Promoting induction cooking to support residential efficiency and decarbonization

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Key takeaways

- Induction cooktops and ranges can serve as key electrification technologies when they replace gas units. When they replace electric units, they're effective efficiency measures with appealing non-energy benefits.
- Just a few utilities offer incentives for induction cooktops, but that's poised to change as utilities focus more on decarbonization and as the ENERGY STAR program supports the technology.
- Existing program strategies like midstream and upstream programs, bulk buys, trade ally training, and product demonstrations can help promote induction cooktops.

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Electric and dual-fuel utilities face two key challenges: finding new energy-efficiency measures for their demand-side management (DSM) portfolios and incorporating beneficial electrification into their decarbonization goals and plans to increase revenue. Induction cooking is a proven technology—though largely unknown in the US and Canada—that can help meet both needs. Induction cooktops benefit the customer too: selling points include improved cooking performance, greater safety, and easy cleanup. Although few utility programs currently promote this technology, many existing program models are well suited to support it.

The induction cooktop

Traditional electric cooktops work by running a current through a resistive element to heat up the burner. Induction cooktops don't have these heating elements. Instead, they create an alternating electromagnetic field that heats the pot or pan directly, without actually heating the cooktop. This improves both energy efficiency and cooking performance. In fact, induction cooktops can compete with and even outperform gas burners, based on both delivered heating power and responsiveness and controllability.

When homeowners want to convert space or water heating from gas to electric but hesitate to adopt electric ranges or cooktops—given their reputation for poor cooking performance—induction cooktops are a good solution.

Benefits of induction cooking

Improved energy efficiency

Induction cooktops improve a kitchen's energy efficiency because they substantially reduce the amount of waste heat escaping to the air around the pan or cooking surface. Indirect benefits to efficiency include reduced cooling and ventilation loads, but these vary from kitchen to kitchen.

Typical energy savings for residential induction cooking haven't been clearly established—particularly because a standardized, federally accepted test methodology didn't appear until 2017. But recent studies and estimates suggest a potential energy savings of 5% to 20% over traditional electric cooktops and more than 65% compared to gas cooktops (on the basis of heating efficiency).

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To reduce uncertainty and support this promising technology, the ENERGY STAR program has created a new product category, Residential Induction Cooking Tops, for its 2021 Emerging Technology Award. As savings are more clearly demonstrated and as ENERGY STAR helps promote the technology, it will likely become much easier for utilities to claim deemed savings for these products and incorporate them into their DSM portfolios.

A gas replacement full of non-energy benefits

Beyond the efficiency benefits of induction, the technology is especially likely to shine in residential electrification programs. These kinds of programs face a substantial challenge: cooking is one of the few energy end uses where many customers have a strong emotional attachment to gas, and they often think electric options are inferior. This could make it a sticking point in any efforts to promote whole-home electrification.

In the 2019 E Source DER Residential Customer Market Research, we found that only 21% of US respondents who hadn't already replaced gas appliances with electric (or about 13% of all respondents) would consider replacing gas cooking equipment with electric equipment. The good news is that induction cooktops offer a slew of non-energy benefits that could help overcome customers' hesitations.

Better cooking performance. Induction offers a wide range of power settings, from low power gentle enough for bakers to melt chocolate without a double boiler to high power that can boil water much faster than a comparable gas stove. Unlike traditional electric cooktops that are less responsive to temperature-control changes, induction offers precise and nearly instantaneous temperature control. Induction cooktops can change temperature faster than even gas burners.

Induction is also more predictable. For any one pan, a given temperature setting will always produce the same amount of heat. So there's no need for cooks to guesstimate heat levels by holding a hand over the pan or looking under the pan to judge the size of the flame.

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Increased safety. Because only the pots and pans heat up, the induction cooktop's surface remains much cooler compared to traditional gas or electric cooktops. This reduces the chance of burns. Particularly for families with curious children, that can be a huge benefit. It also reduces the risk of fire when items like wooden spoons, oven mitts, towels, and napkins are left near a burner. Many induction cooktops detect the presence or absence of pans and automatically shut off elements after a pan is removed for an extended period of time.

