ENERGY STAR® Commercial Electric Cooktops Version 1.0 Discussion Guide February 2021

The U.S. Environmental Protection Agency (EPA) is launching the development of an ENERGY STAR® specification for commercial electric cooktops. This discussion guide provides background on the ENERGY STAR program, outlines EPA's reasoning for adding this category to the ENERGY STAR portfolio, and seeks stakeholder feedback on topics such as scope, testing, and criteria.

Background

ENERGY STAR is the government-backed symbol for energy efficiency, providing simple, credible, and unbiased information that businesses and consumers rely on to make well-informed decisions. ENERGY STAR is an influential brand that is recognized by over 90% of Americans nationwide. More than **800** utilities, state and local governments, and nonprofits leverage ENERGY STAR in their efficiency programs in 2018.

ENERGY STAR partners have over **70,000** certified product models across more than 75 product categories, including nine commercial food service (CFS) products. (A complete list of ENERGY STAR products can be found at www.energystar.gov). Americans purchased more than **300 million** ENERGY STAR certified products and more than 300 million ENERGY STAR certified light bulbs in 2018. Products that earn the ENERGY STAR prevent greenhouse gas emissions by meeting strict energy efficiency guidelines.

Manufacturers that qualify their products to meet ENERGY STAR requirements may use the label as a tool to educate their customers about the enhanced value of these products. The ENERGY STAR program benefits partners by benefitting their customers. The program is designed to encourage the manufacture, purchase, and use of energy efficient products to help protect the environment. In 2018 alone, ENERGY STAR and its partners helped Americans save nearly 430 billion kilowatt-hours of electricity and avoid **$35 billion** in energy costs, with associated emission reductions of 330 million metric tons of greenhouse gases, 220,000 short tons of sulfur dioxide, 210,000 short tons of nitrogen oxides, and 23,000 short tons of fine particulate matter (PM2.5).

Consistent with the program's commitment to helping businesses and consumers save money and reduce their environmental impact, EPA seeks to expand the ENERGY STAR program as new opportunities arise. EPA recently evaluated commercial electric cooktops as a potential product category for inclusion in the ENERGY STAR program. To develop an ENERGY STAR specification, EPA relies on a systematic process that prioritizes transparency, inclusiveness, and consistency. Decisions regarding ENERGY STAR specifications are made by EPA with the benefit of stakeholder input consistent with the ENERGY STAR Strategic Vision and Guiding Principles such that the ENERGY STAR label identifies products that meet the highest energy conservation standards.

Key elements for the development of this specification include the following:

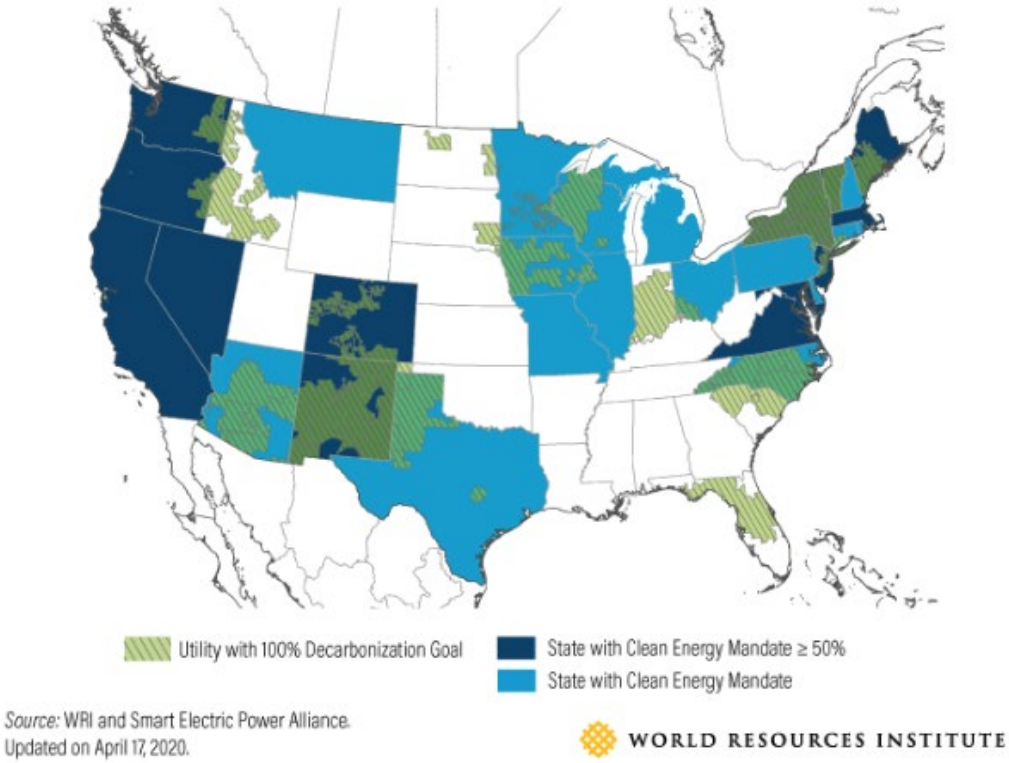
- Scope of category, definitions and most popular electric cooktop configurations
- Energy efficiency testing of electric cooktops
- How to best measure and evaluate the quality and energy performance of electric cooktops

