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Households, Gender, and Energies: Issues and Perspectives

Abstract

By connecting two historiographies that, with a few exceptions, have generally ignored one another—gender history and the history of energy—this introductory article for the special issue "Home and Hearth: Gender and Energies within the Domestic Space, 19th-21st Centuries" highlights the fruitfulness of this encounter. The household is a locus for energy practices and choices, where the marketing strategies of energy suppliers, public policies, and family decisions meet, all of which bring gender relations into play. We propose different avenues of analysis that open up prospects for research, especially regarding issues connected to the energy transition.

Plan of the article

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CONNECTING GENDER AND ENERGY: A PROBLEMATIC IN NEED OF RENEWAL

1 Observing and analyzing issues relating to energy use within the domestic space opens up broad perspectives for understanding how consumption choices are organized. They depend on numerous factors; the offer of a particular energy, along with the combination of multiple energies to meet different needs, determine their role. Rates and selling price are therefore essential. Household equipment, and more broadly energy infrastructure, can facilitate consumption or, on the contrary, prevent it. Technological possibilities are therefore equally important in explaining the emergence or abandonment of certain domestic uses. In any event, members of the household intervene at every step in a series of decisions leading to energy uses. Choosing appliances, preferring a particular form of lighting or heating, performing the everyday gestures that go along with the use of equipment, taking action regarding consumption expenses, determining the forms of comfort desired, and inscribing one's own practices in energy-consuming or energy-efficient societal behaviors are so many decisions made in households. They are never dissociated from the relations established outside the household, whether it is the advertising that guides consumers, the commercial strategy of energy suppliers, the purchase of appliances, or energy delivery. All of these aspects that are part of the history of energy, in accordance with diverse chronological sequences, contribute to a vast historiography of energy choices, which focuses on the history of companies, the economy of consumption, and the sociology of uses. Stimulating reflection and research in this direction would not be particularly original, even though the history of energy is quite often written based on companies that produce or distribute energy, or on the geopolitical mechanisms of the energy business.

2 Our objective is to follow a different path. Focusing on the household and understanding how energy consumption occurs invite us to bring to bear the questions raised by the history of consumption, and even more so by gender history. Who fulfilled what roles? What power of decision did each member have in the choice of energies? What duties fell to women and men in domestic practices connected to lighting for rooms, heating for living spaces, cooking methods, hot water needs, regulating air conditioning, and keeping the embers going in a fireplace? By proposing a conference bringing together specialists from the history of energy and gender studies, we hope to spark questions that link fields of study that are not frequently connected. These issues have of course already been raised in books. The one by Ruth Schwartz-Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave*,[1] was one of the first to emphasize the importance of doing so, indicating right from its title the question that should be asked regarding domestic energy use. Additional studies followed. Some focused more on a particular technology or energy,[2] while others often isolated the feminine figure in home economics and the division of chores.[3] Recent research programs have also emphasized the need for a cross-cutting approach involving gender and energy, with greater awareness of all aspects required by the

1 Ruth Schwartz-Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983).

2 Marsha Ackermann, *Cool Comfort: America's Romance with Air-Conditioning* (Washington: Smithsonian Books, 2013), Anne Clendinning, *Demons of Domesticity: Women and the English Gas Industry 1889-1939* (London: Routledge, 2017), Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (London: Pickering & Chatto, 2008), Joao Luiz Maximo da Silva, *Cozinha modelo : o impacto do gas e da electricidade na casa paulistina* (Sao Paulo: Edusp, 2008).

3 Caitriona Beaumont, *Housewives and Citizens* (Oxford: Oxford University Press, 2015), Priscilla Brewer, *From Fireplace to Cookstove: Technology and the Domestic Ideal in America* (Syracuse: Syracuse University Press, 2000), June Freeman, *The Making of the Modern Kitchen* (London: Bloomsbury, 2004), Victoria De Grazia, Ellen Furlough, *The Sex of Things* (Berkeley: University of California Press, 1996), Hiroki Shin, "Energy/Culture: A Reading Guide for Historical Literature", *Science Museum Group Journal* ,2018, n° 9; Katherine Parkin, *Food is Love: Advertising and Gender Roles in Modern America* (Philadelphia: University of Pennsylvania Press, 2006), Jennifer Scanlon (ed.), *The Gender and Consumer Culture Reader* (New York: New York University Press, 2000), Elizabeth B. Silva, *Technology, Culture, Family: Influences on Home Life* (London: Palgrave Macmillan, 2010).

energy transition, particularly the recent book by Abigail Harrison Moore and Ruth Sandwell, *In a New Light: Histories of Women and Energy*.[4]

From the Conference to its Publication: Avenues for Future Research

3 The conference we launched in 2019 under the title "Home and Hearth: Gender and Energies within the Domestic Space, 19th-21st Centuries (Wood, Coal, Electricity, Gas, Oil): Societal, Economic, and Mediation Issues" is in keeping with this movement. The call for papers helped identify angles of interest, and justified what resembled a first go around the table.[5] The 35 proposals received were formulated by 49 participants, emphasizing the international attention garnered by this topic. They were from 38 geographical origins located in South America (2), Africa (5), North America (6), and Europe (25). Representatives from Asia were clearly missing from the call for proposals. It was also regrettable that while there was genuine diversity of nationalities among Europeans (the Netherlands, Great Britain, Italy, Spain, Germany, Austria, Finland, Denmark, Belgium, France), the proposals often focused on an energy-based approach without including, as much as desirable, issues relating to gender history. Opening up research to other fields and interpretations is not self-evident. Presentations were heavily weighted toward the twentieth century (88%). Topics clearly emerged, such as the organization of home economics and associated material cultures, the distribution of domestic work and women's role therein, the history of increasing energy consumption, media channels for the commercial promotion of energies, and the technological choices and standards most often established by male actors. Among the 35 proposals submitted, 17 were selected (48%). The pandemic and the suspension of travel prevented the conference from being held, and prompted the organizers to establish a different calendar that inverted the various stages.

