ENERGY STAR® Program Requirements for Connected Thermostat Products

Partner Commitments

Following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the provision and labeling of ENERGY STAR connected thermostat products. The ENERGY STAR Partner must adhere to the following partner commitments:

Providing Qualified Service/Hardware Products

1. Comply with current ENERGY STAR Connected Thermostat Products Eligibility Criteria, which define performance requirements and test procedures. A list of eligible products and their corresponding Eligibility Criteria can be found at www.energystar.gov/specifications.

2. **Prior to associating the ENERGY STAR name or mark with any product**, obtain written certification of ENERGY STAR qualification from a Certification Body recognized by EPA for Connected Thermostats. As part of this certification process, products must be tested in a laboratory recognized by EPA to perform connected thermostat device testing. A list of EPA-recognized laboratories and Certification Bodies can be found at www.energystar.gov/testingandverification.

3. A new product is defined as a connected thermostat with either significantly different hardware or software features relative to an existing product. Products receiving software updates are not considered new products.

Note: EPA typically requires retesting and recertification of products when they change significantly. EPA is seeking a clear and easy way to identify when a connected thermostat product changes enough to require recertification that can support clarifying Section 3 above. We recognize this is a case where regular updates are to be expected. If a regular update improves the metric performance of an existing product, we expect that the Service Providers will be able to work with their CB to have the savings listed with their product updated.

Using the ENERGY STAR Name and Marks

4. Comply with current ENERGY STAR Identity Guidelines, which define how the ENERGY STAR name and marks may be used. Partner is responsible for adhering to these guidelines and ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance. The ENERGY STAR Identity Guidelines are available at www.energystar.gov/logouse.

5. Use the ENERGY STAR name and marks only in association with qualified connected thermostat products. The Partner may not refer to itself as an ENERGY STAR Partner unless at least one product is qualified and offered for sale in the U.S. and/or ENERGY STAR partner countries.

6. Provide clear and consistent labeling of ENERGY STAR certified connected thermostat products (i.e. service and device).

    6.1. The ENERGY STAR mark must be clearly displayed in product literature (i.e., user manuals, spec sheets, etc.) and on the partner's Internet site where information about

ENERGY STAR qualified products is displayed. Specific guidance on using the ENERGY STAR mark on Internet sites is provided in the Web-Based Tools for Partners document.

6.2. All ENERGY STAR Connected Thermostat applications and web interfaces must bear electronic certification marks, legible, in cyan, black or white, as applicable:
- The mark shall appear on the main menu of the control application, and be at least 76x78 pixels; and
- The mark shall appear on the web interface's main screen or main settings screen and be at least 76x78 pixels.
- Alternative proposals will be considered, as long as the certification mark appears periodically in the course of ordinary use of the application.

6.3. All ENERGY STAR Connected Thermostat devices must bear certification marks as applicable:

6.3.1. For products that use a dedicated hardware device (i.e., the device is only for use with services provided by a single service provider):
- The certification mark must appear on the front or top of the device OR electronic labeling may be used (see 6.3.2.)
- The certification mark must appear on product packaging.

6.3.2. For products that do not use a dedicated hardware service:
- The mark shall appear on the interface's main menu and be at least 76x78 pixels.
- Alternative proposals will be considered, as long as the certification mark appears periodically in the course of ordinary use of the application.

6.4. For ENERGY STAR Connected Thermostat products that are part of a broader product, such as a home security system, labeling shall clearly indicate that only the Connected Thermostat product is certified. Neither physical nor electronic labels shall not be associated with the full product, and product literature shall state: *"This [insert product type (e.g., security system, home automation system)] includes an ENERGY STAR Connected Thermostat. Only the Connected Thermostat is certified as ENERGY STAR."*

Note: EPA appreciates the feedback we received on the Draft 1 proposed labeling requirements. Several stakeholders expressed a need to preserve ease of use and clean, attractive interfaces, lest the presence of the ENERGY STAR certification mark interfere with the primary purpose of the thermostat. Recognizing this, EPA proposes reducing the required size of certification marks from 1" to 76 x 78 pixels (around 1/4" for most device, smart phone and tablet screens), and removing the requirement that it be on a splash screen delaying use of the device. EPA proposes consideration of alternative labeling proposals from service providers as well. Stakeholders did not indicate concerns with package or marketing material labeling as proposed in Draft 1. EPA looks forward to further stakeholder dialogue regarding labeling.

