

Electrification, Past and Present: Energy and Home Economics

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ABSTRACT

Energy efficiency program administrators are being asked to scale up delivery of home weatherization and electrification to fight climate change. Fuel cost and product amenity have historically interplayed to promote fuel switching and adoption of new household technologies. The rise of utility companies in the early twentieth century occurred at the same time as mass advertising, providing a record of the important energy transition towards fossil fuels and electricity. Utilities and manufacturers provided products and services that fundamentally changed how people labored to provide lighting, heating, cooking, and cleaning. Advertising initially spoke to the “economy,” meaning the labor and money savings provided by these new products and later shifted to focus on convenience and improved services.

Program administrators have a similar challenge today of getting households to adopt new technologies and switch fuels. They have an opportunity to discuss the health, comfort, and convenience of new technologies and fuels relative to conventional versions. For example, they can emphasize how induction cook tops cook faster and improve indoor air quality to move more customers to abandon their gas stoves, versus emphasizing how induction stoves can save customers money and energy.

By exploring how utilities in the early twentieth century effectively marketed energy services, program administrators can consider how to increase adoption of weatherization and electrification in the twenty first century. This paper will discuss what program administrators can learn from the history of residential energy technology adoption.

Introduction

Policy makers in Northeastern states increasingly support switching residential end uses from fossil fuels to electricity through residential energy efficiency programs. The 2022-2024 Three Year Efficiency Plan in Massachusetts is a good example of this trend as it directs Massachusetts program administrators to shift focus from delivering kilowatt hour and therm savings to delivering greenhouse gas reductions. “The plan is designed to increase the number of buildings that are retrofitted and weatherized each year and electrify existing buildings to transition customers away from fossil fuels” (DPU 2022). While energy efficiency program administrators in Massachusetts have been encouraging the “optimization” of heating by incentivizing customers who heat with oil and propane to shift to electric heat pumps since 2018 (Berg et. al. 2021), the new plan supports incentives for shifting from natural gas to electric heat pumps for the first time (Noor 2022). Connecticut, Maine, New Hampshire, New York, Rhode Island, and Vermont also all have policies and programs designed to encourage residents to switch their heating load from fossil fuels to electric heat pumps (VEIC 2018). This may be due to the large proportion of homes that heat with delivered fuels such as oil and propane. In the Northeast, 23% of homes heat with oil or propane compared to 8% nationwide or 9% in the Midwest (EIA 2021). Municipal utilities in California and the Northwest Energy Efficiency

Alliance (NEEA) are also promoting heating conversions to electric heat pumps, and in all these cases regulators have changed the rules to allow energy efficiency programs to promote fuel switching (Nadel 2018). This type of program is currently regional, but it is possible that other regions could soon see similar shifts in policy.

Such shifts may reflect underlying shifts in technology. Nye (2019) compares the current transition to “alternative energies” (by which he means solar and wind generation of electricity) to the adoption of electricity as a fuel in the nineteenth and early twentieth centuries (Table 1). Nye identifies the need to reduce customer energy demand as a “cultural” problem that needs to be solved in order to lead to the technological expansion and rapid growth of “alternative energies” and the retirement of fossil fuels. Building on this comparison, this paper will look at how utilities promoted the adoption of electricity during the “Expansion,” “Technological Momentum,” and early “Maturity” phases of this technological cycle. Utility advertising in the twentieth century that promoted the adoption of electricity and natural gas to build load may have guidance for today’s program administrators seeking to promote electrification.

Table 1: Nye’s Technological Stages

Stage	Electrification	Alternative Energies
Invention	1808-1875	1880 (wind), 1950s (solar)
Demonstration: “high consumer cost” and barriers	1882-1890	1990s
Expansion: “slow growth”	1890-1900	2000-2013
Technological Momentum: “slow growth”	1900-1910	2010-2020
Maturity: “rapid growth”	1910-1940	2020-2050

Susan Strasser’s fascinating book *Never Done: A History of American Housework* (1982) is also relevant to understanding how electricity and gas spread in the United States in the late nineteenth and early twentieth centuries. In it she explores how domestic labor in the United States transformed over the nineteenth and twentieth centuries. Since much of that transformation is attributable to the development of new energy sources and technologies, Strasser details how those technologies were promoted by manufacturers and utilities as well as how they were received by the women performing domestic work.