4 Issue number 6 of the *Revue d'histoire de l'énergie/Journal of Energy History* will therefore provide the introductory foundation for the topic rather than present the conclusions from a conference. In an effort to develop this idea, nine contributions have been included in this issue, each exploring one of the approaches we would like to emphasize. The current issue consequently offers a reminder of the prospective field of study we are advocating. Different sources of energy (wood, coal, oil, gas, electricity) changed ways of life in the domestic space, doing so in accelerated fashion beginning in the nineteenth century. Markets for new energy uses increased with the expansion of multiple types of household equipment. Living conditions were transformed through the promotion of comfort, the reduction of domestic hardship, and the simplification of tasks. Cooking, heating, refrigeration, hot water, household chores—taken both individually and collectively—have been highlighted as sources of well-being in the household. Their promotion brought the simplification of the most basic everyday practices, from bathroom to the kitchen, from lighting to cleaning. They also transformed activities outside the home, and changed the sociabilities associated with them. They brought about the decline of collective washhouses, and reduced the provision of water and wood, both of which were synonymous with domestic drudgery. These evolutions have already been studied.

From Energy Companies to Households

5 The emergence of new means of communication from the late nineteenth to the mid-twentieth century (posters, advertising images, radio

4 Abigail Harrison Moore and Ruth Sandwell, *In a New Light: Histories of Women and Energy* (Montreal: McGill-Queen's University Press, 2021). See also Martin Anfinsen and Sara Heidenreich, *Energy and Gender - A Social Sciences and Humanities Cross-cutting Theme Report* (Cambridge: Shape Energy, 2017). Another driver of this topic is the AHRC program entitled "Electrifying Women: Understanding the Long History of Women in Engineering" led by Graeme Gooday and Elizabeth Bruton at the Science Museum in London, in partnership with the Women's Engineering Society and the archives of the Institution of Engineering and Technology. See the sites: https://ahc.leeds.ac.uk/philosophy/staff/51/graeme-gooday https://blog.sciencemuseum.org.uk/author/elizabethb.

5 The initial organizing committee included Ana Cardoso de Matos (University of Evora), Léonard Laborie (CNRS), Isabelle Matamoros (Labex EHNE), Charles-François Mathis (Université Bordeaux Montaigne), Renan Viguié (Université Bordeaux Montaigne), Fabrice Virgili (CNRS), and Jean-Pierre Williot (Sorbonne Université).

conferences, televisions shows, audiovisual publicity, websites and social media on the internet) served as one of the privileged avenues for the diffusion of new energy uses. Means of communication especially ensured the transmission of commercial discourses and solicitations aimed at consumers, after the conception and shaping of these discourses by various actors. They sparked competition between energies (coal, coke, gas, electricity, oil) in order to boast about the advantages offered by each one, as well as the multiple types of appliances available. While other means were used to further equip domestic spaces, and the energy consumption subsequently required (for instance rates and selling price, service or equipment offers, usage demonstration, showrooms and stores), the transmission toward consumers grew out of market analysis, as well as the needs and creation of such markets through advertising communications. Other avenues also contributed through the intervention of hygienists, consumer associations, and protest movements. The role of hardware dealers in small towns, and the diffusion of catalogs extending into rural areas, also played an important role in this diffusion. These approaches are not ignored, but they have hardly been explored from a comparative standpoint.

6 Gas and electricity companies, along with companies for other energy sources (oil, wood, coal), quickly took advantage of new opportunities to communicate with clients. Grid companies were more visible because they regularly purchased posters and advertising to boast of the advantages of their energy, as they benefited from the market effect connected to local and later to both regional and national networks. However, all energies will be taken into account. Did advertising targets, slogans, and graphic dramatizations substantially contribute to presenting a highly characteristic division of female and male roles in the domestic space? Commercial strategies followed the emergence of the domestic rationalization objectives that appeared in the late nineteenth century, and that were amplified during the interwar period. They supported the growing trend after the Second World War of the transformation of the domestic environment and mass consumption. It is important to measure the effect that company policies–in the choice of target audiences, slogans, and graphic imaginations–had on female and male roles in the domestic space.

7 These advertising mediations were accompanied by educational measures connected to uses (radio shows, conferences, demonstration workshops, domestic advisors, competitions, development of a dedicated press, television shows, etc.). The education that grew out of this beginning in the late nineteenth century, broadly based on the *Home Economics* initiatives born in the United States in the circles of Cornell University—or in the movement to develop the architecture of domestic space (we are very familiar with the roles of Christine Frederick and Paulette Bernège from the 1920s onward, although this should be expanded to include, for instance, Margaret Schütte-Lihotsky and her kitchen in Frankfurt, or Erne Meyer and her kitchen in Stuttgart)—helped to educate starting in childhood regarding the sharing (or not) of tasks and lifestyles. The emergence of women's associations offering an opinion about the uses of appliances—to orient their production or contest their use—contributes to an analysis of the interaction between the reception of the message and the appropriation of techniques. Without a new itinerary exploring the paths laid out by gender history, these topics will remain a descriptive history of energy consumption.

Primary Fields of Analysis

8 The first objective is to grasp, within the limits of the domestic space, the discourse and forms of marketing used by companies selling an energy source. Carrying coal up from the cellar, using the gas cooker, showing the refrigerator, chopping wood for the fireplace, and declaiming the advantages of hot water were so many situations that dramatized the mother, father, children, young woman, housewife, cook, and coal deliveryman. In what ways were such messages received? What protests were there against uses? What evolutions were imposed on companies through the acceptance or rejection of innovation on the part of consumers? Ana

Cardoso de Matos and Diego Bussola provide initial answers by analyzing the complementary strategies of the gas and electricity industries in Lisbon between 1891 and 1970, which relied on gender stereotypes to diffuse their products.