Providing Information to EPA

7. Provide aggregate savings data and associated statistics to EPA every 6 months in accordance with the ENERGY STAR Test Method for Connected Thermostats. Submitted data shall be representative of savings for the product's entire installed base and must demonstrate continued compliance with the requirements of the specification. This data will also be used for program evaluation purposes:

7.1. Every July 1, Heating season data:
- mean heating run time reduction (%) for a representative sample of subscribed homes, and standard error of the mean
- average resistance heat utilization (%) in 5°F bins from 0F to 60F
- *[TBD] additional statistical data*

7.2. Every January 1, Cooling season data:

- mean cooling run time reduction (%) for a representative sample of subscribed homes, and standard error of the mean
- *[TBD] additional statistical data*

8. Participate in verification of thermostat device hardware through a Certification Body recognized by EPA for Connected Thermostats, providing full cooperation and timely responses. EPA may also, at its discretion, conduct tests on products that are referred to as ENERGY STAR certified. These products may be obtained on the open market, or voluntarily supplied by Partner at the government's request.

Note: EPA typically requires verification testing of off the shelf samples of certified products. For Connected Thermostat products, CBs will test 10% of available connected thermostat devices to ensure that they continue to meet the device requirements in the Eligibility Requirements.

EPA received several comments stressing the importance of metric score verification. EPA has retained the twice yearly reporting requirement, and the Draft 1 test method furthers EPA's goal of aiding auditability of metric scores.

9. Provide unit shipment data or other market indicators to EPA annually to assist with creation of ENERGY STAR market penetration estimates, as follows:

   9.1. Partner must submit the total number of units newly subscribing to the service portion of ENERGY STAR qualified Connected Thermostat products within the calendar year or an equivalent measurement as agreed to in advance by EPA and Partner.

   9.2. Partner must provide subscription data segmented by meaningful product characteristics (e.g., controlled system types, presence of additional functions) as prescribed by EPA.

   9.3. Partner must submit subscription data for each calendar year to EPA or an EPA-authorized third party, preferably in electronic format, no later than March 1 of the following year.

   Submitted unit shipment data will be used by EPA only for program evaluation purposes and will be closely controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the Partner.

Note: EPA collects unit shipment data from all ENERGY STAR partners to monitor market penetration and in order to estimate how much GHGs the program has prevented in the calendar year. For ENERGY STAR Connected Thermostats, EPA believes the relevant information is new users of the service. While we expect services that now exist and have subscribers to earn the ENERGY STAR, the savings are not attributable to the ENERGY STAR Connected Thermostat program. Thus we only ask for new subscribers and not total number of users.

10. Report to EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.
11. Notify EPA of a change in the designated responsible party or contacts within 30 days using the My ENERGY STAR Account tool (MESA) available at www.energystar.gov/mesa.

Training and Consumer Education

12. Partner shall train distributors, sales staff and installation contractors on the value of the ENERGY STAR program. This training shall include, at a minimum, identification of ENERGY STAR certified products within the Partner's offerings and on the Partner's web site.
13. All consumer information documents – operating manuals, installation instructions, etc.—must be

easily accessible to consumers at a public website.

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:

- 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.
- Consider energy efficiency improvements in company facilities and pursue benchmarking buildings through the ENERGY STAR Buildings program.
- 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.
- Feature the ENERGY STAR mark(s) on Partner website and other promotional materials. If information concerning ENERGY STAR is provided on the Partner website as specified by the ENERGY STAR Web Linking Policy (available in the Partner Resources section of the ENERGY STAR website), EPA may provide links where appropriate to the Partner website.
- Ensure the power management feature is enabled on all ENERGY STAR qualified displays and computers 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 products.
- 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, and communicate Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR website, etc. The plan may be as simple as providing a list of planned activities or milestones of which Partner would like EPA to be aware. For example, activities may include: (1) increasing the availability of ENERGY STAR qualified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrating the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) providing information to users (via the website and user's manual) about energy-saving features and operating characteristics of ENERGY STAR qualified products; and (4) building awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event.
- Join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. The SmartWay Transport Partnership 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 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. For more information on Green Power, visit www.epa.gov/greenpower.

