification of Climate Controls.

3) Energy Efficiency Criteria

Only those products referenced in Section 2, above, that meet the criteria below may qualify as ENERGY STAR.

Tier 1

Usability Requirements:

There are two approaches to demonstrate an acceptable level of usability for Climate Controls:

- Compliance with core prescriptive usability requirements **and** demonstration of an acceptable level of usability when evaluated against a performance-based usability test.
- Compliance with core prescriptive usability requirements **and** additional prescriptive usability requirements.

Note: In response to stakeholder concerns, this Draft 2 specification includes revisions to usability requirements that will enhance Climate Control usability through creative implementation of requirements particularly when the performance-based path is selected. Select prescriptive requirements have been relaxed in several cases. Revisions will continue to be incorporated to ensure that the appropriate linkages exist between the prescriptive and performance based paths as the performance-based metric is developed.

Requirements 1 thru 4 are core usability requirements that apply to **all** qualified products:

Note: In order to foster creativity and increase innovative implementations by manufacturers who elect to utilize performance-based testing; the quantity of core usability requirements, applicable to both performance-based and prescriptive usability paths, has been reduced from six to four by moving two requirements to the prescriptive path as requirements 7 and 9.

1. The product shall store all programmed settings for the equipment it is designed to control in non-volatile memory in case of an external power outage or battery failure.
2. The product shall be capable of maintaining the correct date & time without user input, including automatic adjustment for US Daylight Savings Time (DST) by default. The product shall permit automatic daylight savings time adjustment to be cancelled. Correct date & time shall be maintained thru power outages of 7 days or less duration. Minimum timekeeping accuracy shall be $\pm 0.5s$ per 24-hour period. When integrated into an EMS/ESI that includes date & time synchronization with external sources; EMS/ESI date & time synchronization shall take precedence.

Note: Correct execution of program schedules is dependent upon accurate timekeeping by the Climate Control. In recognition of the expected expense of a reliable capability to set the time automatically, and that time & date should be set during installation; this Draft 2 specification revises the previous draft by removing the requirement that the Climate Control automatically set the time and date. EPA envisions that the installer will set the time & date and the Climate Control will maintain it to the accuracy of Quartz timekeeping, including through week-long power outages. The intent of requiring US Daylight Savings Time (DST) support by default, but allowing this function to be overridden, is to provide out-of-the-box timekeeping accuracy for the greatest number of users, while maintaining configurability for use in regions that do not observe DST.

3. The product must include an easily accessible setback mode. Default Away Heat and Cool setpoints for this mode shall be 62°F and 85°F, respectively. The Away Heat setpoint may be user configurable but not above 65°F. Similarly, the Away Cool setpoint may be user configurable but not below 80°F. Requirements for access to this mode are detailed in Requirement 6 for the prescriptive path and as a task in the performance based path.

Note: Explanatory text has been added to the above requirement to clarify that it is intended to be implemented in conjunction with requirement 6 in the prescriptive path and in conjunction with the performance-based requirement that the Climate Control include an easily accessed energy saving mode.

4. The product shall include a low-battery indicator that activates at least 2 months prior to critical battery depletion. This requirement is only applicable to products that use batteries.

Qualified product must either comply with the usability testing requirement 5, below, **or** with the additional prescriptive usability requirements 6 through 12.

5. The product must rate acceptably on a performance-based usability test.

Note: For the performance-based path, a draft Residential Climate Controls usability metric will be released to industry stakeholders in August 2010, followed by an EPA hosted webinar. The metric will be designed to evaluate usability of Residential Climate Control schedule programming and post-installation use. More information on the outlines of this metric is available in the Draft 1 Residential Climate Controls Version 1 specification (Note box following requirement 7) and in the webinar slides for Draft 1. It will also be discussed in the July 14th webinar on this Draft 2. In advance of the draft metric release, EPA encourages stakeholder input, both on the proposed metric content and on performance testing methodology.

Usability requirements 6 through 12, below, are required for a product that has **not** been evaluated to requirement 5, above.

