



ENERGY STAR® Resources for Utilities, States, and Municipalities Exploring Beneficial Electrification

November 2020

To be Beneficial it Needs to be Efficient

Utilities, states, and municipalities are increasingly exploring beneficial electrification as a strategy for achieving environmental goals. Since electrification will increase electric load and capacity needs, to be beneficial, it is important to mitigate those increases by improving the energy efficiency of buildings, industry, and transportation and to ensure that the replacement electric technologies are energy efficient.

ENERGY STAR designates energy efficient electric options in more than 75 electric product categories, and provides simple, credible information that consumers and businesses rely on to make unbiased decisions. Importantly, before a product can carry the ENERGY STAR label, it must be [third-party certified](#), based on testing in an EPA-recognized laboratory and reviewed by an EPA-recognized certification body.

Leveraging ENERGY STAR certification and using the ENERGY STAR label to market related opportunities is particularly valuable when trying to influence suppliers and consumers.

- ENERGY STAR is widely recognized as the simple choice for energy efficiency. More than ninety percent of households recognize the blue label according to a [recent report](#) (PDF, 2.3 MB).
- Most U.S. households also recognize and understand the intent of the ENERGY STAR label. Each year a substantial portion of U.S. households knowingly purchase at least one ENERGY STAR certified product and report being influenced by the label to do so.
- ENERGY STAR has a long history of working collaboratively with efficiency program administrators, manufacturers, and suppliers to advance energy efficiency [program design best practices](#).

The sections below provide information about the most pursued electrification opportunities and related ENERGY STAR resources to help ensure efficiency. End uses typically being considered for beneficial electrification include the following:

- Transportation
- Heating
- Water heating
- Cooking, clothes drying, and miscellaneous end uses
- Commercial cooking

Also covered are connected features and functions that can be leveraged to better match demand and supply.

ENERGY STAR® Resources for Utilities, States, and Municipalities

Exploring Beneficial Electrification

Transportation

The U.S. transportation sector consumes about 28,000 trillion Btu of energy each year.¹ Petroleum products such as gasoline account for about 91% of the total sector energy use.² By mode of transportation, more than half (54.5%) of transportation energy consumption comes from cars, small trucks, SUVs, and motorcycles.³

ENERGY STAR provides the following relevant resources:

- Specifications for ENERGY STAR certified electric vehicle charging systems. The program currently [has criteria for Level 1 \(120v\) and Level 2 \(240 volt\) chargers](#) and is in the process of [developing](#) criteria to add a certification pathway for DC fast chargers. Utilities, states, and municipalities are encouraged to specify ENERGY STAR when purchasing and/or providing incentives for electric vehicle chargers. Among other things ENERGY STAR products require safety certification and open communications standards for network connected chargers.
- The [ENERGY STAR website](#) has content devoted to electric vehicles and chargers providing a one-stop shop for consumers and others to:
 - Find ENERGY STAR certified electric vehicle chargers
 - Research electric vehicles, including [EPA Smartway certified vehicles](#)
 - Find incentives
 - Locate charging stations across the country
 - Use EPA’s calculator to quantify carbon dioxide emission reductions from switching to an EV
 - Review guidance for building an “EV Ready” home
 - Review guidance for commercial building operators on tips for installing EV chargers

Heating

More than half of U.S homes are heated by direct combustion of fossil fuels, with higher proportions in colder climates. According to the EIA Residential Energy Consumption Survey (RECS), about 2,678 billion cubic feet of natural gas; 2,549 million gallons of propane; and 2,891 million gallons of fuel oil/kerosene are used annually to heat U.S. homes.⁴

¹ https://www.eia.gov/totalenergy/data/monthly/pdf/sec2_3.pdf

² <https://www.eia.gov/energyexplained/use-of-energy/transportation.php>

³ <https://www.eia.gov/energyexplained/use-of-energy/transportation-in-depth.php>

⁴ <https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce4.1.pdf>

ENERGY STAR® Resources for Utilities, States, and Municipalities

Exploring Beneficial Electrification

ENERGY STAR provides the following relevant resources:

- Specifications for ENERGY STAR certified residential [air source heat pumps \(ASHPs\)](#) including ducted and ductless models, as well as [geothermal heat pumps](#). The program is in the process of [revising ASHP criteria](#), which will, among other things, include separate requirements for moderate and warm climates and cold climates, and define optional connected criteria for manufacturers wishing to certify models capable of demand response. [Air-to-water heat pumps](#) that meet EPA performance criteria are eligible for recognition through the ENERGY STAR Emerging Technology Award.
- Key consumer tools including the following:
 - [ENERGY STAR product finder](#)
 - [Savings calculator](#)
 - [Heating and cooling guide](#)
 - [Air source heat pump fact sheet](#)
 - [Mini split heat pump fact sheet](#)

Heat pumps are emerging as a focal technology in areas prioritizing beneficial electrification. For heating and cooling, heat pumps have been a popular technology in mild climates for decades. Recent advances in heat pump technologies enable heat pumps to become a viable option in cold climates as well.

Water Heating

After space heating and cooling, water heating is the second largest energy end use in the home and the second largest source of direct combustion. According to RECS, about 1,019 billion cubic feet of natural gas, 835 million gallons of propane, and 432 million gallons of fuel oil/kerosene are used annually to heat water in U.S. homes.⁵

ENERGY STAR provides the following relevant resources:

- Specifications for [ENERGY STAR certified electric water heaters](#), often referred to as heat pump or hybrid water heaters. The program is in the process of [revising the specification](#)⁶ to further increase efficiency and energy savings and to define criteria for optional connected functionality.

⁵ Ibid

⁶ The scope of the revision includes both electric and gas water heating.

ENERGY STAR® Resources for Utilities, States, and Municipalities

Exploring Beneficial Electrification

- Key consumer tools including the following:
 - [ENERGY STAR product finder](#)
 - [Installer finder](#)
 - [Water heater replacement guide](#)
 - [Annual ENERGY STAR water heater promotion](#)

Cooking, Clothes Drying and Other Miscellaneous End Uses

Beyond space and water heating, other sources of direct fossil fuel combustion in homes account for annual consumption of 266 billion cubic feet of natural gas, 567 million gallons of propane, and 57 million gallons of fuel oil or kerosene.⁷

Pool and Hot Tub Heaters

When present, gas home pool heaters are the largest miscellaneous consumer of natural gas, consuming on average 10.09 million Btu per household per year, followed by hot tub heaters, which consume on average 3.41 million per household per year.⁸ While ENERGY STAR does not certify these product categories, the U.S. Department of Energy provides information on [heat pump swimming pool heaters](#). Importantly, [ENERGY STAR certified pool pumps](#), which can be programmed to match the pool operation, can be an important part of ensuring system efficiency.

Cooking

Homes that rely on direct combustion of fuel for cooking consume on average 2.90 million Btu per year of natural gas or 3.13 million Btu of propane, depending on fuel source.⁹ Electric cooktops, particularly [induction cooktops](#), are approximately 2 to 2.5 times more efficient than gas cooktops.¹⁰ EPA began scoping this product category for potential ENERGY STAR criteria development and will resume scoping efforts, pending a revised DOE test procedure.¹¹

Clothes Drying

Nationally, about 20% of clothes dryers use natural gas, but in homes with natural gas as their main space heating fuel, that percentage increases to 34%.¹² Homes that rely on direct combustion for clothes drying, consume on average 2.08 million Btu of natural gas or 2.36

⁷ <https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce4.1.pdf>

⁸ <https://www.eia.gov/consumption/residential/data/2015/c&e/pdf/ce5.4.pdf>

⁹ Ibid.

¹⁰ [Residential Cooktop Performance and Energy Comparison Study](#), Table 4, Energy Efficiency Results. Conducted by Frontier Energy on behalf of the Sacramento Municipal Utility District.

¹¹ DOE withdrew its residential cooktop test procedure method in September 2020.

¹² <https://www.eia.gov/todayinenergy/detail.php?id=18131>

ENERGY STAR® Resources for Utilities, States, and Municipalities

Exploring Beneficial Electrification

million Btu of propane per year, depending on fuel source.¹³ Although clothes dryers may only be run a few times a week, when they do run, they can use a lot of energy potentially during unwanted peak load times, making efficiency a particularly important feature when electrifying this load.