ENERGY STAR Program Requirements
Product Specification for Connected Thermostat Products

Draft 2 Eligibility Criteria
Version 1.0

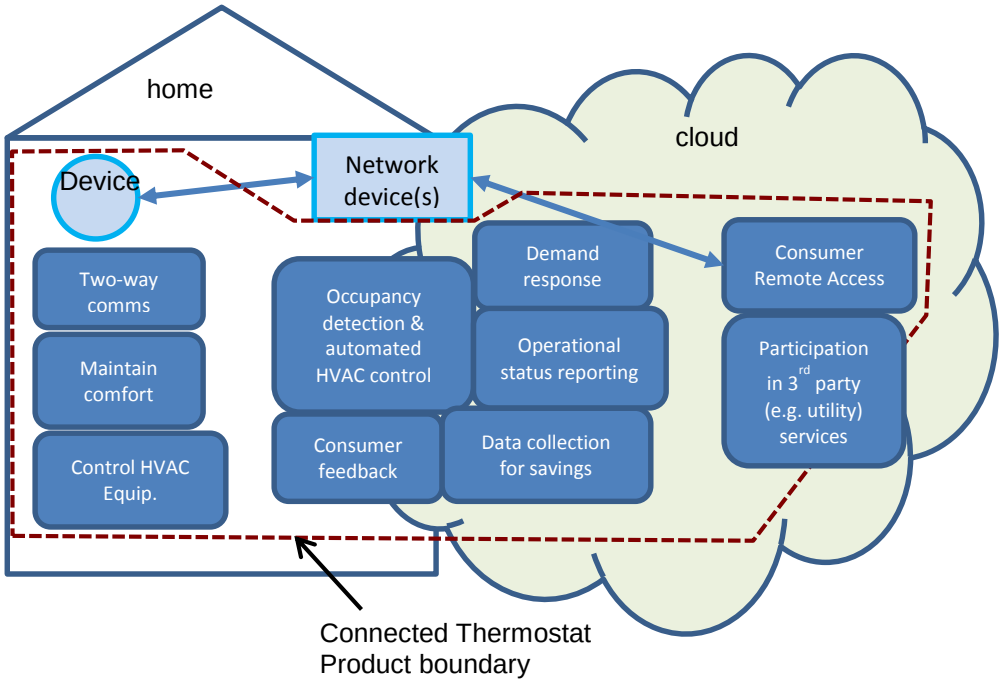
Following are the eligibility requirements for the Version 1.0 ENERGY STAR Connected Thermostats program. Connected Thermostat Products shall meet all of the identified criteria to earn the ENERGY STAR.

1) Definitions:

A. Communication Link: The mechanism for bi-directional data transfers between the CT and one or more external applications, devices or systems.

B. Connected Thermostat Device: A product that controls heating, ventilation, and air-conditioning (HVAC) equipment to regulate the temperature of the room or space in which it is installed, and has the ability to communicate with sources external to the HVAC system. For connection, the device may rely on a home area network (e.g. Wi-Fi) and an internet connection that is independent of the Connected Thermostat.

C. Connected Thermostat Product: For the purposes of this specification, the connected thermostat product includes the thermostat device in the home with associated firmware, which is assumed to be updated during the time the product is used in the home, as well as a service component supported by hardware and software outside of the home. The service component would typically provide web and smart phone based thermostat control. See below for a pictorial representation of one example. Functions on the left must be in the home, those in the center either require both, or may be enabled by various combinations of cloud services and hardware, and those on the right typically reside in the cloud.



D. Connected Thermostat Service Provider: The organization that brands the service component associated with the Connected Thermostat. Associated services typically include smart phone and web control applications, and messaging relevant to energy consumption, and open APIs that enable consumer-authorized interconnection with utilities and other 3rd parties.

E. Demand Response (DR): Changes in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized[1].

F. Demand Response Management System (DRMS): The system operated by a program administrator, such as the utility or third party, which dispatches signals with DR instructions and/or price signals to the ENERGY STAR CTs and receives messages from the CT.

G. Load Management Entity: DRMS, home energy management system, and the like.

H. Static temperature accuracy: The deviation in the displayed room temperature from 70°F (21°C); after one hour in a calibrated temperature chamber set to 70°F (21°C).[2]

I. Network Standby: A state with the Connected Thermostat Device is:

1. installed and interconnected in accordance with provided instructions,
2. with no direct or remote user interaction (e.g., smart phone app, web interface, occupancy detection), and
3. sufficient time has elapsed to allow the device to enter a low power state, as applicable. For example, the screen has dimmed or turned off automatically.