9 Second, attention can be focused on a particular country, as these practices reveal similarities from one country to another, relating to the sometimes international commercial strategy of energy companies, or the modelization of communication mediums that were diffused via transnational transmission, which is proposed by Mariëlle Feenstra and Rachel Guyet for France and the Netherlands during the 1950s. However, as also stressed by the two authors, different cultures and original contextualized slogans equally contributed to creating distinct choices. Comparing discourses, types of advertisements, the topics promoted by companies in each country, the educational and pedagogical practices of home economics, and the attitudes of women and men within the domestic space should shed light on the existence of national forms of communication. The latter will be analyzed both with regard to the description of energies themselves, as well as the forms of competition between energies in the fairly different economic and energy contexts in the European countries under consideration, as well as with respect to the favored uses of each energy.

10 Finally, if sources from energy companies enable it, a third approach could focus on the expenses and investment dedicated to commercial strategies. We are familiar with the role of credit in household equipment, which incidentally was unequal across countries, and followed variable chronologies. It could be reinterpreted by paying closer attention to forms of cooperative economy, the role of company stores, and mutualist action often more concerned with the family dimension of the publics involved. Yet we are less familiar with the budgets allocated by companies to create sales targets, and to adjust their strategies to uses. Similarly, should there be a focus on the budgetary approach, in conjunction with legal capacity, in order to determine who paid for energy in the household, who made choices relating to it, and who purchased the new equipment that was indispensable for its uses? What mediation occurred within couples regarding these life choices and their associated budget?

11 In an effort to launch these perspectives, this special feature will include a number of articles that initiate this reflection along multiple guiding lines. The household may seem narrow as a scope of analysis. Let us immediately rid ourselves of this criticism.

From Spheres to the Sexes

12 The human and social sciences, namely philosophy (Habermas, Arendt), sociology (Delphy, Kergoat), anthropology (Tabet), and history (Perrot), agree about the essential importance of the separation—if not the invention—of the private and public spheres beginning in the nineteenth century, whether it is the organization of work and hence of each person's time, the increasing separation between home and factory, the organization of these spaces in the lives of individuals, the distribution of tasks intended for the interior or exterior, and the role of each person both inside and outside. While major cities represent, according to Habermas, the ideal type of the bourgeois public sphere for its dominant members, the latter preserve their private sphere from the political, economic, and intimate powers of the state.[6] For this period simultaneously saw the sidelining of women from politics and public speaking, their radical exclusion from the military, the subjection of wives to their husbands as inscribed in the Civil Code and its many adaptations, an unequal gendered division of labor, and an educational system highly differentiated to the detriment of young girls in the humanities as well as science and technology, with this accumulated submission making the separation between the public

6 Jürgen Habermas, *L'espace public* (Paris: Payot, 1992 [1962]), especially chapter I, "Définition propédeutique d'un modèle de la sphère publique bourgeoise", 13-37, cited by Michel Christian and Sandrine Kott, "Introduction. Sphère publique et sphère privée dans les sociétés socialistes. La mise à l'épreuve d'une dichotomie", Histoire@Politique no. 7/1, 2009, 1.

and private spheres increasingly seem like one between the male and female. Whether seen as the lady of the house or a prisoner of the household, women were clearly located in a secluded space with their husband and family. Outside of this alienating and protective space, they could be exposed to the many dangers of urban and industrious promiscuity, and quickly fall into immorality.

13 It was initially outside of this space that the social sciences, among them the pioneers of women's history, sought to make women visible in history. Because it enabled an even relative financial independence, the workplace was a space where women met one another, and where participation in the struggle for freedom was initially fostered. When the family and the household garnered attention, in an extension of the mid-1960s slogan "the private is political," it was firstly to denounce it as a place of male control: at best a place where it is difficult to have "a room of one's own," at worst a place where domination is endured up to and including violence. In 1970, Christine Delphy denounced a specific exploitation of women within the exploitation of families, which translated into free work (childcare, housework, sewing, meal preparation).[7] On the other side of the Atlantic, Ann Oakley, who is known for developing the concept of gender in the social sciences, deconstructed naturalist justifications for domestic activities, on the contrary pointing out how much they were perceived by women as monotonous, exhausting, and demeaning, thereby reflecting the weight of social constraints.[8] At the end of that decade the anthropologist Paola Tabet showed, in a pioneering article, how male domination was exerted over women by excluding them from technological resources.[9] She rejected any notion of a "natural" sexual division of labor as part of a complementarity or reciprocity of work, and envisioned this division as a "political relation between the sexes." In this issue, Sean Adams provides an account of this by showing how the division of energy-related tasks as idealized by energy companies in particular (the husband buys, the woman manages) is actually clouded by multiple negotiations within the household.

14 While the social sciences took little interest in the household other than to imagine forms of protest and evasion from this place where women were kept apart from our societies, energy production companies already perceived, in the nineteenth century, the role of the "lady of the house" in changes to energy choices. If the *foyer* (household, hearth and home), initially defined as a "place where a fire is made"[10] gradually became a "space for sheltering individuals," and later a place where "a family lives or inhabits," it was by meeting needs that gradually became essential, namely providing light, heating, and the ability to cook. Since the nineteenth century, there have been numerous technological innovations that were subsequently diffused to a wide audience, with changes to practices that largely surpassed the single choice of "flame," and instead became that of a lifestyle. In this respect, the installation of geothermal heating in the city of Reykjavik between 1939 and 1944, as studied by Odinn Melsted, is exemplary in that it reveals the liberating discourse of authorities, women's hopes for emancipation and subsequent disappointment and injustice, persistent inequality, and the transformation of domestic roles.