It is easy to overlook just how differently households function when comparing life in the twenty-first century to life in the nineteenth. Heating, lighting, cooking, and cleaning all required significant human labor. Strasser describes how coal and wood fired stoves replaced open hearths for heating and cooking in American homes because “less fuel could produce more heat with less tending,” they were safer for small children, and required less bending and lifting (Strasser 1982, p. 40). Furthermore, new homes could be built more economically without central chimney stacks and were therefore less likely to burn down. Gas and electric ranges in turn were attractive because they were less likely to produce skin burns, were not sensitive to outdoor wind conditions interacting with the stove flue, and required less tending. Strasser describes an experiment conducted in 1899 by the School of Housekeeping in Boston which found that over six days it took an hour a day to care for a solid fuel stove and that “292 pounds of new coal were put into the stove..., 27 pounds sifted out of ashes, and more than 14 pounds of kindling” needed to be carried (Strasser 1982, p. 41). Finally, stoves “were used only when

economical in time, in labor, and in fuel. This made them less flexible than modern gas and electric stoves, which cooks can use one burner at a time (Strasser 1982, 40-41).”

The transition of technologies for lighting were similarly dramatic. In the early nineteenth century, people had a choice between expensive wax candles and inexpensive tallow candles. Whale oil became more common and was less expensive than wax candles and offered superior light quality with less spattered grease than tallow candles. By the latter half of the nineteenth century, whale oil became more expensive as the whale population declined, and kerosene became cheaper with improved lighting quality. Kerosene lamps were widely adopted but also presented significant downsides. They risked fire when knocked over or overfilled, and the soot emitted required arduous and regular cleaning of both the lamp and the entire room (Strasser 1982).

The interplay between cost and light quality seems very familiar to those of us with experience promoting the transition from incandescent, to compact fluorescent, to LED lighting in the twenty-first century, but the same transition did not offer the immediate relief in domestic labor presented by the transition from kerosene lamps to incandescent bulbs. Figure 1 provides a dramatic illustration of how the labor to produce an hour of light has been reduced over the past two centuries. In 1800 people spent six hours of labor to produce an hour of light, compared to just seconds of labor in 2010. This is based on the cost of fuel translated into wages and likely does not include the time saved from cleaning and reduced risks associated with these transitions.

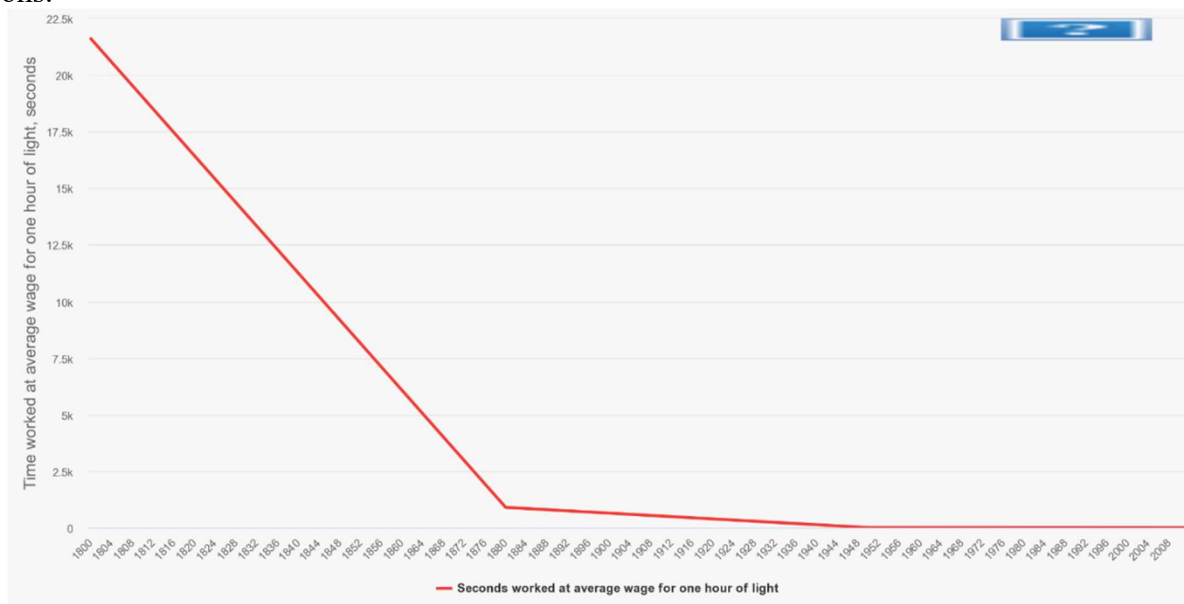


Figure 1 Labor needed to produce light greatly decreased over the nineteenth, twentieth, and twenty-first centuries.
Source: Ridley 2010 (via Human Progress.org)

