



ENERGY STAR® Program Requirements Product Specification for Clothes Dryers

Partner Commitments

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

Qualifying Products

1. Comply with current ENERGY STAR Eligibility Criteria, which define performance requirements and test procedures for clothes dryers. 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 clothes dryers. As part of this certification process, products must be tested in a laboratory recognized by EPA to perform clothes dryer testing. A list of EPA-recognized laboratories and Certification Bodies can be found at www.energystar.gov/testingandverification.

Using the ENERGY STAR Name and Marks

3. 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.
4. Use the ENERGY STAR name and marks only in association with qualified products. 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.
5. Provide clear and consistent labeling of ENERGY STAR qualified clothes dryers.
 - 5.1. The ENERGY STAR mark must be clearly displayed on the top/front of the product (by placement of the ENERGY STAR logo on product labels, and/or as a permanent mark), 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.
 - 5.2. It is also recommended that the mark appear on the product packaging.

Verifying Ongoing Product Qualification

6. Participate in third-party verification testing through a Certification Body recognized by EPA for clothes dryers, providing full cooperation and timely responses. EPA/DOE may also, 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 the government's request.

Providing Information to EPA

7. Provide unit shipment data or other market indicators to EPA annually to assist with creation of ENERGY STAR market penetration estimates, as follows:
 - 7.1. Partner must submit the total number of ENERGY STAR qualified clothes dryers shipped in the calendar year or an equivalent measurement as agreed to in advance by EPA and Partner. Partner shall exclude shipments to organizations that rebrand and resell the shipments (unaffiliated private labelers).
 - 7.2. Partner must provide unit shipment data segmented by meaningful product characteristics (e.g., type, capacity, presence of additional functions) as prescribed by EPA.

7.3. Partner must submit unit shipment 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.

8. Report to EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.
9. 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.

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 Clothes Dryers

Eligibility Criteria Version 1.1

Following is the **Version 1.1** product specification for ENERGY STAR certified residential clothes dryers. A product shall meet all of the identified required criteria to earn the ENERGY STAR.

- 1) Definitions:** Below are the definitions of the relevant terms in this document. As noted below, definitions are identical with definitions in the DOE test procedure at 10 CFR 430, Subpart B, Appendix D2 or 10 CFR 430.2. When in conflict, the definitions in the Code of Federal Regulations (CFR) take precedence.
- A. Electric Clothes Dryer¹: A cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation. The heat source is electricity and the drum and blower(s) are driven by an electric motor(s).
 - B. Gas Clothes Dryer¹: A cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation. The heat source is gas and the drum and blower(s) are driven by an electric motor(s).
 - C. Compact size Clothes Dryer²: A clothes dryer with a drum capacity of less than 4.4 cubic feet.
 - D. Standard size Clothes Dryer²: A clothes dryer with a drum capacity of 4.4 cubic feet or greater.
 - E. Conventional (Vented) Clothes Dryer²: A clothes dryer that exhausts the evaporated moisture from the cabinet.
 - F. Ventless Clothes Dryer²: A clothes dryer that uses a closed-loop system with an internal condenser to remove the evaporated moisture from the heated air. Moist air is not discharged from the cabinet.
 - G. Water-Cooled Ventless Clothes Dryer: A ventless clothes dryer that uses cold tap water for internal condenser cooling.
 - H. Commercial Clothes Dryer: An electric or gas clothes dryer that is designed for use in:
 - 1. Applications in which the occupants of more than one household will be using the clothes dryer, such as multi-family housing common areas and coin laundries; or
 - 2. Other commercial applications.
 - I. Combination All-in-One Washer-Dryer: A consumer product designed to clean and dry fabrics in a single drum, where a separate drying cycle uses electricity or gas as a heat source and forced air circulation.
 - J. Residential Clothes Washer with Optional Dry Cycle: A Residential Clothes Washer that has an optional add-on dry cycle, where drying is accomplished through use of electricity or gas as a heat source and forced air circulation; drying cannot be selected independently from a wash cycle.
 - K. Clothes Dryer with Supplementary Drying System: A consumer product that meets the definition of an Electric or Gas Clothes Dryer and includes a supplementary drying system in the same housing, but in a separate compartment from the primary dryer. The supplementary drying system does not have a tumble-

¹ 10 CFR 430 Subpart A, Section 430.2

² 10 CFR 430 Subpart B, Appendix D2

type drum. The supplementary drying system has a rated input power that is less than 20% of the primary dryer's rated input power³ and draws no discernable power when not in use.