15 Finally, we wanted to make the household central to our investigation, as it is at the intersection of numerous transformations. Firstly those involving relations between its inhabitants, whether it is a single, mixed, or blended household, and whether they are from the same family or include a certain domesticity. Then there are

7 Christine Delphy, "L'ennemi principal", *Partisans*, special issue of "Libération des femmes, année zéro", 1970, n° 54-55.

8 Caroline Ibos, "Travail domestique/domesticité", in Juliette Rennes (dir.), *Encyclopédie critique du genre* (Paris: La Découverte, 2016), 649-658.

9 Paola Tabet, "Les Mains, les outils, les armes", *L'Homme*, vol.19/3-4 (Les catégories de sexe en anthropologie sociale), 1979, 5-61.

10 "Foyer," *Trésor de la langue Française informatisé*, https://www.cnrtl.fr/definition/foyer, accessed on August 26, 2021.

the transformations stemming from changes to housing and the arrangement of interior space, including the relation to the "outside," whether it is thought of as a place for work, consumption, leisure, or public life. The household bore the shifting of spheres (public or private) among the sexes,[11] while the gradual separation of the place of work and place of residence prompted a reorganization of lifestyles. The transformations that formed the general framework for changes to households affected bourgeois homes, such as the *Sweet Home* described by Catherine Hall in the United Kingdom[12] or the bourgeois homes of Northern France,[13] which were more capable of welcoming successive innovations. They also modified, on other scales, working-class housing, ranging from the oldest, most dilapidated and insalubrious specimens to the most recent, which grew out of an awareness that housing had to provide the conditions needed for the well-being and hygiene henceforth promised to proletarians. In the example of Denmark in the second half of the twentieth century, studied here by Mogens Rüdiger, the modernization of homes, installation of central heating, and new standards of thermal comfort did not lead—with all due respect to the architects of the time—to a new distribution of roles among spouses.

WHAT GENDER ISSUES RELATING TO ENERGY IN THE HOUSEHOLD?

16 A detailed list of the major changes that have occurred in dwellings since the Industrial Revolution would be too long to provide here. It is nevertheless important to keep in mind that these changes involved the location (rural, urban), size, and number of rooms of the housing, including specialized rooms (kitchen, bathroom); the number of available energy products (wood, candles, coal, coke, oil, electricity, geothermal), changes in their cost and accessibility, their connection to outside networks, and individual and/or collective choices in their use. It is in this most shifting of worlds that individuals have met their energy needs.

Which Energy to Choose?

17 Women could sometimes use their command of gestures and knowledge to defend their role in the household and impose a certain authority, an area of skill and action that could not be challenged by spouses without leading to unpleasantness and great tension in the couple. Joanna Bourke has shown the emergence of this form of empowerment in English working-class interiors at the turn of the twentieth century: by demanding instruction in home economics, working-class women were able to attribute scientific endorsement to their expertise, which they could subsequently emphasized before their spouses. Watch out if he had a notion to challenge their choices or energy spending![14] Similarly, the cook who resisted a gas or electric appliance was not simply displaying archaic stubbornness, she was also defending her know-how acquired over the years, a source of pride and recognition. A change in cooking method meant relearning everything, going back to the end of the line, starting from zero.[15] Hence the efforts, recounted by Jan Hansen, of the Los Angeles Department of Water and Power (MADWP) in the very early twentieth century to train the city's inhabitants in the pioneering and sometimes constraining use of electricity, which meant that "after turning on your heating, instead of taking a nap (...) you have to keep an eye on the water heater."

Who Pays with What Money?

18 We cannot overemphasize these tasks weighing on the shoulders of domestic employees, female workers, and working-class women, which took up so much of their time in running a household

11 Michelle Perrot, "Public, privé et rapports de sexes", in Jacques Chevalier (dir.), *Public/Privé* (Paris: PUF, 1995).

12 Leonore Davidoff and Catherine Hall, *Family Fortunes : hommes et femmes de la bourgeoisie anglaise 1780-1850* (Paris: La Dispute, 2014 [1987]).

13 Bonnie Smith, *Les Bourgeoises du Nord, 1850-1914* (Paris: Perrin, 1989 [1981]).

14 Joanna Bourke, "Housewifery in Working-Class England", *Past & Present*, 1994, n° 143, 167-197.

15 Jean-Pierre Williot, "Cuire avec ou sans flamme ? Le gaz en transition énergétique, de la modernité à la défaveur", in Nathalie Ortar and Hélène Subrémon (dir.), *L'énergie et ses usages domestiques. Anthropologie d'une transition en cours* (Paris: Pétra, 2018), chapter 2.

through energy use. This raises the essential question of the value of women's time, with the electrification of households proving revelatory in this regard, for it was no doubt electricity that best personified the construction of a singular mental world, given the powerful imaginary of emancipation and wonder it conveyed in its beginnings.[16] The promotion of gas had also traveled along this path, but without creating the same level of disruption. The use of earlier energy sources presented less complexity. Most household appliances were invented in the early twentieth century, such as the washing machine in 1910, the refrigerator in 1913, and the vacuum in 1915, thereby increasing the domestic use of energy with the trio of lighting, heating, and cooking. An abundance of appliances with different purposes now made it possible to save time. Other occupations became possible, with the novelty of spending one's time listening to the radio or a record, and much later watching television.[17] Analyzing the electrification of our societies is highly instructive with respect to gender relations, especially the many impediments to this change. The gradual reduction of production cost, in conjunction with improved purchasing power and the development of credit, did not translate into a linear development that transformed these luxury objects into products of everyday consumption. In this issue, Gooday and Harrison show how aristocratic elites served as a basis for experimentation, with a few wealthy celebrities subsequently setting a trend. An essential economic and social question remains behind these descriptions of uses and diffusion, namely the financing of such energy uses.