ENERGY STAR provides the following relevant resources:

- Specifications for [ENERGY STAR certified electric clothes dryers](#), including electric dryers that use heat pump technology. The program also certifies [clothes washers](#), which provide efficient washing and contribute to efficient drying by removing excess water.
- Key consumer tools including the following:
 - ENERGY STAR Product and Incentive Finders
 - Buying guidance
 - [Annual ENERGY STAR laundry promotion](#)

Commercial Cooking

Buildings that are used primarily for food service, consume 222 billion cubic feet of natural gas per year, 67% of that consumption comes from cooking. According to EIA analysis of the building sector, the natural gas energy intensity for cooking in these buildings (117.6),¹⁴ surpasses that of all other end uses and primary building activities.¹⁵

ENERGY STAR provides the following relevant resources:

- [Specifications](#) for ENERGY STAR certified electric fryers, steam cookers, ovens, griddles, and hot food holding cabinets. In addition, EPA will soon release a discussion guide to explore criteria development for commercial cooktops. The program also provides criteria for other commercial kitchen appliances including dishwashers, refrigerators and freezers, ice makers and coffee brewers to make an all-electric kitchen as efficient as possible.

¹³ Ibid.

¹⁴ Natural gas energy intensity is the natural gas consumption for the end use divided by the floorspace in buildings that use natural gas for that particular end use.

¹⁵ <https://www.eia.gov/consumption/commercial/data/2012/c&e/pdf/e8.pdf>

ENERGY STAR® Resources for Utilities, States, and Municipalities

Exploring Beneficial Electrification

- [Key consumer tools](#) include the following:
 - ENERGY STAR product finders that can be sorted by fuel source
 - Commercial Food Service dealer and distributor finder
 - Rebate finder
 - Calculators
 - Fact sheets on energy and cost savings
 - ENERGY STAR guide for cafes, restaurants, and commercial kitchens
 - A Commercial Food Service program design guide

Connected Functionality

To meet their greenhouse gas emissions reduction goals, state and local governments are pursuing a combination of efficiency, beneficial electrification, and increased electricity generation from renewable resources. The intermittency of solar and wind resources requires new strategies to better balance demand and supply. Current strategies include introducing time-based rates that reward consumers for using or not using energy during specified periods and shifting or curtailing consumption when needed through demand response. Both strategies can be better enabled by connected functionality, which allows devices to be connected to smart phones, smart hubs, and/or utility operations.

ENERGY STAR defines optional connected functionality in 11 product categories and mandatory connected functionality for ENERGY STAR certified smart thermostats, and is in the process of defining optional connected functionality for several large loads. The program also provides a certification pathway for Smart Home Energy Management Systems (SHEMS).

While all ENERGY STAR connected criteria share the common goal of encouraging interoperability, lowering energy use, and protecting consumer interests, the major drivers or use cases for connectivity can differ by product category, and are related to the strategies above. For example,

- For major white good appliances that consumers interact with daily, connected- or smart features are currently driven by consumer amenity and enhanced energy management, such as scheduling clothes drying for convenience or to respond to time-based rates.
- For large loads, the use case for connectivity is driven by the need for utility control of certain functions such as shifting heating of the hot water tank (without negatively affecting hot water availability) to better manage demand to available renewable energy supply.

ENERGY STAR provides the following relevant resources:

ENERGY STAR® Resources for Utilities, States, and Municipalities Exploring Beneficial Electrification

- Specifications defining optional connected functionality in 11 product categories and mandatory connected functionality for ENERGY STAR certified smart thermostats, and criteria for certification of [Smart Home Energy Management Systems](#). EPA also is in the process of developing optional connected criteria for heat pump water heaters, heating and cooling systems, and revising connected functionality for electric vehicle charging systems. Connected functionality is defined in the most recent version of each specification. Existing criteria and revisions in progress can be accessed through the [ENERGY STAR specification search tool](#).
- Key consumer tools include the following:
 - A web portal devoted to [ENERGY STAR Connected Functionality](#)
 - ENERGY STAR product finders that can be filtered for products with connected features
 - Rebate finder
 - Consumer education such as ask the expert post, [“Does the Time of Day I Use My Appliance Matter?”](#)