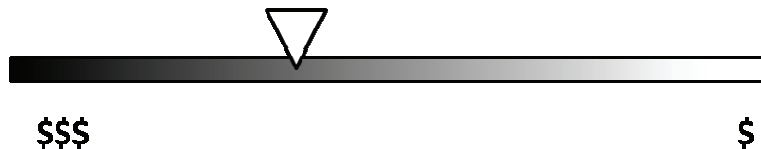
6. The product shall include an operating mode, activated and cancelled by single user operations, that triggers an energy saving mode. This mode shall simultaneously activate the energy saving setpoint as described in Requirement 3 above and place the Residential Climate Control in Long Term Hold. The mode should be given a descriptive label; EPA recommends use of the term "Away."

Note: The Away mode requirement is revised in this Draft 2 specification to clarify that this mode must be activated and cancelled by single user operations, and not necessarily a single-button push.

7. Climate Controls shall include visual indication that controlled HVAC heating or cooling elements are active. Climate Controls capable of controlling Heat Pump systems that use electric resistance auxiliary heat shall additionally convey high relative cost when auxiliary heat is energized. The following examples are given for reference, but stakeholders are encouraged to use other effective methods for communicating this information:

Heat Pump Systems with electric resistance auxiliary heat

\$	Stage 1 Heat or Cool Active
\$\$	Stage 2 Heat or Cool Active
\$\$\$\$	Electric Resistance Auxiliary Heat Active



Note: Research indicates that most users do not understand HVAC system operation, including the implications of commonly used inefficient electric resistance backup heat for Heat Pumps. The most important information that can be conveyed to consumers in regards to Climate Controls is the high relative cost of operating in this mode. The intent is to visually convey this information in an easily understood manner that will elicit consumer response. Accordingly, EPA is requiring that Heat Pump compatible Climate Controls include a visual indicator that specifically communicates cost. As in the example above, this visual cost indicator may also be used to alert the consumer to other operating modes as well. The prescriptive requirement that specified text for this indicator has been removed from this Draft 2 specification, allowing stakeholders additional latitude in its implementation.

8. The product shall provide the user the ability to raise or lower the setpoint with a single user action. Setpoint changes made while the product is following a program schedule shall activate a Short Term Hold or Temporary Hold indicator that informs the user that the change will be overridden by the schedule at the next scheduled change.
9. The product shall operate in Fahrenheit with a minimum resolution for indoor temperature display and setpoint of 1°F. If Celsius operation is included, the product shall provide a minimum resolution for indoor temperature display and setpoint of 0.5°C.

Note: After significant deliberation, EPA has elected to reinstate the 0.5°C minimum resolution for Celsius, while simultaneously allowing Climate Controls that do not offer Celsius operation to qualify. 1°C resolution is considered to be too large a temperature differential both for room temperature display and setpoint adjustability.

10. The product shall provide indication of current operating mode, as follows:
- a) Following program schedule, Away, Long-Term Hold, Short Term Hold, etc.
 - b) HVAC mode (Heat, Cool, Auto, Off)
 - c) Fan mode (Auto, On)
 - d) Program (configuration/setup) mode

Note: The above requirement has been added to this Draft 2 specification to ensure Climate Controls clearly indicate operating status to help users understand the operation of their HVAC system as they interact with the Climate Control. Research indicates that most currently available Programmable Thermostats meet this requirement.

11. The product display shall have primary and secondary characters (i.e., numbers) that are at least 16mm and 4.75mm in height, respectively. In the default display mode or screen, primary characters shall indicate current room temperature.

Note: After reviewing and considering stakeholder comments regarding character sizes, EPA has elected to retain the Draft 1 proposed requirement and further specify that the larger primary characters must display room temperature in the default display mode, as is commonly implemented in programmable thermostats.

12. The product shall incorporate green, yellow and red LEDs (or an equivalent implementation using the same colors) to indicate current energy price tier, as follows:

Example 1 – Three tier implementation

Green – Off Peak

Yellow – Mid Peak

Red – On Peak

Example 2 – Four tier implementation

Green – Off Peak

Yellow – Mid Peak

Red – On Peak

Flashing Red – Critical Peak

The color coded implementation shall ensure that each mode is also discernable to individuals with color vision deficiency, for example with differing physical locations for each indicator.

