



ENERGY STAR® Program Requirements for Geothermal Heat Pumps

Partner Commitments Version 3.0

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 Identity Guidelines, describing how the ENERGY STAR marks 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 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 mark 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 mark 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; distribution systems and their effect on performance; proper domestic water heater connection for desuperheater or demand 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 loop installers who have received training on the design and installation of the ground heat exchanger and who provide warranty protection for the integrity and performance of the ground heat exchanger for at least two years. Ground heat exchanger training may be provided by Partner or a well-regarded training program. Partner shall focus its ENERGY STAR marketing efforts in regions where contractors and loop installers have received training and provide warranties;
- offer a means to provide some or all of the domestic water heating through the use of a desuperheater, integrated demand water heater, or stand-alone demand water heating model. Partner will strive to ensure that customers, distributors, and contractors are made aware of the benefits of using a geothermal heat pump system to provide water heating in its marketing materials, installation manuals, and training programs;

- 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 qualified geothermal heat pumps, 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. 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 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 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 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 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 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;
- 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 <http://www.epa.gov/grnpower>.



ENERGY STAR® Program Requirements for Geothermal Heat Pumps

Eligibility Criteria Version 3.0

Below is the Version 3.0 product specification 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 are the definitions of the relevant terms in this document.

A. Geothermal Heat Pump: A geothermal heat pump uses the thermal energy of the ground or groundwater to provide residential space conditioning and/or domestic water heating. A geothermal heat pump model normally consists of one or more factory-made assemblies that include indoor conditioning and/or domestic water heat exchanger(s), compressors, and a ground-side heat exchanger. A geothermal heat pump model may provide space heating, space cooling, domestic water heating, or a combination of these functions and may also include the functions of liquid circulation, thermal storage, air circulation, air cleaning, dehumidifying or humidifying. A geothermal heat pump system generally consists of one or more geothermal heat pump models, the ground heat exchanger(s), the air and/or hydronic space conditioning distribution system(s), temperature controls, and thermal storage tanks.

B. Single-Stage: Geothermal heat pumps that are designed to operate at one stage and one capacity.

C. Multi-Stage: Geothermal heat pumps that are designed to operate at more than one stage or capacity through the use of technologies such as multiple stage compressors, dual compressors, variable speed compressors, etc. Multi-stage models are more efficient while running at lower capacities, but have the capability to supply more heating or cooling using higher capacities when required.

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 exchange, which includes horizontal, vertical, or submerged surface water closed loops; open loops using ground water, reclaimed water, or surface water; or direct refrigerant-to-ground or refrigerant-to-water heat exchange.

E. Closed Loop: A ground heat exchange method in which the heat transfer fluid is permanently contained in a closed piping system. Also called a *ground-loop* system.

F. Open Loop: A ground heat exchange method in which the heat transfer fluid is part of a larger environment. The most common open loop systems use ground water, reclaimed water, or surface water as the heat transfer medium. Also called a *ground-water* system.

G. Water-to-Air: A geothermal heat pump model that provides space conditioning primarily by the use of an indoor air heat exchange coil. Water-to-air models may also provide domestic water heating and hydronic space heating by using desuperheater and/or demand water heating functions.

H. Water-to-Water: A geothermal heat pump model that provides space conditioning and/or domestic water heating by the use of indoor refrigerant-to-water heat exchanger(s). Water-to-water models may provide domestic water heating by using desuperheater and/or demand water heating functions.

I. Direct Geoexchange (DGX): A geothermal heat pump model in which the refrigerant is circulated in pipes buried in the ground or submerged in water that exchanges heat with the ground, rather than using a secondary heat transfer fluid, such as water or antifreeze solution in a separate closed loop.

J. Desuperheater: A partial heat recovery system that captures heat from the hot refrigerant gas 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.

K. Demand Water Heating: Demand geothermal heat pump water heating models provides for all, or nearly all, of the domestic hot water needs even when space conditioning is not required. This may be accomplished by either stand-alone domestic water heating models or integrated models that use the same compressor for both space conditioning and domestic water heating. This product type is sometimes referred to as a *dedicated* or *full-time* water heater.

L. Coefficient of Performance (COP): 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 or 13256-2 as stated in Section 5 below. For DGX systems, COP will be calculated in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 870 conditions.

M. Energy Efficiency Ratio (EER): 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 or 13256-2 as stated in Section 5 below. For DGX systems, EER will be calculated in accordance with AHRI 870 conditions.

N. 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

O. Manufacturer Limited Warranty: Manufacturer limited warranty is an assurance by the Partner that purchased equipment is warranted for a certain required amount of time. The exact terms of the limited warranty, given the minimum specifications, shall be determined by the Partner.

2) **Qualifying Products**: For purposes of ENERGY STAR qualification, geothermal heat pumps include the following: open loop, closed loop, and DGX that are powered by single phase current. The specifications in Section 3 apply to single stage models. Multi-stage models may be qualified based on

- **EER** = (highest rated capacity EER + lowest rated capacity EER) / 2 and
- **COP** = (highest rated capacity COP + lowest rated capacity COP) / 2.