Such technology transitions were driven by multiple factors that again feel relevant in the early twenty-first century. Costs—both fuel and labor—of course played a major factor in the decision to adopt one fuel or technology over another. Strasser points out that “as forests were cut down and railroads brought fuel from distant coal fields, wood became more expensive than coal in urbanizing areas (Strasser 1982, 41).” Coal also reduced the costs of labor to deliver

services because “it burned longer and so required much less frequent feeding and fire tending (Strasser 1982, 41),” and the same heating value could be delivered in smaller volumes of fuel. This became more and more important as servants became scarcer. As industrial labor opportunities arose domestic labor became less attractive to laborers, so servants became scarce. Electric appliances were positioned as an alternative (Strasser 1982).

Concerns about indoor air quality are also nothing new. Combustion for light and heat produced a great deal of soot and carbon monoxide. Strasser describes how Catherine Beecher, author of *The American Woman's Home* believed “providing healthy air was...both a woman's central duty as a mother and wife and her particular problem because, unlike men, who at least got out, women shut themselves in all day (Strasser 1982, 57).”

Finally, concerns about environmental quality were also present in the nineteenth century. Richard Rhodes wrote in *Energy: A Human History* that in the 1850s “a memoirist recalls early settlers speculating about what might be ‘a possible source of supply for [lamp] oil when all the whales have been killed.’ It was general knowledge, then, that whales were over hunted in whaling's so-called golden age, their populations declining (Rhodes 2018, 138).”

Changes in fuel, technology and overall economic activity are nothing new, and this paper seeks to explore what we can learn from a few historical examples. While a great deal of excellent work applying behavioral science to messages promoting energy efficiency has been done over the past two decades (see for example Chalasani et al. 2020 for an excellent literature review), this essay takes a more historical approach. So, what can we learn from those in this business a century ago?

Promoting Appliance and Utility Adoption

Manufacturers quite obviously were interested in selling more products and touted the benefits freely in print advertisements. Not all advertising is effective (Jones 1999), and with no long time series of appliance sales available at the brand level, it is difficult to quantify the impact of these ads. However, they can still be used as cultural indicators of what manufacturers and utilities thought would resonate with their customers. Early ads focused more heavily on the “economy” (that is, efficiency benefits) these products offered, but by the 1920s, “economy no longer dominated ads, which now celebrated electricity's ability to relieve women of burdens and chores (Strasser 1982, 81).” Figure 2 shows an ad for Premier Duplex electric vacuum cleaners from the 1920s that touts the leisure such appliances afforded. Before describing the technical benefits of the product, the ad touts “Twice as many rooms cleaned. Cleaned more easily, with greater thoroughness, yet twice as much leisure left for you to enjoy. To enjoy more fully, with fresher body (Lenssen 2010).” Prior to electric vacuum cleaners, cleaning rugs required the heavy manual labor of moving furniture, lifting rugs, bringing them outside and beating them. It's easy to understand why in comparison leisure was such an attractive benefit of a vacuum cleaner (Strasser 1982).

Electric and gas utilities were also interested in promoting the adoption of electric and gas household appliances to build load. The Connecticut Power Company (now a part of Eversource) put it bluntly in a magazine for employees. The magazine states that the sales department sells “gas and electricity by selling appliances...every appliance sold means an increase in our load, and, because the quality is high, they serve as our standards throughout our communities” (The Connector, 1950).

Twice the cleaning... twice the leisure!

TWICE as many rooms cleaned. Cleaned more easily, with greater thoroughness. Yet twice as much leisure left for you to enjoy. To enjoy more fully, with fresher body.

Clean with double action—and you clean quickly and easily. When a motor-driven brush and strong suction work *together*, your tasks are soon done. The brush sweeps up threads and dislodges grit. The suction draws up the dirt. With double action the Premier Duplex captures *all* the dirt.