Recent research has revealed the air-quality hazards that gas cooktops pose due to insufficiently eliminated products of combustion. For example, in a 2020 report from Rocky Mountain Institute, Gas Stoves: Health and Air Quality Impacts and Solutions, researchers found that peak indoor air pollution from gas stoves can reach levels as much as five times higher than the legal outdoor limit. With greater air pollution comes an increased risk of adverse health impacts, such as:

- Asthma and other respiratory symptoms
- Learning deficits in children
- Decreased lung function
- Cardiovascular effects

- Increased susceptibility to allergies

Researchers also found that children and the elderly are particularly susceptible to negative health impacts, and low-income families can be disproportionately affected by poor air quality.

Easy cleanup. Like radiant electric cooktops, induction ranges have a smooth ceramic surface. But unlike radiant tops, they're easy to clean because only the pan heats up, and any food spills or splatter won't cook onto the cooktop surface. Also, the cool surface means the spills won't burn, further reducing airborne particulate matter.

Barriers to growth in the induction-cooktop market

ENERGY STAR estimates the US market share for residential induction cooktops to be 0.64% to 1.7%. Despite the many benefits of induction cooktops, four main barriers have largely prevented the technology from becoming more recognized and widespread in the residential sector.

Lack of awareness

It's not surprising that many customers simply aren't aware that induction cooktops exist. The market share is small, induction cooktops resemble radiant electric cooktops (which offer inferior performance), and marketing for gas cooking is prominent.

Major retailers such as Lowe's and the Home Depot don't often display induction ranges or cooktops in their showrooms—much less offer product demonstrations that could highlight the benefits of induction. Stores don't usually keep the products in stock either. This forces any interested customer to special order the induction appliances.

Home designers and builders are in an ideal position to help customers learn about and adopt exciting yet unfamiliar technologies. But even they are often unaware of induction, making it unlikely that customers will learn about it from trusted experts.

Cost

Full residential induction ranges cost about $1,000 to $6,000. In some retrofit scenarios, homes may need to upgrade the capacity of their electrical panel to support an induction range, which can substantially add to the installation costs. According to 2019 data from the E Source Residential Utility Customer Survey, 26% of US respondents who were somewhat or not at all familiar with induction cooktops but had decided not to purchase one made their decision because of the perception that induction was too expensive. However, while induction appliances certainly are higher priced than introductory-level gas or radiant electric units, they're generally not much more expensive than high-performance gas or dual-fuel units.

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Manufacturers we've spoken to also suggest that, if market share increases, costs for induction ranges and cooktops could decrease with economies of scale. In new home construction, the incremental cost of induction cooking could be partly or fully offset if it eliminates the need to run a natural gas line to the kitchen. Costs would also be offset if using induction means builders can reduce the size of kitchen

ventilation or makeup air systems (particularly in energy-efficient homes that are more airtight). Given all these considerations, it seems likely that utility rebates and thoughtful program design could help remove cost as a major barrier to adoption.

Cookware

Pots and pans must be ferromagnetic to work with induction cooktops. Many stainless-steel, cast-iron, and carbon-steel pans will work well, but 100% copper cookware and certain types of stainless-steel products might not be compatible. To see whether their existing pots and pans could work with a new induction cooktop, customers can try to stick a magnet to the pan's bottom—if it sticks, the pan will work. If not, customers may need to buy new pans. Most flat-bottomed woks work well with induction, and some newer cooktops even offer concave burners to support traditional round-bottomed woks.

Safety for customers with pacemakers

As with almost any device that creates a strong magnetic or electromagnetic field, theoretically, induction cooktops can interfere with implantable cardioverter defibrillators (ICDs) and pacemakers. A general rule of thumb that manufacturers and medical professionals often cite is users should keep their devices 1 to 2 feet away from an induction heating element. While we at E Source aren't medical experts, the available scientific medical papers we're aware of generally suggest that the risk to these kinds of devices from induction cooktops is fairly low. Some studies found no evidence of adverse effects, and others found potential for interference only under worst-case scenarios. For more information, members of the E Source Technology Assessment Service can access our report Do induction cooktops pose a health risk for customers with defibrillators or pacemakers?

Utilities need to be aware of potential risks to customers with these medical devices before promoting an incentive program. For more information about devices that might interfere in some way with ICDs and pacemakers (from hairdryers and power tools to jumper cables and electronic body-fat scales), see a summary on Kaiser Permanente's Pacemaker: Living Well With It web page.

Strategies for promoting induction cooktops

Although induction cooktops haven't made their way into many utility programs yet, it doesn't mean there aren't good ways to promote the technology. Consider the following strategies to boost awareness and adoption of induction technologies.