Note: Commercial (i.e., 3-phase) units are not eligible for qualification under the ENERGY STAR specification at this time.

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

- 3) **Efficiency Requirements for Qualifying Products:** Only those product types listed in Section 2 that meet the criteria below may qualify as ENERGY STAR.

Table 1: Tier 1 Requirements (December 1, 2009)		
Product Type	EER	COP
Water-to-Air		
Closed Loop Water-to-Air	14.1	3.3
Open Loop Water-to-Air	16.2	3.6
Water-to-Water		
Closed Loop Water-to-Water	15.1	3.0
Open Loop Water-to-Water	19.1	3.4
DGX		
DGX	15.0	3.5

Table 2: Tier 2 Requirements (January 1, 2011)		
Product Type	EER	COP
Water-to-Air		
Closed Loop Water-to-Air	16.1	3.5
Open Loop Water-to-Air	18.2	3.8
Water-to-Water		
Closed Loop Water-to-Water	15.1	3.0
Open Loop Water-to-Water	19.1	3.4
DGX		
DGX	16.0	3.6

Table 3: Tier 3 Requirements (January 1, 2012)		
Product Type	EER	COP
Water-to-Air		
Closed Loop Water-to-Air	17.1	3.6
Open Loop Water-to-Air	21.1	4.1
Water-to-Water		
Closed Loop Water-to-Water	16.1	3.1
Open Loop Water-to-Water	20.1	3.5
DGX		
DGX	16.0	3.6

- 4) **Warranty Requirements:** Partner must provide, as standard, a manufacturer limited warranty for its ENERGY STAR qualified geothermal heat pump models for all parts and labor for a minimum of two years. The major refrigerant circuit components, including the compressor(s), heat exchanger(s), and expansion and reversing valve(s) will be warranted for parts and labor for a minimum of five years.
- 5) **Test Criteria:** Partner is required to perform tests and self-certify those product models that meet the ENERGY STAR guidelines. The test results must be reported to EPA using the Geothermal Heat Pump Qualifying Product Information (QPI) Form. When testing geothermal heat pumps, the partner must use the following test procedures to determine ENERGY STAR qualification:
- A. **Closed Loop Systems:** Geothermal heat pump models shall qualify under rating conditions in accordance with ISO 13256-1 for water-to-air models or ISO 13256-2 for water-to-water models.
 - B. **Open Loop Systems:** Geothermal heat pump models shall qualify under rating conditions in accordance with ISO 13256-1 for water-to-air models or ISO 13256-2 for water-to-water models.
 - C. **DGX Systems:** Geothermal heat pump models shall qualify under rating conditions in accordance with AHRI 870.

- 6) **Product Certification Requirements:** To participate in the ENERGY STAR program, each model must be certified by an EPA approved third-party certification organization according to requirements developed for the ENERGY STAR Enhanced Verification Program. These requirements are still to be determined and will be developed through a separate stakeholder process. The effective date for these requirements will be determined as part of these broader ENERGY STAR testing efforts.
- 7) **Requirements of Organizations Certifying Products for ENERGY STAR:** The specific requirements for organizations certifying products for ENERGY STAR will be developed as part of the ENERGY STAR Enhanced Verification Program and will include requirements for laboratory accreditation, verification testing procedures, and challenge testing procedures.
- 8) **Effective Date:** The date that products must meet the requirements specified under the Version 3.0 geothermal heat pump specification will be defined as the effective date of the agreement. Any previously executed agreement on the subject of ENERGY STAR qualified geothermal heat pumps shall be terminated effective November 30, 2009.
- A. **Tier 1 Requirements:** The first phase of this specification shall commence on **December 1, 2009**. All products, including models originally qualified under the previous Version 2.0 specification, with a date of manufacture on or after **December 1, 2009**, must meet the new Version 3.0 Tier 1 requirements in order to qualify for ENERGY STAR. The date of manufacture is specific to each unit and is the date (e.g., month and year) on which a unit is considered to be completely assembled.
- B. **Tier 2 Requirements:** The second phase of this specification, Tier 2, shall commence on **January 1, 2011**. All products, including models originally qualified under Tier 1, with a date of manufacture on or after **January 1, 2011** must meet the new Tier 2 requirements in order to qualify for ENERGY STAR.
- C. **Tier 3 Requirements:** The third phase of this specification, Tier 3, shall commence on **January 1, 2012**. All products, including models originally qualified under Tier 2, with a date of manufacture on or after **January 1, 2012**, must meet the new Tier 3 requirements in order to qualify for ENERGY STAR.
- D. **Elimination of Grandfathering:** EPA will not allow grandfathering under this Version 3.0 ENERGY STAR specification. **ENERGY STAR qualification under previous Versions is not automatically granted for the life of the product model.** Therefore, any product sold, marketed, or identified by the manufacturing partner as ENERGY STAR must meet the current specification in effect at the time of manufacture of the product.
- 9) **Future Specification 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 ENERGY STAR qualification is not automatically granted for the life of a product model. To carry the ENERGY STAR mark, a product model must meet the ENERGY STAR specification in effect on the model's date of manufacture.