And it requires no after hours' care. With ball bearings in brush and motor, it needs no oiling. For years to come the Premier Duplex will do double the work and give you double the leisure.

Premier Duplex

ELECTRIC VACUUM CLEANER CO., INC.
Depts. 502 Cleveland, Ohio.

Manufactured and distributed in Canada by Premier Vacuum Cleaner Co., Ltd., General Office, Toronto.

Sold over the entire world, outside of the U. S. and Canada, by the International General Electric Co., Inc., Schenectady, N. Y.



Figure 2. Vacuum as time saving and leisure promoting device. *Source:* Lenssen 2010

In the very early days of electrification, Edison Lamp Works (part of General Electric) promoted electricity as a service because customers had to have electric service to their homes to use electric light bulbs. A 1917 ad from Edison Lamp Works reads:

Housework is hard work—and the problem of help in the home is growing more and more acute. But there's a way to simplify both the work and the problem—a way surprisingly easy and inexpensive. And here it is –

Electric servants can be depended on—to do the muscle part of the washing, ironing cleaning and sewing. They will cool the house in summer and help heat the cold corners in winter. There are electric servants to percolate your coffee, toast your bread and fry your eggs. There's a big, clean electrical servant that will do all your cooking without matches, without soot, without coal, without argument—in a cool kitchen.

Don't go to the Employment Bureau. Go to your Lighting company or leading Electric Shop to solve your servant problem.

Strasser (1982, 77)

Edison Lamp Works appeals most clearly to the need to supply domestic labor, but it also implies the improved indoor air quality, safety, and cleanliness of electric appliances compared to combustion.

By the 1950s, the message centered less on replacing servants and more on increasing leisure. An ad for natural gas appliances (Figure 3) from that decade claims that “Gas Gives You More Free Time.” It speaks to cost savings (“You'll have lower initial cost, lower operating cost, and lower upkeep cost year after year with gas”), free time (“today's gas appliances are completely automatic. You just set them and forget them! New gas ranges cook while you enjoy carefree leisure”), and cleanliness (“Gas is faster, quieter, cleaner, and leaves no dust or smudge on walls or ceilings.”). The woman in the illustration stands in front of a canvas with a paint brush in her hand, providing an example of how that leisure time can be used (Romero 2022).

The Connecticut Power Company provided an overview of the benefits of electric and natural gas appliances to its employees in another issue of its internal magazine and promoted them with employee discounts. The article spoke to the benefits in very specific and personal terms. Figure 4 shows Mr. and Mrs. H. J. Mosher who “find it's much easier to leave early for an evening out when you have an automatic electric dishwasher.” Mrs. Mosher loads dishes into the dishwasher as Mr. Mosher stands at the door with her coat, ready to leave. Figure 5 shows Mrs. Robert Grier kneeling next to an open clothes dryer pulling out clothing. The caption explains that she is “sold” on her gas clothes dryer because “It keeps her two small children in fluffy dry clothes no matter how bad the weather outside.” Again, from the perspective of the twenty-first century, most people are not as used to being dependent on the weather to dry our clothes outdoors on a clothesline, and so it may be easy to miss this implication. Electric and gas appliances were changing how people lived and providing amenities far beyond simple cost savings.

Gas

GIVES YOU MORE FREE TIME

5 ways Gas gives you MORE Automatically!

MORE ECONOMY. You'll have lower initial cost, lower operating cost and lower upkeep cost year after year with GAS.

MORE FREE TIME because today's gas appliances are completely automatic. You just set them and forget them! New gas ranges cook, bake, broil automatically while you enjoy catnap time!

MORE SPACE FOR LIVING. Compact automatic gas water heaters, heating units, air conditioners and incinerators can be tucked away in a tiny closet.

MORE SELECTION because GAS gives you a wider variety of makes and sizes of appliances to choose from.

CLEANER, QUIETER HOME because GAS is faster, quieter, cleaner and leaves no dirt or smudge on walls and ceilings.