Stakeholder engagement is key to the success of the ENERGY STAR program and to the product specification development process. As such, EPA looks forward to working closely with stakeholders to develop the ENERGY STAR commercial electric cooktops specification.

Interest in Efficient Electric Cooktops

EPA recognizes a growing interest in reducing the carbon footprint across various parts of the country. Many U.S. states are enacting legislation of some level of clean-energy or carbon-reduction goals over the coming decades (see Figure 1).[1]

Figure 1. U.S. States with Clean Electricity Mandates and Utilities with Decarbonization Goals, 2019



To achieve these energy and environmental goals, utilities, states, and municipalities are increasingly exploring a strategy of beneficial electrification. Because 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.

To encourage the shifts, utilities are encouraging operators with financial incentives. Sacramento Municipal Utility District (SMUD), for example, is currently offering a "Go Electric Business Incentive" for commercial food service operations' conversion from natural-gas cooking equipment to induction cooktops/ranges. The incentive is $450 per hob with technical requirements (replacing a minimum of two hobs and 3.5 kW and 208 V minimum per hob)[2]. In addition, SMUD is offering a $2,500 bonus for those who convert to all-electric kitchens. On the residential side, builders of new houses get a $5,000 rebate if they do not include any gas equipment in the house.[3] Meanwhile, the Council of the City of Berkeley, CA

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[1] Byrd L., and Clevenger T. 2019. *2019 Was a Watershed Year for Clean Energy Commitments from U.S. States and Utilities.* December 20, 2019. https://www.wri.org/blog/2019/12/2019-was-watershed-year-clean-energy-commitments-us-states-and-utilities

[2] Sacramento Municipal Utility District (SMUD). 2020. Express Energy Solutions (EES) Procedures Manual and Rebates. https://www.smud.org/-/media/Documents/Business-Solutions-and-Rebates/EES-Procedure-Manual.ashx

[3] Lloyd A. 2018, October 11. *California utility offers rebates and incentives for going all-electric.* https://www.treehugger.com/fossil-fuels/california-utility-offers-rebates-and-incentives-going-all-electric-smud.html

has put forth an ordinance prohibiting natural gas infrastructure in new buildings effective January 1, 2020.[4]

EPA is aware that cooktops, among other cooking equipment, have shown sales growth in recent years and expects that trend to continue after the current COVID-19 pandemic is under control. According to a 2018 North American Association of Food Equipment Manufacturers (NAFEM) Study[5], which gathers revenue data but not unit-shipment data, 83% of NAFEM members reporting in the primary cooking equipment market anticipated product-category sales to increase in 2018. From 2007 to 2017, NAFEM estimated U.S. manufacturers' global primary cooking equipment market grew by 68%, to $2.9 billion. In 2017, ranges made up 7% of that volume[6] with sales estimated at $181 million, while induction cooktops - a subset of ranges – made up 6.6%, or $12 million.[7] NAFEM data and stakeholder feedback suggests steady growth of induction cooktops in the market since 2009.