- L. Combined Energy Factor (CEF)⁴: The clothes dryer test load weight in pounds divided by the sum of the per cycle standby and off mode energy consumption and either the total per-cycle electric dryer energy consumption or the total per-cycle gas dryer energy consumption expressed in kilowatt hours (kWh).
- M. Basic Model⁵: Units of a given type of covered product (or class thereof) manufactured by one manufacturer, having the same primary energy source, and which have essentially identical electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency.
- N. Consumer Product⁵: Any article (other than an automobile, as defined in Section 501(1) of the Motor Vehicle Information Cost Savings Act) which: (1) in operation consumes, or is designed to consume, energy and (2) to any significant extent, is distributed in commerce for personal use or consumption by individuals.

2) Scope:

- A. Included Products: Products that meet the definition of an Electric Clothes Dryer or Gas Clothes Dryer, and the definition of a consumer product as specified herein are eligible for ENERGY STAR qualification, with the exception of products listed in Section 2.B.
- B. Excluded Products: Commercial Clothes Dryers, Water-Cooled Ventless Clothes Dryer, Combination All-in-One Washer-Dryers, and Residential Clothes Washers with an Optional Dry Cycle as defined in Section 1 are not eligible for ENERGY STAR under this specification.

3) Qualification Criteria:

- A. Combined Energy Factor (CEF): CEF shall be greater than or equal to the Minimum CEF (CEF_{MIN}) as calculated per Equation 1.

Equation 1. Calculation of Minimum CEF

$$CEF_{MIN} = CEF_{BASE} - CEF_{Adder_Connected}$$

where,

CEF_{BASE} is the base CEF, per Table 1

$CEF_{Adder_Connected}$ is the CEF connected allowance, per Table 2

³ The supplementary drying system's rated input power and the primary dryer's rated input power both may be determined from a label on the product or the product's user manual.

⁴ 10 CFR 430 Subpart B, Appendix D2

⁵ 10 CFR 430 Subpart A, Section 430.2. Note: Definition of consumer product has been abbreviated to be specific to clothes dryers by omitting the regulatory definition's references to lighting and water.

Table 1: Base CEF

Product Type*	CEF _{BASE} (lbs/kWh)
Vented Gas	3.48
Ventless or Vented Electric, Standard (4.4 cu-ft or greater capacity)	3.93
Ventless or Vented Electric, Compact (120V) (less than 4.4 cu-ft capacity)	3.80
Vented Electric, Compact (240V) (less than 4.4 cu-ft capacity)	3.45
Ventless Electric, Compact (240 V) (less than 4.4 cu-ft capacity)	2.68

* Those products meeting the definition of a Clothes Dryer with Supplementary Drying System - The primary dryer must meet the appropriate CEF to certify for ENERGY STAR as if it were a stand-alone product.

Table 2: Connected Allowance

Description	Product Type	CEF _{Adder_Connected} ²
Connected	All Electric Dryer Types in Table 1 ¹	0.05 x CEF _{BASE}

¹ Product must comply with all Section 4 criteria and be certified using the final and validated ENERGY STAR Clothes Dryers Test Method to Validate Demand Response to use the allowance.

² Calculated allowance shall be rounded down to the nearest hundredth before being applied in Equation 1.

- B. **Cycle Time:** The elapsed time for the product to complete the test cycle, as measured by Section 5.C, must be 80 minutes or less.

Note: Note: The cycle setting(s) tested under Appendix D2 should be designed to deliver satisfactory user experience, such that settings providing equivalent or reduced energy use are encouraged across most loads and anticipated consumer savings and environmental benefits are realized.