Note: EPA has received and considered a number of stakeholder comments regarding the above requirement and has decided to proceed with a modified implementation. This implementation retains a standardized three-color format, but requires a flashing red mode to accommodate four-tier TOU implementations. It further mandates appropriate design measures to ensure usability to those with color vision deficiency. With Climate Controls typically installed in high-traffic areas of the home, EPA believes that this the Climate Control is an ideal candidate to incorporate ambient display technology to inform users of current energy price as they pass by with no intention of discerning the current TOU tier.

Technical Requirements:

13. The product shall be capable of maintaining room temperature within $\pm 1^\circ\text{F}$ of the setpoint temperature in accordance with NEMA DC 3-2008 section 4.5.2 Differential Tests. This may be a configurable setting.

14. The product shall have access to outdoor temperature data. For Dual Fuel Heat Pump installations, the Residential Climate Control shall use the outdoor data to provide automatic

cutover to/from the backup heat source based on installer configurable cutover temperatures.

15. The product shall include humidity display and be capable of maintaining desired humidity levels when coupled with suitable HVAC equipment. Humidity sensing must be accurate to within $\pm 5\%$. Line-Voltage Climate Controls are exempt from this requirement.

Note: The accuracy requirement for humidity measurement and display has been relaxed to $\pm 5\%$ in response to stakeholder concerns regarding incremental cost of the previous proposed requirement of 3% with little benefits to the consumer

In order to avoid increased Climate Control complexity and subsequent decreases in usability, EPA has elected not to suggest, define or mandate humidity control parameters or setpoints. However, stakeholders are encouraged to consider HVAC control implementations that will use both temperature and humidity data to reduce energy consumption. In particular, there appears to be an opportunity for reduced consumption from homes in vacation mode during the cooling season.

16. The product shall be equipped with installer selectable recovery algorithms. When configured for non Heat Pump HVAC installations, the default recovery algorithm shall comply with the definition for Recovery, Adaptive (Section 1A). When configured for Heat Pump installations, that use electric resistance auxiliary heat, the default recovery algorithm shall comply with the definitions for Recovery, Adaptive and Recovery, Heat Pump with Auxiliary Heat (Section 1A).

Note: The above requirement is revised to remove the requirement for Climate Controls configured with Dual Fuel Heat Pumps to also comply with the definition for Recovery, Heat Pump with Auxiliary Heat. This requirement is intended to minimize use of less efficient electric resistance auxiliary heat. Dual Fuel systems automatically select the most efficient heat source.

17. Communicating Climate Controls shall consume no more than 2.0 watts of average power, evaluated in accordance with requirement 30.

18. Climate Controls that do not include communication capability shall consume no more than 1.0 watt of average power, evaluated in accordance with requirement 30

Note: EPA has received and considered a number of stakeholder comments indicating the 0.5w power consumption limit was too strict and that disabling communication circuitry for measurement was impractical. In response, EPA has provided separate power consumption limits for Climate Controls and Communicating Climate Controls in this Draft 2 specification. Stakeholders are requested to supply data that documents actual Climate Control power consumption to help EPA assess the acceptability of the proposed limits. Without this data, relaxing the limits further will not be justifiable.

19. Residential Climate Controls shall be shipped from the factory with an active, default program schedule, as defined in Tables 1 and 2, below. A minimum of four possible schedule periods is required. These periods, shall use the descriptive names: "Morning", "Day", "Evening" and "Night." Products with more than four schedule periods may use alternate schedule period nomenclature. Default day and night (setback) periods must be at least 8 hours in duration.

Table 1: Residential Climate Control Setpoints

Setting	Setpoint (Heat)	Setpoint (Cool)
Morning	$\leq 70^{\circ}\text{F}$	$\geq 78^{\circ}\text{F}$
Day	Set-back at least 8°F	Set-up at least 7°F
Evening	$\leq 70^{\circ}\text{F}$	$\geq 78^{\circ}\text{F}$
Night	Set-back at least 8°F	$\geq 78^{\circ}\text{F}$

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Table 2: Residential Climate Control – Acceptable Schedule Periods and Setpoints			
Setting	Time	Setpoint (Heat)	Setpoint (Cool)
Morning	6 a.m.	70°F	78°F
Day	8 a.m.	62°F	85°F
Evening	6 p.m.	70°F	78°F
Night	10 p.m.	62°F	78°F

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Note: Clarification is provided that EPA is mandating use of consistent schedule period nomenclature for all qualified Climate Controls with four-period per day programmability. Climate Controls that incorporate more than four program periods per day are permitted to use alternate nomenclature.