Induction cooktops in particular have vast potential for energy efficiency - up to 90%.[8] That higher efficiency means less waste heat, which means less ambient heat gain into the workspace. This likely translates into less air-conditioning load during the warmer months, though as of now the EPA is not aware of any data that quantify that impact on air conditioning in commercial kitchen settings. However, Frontier Energy Inc[9] found significant reductions in waste heat and required ventilation energy in electric, particularly induction, cooktops. Similarly, capture and containment (C&C) rates of kitchen ventilation equipment were reduced with induction ranges.

In addition, Frontier Energy Inc conducted a study[10] replacing an electric hotplate with an induction hotplate in a small restaurant. They concluded that the energy use was reduced by 59% and estimated annual U.S. dollar energy savings was about $600. EPA recognizes that there is likely efficiency potential associated with gas equipment as well and the Agency will analyze the potential benefit of covering gas cooktops at a future date as the federal policy landscape with respect to electrification becomes clearer.

Furthermore, induction cooktop use results in improvements in several non-energy related benefits:

- **User safety**: Induction cooktops work by heating the cookware rather than the cooktop, reducing the risk of burns, and many have sensors to automatically shut off when they detect metallic objects smaller than a pot or pan on the surface.
- **Cooking precision**[11]: Induction cooktops allow very specific temperature controls and faster cooking times, heat up, and cool down than other types of cooktops. Induction has a faster temperature response rate which encompasses both response time and precision to temperature change. Induction directly heats the pan eliminating residual energy in the cooktop surface, which allows for the unit to quickly respond to change with almost no temperature overshoot.

EPA understands that there may be indoor air quality improvements too with induction cooktops and is gathering more data. EPA requests input on these and any additional ancillary benefits for consideration before the ENERGY STAR commercial electric cooktops product specification is developed.

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[4] Ordinance NO.7,672-N.S. 2020, January 1.
https://www.cityofberkeley.info/recordsonline/api/Document/AUoJRvFLlg6Wu1VBOu4N307VwALzPV%C3%81odACgIFcrndn24omprWFfHnWoZe7zVcpSqRy81J92GmyxWq%C3%89DJBwJyaw%3D/

[5] North American Association (NAFEM). 2018. Size and Shape of the Industry Study (pp. 16)

[6] North American Association (NAFEM). 2018. Size and Shape of the Industry Study (pp. 16-17)

[7] North American Association (NAFEM). 2018. Size and Shape of the Industry Study (pp. 34)

[8] Sweeney M., Dols J., Fortenbery B., Sharp F. (Electric Power Research Institute (EPRI)). 2014. *Induction Cooking Technology Design and Assessment*. American Council for Energy-Efficient Economy.
https://www.aceee.org/files/proceedings/2014/data/papers/9-702.pdf

[9] Young, R. 2019, July 25. *Cool it: How to Create More Comfortable Kitchens*. Frontier Energy.
https://caenergywise.com/seminars/2019/

[10] Young, R. 2019, July 25. *Cool it: How to Create More Comfortable Kitchens*. Frontier Energy.
https://caenergywise.com/seminars/2019/

[11] Food Service Technology Center (FSTC). *Induction Cooktop Analysis*. Boil test performed (at 170^{0}F to 200^{0}F) with various induction units resulted in heat-up time averages of 37.0 minutes (120V) and 16.1 minutes (208V). Preheat times for the sauté test (pan to 375^{0}F) were 1.46 minutes (120V) and 1.14 minutes (208V).