- C. **User Information Requirements:** Product shall be shipped with informational materials to notify consumers of the following:
- The specific cycle and setting selections (cycle type, heat setting, default settings engaged, etc.) that the energy use rating of this dryer is based upon.
 - Guidance about cycles and settings that may use more or less energy than this one, for example: "Choosing the "Energy Saver Mode" will save about (*to be determined by manufacturer*)% energy. Longer, low heat drying cycles tend to use less energy, as do less dry settings."
- D. **Significant Digits and Rounding:** All calculations shall be carried out as specified in Subpart B of Part 430 Appendix D2, as applicable; and 10 CFR Part 430.23(d)(3), as applied to Appendix D2.
- E. **Model Numbers:** Model numbers used for ENERGY STAR certified product submissions shall be consistent with Federal Trade Commission (FTC) and DOE submissions.

4) Connected Product Criteria:

The following optional connected criteria are applicable to Included Products, Section 2.A, that meet the definition of an Electric Clothes Dryer.

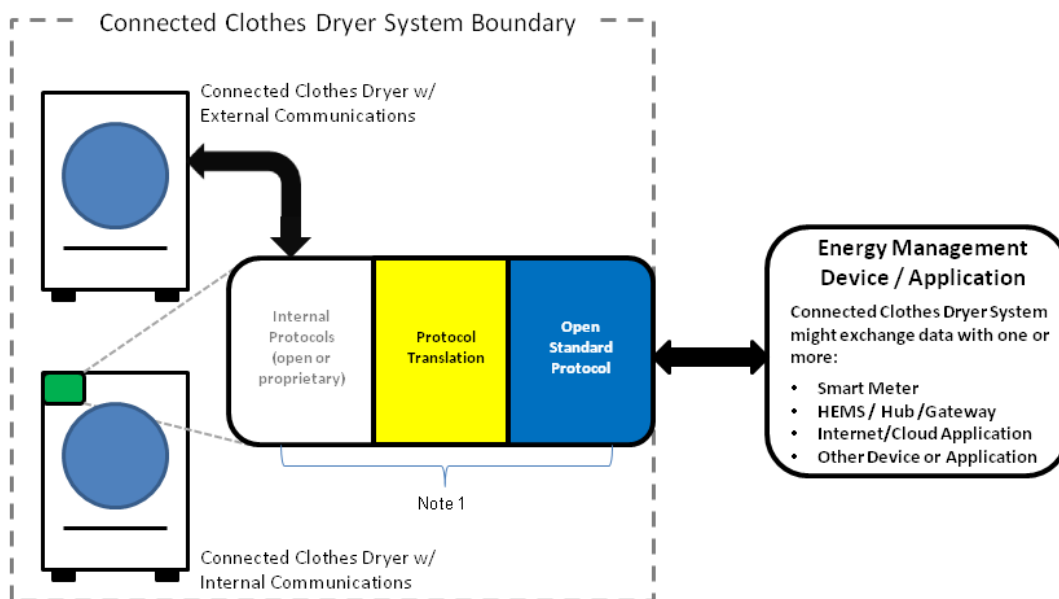
A. Connected Clothes Dryer System

To be recognized as connected and to be eligible for the connected allowance, a “connected clothes dryer system” (Connected Clothes Dryer System, as shown in Figure 1) shall include the base appliance plus all elements (hardware, software) required to enable communication in response to consumer-authorized energy related commands (*not including third-party remote management which may be made available solely at the discretion of the manufacturer*). These elements may be resident inside or outside of the base appliance. This capability shall be supported through one or more means, as identified in section 4.B.2.

The specific design and implementation of the Connected Clothes Dryer System is at the manufacturer's discretion provided it is interoperable with other devices via open communications protocol and enables economical consumer-authorized third party access to the functionalities provided for in sections 4.D, 4.F and 4.G. The capabilities shall be supported through one or more means, as identified in section 4.B.2. A product that enables economical and direct, on-premises, open- standards based interconnection is the preferred option for meeting this requirement, but alternative approaches are also acceptable.