19 What is the point of spending sums of money, which for a long time remained substantial, in order to save a woman's time, which precisely was free? Only working-class women whose outside wages were needed to maintain the household would appreciate reducing their double day, although their modest income could not buy these "marvelous machines." These economic reasons were joined by those of know-how acquired over the long term, habits that one did not want to abandon, in addition to the more difficult to quantify role of taste, sensation, and pleasure. Energy prices thus emerge as a key to gender relations, insomuch as the portion of budgets spent on energy consumption could provide flexibility in terms of the household's time.

Energy for What Purpose?

A hierarchy of uses must therefore be reconsidered, one that is no longer based on domestic utility (lighting, cooking station), but on the increased activity and distribution of chores they enabled. Studying appliances for passing the time—initially the radio—is very stimulating, as they spread very quickly without being associated with a vital need. The fact that the electrification of households was accompanied by a massive and initial diffusion of radio sets raises questions. Should we see it as the husband imposing a preference for leisure that he would enjoy, at the expense of appliances that would surely reduce his spouse's hard work, but in any event would not prevent the home from being clean and the laundry from being done? We could also see it as a joint decision for shared leisure at night, one that also made domestic work less boring when it could be done to music, or while listening to entertaining shows. Beyond this very traditional blueprint of a household, what of the other households that did not consist of a family? 20

What Gendered Mediums of Energy Diffusion Were Used by Companies?

What distinguishes the commercial policies of appliance merchants, like those of energy companies, was that their messages were explicit enough such that none of the household's members were left indifferent, an energy's use responded to a felt need, and the description of use created hopes of savings in time, money, and comfort. They consequently had to come 21

16 Alain Beltran, Patrice Carré, *La Vie électrique. Histoire et imaginaire* (18e – 21e siècles) (Paris: Belin, 2016).

17 Sue Bowden and Arner Offer, "The Technological Revolution That Never Was", in Victoria de Grazia and Ellen Furlough (eds.), *The Sex of Things: Gender and Consumption in Historical Perspective* (Berkeley: University of California Press, 1996).

up with brief appeals, attractive messages, and effective slogans. Ultimately this was not very different from other advertising strategies, although the discourse on energy also had to spark dreams and take its place within the mentalities of a period. It is much more interesting to understand how the prices of an energy were determined, and what societal symbols justified changes to them. Dreaming of a brighter interior at the ideal temperature and with minimal constraints, such are the elements that companies have underscored since commercial advertising strategies were initiated in the late nineteenth century. It has also involved providing lessons, for this dream required financial efforts as well as the learning of new practices. Each energy companies followed its own score when providing instructions, advice, or demonstrations on how best to use a particular electric appliance or gas cooker.[18] This is what Jordi Ferran Boleda shows in his article retracing the efforts of electricity companies in the 1930s to initiate "housewives" to electricity, especially through the prosaically titled journal *Electricidad Industrial y Domestica*.

Should Gendered Cultures of Energy be Considered?

22 Challenging the apparent determinism of the energy source as an energy system using a gender-based approach raises numerous issues. The energy choices of societies shape what have been called energy systems: a series of technical, social, political, cultural, and economic relations that reflect, at least partially, the structures born of the energies used.[19] Without of course evaluating any potential determinism, a society is clearly not organized in the same way when it is based essentially on muscle power (of men, women, and animals) or on fossil energies, for example. Hence the emergence, within this framework, of energy cultures that have drawn increasing interest from sociologists, anthropologists, and historians.[20] Whether we speak of "petroculture" to refer to the symbolic and material world that grew out of the unbridled consumption of hydrocarbons,[21] or whether we take an interest in the representations, hopes, and fears connected to the atom, especially in France,[22] a singular relation to dominant energies always emerges, far from the supposed rationality of economic actors, one that includes both consumers and suppliers. However, this energy culture can be understood differently if, based on gender approaches, focus is placed on the division of chores and the market value ascribed to the work required to use a particular energy.

23 Energy is something that is learned, and here we have an entire area of research that remains little explored by historians. The nineteenth century saw the blossoming of the science of thermodynamics, instruments for measuring power, a theorization of energy, and a reflection on the origins of fossil sources. In the nineteenth century, at school or at home, the schoolteacher, mother, father or grandparent taught children about the benefits of coal; the risks to national power and individual well-being from a lack of resources, such as forest or fossil ones; the uses of a particular fuel; the gestures to be performed for lighting, heating, and cooking; the danger of gas; and the defect of electricity, which causes electrocution. In the mid-twentieth century, alphabet books bore the trace of a modernity connected to energy equipment, the extraordinary oil, the new natural gas, and the wonders of electricity. Today junior high school students are made aware of the management of limited resources, although digital uses necessitate considerable quantities of electricity that must be supplied.

24 In doing so, gender distinctions can of course appear. The example of Britain is quite telling

18 Caroll Pursell, "Domesticating Modernity: The Electrical Association for Women, 1924–86", *The British Journal for the History of Science*, vol. 32/1, 1999, 47–67.

19 Jean-Claude Debeir, Jean-Paul Deléage and Daniel Hémery, *Une Histoire de l'énergie* (Paris, Flammarion, 2013 [1986]).

20 Sarah Strauss, Stephanie Rupp and Thomas Love (eds.), *Cultures of Energy* (Walnut Creek: Left Coast Press, 2013); Brendan Dooley (ed.), *Energy and Culture: Perspectives on the Power to Work* (London: Routledge, 2016).