Scope

EPA is working to determine how the class of electric cooktops to be covered by the new ENERGY STAR specification should be defined. ASTM defines ranges/cooktops as, "*a device for cooking food by direct or indirect heat transfer from one or more cooking units to one or more cooking containers*."[12] EPA intends to offer ENERGY STAR certification to the most energy efficient commercial electric cooktops. Within this category, there are many possible configurations and models of cooktops. There are portable models and built-ins, different numbers of hobs, and specialized shapes, such as those designed for cooking with woks.[13] In order to refine the scope to the highest-selling and highest-growth product types stakeholders are encouraged to provide feedback on the following.

1. What are the most popular configurations of electric cooktops and which types are growing most rapidly in popularity, and why?
2. What products should be explicitly excluded or included in an ENERGY STAR electric cooktop specification? Products for consideration may include woks and plenches, for example, unless the referenced test procedure could not be effectively applied. Griddles would be excluded since an ENERGY STAR specification already exists for that category. Are there other cooktop categories that should be considered for scope expansion? Is further classification needed for the cooktop category, such as table or countertop, floor standing, and drop-in?
3. Are there relevant warming or holding applications that are an offshoot of cooktops that should be further considered, such as holding equipment? For example, soup wells or bain-maries. If not, is there a clear distinction that should be made between cooking and warming/holding equipment?
4. In cases where additional sought after features that impact energy use are included in products, EPA will consider offering an energy adder reflective of best implementation of that feature. Are such features common with cooktops? What data are available to demonstrate the energy use of this feature?
5. EPA is interested in developing educational material that includes estimates of savings associated with other aspects of efficient electric cooktops such as HVAC savings or a decrease in labor costs with respect to cleaning. Do stakeholders have data to demonstrate savings from such aspects or others?

Testing Methodology

Testing centers such as Frontier Energy's Food Service Technology Center test cooktops with ASTM method F1521 (*Standard Test Methods for Performance of Range Tops*). Currently, the test method includes a water boil test, but ASTM is revising it to potentially add sauté and simmer testing as well as modifying definitions and tightening language to reduce repeatability concerns. Based on the current trajectory, it is likely that the newly revised method will be balloted in 2021.

EPA has reviewed the preliminary test results outlined in the *Induction Cooktop Analysis Report* that was completed by Frontier Energy, Inc. as part of the California Energy Commission's Public Interest Energy Research (CEC-PIER) through the Electric Program Investment Charge (EPIC). These performance data based on the current ASTM F1521 test method are considered viable for the purposes of setting criteria for the water boil parameter, but additional data are requested.

Furthermore, once data become available from the sauté and simmer testing, the EPA would consider setting criteria for these parameters as well. In the interim, EPA may propose reporting criteria for the

[12] ASTM F1521-12. 2018. *Standard Test Methods for Performance of Range Tops*.
[13] CookTek. *Induction Cooking.* Retrieved from https://cooktek.com/product-category/induction-cooking/

purpose of aggregating data that may support these parameters in the future or otherwise guide development of the specification over time.

1. Are there comments or concerns for using the ASTM F1521 test method?
2. Would the three efficiency tests be appropriate for all electric cooktops within scope?
3. Do manufacturers or other stakeholders have specific data reports or numbers that are publicly or otherwise available for consideration?

Criteria

The ENERGY STAR program promises operators energy savings without sacrificing quality or performance. In this case, that means ENERGY STAR certified equipment uses less energy than conventional cooktops while achieving equivalent or better cooking performance and durability. EPA seeks to ensure that cooktops certified under this new specification meet those requirements by satisfying two main criteria:

- **Energy Efficiency**: EPA proposes to adopt the most recently revised ASTM standard test method F1521 (*Standard Test Methods for Performance of Range Tops*) and implement requirements for the three efficiency tests (boil, sauté, and simmer).
    1. For purposes of defining energy efficiency rates, how should the three tests (boil, sauté, and simmer) be weighted?
        - Should all three tests be considered in an overall evaluation, an average of the three scores?
        - Should the boil test serve as the efficiency level with additional reporting requirements for the sauté and simmer tests?
        - Should all three tests have separate efficiency levels?
    2. Are there other methods of evaluation to determine certification criteria?
    3. How does energy efficiency vary among electric cooktop models? EPA is interested in assembling and reviewing additional energy performance data to better understand potential annual savings.