The product must continue to comply with the applicable product safety standards – the addition of the functionality described below shall not override existing safety protections and functions. The appliance must meet manufacturer's internal minimum performance guidelines, e.g., drying performance.

Figure 1. Connected Clothes Dryer System Boundary – Illustrative Example



Note 1: Communication device(s), link(s) and/or processing that enables open standards-based communication between the Connected Clothes Dryer System and Energy Management Device/Application(s). These elements could be within the base appliance, and/or an external communication module, a hub/gateway, or in the Internet/cloud.

B. Communications

1. Open Standards – Communication with entities outside the Connected Clothes Dryer System that enables connected functionality (sections 4.D, 4.F and 4.G) must use, for all communication layers, the standards:
 - Included in the Smart Grid Interoperability Panel (SGIP) Catalog of Standards,⁶ and/or

⁶ http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PMO#Catalog_of_Standards_Processes

- Included in the NIST Smart Grid framework Tables 4.1 and 4.2, and/or
 - Adopted by the American National Standards Institute (ANSI) or another well-established international standards organization such as the International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), International Telecommunication Union (ITU), Institute of Electrical and Electronics Engineers (IEEE) or Internet Engineering Task Force (IETF).
2. Communications Hardware Architecture – Communication with entities outside the Connected Clothes Dryer System that enables connected functionality (sections 4.D through 4.G) shall be enabled by any of the following means, according to the manufacturer’s preference:
- a. Built-in communication technology
 - b. Manufacturer-specific external communication module(s) and/or device(s)
 - c. Open standards-based communication port on the appliance combined with open standards-based communications module
 - d. Open standards-based communication port(s) on the appliance in addition to a, b or c, above

If option b or c is used, the communication module/device(s) must be easy for a consumer to install and shipped with the appliance, provided to the consumer at the time of sale, or provided to the consumer in a reasonable amount of time after the sale.

C. Open Access

To enable interconnection with the product, in addition to section 4.B.1 that requires open-standards, an interface specification, API or similar documentation shall be made available to interested parties that at a minimum, allows transmission, reception and interpretation of the following information:

- Energy Consumption Reporting specified in section 4.D (must include accuracy, units and measurement interval);
- Operational Status, User Settings & Messages specified in section 4.F (if transmitted via a communication link);
- Demand Response specified in section 4.G.

D. Energy Consumption Reporting

In order to enable simple, actionable energy use feedback to consumers and consumer authorized energy use reporting to 3rd parties, the product shall be capable of transmitting energy consumption data via a communication link to energy management systems and other consumer authorized devices, services, or applications. This data shall be representative of the product’s interval energy consumption. It is recommended that data be reported in watt-hours for intervals of 15 minutes or less, however, representative data may also be reported in alternate units and intervals as specified in the product manufacturer’s interface specification or API detailed in section 4.C.

The product may also provide energy use feedback to the consumer on the product itself. On-product feedback, if provided, may be in units and format chosen by the manufacturer (e.g., \$/month).

E. Remote Management

The product shall be capable of receiving and responding to consumer authorized remote requests (*not including third-party remote management which may be made available solely at the discretion of the manufacturer*), via a communication link, similar to consumer controllable functions on the product. The product is not required to respond to remote requests that would compromise performance and/or product safety as determined by the product manufacturer.

F. Operational Status, User Settings & Messages

1. The product shall be capable of providing the following information to energy management systems and other consumer authorized devices, services or applications via a communication link:
 - Operational / Demand Response status (for example: off, standby, cycle in process, delay appliance load, temporary appliance load reduction).
2. The product shall be capable of providing the following information on the product and/or to energy management systems and other consumer authorized devices, services or applications via communication link:
 - At least two types of messages relevant to the energy consumption of the product. For example, messages for clothes dryers might address performance issue such as a clogged lint filter or report of energy consumption that is outside the product's normal range.