Gas is

**ECONOMICAL • DEPENDABLE • MODERN
AUTOMATIC • FAST • CLEAN • SAFE and SILENT**

How you can have more with GAS is brought to your attention by these Suppliers in the Gas Industry:

American Cast Iron Pipe Company	A. C. Lawrence Leather Company
American Meter Company	Rockwell Manufacturing Company
Cleveland Trencher Company	M. B. Skinner Company
Drucker Industries, Inc.	Sprague Meter Company
E. F. Griffiths Company	U. S. Pipe and Foundry Company

SEE YOUR DEALER OR GAS COMPANY TODAY AND LEARN HOW MODERN YOUR HOME RANGE WITH GAS. RANGES • WATER HEATERS • CLOTHES DRYERS • INCINERATORS • REFRIGERATORS • AIR-CONDITIONERS • REFRIGERATORS

original listing card DEC 31 1955

Figure 3. Gas ad features time savings. Romero 2022.



Mr. and Mrs. H. J. Mosher find it's much easier to leave early for an evening out when you have an automatic electric dishwasher. Their home is at 221 Ridge Road, Middletown. John Mosher is Operating Superintendent, Central District.

Figure 4. Utility magazine highlights time saving benefits of an automatic dishwasher. *Source:* The Connector 1953



Figure 5: Clothes dryer frees woman from weather dependence. *Source:* The Connector 1953

Figure 6 depicts a powerful visual summary of these benefits. This is a picture of a window in the appliance show room of Public Service New Hampshire (also now part of Eversource) taken at Christmas 1931. The window displays a Hot Point electric range with the statements “What Mother Really Wants” and “Today you can practically take Mother out of the kitchen by giving her the Hotpoint Modern Maid.” The words refer to the labor savings offered by the range, but the display also includes drawings of “Great-Grandmother” in 1831 cooking over an open hearth and “Grandmother” in 1881 loading logs into the firebox of a woodstove. In both pictures the flames are very prominent, Great-Grandmother is standing well back using a long-handled spoon to stir a pot and Grandmother appears to be sweating. These drawings evoke

the danger and discomfort of cooking with fire, drawing the viewers' attention to the sleek, modern new range to the left. Who, viewing this, would want to deny their mother the advantages of modern appliances?



Figure 6: Utility Showroom advertising electric stove in 1931. *Source:* Chagnon 2012

Discussion

This history of domestic technology serves to highlight the challenge program administrators face today. They can, in many cases, offer cost savings, speed, and other benefits with improved products, but they likely will not have the level of impact that labor saving devices had in the early twentieth century. Moving from incandescent lighting to LEDs may save money and may even improve light quality, but it does not remove the burden of cleaning the way moving from kerosene lamps to electric incandescent lighting did in the early twentieth century. Program administrators need to work to find the ways in which efficient products can improve peoples' lives, and to find new ways to encourage consumers to adopt these products.

Seth Godin provides one possible way out of this conundrum in his book *This Is Marketing* when he says "People don't want what you make. They want what it will do for them. They want the way it will make them feel (Godin 2018, 21)." Put even more succinctly, he says "We sell feelings, status, and connection, not tasks or stuff" (Godin 2018, 78). Mark Jewell

applies this to energy and homes by pointing out that “In most cases, purchasing decisions are *emotionally driven*. People are not always convinced by facts and figures...When you buy a house, do they give you technical specifications of the house—the construction drawings and the appliance specifications? Or do they work with you to help you build a connection with the house?” (Jewell 2014, 92-93). Both these experts provide an invitation and permission to explore more fully what emotional connection marketers of energy efficiency may need to make with homeowners to help guide them to implementing deeper energy efficiency and move into more electrification.

One path to emotional engagement in modern energy efficiency marketing may be through environmental messaging. The Yale Program on Climate Change Communication conducts research that categorizes Americans based on “their beliefs, attitudes, policy support, and behavior about climate change.” In their most recent study, they have found that 33% of respondents were “Alarmed” and 25% were “Concerned” (Figure 7, Leiserowitz et al. 2022). Representing over half of Americans and growing over the past five years, this provides a good basis for future exploration, though finding the right message may be difficult. Previous Eversource market tests found that environmentally concerned customers may convert to home weatherization projects at lower rates than the rest of the population (Rodgers, 2016).