- **Lifecycle/Life Expectancy:** As in other categories of equipment, electric cooktop longevity estimates vary with use pattern, maintenance, and product design. Especially in the case of induction cooktops, that variability might be perceived by the market as a barrier to novel technology adoption. At the same time, life expectancy also is a factor in offering cost-effective financial incentives for adopting newer and more sophisticated technologies such as induction. For these reasons, EPA seeks input on lifecycle/life expectancy on typical commercial induction cooktops and similar information related to maintenance/repair on significant components such as fans, copper coils, electronics, control membranes, knobs, and other relevant components.
    1. Are there specific hardware or controls factors in electric cooktops in general or in induction cooktops specifically that ensure durability that could be included as ENERGY STAR criteria in defining the ENERGY STAR scope?
    2. Are there particular design elements or features that indicate a more durable electric cooktop?
    3. Are there any emerging technologies or features that may impact the efficiency or quality of electric cooktops?
    4. What other metrics could EPA use to measure a standard of quality among electric cooktops?
    5. What is the typical serviceable life of a commercial conventional electric cooktop? For an induction cooktop?

6. What is the typical serviceable life of fans for induction cooktops? What is the typical serviceable life for copper coils, electronics, control-panel membranes, knobs, and other relevant components in induction cooktops?

Data Assembly

Recognizing revisions to ASTM F1521 are not yet final, as part of the data assembly effort, EPA is interested in reviewing any additional preliminary energy performance data that could help inform the potential energy savings analysis comparing baseline and high-performance models that would be considered for this category. The Agency reviewed existing research and conducted extensive stakeholder outreach efforts in the development process of this discussion guide. Following is a list of some key resources, in addition to various other documents, cited throughout this discussion guide. Note, this is not an exhaustive list and does not include stakeholder outreach:

- NAFEM (2018) *Size and Shape of the Industry Study*
- Electric Power Research Institute (2014) *Induction Cooking Technology Design and Assessment*
- Frontier Energy Webinar (2019) *Cool it: How to Create More Comfortable Kitchens*
- ASTM F1521-12 (2018) *Standard Test Methods for Performance of Range Tops*

1. Are there any additional available studies or reports beyond what is mentioned above and/or cited throughout this discussion guide that EPA should review that would be useful in the development of energy performance criteria for a Draft 1 specification and savings analysis?
2. Are there any available studies or reports beyond what is mentioned above and/or cited throughout this discussion guide that EPA should review that would be useful to better understand the commercial cooktop U.S. market?

The Agency welcomes any additional input that is not included within this discussion guide to further assist in the development of the specification development process for this new category.

Next Steps

EPA intends to host a webinar to further discuss outstanding questions, input, and issues outlined within and in response to this discussion document and other information related to the commercial cooktop category.

Comments regarding commercial electric cooktops and other relevant categories of commercial electric cooktops that fall within the scope of the Agency's goal of recognizing the energy efficient opportunities within the category will be considered.

Additional commercial cooktop performance data is welcomed and appreciated. The Agency strongly encourages manufacturer and other stakeholder feedback during this ENERGY STAR specification development process.

Tentative Timeline

- Discussion Guide: February 2021
- Stakeholder Webinar & Comment Deadline: March & April 2021
- Draft 1 Version 1.0 and Webinar: June 2021
- Draft 2 Version 1.0: September 2021
- Final Draft: December 2021
- Final: February 2022

EPA will host a webinar on Wednesday, March 17, 2021, to discuss the key elements outlined in this discussion guide to help inform the Draft 1 Version 1.0 specification. Please send any written comments,

energy performance data, market data and/or any additional information to CFS@energystar.gov no later than Wednesday, April 7, 2021. If you have any questions, please feel free to contact Tanja Crk, EPA, at Crk.Tanja@epa.gov or (202) 566-1037 and Brian Ward, ICF, at Brian.Ward@icf.com or (224) 622-4068.