Note: The definitions for droop and operating differential have been removed as the corresponding requirements are no longer proposed for the specification. The Home Area Network definition was similarly removed as it is not used in the specification. The definition of Network Standby has been updated to accommodate CTs that exit network standby when occupancy is detected. A number of definitions have been added that are relevant to the newly added Demand Response requirements. Note that EPA has elected to use the broad Federal Energy Regulatory Commission definition for Demand Response that encompasses traditional reliability signal response as well as ancillary services and price response. Stakeholders are encouraged to provide feedback on these definitions and note additional definitions which may be needed to make this specification clear.

2) Scope:

A. Included Products: Only products that meet the definition of a connected thermostat product, as specified herein, are eligible for ENERGY STAR certification. Connected thermostats provided as part of a larger product offering, such as a home security system, may be certified but will be subject to specific labeling requirements. Low voltage and line voltage thermostats are included.

B. Excluded Products: Products that are unable to collect the required data for the energy savings metric (as required by Section3B4 are not eligible.

3) Eligibility Criteria:

A. Thermostat Device Requirements:

For providers that offer a service which may be used with several devices, all device choices for the service shall fulfill these requirements.

[1] Federal Energy Regulatory Commission, http://www.ferc.gov/industries/electric/indus-act/demand-response/dem-res-adv-metering.asp

[2] NEMA DC 3, Annex A-2013

1. In the absence of connectivity, retain the ability for residents to locally:
    a. view the room temperature,
    b. view and adjust the set temperature, and
    c. switch between off, heating and cooling.
2. Meet requirements set out in Table 1, below.

Table 1. Network Standby Criteria

Parameter	Performance Requirement	Applicable Products
Static Temperature Accuracy	± 1.0°F	All
Network Standby average power consumption[1]	≤ 2 W average	
Time to enter network standby after user interaction (on device, remote or occupancy detection)	≤ 5 minutes	

[1] Includes all equipment necessary to establish connectivity, except those that can reasonably be expected to be present in the home, such as Wi-Fi routers and smart phones.

Note: EPA received many comments on the static temperature accuracy, operating differential and droop requirements and the proposed methods to test them. They noted that there are no independent laboratories currently able to use the test method proposed in Draft 1 to test these requirements, NEMA-DC3, and that the set up for testing is a significant investment. In subsequent conversations, EPA learned that droop is not an issue for modern electronic thermostats, and that a requirement for operating differential needlessly limits providers' design choices. EPA has removed droop and operating differential requirements from this draft. EPA also realized through comments and discussions with stakeholders that the ±0.5°F static temperature accuracy proposed in Draft 1 is not critical to the results of the metric calculation, because of the self-baselining. In addition, the temperature sensors typically used in modern thermostats have ± 1°F accuracy, which is accurate enough to ensure users have a good experience with the product. As static temperature inaccuracy is a common user complaint for low quality thermostats, EPA has included a ± 1°F accuracy requirement in Draft 2. A straightforward method of measurement is outlined below.

EPA did not receive stakeholder comments on the standby power requirement and it is retained unchanged. EPA has also included a requirement for how long it takes for the device to enter standby here in the specification for additional clarity. EPA welcomes feedback on the proposed time.

B. Connected Thermostat Product Requirements: The following capabilities may be enabled through hardware, service or any combination of the two. The product shall maintain these capabilities through subsequent firmware and software changes. The Connected Thermostat Service Provider shall maintain documentation that demonstrates compliance to these requirements. Initial certification of these requirements will be based on a review of product literature.

1. Ability for consumers to set and modify a schedule.
2. Provision of feedback to occupants about the energy impact of their choice of settings.
3. Ability for consumer to access information relevant to their HVAC energy consumption, e.g., HVAC run time.
4. The product shall be capable of collecting the following data, including where noted, to the indicated resolution and accuracy:

a. Unique thermostat ID

b. ZIP code (installed location)

c. Controlled HVAC equipment type to the extent it can be determined by the CT Product:

- Single stage heat pump with aux and/or emergency heat
- Single stage heat pump without aux and/or emergency heat
- Single stage non heat pump with single-stage central air conditioning
- Single stage non heat pump without central air conditioning
- Single stage central air conditioning without central heating
- Other – e.g. multi-zone multi-stage, modulating

d. Daily cooling equipment run time (reported to the nearest second)

e. Daily heating equipment run time (reported to the nearest second)

f. Hourly auxiliary heat run time (reported to the nearest second)

g. Hourly emergency heat run time (reported to the nearest second)

h. Hourly average conditioned space temperature (reported to nearest 0.5°F, accurate to ±1.0°F)

i. Hourly average heating setpoint temperature (reported to nearest 1.0°F)

j. Hourly average cooling setpoint temperature (reported to nearest 1.0°F)

5. Demand Response

a. Grid Communications – The product shall include a communication link that uses open standards, as defined in this specification, for all communication layers to enable DR functionality.

b. Open Access – To enable interconnection with the product over the communication link, an interface specification, application programming interface (API) or similar documentation shall be made readily available that, at a minimum, enables DR functionality.

Note: Products that enable direct, on-premises, open-standards based interconnection are preferred, but alternative approaches, where open-standards connectivity is enabled only with use of off-premise services, are also acceptable.

c. Consumer Override – Consumers shall be able to override their product's response to any DR signal.

d. Capabilities Summary – A ≤250 word summary description of the CT Product's and/or associated Service Provider's DR capabilities/services shall be submitted. In this summary, EPA recommends noting the following, as applicable:

- Capabilities model, e.g. DR aggregator vs. uniquely addressable CT Products.
- CT Product DR Types, e.g. load dispatch, ancillary services, price notification, price response.
- Response configurability/flexibility by the consumer and/or Load Management Entity.
- Feedback to Load Management Entity, e.g. verification/M&V, override notification.
- Measures to limit consumer comfort impacts, if any.

Note: Several stakeholders objected to the Draft 1 requirement that the product sense occupancy or accept an occupancy signal, noting that it is only one way to save energy with a connected thermostat, and providers should have the flexibility not to use the strategy as long as they save energy. EPA has removed the requirement from Draft 2.

EPA has added data collection criteria to ensure that CT Products are able to collect requisite data for reporting of Field Savings.

Revised grid connectivity requirements are less prescriptive in consideration of stakeholder comments received on the September 21, 2015 proposal such that they better align with the wide range of CT Product grid responsiveness capabilities and CT Service Provider business models currently available.

While consumer override, open standards and open access criteria remain, EPA has replaced detailed response mode criteria with a requirement for each service provider to submit a DR capabilities summary that will available for each qualified CT Product on the ENERGY STAR website. EPA did not receive comments on other requirements in section 3B, and has retained them.

C. Field Savings: Connected thermostat products will demonstrate typical product performance in the field by one of two methods. To be certified, products must have at least one complete cooling season or one complete heating season of data. These requirements refer to reported performance of the connected thermostat product.

1. Metric Performance:

Table 2. Connected Thermostat Energy Savings Criteria

Metric	Performance Requirement	Applicable Products
Average annual % run time reduction, heating (HS)	≥ TBD	All
Average annual % run time reduction, cooling (CS)	≥ TBD	
Average resistance heat utilization for heat pump installations (RU)	Reported in 5°F outdoor temperature bins from 0 to 60°F	

Note: The requirements in section 3C1 are yet to be determined, but stand in for required performance on the run time reduction metrics currently being developed. While Draft 1 did not propose required performance levels, EPA received several specific comments on the proposal. One was a suggestion that in addition to requiring mean metric score, EPA should also set a requirement limiting the number of households with very low metric scores. This would provide further assurance that users, broadly, save energy with ENERGY STAR certified connected thermostats. EPA will consider this proposal as we work to set specific metric score requirements for Draft 3. EPA will also consider whether it makes sense to have regional requirements, which would tend to correct for vendors' savings being unduly inflated or deflated based on the climates in which they happen to have the most customers. This arises because naturally homes in more extreme climate have more savings potential. EPA expects that the next draft specification, currently planned for January 2016, will contain proposed levels. The levels will be based on ensuring anticipated consumer payback is sufficient to justify the purchase of the product, and on metric data stakeholders contribute. Stakeholders are encouraged to participate in the highly technical process of metric development. EPA continues to anticipate that resistance heat utilization of heat pumps will be a reporting requirement only.

2. A/B Study: In lieu of meeting metric performance requirements outlined in Table 2, partner may propose an A/B study which demonstrates the mean reduction of run time (or mean reduction in energy use) for homes using their product as compared to a typical thermostat.

