



ENERGY STAR® Program Requirements for Geothermal Heat Pumps

Partner Commitments

Commitment

The following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacturing of ENERGY STAR qualified geothermal heat pumps. 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 geothermal heat pumps and specifying the testing criteria for geothermal heat pumps. 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 Logo Use Guidelines, describing how the ENERGY STAR labels and name 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;
- qualify at least one ENERGY STAR labeled geothermal heat pump model within one year of activating the geothermal heat pumps portion of the agreement. When Partner qualifies the product, it must meet the specification (e.g., Tier 1 or 2) in effect at that time;
- provide clear and consistent labeling of ENERGY STAR qualified geothermal heat pumps. The ENERGY STAR label must be clearly displayed in product literature (i.e., user manuals, spec sheets, etc.) and on the manufacturer's Internet site where information about ENERGY STAR qualified models is displayed. It is also recommended that the label appear on the top/front of the product and on the product packaging;
- offer and encourage training to distributors and/or contractors on the following issues: proper equipment installation and hookup, domestic water heater connection for desuperheater or integrated water heating, code compliance, and proper use of the Manual J calculation, or other equivalent calculation, in order to encourage proper sizing of equipment. In addition, Partner should strive to use contractors or well installers who have received training on the design and installation of the ground heat exchanger. Ground heat exchanger training may be provided by Partner or a well regarded training program such as the International Ground Source Heat Pump Association's. Partner shall focus its ENERGY STAR marketing efforts in regions where contractors have received training;
- provide to EPA, on an annual basis, an updated list of ENERGY STAR qualifying geothermal heat pump models. Once the Partner submits its first list of ENERGY STAR labeled geothermal heat pump 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 geothermal heat pumps 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. 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;

- notify EPA of a change in the designated responsible party or contacts for geothermal heat pumps 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 label for buildings;
- purchase ENERGY STAR labeled 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 labeled 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 labeled product models;
- feature the ENERGY STAR label(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 labeled 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.



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Eligibility Criteria

Below is the product specification (Version 2.0) for ENERGY STAR qualified geothermal heat pumps. A product must meet all of the identified criteria if it is to be labeled as ENERGY STAR by its manufacturer.

1) **Definitions:** Below is a brief description of a geothermal heat pump and other terms as relevant to ENERGY STAR.

A. **Geothermal Heat Pump:** A geothermal heat pump model uses the thermal energy of the ground or groundwater as the heat source and heat sink for residential space heating and/or cooling. It may provide both space heating and cooling, cooling only or heating only functions. A geothermal heat pump model consists of one or more factory-made assemblies that normally include an indoor conditioning coil with air moving means, compressor(s) and refrigerant to fluid heat exchanger(s). In addition, for the purposes of this specification, some or all of the domestic water heating shall be provided through the use of a desuperheater, integrated demand water heater or a separately installed compressor that provides demand water heating. The geothermal heat pump includes all the equipment and connections from the point at which the ground heat exchanger enters the house, except for indoor equipment that was installed by someone not representing the manufacturer or manufacturer's representative, such as the ground heat exchanger installer.

B. **Single Speed Models:** Geothermal heat pumps that are designed to run at one speed and one capacity (as compared to Multi-Speed Units described below). These provide the appropriate amount of heating or cooling primarily by cycling on and off.

C. **Multi-Speed Models:** Geothermal heat pumps that are manufactured to operate at more than one speed through the use of technologies such as multiple speed compressors, dual compressors, etc. These models are designed to be more efficient while running on low speed, but have the capacity to supply more heating or cooling at high speed.

D. **Ground Heat Exchanger:** The method by which heat is exchanged with the ground, groundwater or surface water. Geothermal heat pumps may use any form of ground heat exchanger, which may include horizontal or vertical closed loops, open loop vertical wells, or surface water. For the purposes of this specification, the ground heat exchanger comprises all the equipment (piping, connections, grouting, etc.) that is installed outside the house, and up to the point it enters the house and any equipment or connections that the ground heat exchanger contractor installs inside the house.

E. **Closed Loop System:** A ground heat exchanger in which the heat transfer fluid is permanently contained in a closed system.

F. **Open Loop System:** A ground heat exchanger in which the heat transfer fluid is part of a larger environment. The most common open loop systems use ground water or surface water as the heat transfer medium.

G. **Direct Expansion (DX):** A geothermal heat pump system in which the refrigerant is circulated in pipes buried in the ground, rather than using a heat transfer fluid, such as water or antifreeze solution in a separate closed loop, and fluid to refrigerant heat exchanger. For the purposes of this

specification, a DX system includes all of the equipment both inside and outside the house. DX systems may be single or multi-speed.

H. Desuperheater: A partial heat recovery system that captures heat from the hot refrigerant as it leaves the heat pump compressor and transfers it to the domestic hot water. Desuperheaters provide hot water only while the heat pump is providing space conditioning.