21 Stephanie LeMenager, *Living Oil: Petroleum Culture in the American Century* (Oxford: Oxford University Press, 2014).

22 Gabrielle Hecht, *Le rayonnement de la France* (Paris: La Découverte, 2004).

in this area. In the nineteenth century, children learned, sometimes very young, about the central role of coal in their nation's global hegemony, as well as its spectacular origins in ancient forests that had since decomposed and been transformed. They also learned ways of using it—how to light a fire, how to arrange the pieces in the hearth for optimal burning, how to poke, how to save this fuel, etc. Significantly, this teaching became somewhat specialized around the age of 9 or 10: girls were more directly involved in learning the right gesture for managing a coal fire, already preparing them to be a good lady of the house.[23] In the late nineteenth century, an entire home economics curriculum was established for them. Science was marshaled to train female experts in maintaining the household, especially with regard to energy: people learned just enough theory to understand the process of combustion; they practiced cleaning the hearth properly, polishing the grating by applying a layer of graphite, and cooking while correctly managing the fire.[24] Of course these gender distinctions varied over time and with social background. A poor girl had to learn very early on how to help her mother: if her strength allowed, she would bring up coal from the storeroom, light the fire early in the morning so the men of the household could leave for work fortified by a filling meal. Her future subordination required her to master these tasks as early as possible, which she would repeat throughout her life for employers and in her own household. This daily instruction also took place in other European countries, in Finland by crafting tales involving knowledge of the forest and the use of wood, and in France by teaching girls basic kitchen procedures via home economics lessons promoted by the republican school system. Multiple avenues can be used to recapture this teaching, namely by exploring the discourse specifically addressed to women and men. It can also be grasped based on how energy was used. For example, cookbooks are a documentary medium that food history has traditionally used, but rarely in combination with the study of energy techniques, the domestic economy, or gender discourse. Yet this is a very fertile approach, as demonstrated by books in the field of food history.[25]

In her work on Canada, Ruth Sandwell has similarly revealed the often justified fears connected to the use of gas, electricity, and certain appliances, as well as the role they played in the energy choices of stay-at-home wives and mothers.[26] Contemporaries, energy companies in particular, were of course not insensitive to this resistance—sometimes interpreted as proof of women's weak intellectual capacities and meager scientific knowledge—which experienced door-to-door salespersons strove to overcome.[27] Nevertheless, women's central role in domestic energy decisions and their imagined expectations were integrated more often. During the interwar period, suppliers of gas, electricity, and coal all used the same language: their advertising touted, in almost identical fashion, the ease of use, cleanliness, and low cost of their energies, whose benefits were praised by female employees recruited to convince their colleagues in the household. Associations were explicitly created for this purpose, for instance in the United Kingdom with the Electrical Association for Women in 1925, the Women's Gas Council in 1935, and the Women's Advisory Council on Solid

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23 Charles-François Mathis, *La civilisation du charbon* (Paris: Vendémiaire, 2021), chapter 6.

24 On home economics, see especially Carol Dyhouse, "Towards a 'Feminine' Curriculum for English Schoolgirls: The Demands of Ideology, 1870-1963", *Women's Studies International Quarterly*, vol. 1, 1978, 291-311; Vanessa Heggie, "Domestic and Domesticating Education in the late Victorian City" *History of Education*, vol. 40/3, 2011, 273-290.

25 For example Sonja Petersen, "Das elektrische Kochen - Die volleektrische Küche als Leitbild moderner Haushalsführung", *Food & History*, vol. 11/1, 2013, 75-106; Jean-Pierre Williot, "Vendre la cuisine au gaz et la cuisine électrique par l'affiche, des années 1890 aux années 1930", *Food & History*, vol. 16/2, 2018, 83-105.

26 Ruth Sandwell (ed.), *Powering Up Canada: The History of Power, Fuel, and Energy from 1600* (Montreal: McGill University Press, 2017). See also Ruth Sandwell, "Fear and Anxiety on the Energy Frontier", in Abigail Harrison, Ruth Sandwell (eds.), *Women and Energy*, issue of *Rachel Carson Center Perspectives*, 2020/1, 37-41.

27 See for example the remarks in a sales manual from an association including coal producers and distributors in interwar England: Coal Utilisation Council, *Course in Coal Salesmanship*, 1st handbook: *The Groundwork of Coal Salesmanship* (London: CUC, 1936?), 53-54.

Fuels in 1943. Yves Bouvier has shown the marketing strategies of companies, and how they successfully included some of the consumer's expectations and shaped some of their representations.[28]

26 The distribution of gender roles can extend the boundaries of the household, where an energy culture was practiced, to broader cultural spaces. Gathering wood, going to the washhouse, buying a bag of coal, a can of oil, or a bottle of gas were so many chores but also opportunities to go out and frequent places of female sociability, certainly in the case of the washhouse and potentially for other places. Understanding the role of women in energy decisions, evaluating their expectations and fears, hearing the reasons for their resistance, and measuring their pride in mastering gestures and knowledge are all needed to make practices and representations evolve. Because it is at the intersection of issues relating to the family, entrepreneurship, and public policy, the household is a locus for national energy trajectories, for instance during the fascist *ventennio* in Italy, where the state effort described by Andrea Giuntini brought about a shift in national gas use from lighting to kitchens. A policy of technological innovation was initiated in order to combine modernization and economic autarky, as was a cultural change in which women and their culinary practices were a major consideration.

27 There are therefore many avenues of exploration surrounding this fertile intersection between gender and energies: one can focus, for example, on opinion surveys for energy expenses; women's educational programs relating to domestic uses on all continents; the research laboratories of major energy companies, which conducted usage tests on household appliances, such as at Cornell University in the 1920s as part *Home Economics* initiatives; the vocabulary of transmission that appeared in user manuals; and consumer associations, among others. Without attempting to outline a working program that would later become a major project combining gender and energies—active convergence of interests would be needed to do so—the topics explored can take their place in a wider ambition. The roles that will determine the paths to success—or failure—in the dynamics of the energy transition imposed by a changing environmental context can contribute to changes involving women and men in equal parts. Analyzing them can help formulate proposals for the future, as done by Beatrice Khamati-Njenga for countries of the Global South, and by Benoît Granier for Japan.[29]

28 Yves Bouvier, "Entreprises, énergies et consommateurs en France depuis 1945" (unpublished HDR thesis, Sorbonne Université, December 2020).