To earn the ENERGY STAR, field savings studies shall show at least TBD% run time reduction in core seasons, with a confidence interval of at least 90%.

a. All studies must be pre-approved and shall meet the following requirements:

   i. Two groups of consumers shall have products present in their home which they use as the thermostat(s) for their homes during the study period. The test group shall have capabilities available equivalent to the least energy savings version of the products the study covers. The control group shall have capabilities available to them that represent a typical thermostat and provide a reasonable baseline for comparison.

   ii. Both groups of consumers will use the products for a length of time, and the groups shall be large enough, to estimate savings in core heating and cooling seasons with statistically significant results.

   iii. Results of the study will be relative mean run time reduction or relative mean energy savings in the test group compared to the control group, and the associated confidence interval as required by the specification. The confidence interval may be calculated with the simplifying assumption that the relative energy or run time reduction has a Gaussian distribution around the mean.

   iv. If only a smaller sample of homes is available, a study design using a pre-study matching period in which test and control groups have access to the same capabilities may be proposed. Application of a correction factor derived from the comparison of groups in the pre-test period may be used to account for fluctuations in home properties between groups. In this case, the pre-test and test periods shall be as close together in time as possible, and the uncertainty shall be estimated as half what it would have been without the correction from the pre-test period.

   v. Results of the study shall be representative of mean savings across the CT Products' U.S. installed base. This will generally require participants throughout the geographic spread of the Partner's customer base.

   vi. The study shall provide a method for ongoing monitoring of results, equivalent to semi-annual reporting of metric scores. This may involve periodically re-running the study on a smaller set of consumers, for instance.

b. Process

   i. Partner shall submit a proposal for the study to EPA, demonstrating compliance with the study requirements. This is expected to be an iterative process involving conversation between the Partner and EPA.

   ii. Once the study design is approved, the Partner will execute the study and report the results to EPA. Results should include at minimum the mean relative HVAC run time or HVAC energy use reduction from the control group to the test group, and the associated uncertainty.

   iii. EPA will publish the results of all approved studies, and will confirm whether results meet the requirements of the specification.

Note: In section 3C2, EPA proposes including an option for vendors to demonstrate field savings through use of an A/B study instead of through their metric scores. This option is included in response to vendors who convincingly showed EPA that some products with proven meter savings may not perform well against the metric, to the extent they take an approach not contemplated by the metric design. Given the

Note (cont.): broad scope for innovation in influencing HVAC use towards energy savings, it may be that even as the metric improves to properly reward a wide variety of approaches, some highly effective products could be excluded. Allowing for a more tailored demonstration of savings in such cases is in the interest of the environment and consumers, as well as allowing innovation to flourish.

EPA's intention is that the field study option provide broadly equivalent results with similar confidence and rigor. For instance, the required savings will be equivalent to that expected when comparing the metric scores to a realistic baseline. Both methods' results will reflect the geographic spread of the product's use in North America. Both will show results for core heating and core cooling seasons. The proposed confidence interval is intended to reflect the rigor of the metric. Partners are encouraged to provide comments on this option, as described above.

Partners using the A/B study must also submit metric performance data using the ENERGY STAR Method for Demonstrating Field Savings, to enable EPA to continue improving the metric.

D. Significant Digits and Rounding:

1. All calculations shall be carried out with directly measured (unrounded) values.
2. Unless otherwise specified below, compliance with specification limits shall be evaluated using directly measured or calculated values rounded to the nearest 0.1°F.
3. Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.

4) Test Requirements:

A. Test Methods:

The following methods shall be used to demonstrate ENERGY STAR qualification:

Table 3: Test Methods for ENERGY STAR Qualification

ENERGY STAR Requirement	Test Method Reference
Functionality in the absence of connectivity	As per section 4.B and 4.C below
Static temperature accuracy	As per section 4.B and 4.D below
Network standby power consumption	IEC 62301, Ed. 2.0, 2011-01, Household electrical appliances – Measurement of standby power, subject to clarifications in section 4.B and 4.E below
Time to standby	
Reduction in average annual % run time, heating (HS)	ENERGY STAR Method for Demonstrating Connected Thermostat Field Savings, V1.0
Reduction in average annual % run time cooling (CS)	
Average resistance heat utilization for heat pump installations (RU)	

B. Device configuration for testing

1. Install and configure the device either into a test environment or to control compatible HVAC heating and cooling source equipment. Ensure that the test setup enables observation of the UUT's HVAC control signals or actions, e.g. monitoring the UUTs wiring terminals for state changes or observing switching of HVAC equipment.
2. Configure & provision the UUT's connected functionality, including enrollment of applicable services and updating to latest version of firmware.