Use an upstream or midstream program model. Utilities are increasingly offering incentives for certain efficiency measures directly to manufacturers (upstream) or retailers (midstream). Their aim is to increase adoption and overall program cost-effectiveness. By taking a midstream or upstream approach with induction, you can lower the cost barrier while encouraging more products to be stocked, available, and visible to customers.

Midstream programs in particular might help lower prices and encourage retailers to promote them. Stores can include induction products in their showrooms and offer engaging educational materials. Collectively, these steps can address several of the largest market barriers induction cooktops face. And since market penetration is currently very low, utilities won't likely face concerns about free-ridership.

Offer demos to inform customers. According to our conversations with induction manufacturers and innovative utilities, in-person or video demos of induction cooktops are some of the best ways to help customers quickly understand and get excited about induction cooking. Work with retailers, distributors, home designers, and residential trade allies to support demonstrations. And consider offering demo induction hobs (essentially portable cooktops with one or two burners) for free or for rent to let customers experience induction for themselves. Some utilities have bolstered engagement with these lending programs by pairing them with interactive cooking classes that include an aspect of community education.

Do a bulk purchase of induction products. Utilities can make a bulk purchase of induction cooktops that they then sell to residential customers (possibly with an extra rebate added). This tactic can be an effective way to lower costs for customers without depleting a utility's DSM or electrification budget. Some utilities have done bulk purchases with measures such as lighting, smart thermostats, and advanced power strips, so the idea isn't entirely new. But we aren't aware of any utilities that have used this strategy with large appliances or equipment.

Train your trade allies. Trade allies connect directly with your customers and have a unique opportunity to share information about induction cooktops. But they might be unfamiliar with the technology. Many utilities offer training to trade allies and conduct knowledge-based vetting of these partners, so offering education around induction is a natural next step.

Another approach is to expand your home energy audits to focus on elements of safety, indoor air quality, and beneficial electrification, and highlight the benefits of induction cooktops. Partner with local real estate agents to help them learn more about induction cooktops and ranges—and the benefits of energy efficiency in general. Offer specific information that can help them support and educate the homebuyers they work with.

Expand move-in outreach to new homeowners. When families move into a new home, utilities have a unique opportunity to engage them and share information about the utility's DSM and electrification offerings. This is an ideal time to provide helpful information about new appliances that could help the new owners customize their homes, make the homes better suited to their needs, and reduce energy consumption.

Offer induction to income-qualified customers. Low- and moderate-income customers can be disproportionately affected by poor air quality, may not be able to easily upgrade their appliances, and are often looking for ways to better manage their energy bills. As a result, induction cooktops may be a great fit for this customer group if utilities can drive down costs enough. You could even consider offering induction-ready cookware to these customers so they're fully prepared to use the appliances. In cases where this approach results in fuel switching, review your existing electric rate structures to confirm that the new induction appliances won't increase energy bills.

Focus on new construction. In new construction, induction ranges can eliminate the need for home builders to install costly natural gas lines—and let them reduce the size of ventilation and makeup-air systems. At the same time, the builders get a chance to create high-tech and high-performance kitchens. Particularly for single-family homes, the safety and cleanliness benefits of induction cooktops and ranges may be appealing to customers with children.

Utility programs promoting induction cooktops

Few utility programs include residential induction appliances. They're limited to utilities in California that are focused on decarbonization. **Figure 1** summarizes these incentives.

Figure 1: Utility incentive programs for residential induction cooking

Incentives for induction cooking range from $50 (for products offered through a marketplace) to $750 or more for a new induction range.

Administrator	Program	Incentive
Bay Area Regional Energy Network	Home+ Rebates (PDF)	$300 for an induction range that replaces an existing natural gas range or cooktop
Central Coast Community Energy	New Construction Electrification Grant Program	Up to $5,000 per single-family home for all-electric construction
East Bay Community Energy	Get cooking with induction	Up to $15,000 for induction ranges and cooktops for new construction or gas replacement; up to $400 for portable induction hobs
Marin County, California	Electrify Marin—Natural Gas Appliance Replacement Rebate Program	$500 for replacing a natural gas cooktop and oven with induction; $250 for a cooktop-only replacement
Sacramento Municipal Utility District	Residential appliance rebates program	$750 per induction cooktop or range when replacing a gas unit; $100 per unit when replacing an electric cooktop
Silicon Valley Clean Energy	Online Appliances Assistant	$50 for purchasing a single- or double-burner induction hob through the company's online marketplace
Sonoma Clean Power	Advanced Energy Build	Up to $4,500 per unit for high-performance home development

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