29 Beatrice Khamati-Njenga, Joy Clancy, "Concepts and Issues in Gender and Energy", *Energia*, 2003; Benoît Granier, "Gouverner la consommation d'énergie des ménages. Renouvellement des enjeux et des instruments d'intervention (1973-2017)", *Ebisu. Etudes japonaises*, n° 56, 2019.

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Making Coal Sharp: Gendered Consumers and Users of Mineral Fuel in the 19th Century United States

Abstract
At the same time that urban American hearths and kitchens became dependent upon coal, proscriptive accounts of gendered domesticity grew in popularity. Buying coal was a man's world, full of sharp dealings, underhanded sellers, and cutthroat competition. Using coal, on the other hand, was women's work, in which emergent ideas of domestic economy placed an emphasis upon efficiency and order. Although these worlds were separate in theory, in actuality the use of coal blurred idealistic visions of a gendered division of labor in the home. "Making Coal Sharp" examines the ways in which industrial capitalism connected the hearth and kitchen to wider energy markets, while complicating an idealized gendered division of labor held dear by middle and upper-class American households as they negotiated this first major energy transition to fossil fuel use.

Plan of the article

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INTRODUCTION

1 In 1966, the Connecticut Yankee Atomic Power Company produced a brief film to support the construction of their nuclear power plant in Haddam Neck, Connecticut. The film, entitled *The Atom and Eve*, featured the Broadway actress Leslie Franzos dancing amid a showcase of household goods meant to represent the power of electricity—and in this particular case nuclear power—to make an idyllic home life a possibility. "Eve and thousands of Eves like her," the narrator proclaims, "live in truly an electrical Garden of Eden." (fig. 1). The images of Franzos cavorting with a refrigerator and several other home appliances demonstrated the ease of modern life and the role of energy in creating those many luxuries. As an angelic figure separated from the dirty work of creating energy, Eve represented the pinnacle of domestic life made clean, simple, and alluring through the application of cheap and easy energy. Rather than struggle with coal or oil furnaces to stay warm in the frosty New England winters, families could rely upon nuclear power to provide a clean and efficient alternative to their existing energy regimes. But would this new form of energy work the wonders as promised? *The Atom and Eve* attempted to convince a skeptical American public of nuclear energy's utility for domestic work; in doing so it tapped into longstanding tropes about the role of women and energy in the American home.

2 Since the founding of the American Republic, the notion of making domestic work cheap and easy through the application of new forms of energy have made their way into public forums via household management literature, newspaper and journal articles, and various forms of advertising. Changing an everyday routine is not easy, and where new technology is involved the learning curve can be steep. Eve might dance around the wonderous appliances made possible by new forms of energy, but the work of purchasing and installing them most likely fell to her male counterpart, Atom (or Adam). Staying warm in North American winters remained a constant

Figure 1: Leslie Franzos surrounded by nuclear energy's labor-saving devices. The actual reaction to domestic appliances by women in the industrial era was less celebratory.
(Source: YouTube. https://youtu.be/2_epgo6cxdg)

even as the means to do so would undergo periodic change. How do these energy transitions occur on the ground level? In the urban centers of the East Coast, where much of this change originated, the distinction between the *users* and *consumers* of technology became significant, as there was a gendered division between those who mostly used energy-intensive appliances and the household occupants who purchased them. This distinction was rooted in the emergence of middle-class assumptions about the role of men and women in the growing industrial economy of nineteenth-century urban America; one based upon labor-saving devices that implemented new technological systems. These changes necessitated participation in a market economy that emphasized aggressive bargaining under the rules of *caveat emptor*. For Americans steeped in this nineteenth-century mindset, men were naturally suited for this activity and women more adept at implementing innovations once they crossed the threshold of the home. The notion of "sharp dealing," or negotiating a good price for goods in a competitive marketplace at the expense of the other party, remained quintessentially male while the housework itself occupied the feminine sphere of influence. These proscriptive distinctions broke down many times in the face of reality, and yet the common assumption that men would act as consumers of new forms of industrial technology, while women would use them, remained in place from the age of wood-burning fireplaces through the Franzos' Atomic Age dance routine.[1]

3 In the early part of this campaign to apply energy to the housework, a quotidian Eve was much more likely to burn coal than flip an electrical switch. Yet the need for a cultural campaign to switch energy regimes drew upon similar themes that emphasized both economy and ease. In 1823 the editors of *Niles' Register* sought to "induce prudent housekeepers to adopt the use of this very cheap fuel" and the designers of one anthracite coal cooking grate promised housekeepers in 1826 "No stoop, no smoke, no odors—little care and less fuel." Despite the centuries that separated the adoption of mineral and nuclear energy in the American household, the message sent from energy producers was the same: our product can make your life easier, your home comforts many, and your family happy. The comparison here might seem strange—isn't burning coal a natural extension of firewood? In fact, the implementation of a new technology such as a coal-burning stove, while perhaps not complex to modern eyes, did represent an integration of America's rising industrial economy—one that became increasingly dependent upon manufacturing, complex systems of transport, and a closer reliance upon fuel efficiency—into the home.[2]

4 Despite promises of domestic bliss, historians of technology and the home have long documented the many problems that new energy regimes faced as households attempted to integrate them into their daily routine. The transformation of the hearth over the course of the nineteenth century was revolutionary, as the incorporation of coal in home heating and cooking linked urban households, particularly in the North where home heating needs were most acute, into America's industrial economy at two critical junctures: the market for consumer durables and the national distribution network for mineral fuel. Theoretically, this change reduced the cost of heating a home and spared families from the endemic shortages of firewood that plagued northern cities and towns during the early 19th century. Reducing the price of home heating fuel might please male consumers, yet the female

1 Historians of technology have unpacked the gendered assumptions about male-dominated production and female-centered consumption to reveal more subtle relationships at work in both public and private settings. In this case, the focus upon energy use in domestic technology sidesteps the production/consumption divide. See, for example, the essays in Roger Horowitz and Arwhen Mohun (eds.), *His and Hers: Gender, Consumption, and Technology* (Charlottesville: University of Virginia Press, 1998).