C. Functionality in the absence of connectivity

1. Disable connectivity, for example by shutting down the WLAN.
2. Verify (pass/fail) the capability for a user to interact with the CT Device to:
    a. Observe the room temperature,
    b. Observe and adjust the setpoint, and
    c. Switch between off, heating and cooling

D. Static temperature accuracy

1. Assure that the device is appropriately configured as per section 4.B.
    a. Install the UUT in a temperature chamber, set to 70°F (±2°F accuracy), along with a calibrated digital thermometer, ±0.5°F accuracy.
    b. Power the UUT and ensure connectivity is enabled. It is not necessary that the device be enabled into a test environment or to control HVAC source equipment.
2. Test Conduct
    a. Ensure the UUT and thermometer remain in the 70°F temperature chamber for at least 1 hour.
    b. Record the room temperature displayed by the UUT and the temperature in the chamber as measured by the calibrated thermometer.

E. Implementation of IEC 62301 for Connected Thermostat Testing

Note: This test is not applicable to UUTs powered solely by batteries.

1. Assure that the device is appropriately configured as per section 4.B.
    a. This test need not be performed in a temperature chamber.
    b. Configure the UUT in accordance with the requirements of IEC 62301, Ed. 2.0, 2011-01, "Measurement of Household Appliance Standby Power," Section 4, "General Conditions for Measurements," unless otherwise noted in this document. In the event of conflicting requirements, this ENERGY STAR test method shall take precedence.
2. Test Methodology – Measure power consumption at the power input to the UUT using the sampling method, section 5.3.2 of IEC 62301, Edition 2.0 2011-01.
    a. Verify ability to control the CT over the communication link, then close all apps & web interfaces.
    b. Increase the setpoint using the CT Device controls.
    c. Wait 5 minutes, while taking appropriate measures to allow the UUT to enter into and remain in network standby mode for the duration of the test, e.g.
        - No additional UUT user interactions
        - Ensure occupancy sensing UUTs do not detect occupancy,
        - Ensure apps and/or web remote interfaces remain closed.
    d. Separately measure and record average energy consumption over a 5-minute period.
    e. Check measurement stability in accordance with IEC 62301, Edition 2.0 2011-01, section 5.3.2.
    f. If stability criteria is not satisfied, repeat the test, starting from step 2b, with the test period extended in 5 minute increments (i.e. 10m, 15m, 20m…) as necessary to establish requisite measurement stability.
    g. Once stable, repeat the test over two additional test periods, starting from step 2b.

h. Record power consumption as the average over the second and third test periods.

Note: The device configuration is intended to ensure the UUT evaluation is representative of how the product will be used in consumer's homes. For the test of functionality without connectivity, it is preferred that connectivity be externally disabled, such that testing represents the wireless LAN or internet connection going down.

The static temperature accuracy test is based on, but does not reference NEMA DC-3. The temperature that really needs to be accurate is not the displayed temperature, but that which is reported over the communications link. However, as that information is generally only available to the service provider, EPA has not assumed it can be used. EPA welcomes stakeholder feedback on how this might be managed.

The standby power consumption test references IEC 62301, but measures power at the UUT input terminals, which for Low-Voltage UUTs will be 24 Vac. It is imperative that appropriate measures be taken to enable the UUT to enter standby mode. Ensure that the user interaction and 5-minute waiting period is performed in conjunction with each test period.

A draft of the ENERGY STAR Method for Demonstrating Connected Thermostat Field Savings has been released in conjunction with this Draft specification.

5) Effective Date:

The ENERGY STAR Connected Thermostat specification shall take effect TBD. To qualify for ENERGY STAR, a Connected Thermostat Product shall meet the ENERGY STAR specification in effect on the date of connection. The date of connection is specific to each unit and is the date on which a unit is considered to be a Connected Thermostat Product.

Note: ENERGY STAR specifications for new products generally take effect immediately upon publication of the final requirements, and potential Partners are free to submit products for certification at that time. EPA currently estimates this specification to be finalized in Q2 2016. The specific effective date will be established in future drafts.

6) Future Criteria Revisions:

EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions. In the event of a specification revision, please note that the ENERGY STAR qualification is not automatically granted for the life of a product model.