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577 **Communication Requirements:**

578 20. A Software Development Kit, or Interface Control Document, as appropriate, shall be available to
579 3rd party developers to enable access to the product's full range of communication and remote
580 control capabilities.

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Note: Although EPA encourages the use of open communication standards, in response to stakeholder comments, EPA has eliminated the *requirement* to do so. In addition, while a single standard may best serve customer's needs in the long term, requiring it at this time may limit product availability. Requirement 20, above is considered sufficient to encourage interoperability with 3rd party devices and applications.

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21. The product shall facilitate secure communications, including:
- Basic authentication and authorization so that only authorized devices or software applications can access the product.
 - Security measures to protect against unauthorized access.
22. The product shall be capable of collecting and transmitting the following thermostat settings and data points on a periodic basis to connected devices external to the HVAC system. The product must be capable of recording data at least once every 60 seconds and transmitting data at least once every 5 minutes.
- Unique Thermostat ID
 - Room Temperature in °F or °C (0.1 °F resolution)
 - Active Cool and Heat setpoints in °F or °C
 - HVAC mode setting (off, Heat, Cool, auto)
 - Active HVAC mode (off, Heat, Cool)
 - Fan mode setting (off, on, auto)
 - Active Fan mode (off, on)
 - Current Hold mode type and state (e.g. Long Term – on)
 - Current Away mode status (on, off)
 - All Programmable settings, including program schedules & setpoints, hold modes, fan modes, HVAC modes and installer settings.
 - Current Humidity reading and control mode

Note: Stakeholder comments have been received and reviewed by EPA that indicates the proposed data frequency requirements are too high and data storage will become problematic. Additional comments point out that existing utility backhaul networks may not have sufficient bandwidth for this data frequency. EPA has elected to retain the Climate Control data frequency requirement, but has clarified the language such that it applies only to the Climate Control. Data storage considerations and system level implementations regarding frequency of Climate Control data are independent from, and may differ from, the Climate Control data requirements. As written, this requirement ensures that the Climate Control does not limit adequate density of Climate Control data required by 3rd party energy analysis and energy management application providers.

23. The product shall be capable of accepting remote control commands from authorized devices or software applications to enable near-real time (within roughly 5 seconds) settings changes to the following, at any point of time:

- Time synchronization
- Active Cool and Heat setpoints in °F or °C
- HVAC mode (off, Heat, Cool, auto)
- Fan mode (off, on, auto)
- Select hold mode type and status (e.g. Long Term – on)
- Select away mode status (on, off)
- Control (green, yellow, red) energy tier indicators
- All program schedule settings including times and setpoints for active and inactive schedules
- Select active program schedule

Ease of Installation Requirements:

24. Installation instructions must utilize graphics and text, as appropriate, to guide the installer through both installation and configuration of the Residential Climate Control. These instructions shall include necessary installation steps and connection diagrams for all supported HVAC systems, both heat pump and non heat pump.

25. Installer documentation must be posted on the manufacturer's Web site in electronic format and must be available for at least 10 years after cessation of product manufacture.

26. HVAC wiring terminal designations of Low Voltage Climate Controls shall comply with Table 5-1 in NEMA DC 3-2008. Line Voltage Climate Controls shall be marked to identify the Line, Load and Earth terminals. Low Voltage Climate Controls that utilize wired or wireless digital data interfaces between the Climate Control and the controlled HVAC equipment shall be exempt from this requirement.

27. The product shall use commonly available batteries free of special handling and/or hazardous waste disposal requirements. This requirement is only applicable to products that use batteries.

28. The product shall be designed for a typical battery life of a minimum of 12 months. This requirement is only applicable to products that use batteries.