G. Demand Response

The product shall have the capability to receive, interpret and act upon consumer-authorized signals by automatically adjusting its operation depending on both the signal's contents and settings from consumers. At a minimum, the product shall be capable of providing the following for all cycle and setting combinations:

1. *Delay Appliance Load Capability*: The capability of the product to respond to a signal in accordance with consumer settings, except as permitted below, by delaying the start of an operating cycle beyond the delay period.
 - a. Default settings –The product shall ship with default settings that enable a response in accordance with 4.G.1 for at least 3 hours.
 - b. Consumer override – The consumer shall be able to override the product's Delay Appliance Load response before or during a delay period.
 - c. The product shall be able to provide at least one Delay Appliance Load response per consumer initiated operating cycle, but is not required to provide more than three Delay Appliance Load responses in a rolling 24-hour period.
2. *Temporary Appliance Load Reduction Capability*: The capability of the product to respond to a signal by providing load reduction for a short time period, typically 10 minutes. Upon receipt of signal and in accordance with consumer settings, except as permitted below, the product shall restrict its average power draw during the load reduction period to no more than 20% relative to the baseline average power draw defined in the ENERGY STAR Clothes Dryer Test Method to Validate Demand Response.
 - a. Default settings - The product shall ship with default settings that enable a response in accordance with 4.G.2 for a time period of at least 10 minutes.
 - b. Consumer override – The consumer shall be able to override the product's Temporary Appliance Load Reduction response before or during a load reduction period.
 - c. The product shall be able to provide at least one Temporary Appliance Load Reduction response during each consumer initiated operating cycle.

H. Information to Consumers

If additional modules, devices, services and/or infrastructure are part of the configuration required to activate the product's communications capabilities, prominent labels or other forms of consumer notifications with instructions shall be displayed at the point of purchase and in the product literature. These shall provide specific information on what consumers must do to activate these capabilities (e.g.

“This product has Wi-Fi capability and requires Internet connectivity and a wireless router to enable interconnection with an Energy Management System, and/or with other external devices, systems or applications.”).

5) Test Requirements:

- A. One of the following sampling plans shall be used to test energy performance for qualification to ENERGY STAR:
 - 1. A representative unit shall be selected for testing based on the definition for Basic Model provided in Section 1 above; or
 - 2. Units shall be selected for CEF testing per the sampling requirements defined in 10 CFR § 429.21, which references 10 CFR § 429.11.
- B. When testing the energy efficiency of clothes dryers, the following test method shall be used to determining ENERGY STAR qualification:

Table 3: Test Method for ENERGY STAR Certification

	ENERGY STAR Requirement	Test Method Reference
Clothes Dryers	CEF	10 CFR 430, Subpart B, Appendix D2 ¹

¹ And in accordance with any applicable DOE issued test procedure guidance, listed here: <http://www1.eere.energy.gov/guidance/default.aspx?pid=2&spid=1>

- C. The length of the drying cycle shall be determined, as required by Section 3.B, by measuring the test cycle time, t, for the drying test cycle specified in sections 3.3.1 and 3.3.2 of Appendix D2 for timer dryers and automatic termination control dryers, respectively, using a timer accurate to within 2 seconds.

For timer dryers, the following correction shall be applied to determine the drying cycle time:

$$t_{dry} = [55.5 / (W_w - W_d)] \times t$$

Where:

W_w = the moisture content of the wet test load as recorded in section 3.4.2 of 10 CFR 430, subpart B, appendix D2.

W_d = the moisture content of the dry test load as recorded in section 3.4.3 of 10 CFR 430, subpart B, appendix D2.

t = the measured test cycle time.

For automatic termination dryers, the drying cycle time equals the test cycle time.

- D. Compliance with connected functionality, as specified in Section 4, shall be through examination of product and/or product documentation. In addition, demand response functionality shall be certified using the ENERGY STAR Clothes Dryers Test Method to Validate Demand Response (Ref TBD) in order to be eligible for the connected allowance.

6) Effective Date: The ENERGY STAR Clothes Dryer specification shall take effect on **January 1, 2015**. Any product model with a date of manufacture on or after this date shall meet this specification to earn the ENERGY STAR. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

7) Future Specification Revisions: EPA reserves the right to change the specification should federal requirements, 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.