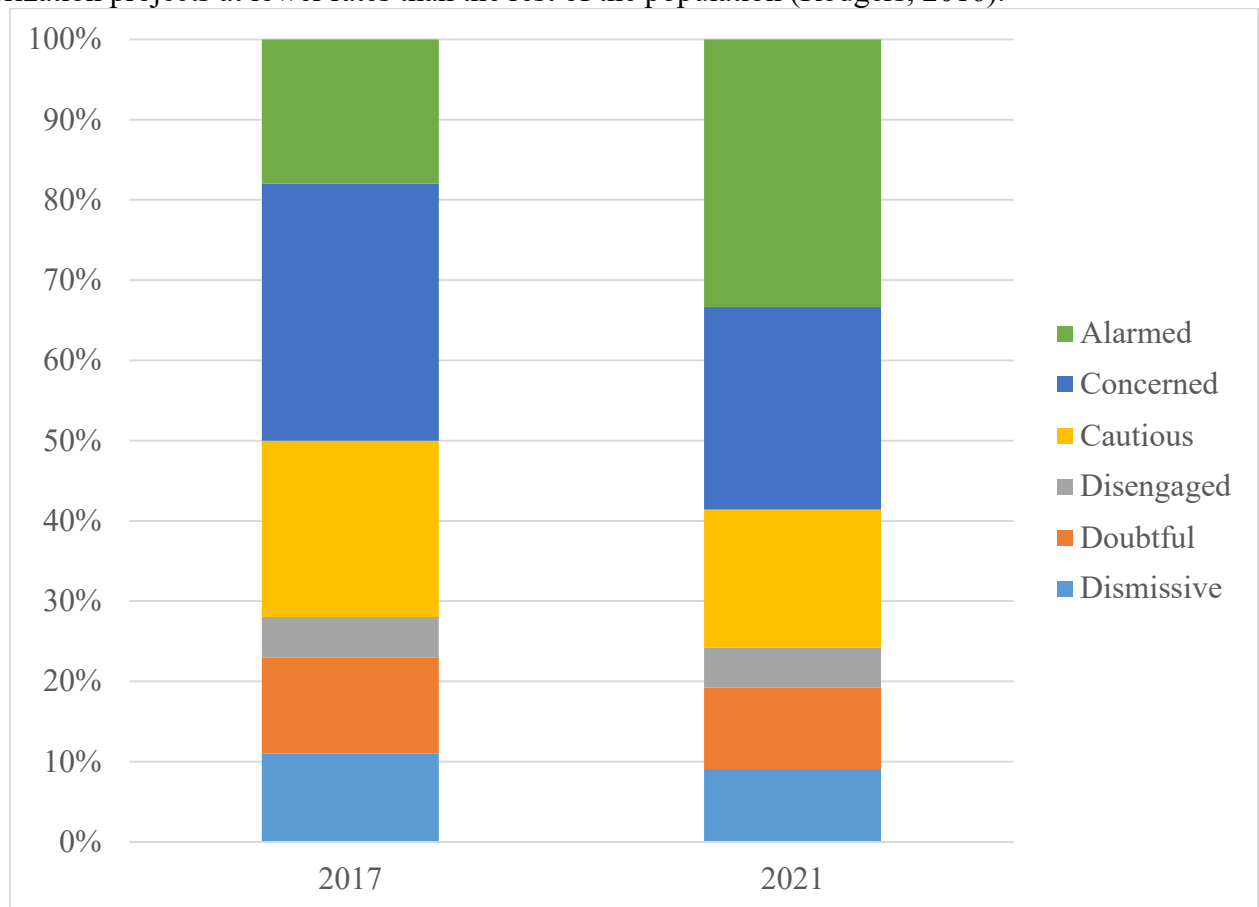


Figure 7: Global Warming’s Six America’s. *Source:* Leiserowitz et al. 2022

Another avenue that may resonate emotionally with consumers is home comfort. Nate Adams is a home performance specialist who has conducted many deep energy retrofits and heat pump conversions. He sees people whose homes have problems other contractors have not been able to fix, and he states that people often come to him looking for help with health concerns (asthma, allergies, and other illnesses), uncomfortable rooms (especially bedrooms), mold, damp basements, and moisture problems (Adams 2017). Energy cost is notably absent from that list, though it is very common in energy efficiency program administrator advertising.