Tier 2

All Tier 1 requirements, plus:

29. The product shall comply with the recommendations of the NIST Smart Grid Interoperability Task Force, as relevant to the communications protocols for smart grid enabled devices. As the work of the Task Force is completed, EPA will clarify this requirement.

Note: EPA is monitoring the NIST Smart Grid Interoperability Standards Project in the hopes that it will provide a clear roadmap towards a unified communication protocol for smart grid enabled devices. Such a protocol would increase the consumer value of the smart grid by simplifying purchasing choices and maximizing interoperability.

30. The product shall use bi-directional digital communications between the Climate Control and controlled HVAC equipment. The details of this requirement shall be developed in the interval between the release of this specification and the Tier 2 effective date.

Note: EPA notes that proper installation and maintenance are required to maintain the rated efficiency of HVAC equipment. The Climate Control is the ideal platform to communicate HVAC diagnostic information to residents and service professionals, but doing so requires a digital communication link. Since there are several products on the market currently with this capability, EPA expects Tier 2 to be achievable in the near future. EPA anticipates that upcoming specifications for HVAC equipment will include corresponding requirements. EPA favors a single, preferably open, standard for this space as well, which will best serve consumer interest.

4) Other Criteria

31. All Residential Climate Control models shall comply with Restriction of Use of Hazardous Substances (RoHS) regulations for lead and mercury.

5) Test Criteria

Note: EPA is in the process of defining enhanced testing and verification requirements that will impact all ENERGY STAR specifications including Climate Controls. It is likely that Climate Controls will need to be tested in accredited labs, with test reports approved by a Certification Body approved by the EPA. Stakeholders are urged to participate in the stakeholder process for developing these requirements. More information is available on the following ENERGY STAR webpage:
<http://www.energystar.gov/testingandverification>

32. For verification of compliance with requirement 17 and/or 18, average power consumption of the Device Under Test shall be measured and compared to the applicable limit over a 5-minute duration, in accordance with the following table.

Table 3: Residential Climate Control – Power Consumption Measurement		
Device Under Test	Limit (W)	Test Parameters
Climate Control	1.0	<ul style="list-style-type: none">5-minute measurement durationAway mode activated 1x during test
Communicating Climate Control	2.0	<ul style="list-style-type: none">5-minute measurement durationAway mode activated 1x during testCommunication with device external to HVAC system, at least 1x during test

Note: Compatible communication modules placed on the market after the Residential Climate Control is qualified require revision to the qualified product file, including supporting power consumption test data of the Communicating Climate Control with communication module. EPA will publish a Residential Climate Control Qualified Product List that includes the Climate Control as well as the available communication options. A sample entry follows:

Product	Communication options	Energy use (W)
Anonymom SuperComfort 3	—	0.8
	Zigbee	1.5
	WiFi	1.48
	Ethernet	1.82

6) Effective Date

The date that products must meet the requirements specified under the Version 1.0 Residential Climate Controls specification will be defined as the *effective date* of the agreement. The ENERGY STAR Version 1.0 specification for Residential Climate Controls shall go into effect on **November 1, 2010**. All products must meet the requirements presented in Sections 2 – 4, above, to qualify for ENERGY STAR. **Tier 2** will go into effect **June 1, 2012**.

Note: The proposed November 1, 2010 date is aggressive, but in response to stakeholder requests, EPA is committed to complete the specification development as quickly as possible. In particular, our ability to meet the proposed schedule is dependent on timely development of the usability metric and associated test procedure. Active and timely stakeholder participation in this process is strongly encouraged and will help EPA meet its proposed schedule.

Grandfathering: When ENERGY STAR specifications are revised, EPA does not automatically grant continued qualification to products submitted under previous specification versions. Any product sold, marketed, or identified by the manufacturing Partner as ENERGY STAR must meet the specification in effect on the date of manufacture of the product.

7) Future Specification Revisions

ENERGY STAR reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers or industry or its impact on the environment. In keeping with current policy, revisions to the specification will be discussed with stakeholders. In the event of a specification revision, please note that ENERGY STAR qualification is not automatically granted for the life of a product model. To qualify as ENERGY STAR, a product model must meet the ENERGY STAR specification in effect on the model's date of manufacture.