I. Integrated Demand Water Heating: For purposes of this specification, this term is used to describe geothermal heat pumps that include a water heating function in the refrigeration cycle. Integrated demand water heating differs from desuperheater in that the integrated demand water heating model provides all or nearly all of the domestic hot water needs and provides hot water even when space conditioning is not required. This includes systems that employ the use of a separate water heating compressor unit or that use the same compressor for space conditioning and water heating. Also sometimes referred to as full-demand or demand water heating.

J. COP: Coefficient of Performance - A measure of efficiency in the heating mode that represents the ratio of total heating capacity to electrical energy input. For the purpose of this specification, COP will be calculated for Closed Loop and Open Loop systems in accordance with the International Standards Organization (ISO) Test Standard 13256-1 as stated in Section 4 below. For Direct Expansion systems, COP will be calculated in accordance with the Air-Conditioning and Refrigeration Institute (ARI) 870 conditions.

K. EER: Energy Efficiency Ratio - A measure of efficiency in the cooling mode that represents the ratio of total cooling capacity to electrical energy input. For the purpose of this specification, EER will be calculated for Closed Loop and Open Loop systems in accordance with ISO 13256-1 as stated in Section 4 below. For DX systems, EER will be calculated in accordance with ARI 870 conditions.

L. Manual J Calculation: A calculation performed to determine the heating load for a residence or small commercial building. The calculation shall include site-specific characteristics such as regional weather data, building framing materials, building insulation levels, building air infiltration levels, and window area. The calculation follows procedures and protocols developed by the Air Conditioning Contractors of America (ACCA).¹

M. Manufacturer Limited Warranty: For the purpose of this specification, a manufacturer limited warranty is an assurance by the Partner or the Partner's representative (i.e., dealer or distributor) that purchased system equipment and components are warranted for a minimum of two years. Major components, including the compressor(s), heat exchanger(s), air coil(s), expansion and reversing valve(s) shall be warranted for a minimum of five years. The exact terms of the limited warranty, given these minimum specifications, shall be determined by the Partner.

- 2) Qualifying Products: For the purposes of ENERGY STAR, geothermal heat pumps include the following: open loop systems, closed loop systems, and direct expansion systems. Geothermal heat pumps that include a water heating function in the refrigeration cycle (integrated demand water heating) are also covered. The specifications in Section 3 apply to single speed models. Multi-speed models may be qualified based on $EER = (\text{high speed EER} + \text{low speed EER}) / 2$; and $COP = (\text{high speed COP} + \text{low speed COP}) / 2$.
- 3) Energy-Efficiency Specifications for Qualifying Products: Only those products listed in Section 2 that meet the criteria below (see items A through C and Table 1) may qualify as ENERGY STAR.

¹Air Conditioning Contractors of America (ACCA), 2800 Shirlington Road, Suite 300, Arlington, VA 22206.

- A. Partner must provide a manufacturer limited warranty for its ENERGY STAR qualified geothermal heat pump models. The geothermal heat pump will be warranted for parts and labor for a minimum of two years. The major refrigeration components, including the compressor(s), heat exchanger(s), air coil(s), expansion and reversing valve(s) will be warranted for parts and labor for a minimum of five years.
- B. Since the performance of the geothermal heat pump is significantly related to the design and installation of the ground heat exchanger, Partner will strive to ensure that the customer receives warranty protection for the integrity and performance of the ground heat exchanger for at least two years. Partner will inform all distributors and dealers of ENERGY STAR labeled geothermal heat pumps of the need for warranty protection for the customer. Partner will focus its ENERGY STAR marketing efforts in regions where contractors provide customer warranties.
- C. ENERGY STAR labeled geothermal heat pumps must meet the criteria in Table 1 below.

Table 1: Energy-Efficiency Criteria for ENERGY STAR Qualified Geothermal Heat Pumps (Version 2.0)

Product Type	EER	COP	Water Heating
Closed Loop	14.1	3.3	YES
With integrated WH	14.1	3.3	N/A
Open Loop	16.2	3.6	YES
With integrated WH	16.2	3.6	N/A
DX	15	3.5	YES
With integrated WH	15	3.5	N/A

- 4) Test Criteria: Manufacturers are required to perform tests and self-certify those product models that meet the ENERGY STAR guidelines.
 - A. Closed Loop Systems
Closed loop systems shall qualify under rating conditions in accordance with ISO 13256-1.
 - B. Open Loop Systems
Open loop systems shall qualify under rating conditions in accordance with ISO 13256-1.
 - C. DX Systems
DX systems shall qualify under rating conditions in accordance with ARI 870.
- 5) Effective Date: The date that manufacturers may begin to qualify products as ENERGY STAR will be defined as the *effective date* of the agreement. The ENERGY STAR Geothermal Heat Pump Version 2.0 specification is effective on April 1, 2001 and replaces all previous versions.
- 6) Future Specification Revisions: ENERGY STAR 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.