Induction Cooking

Electrification of cooking presents a barrier to electrifying buildings in the mind of end users as gas stoves are prevalent in American homes (Alessi 2022). Induction cooking therefore provides an interesting opportunity to provide an avenue to electrification and a vivid emotional appeal. An online article lists the advantages of induction cooking as reduced indoor air “pollution” compared to natural gas that reduces the need for indoor ventilation, reduced likelihood of burns since the cooking surface does not get hot, and increased speed and precision of cooking (Sherman 2020). Hope writes in *Consumer Reports* that induction cook tops are “2 to 4 minutes speedier than the competition to bring 6 quarts of water to a near-boil (Hope 2021).” The article temporizes this (and nicely highlights the marketing challenges here described) with “Life-changing? Probably not.” Sherman and Hope both point out that many types of common cookware will not work on induction stoves, another barrier to adoption. Both authors present induction cooking from a rational, product evaluation standpoint, though Sherman may not capture the full impact of pollution from stoves. An NRDC expert indicates that stoves may emit methane when not in use, greatly increasing their impact on indoor air quality (Borgeson, 2022). To a homeowner with asthma, improved indoor air quality may indeed be lifechanging.

The power of the shop window display in Figure 6 is that it successfully taps into the fear and fatigue tied to the danger and burden of cooking with fire at a time when many people living had experienced or witnessed it. The window invites the potential purchaser to move beyond that danger. Twenty-first century cooking methods are not as obviously and immediately dangerous, so it may not be beneficial to lead with messages about safety and reduced burns. It may, however, be possible to find another connection to current consumer values, such as the time it takes to cook, or, since cooking is often treated more as a hobby than a chore in days when prepared food is cheap and abundant, connecting with family and friends or the status of presenting a perfectly cooked meal. This combined with a more accurate discussion of the impacts of poor indoor air quality may motivate more consumers to act.

Heat Pumps

Massive adoption of heat pumps technologies will be necessary to shift residential heating loads off fossil fuels, as discussed above. In Massachusetts, incentives for heat pumps and weatherization “are seen as critical to building momentum for the state’s quest to wean one million homes from fossil fuels by 2030” (Shankman 2022). The cost of heating and source emissions go down when compared to oil and propane or electric heating, but costs are less attractive compared to natural gas heating (Nadel 2018). Even when cost comparisons are favorable, promoting heat pumps based on cost is challenging because customers may see

electric bills increase even if the overall cost of heating decreases once the heating source is switched to electricity. How customers perceive an increase to a monthly bill but the absence of a periodic bill when an oil or propane tank is filled remains to be seen. Other barriers to adoption include poor awareness of the product as well as perception that heat pumps may not work in cold climates, may be noisy, may have long recovery times, or that they are unattractive. On the other hand, they are perceived as environmentally friendly (NEEP 2017).

Program administrators have a great opportunity and a great need to continue to educate customers, especially to “solidify the reputation of ASHPs as a heating technology, not solely a cooling solution” (NEEP 2017, p. 51). Eversource’s billboard (figure 8) provides a very succinct example of reinforcing the heating capabilities of heat pumps. A dedicated landing page further explains that “Heat pumps move heat into or out of your home to heat or cool your living space. If you are looking to install or replace a central air conditioner, a ducted heat pump is the efficient way to go. If you are currently using window air conditioners, a ductless heat pump will mean never carrying a window unit up and down the stairs again. Both options can efficiently and effectively heat your home during the winter while reducing and even eliminating your use of fossil fuels or electric resistance heat” (Eversource 2021). Highlighting the customer pain point of carrying window air conditioners speaks effectively to a New England customer base where 45% of homes cool with window or wall air conditioners (EIA 2022). The ad also highlights reduced reliance on fossil fuels which subtly speaks to those who may want to make changes for environmental reasons without alienating those who may find environmental rhetoric unappealing.



Figure 8: Utility billboard promoting heat pumps. *Source:* Eversource 2021

Conclusions

Utilities and manufacturers helped drive adoption of new domestic technologies in the twentieth century through emotional appeals that explained how people could use these tools to change their lives for the better. Speaking only to cost and technical benefits is unlikely to be sufficient in the twenty-first to drive adoption of home electrification at scale. Program administrators must connect electrification and energy efficiency to making people’s lives better. A hundred years ago, electric and gas home appliances offered relief to women who faced hard, physical labor to cook their meals and heat, light, and clean their homes. Program administrators must look for what we can offer homeowners and renters today to engage them in home electrification efforts. They must connect to emotions. Program administrators have the opportunity to discuss how new technologies will make homes healthier through improved

indoor air quality, and how new features will make it easier to cook meals and heat and cool homes. Above all else, program administrators have the opportunity to engage those customers who are concerned about the use of fossil fuels and help them to find ways to reduce their use of fossil fuels.

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