2 *Niles' Register* (Baltimore), 24 September 1825; Frederick Binder, "Anthracite Enters the American Home," *Pennsylvania Magazine of History and Biography*, 82, 1958, 91. The integration of the industrial economy into the American home is the major theme in Sean Adams, *Home Fires: How Americans Kept Warm in Nineteenth-Century America* (Baltimore: Johns Hopkins, 2014).

users of this new form of domestic energy did not see much in the way of labor-saving innovations with the adoption of stove-coal system. Susan Strasser argues that the cast iron stove "reduced the hazards and some of the work, but did not eliminate the central tasks of hauling fuel and tending fires," which traditionally fell to women of the household. Ruth Schwartz Cowen notes that "stoves were labor-saving devices, but the labor that they saved was male" as the work of cutting and hauling wood disappeared, yet the labor required to provide meals did not. In fact, the integration of coal stoves provided even more work for women in the household, as building and maintaining a fire, as well as cleaning and polishing iron stoves, fell to them.[3]

5 The notion that men and women inhabited "separate spheres" of work and home emerged from the proscriptive ideals of a narrow sliver of middle and upper-class observers during the 19th century rise of the "cult of domesticity." As limited as this doctrine was in its real application, it remained influential in both Victorian England and the United States, where it reached its most idealistic form in the late decades of the nineteenth century. As the application of new technology in the home, as well as the expansion of domestic service in middle class households advanced in the post-Civil War decades, the ways in which male and female Americans integrated their own household within the emerging network of coal-burning domestic appliances reflected a gendered division of men as consumers and women as users of mineral fuel. Of course, overlap in these roles might occur from time to time, but rather than smooth out any differences and make a coal-fired Eve surrounded by newfangled stoves and furnaces, this energy transition reflected an emerging industrial marketplace and yet it was still influenced by notions of domesticity. Both American men and women had proscriptive roles in this new coal-burning world, even as brand new, gendered actors such as coal dealers integrated themselves into the industrialized hearth that was commonplace in northern American cities by the turn of the century.[4]

ENERGY AND GENDER IN THE EARLY AMERICAN REPUBLIC

6 Although mineral fuel did not eclipse the use of wood in the economy of the United States until the 1880s in terms of overall use, American cities were the vanguard of the transition to coal. In the two decades following the War of 1812, urban homes began to burn more and more coal, as disappearing stocks of nearby firewood and increased production in American coal fields helped along this energy transition. By the 1830s and 1840s, the residents of large cities such as Boston, Philadelphia, New York, and Baltimore burned both firewood and coal for home heating, with the latter taking a definitive lead in terms of preference and overall usage. Families saw coal transformed from a novelty used only during periods of firewood scarcity into an everyday commodity; mineral fuel was ubiquitous in the urban American hearth by the outbreak of the Civil War. But unlike the previous energy regime that relied up on local stocks of firewood, the American coal trade developed an extensive network of canals and railroads to distribute coal across the nation. Rather than purchasing wood fuel in a spot market, American consumers in the mineral fuel regime tapped into this extensive network. In doing so, men and women extended the needs of their household both forwards into the industrial marketspace, while also inviting the values of that market backwards into their homes. Firewood appeared in seasonal markets, often shipped to urban centers by local farmers looking to augment their year's

3 Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon Books, 1982), 49; Ruth Schwartz Cowen, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983), 61.

4 For a brief overview on the problematic nature of domesticity as a proscriptive measure in 19th century American society, see Nancy Cott, *The Bonds of Womanhood: "Woman's Sphere" in New England, 1780-1835* (New Haven, CT: Yale University Press, 1977); Linda Kerber, "Separate Spheres, Female Worlds, Woman's Place: The Rhetoric of Women's History," *Journal of American History*, 75, 1988; Cathy N. Davidson and Jessamyn Hatcher (eds.), *No More Separate Spheres! A Next Wave American Studies Reader* (Durham, NC: Duke University Press, 2002).

income. Nineteenth-century households that transitioned to coal usage represented the end-point of a commodity chain that involved corporate mining ventures in distant fields, extensive rail and canal networks, and retail coal dealers seeking to stay afloat in cutthroat urban markets. Men and women in urban households of the North did not necessarily jump into this complex system of energy distribution knowingly; like so many agents negotiating change they fell back upon the familiar roles expected of them. The center of the home, the hearth, thus underwent a kind of industrialization filtered through a gendered lens. Whether they liked it or not, American men and women needed this new and complex industrial system in order to stay warm in the colder months of the year.[5]

7 The change in fuel regime adapted to longstanding gender roles in the reordering and tending to the American hearth. Male family members, or in more affluent households a male servant, were responsible for the outdoor work such as securing wood from local dealers, managing the season's supply outdoors, splitting logs to a manageable size, and carrying the wood fuel into the house. Once fuel entered the proximity of the hearth, female residents or servants took charge of lighting and maintaining the fire, keeping fireplaces clean and orderly, and cooking meals. The installation of a coal grate in existing fireplaces made this adaptation rather straightforward. Coal stoves added more tasks on both sides of this gendered division of labor. Male members of the household generally took responsibility for securing the coal stove from dealers and installing it in the house. Once in place, though, women and female servants experienced an increase in their household responsibilities. The traditional task of lighting and maintaining the fires of the household remained in place for women, but the installation of an apparatus such as an iron stove or a coal-burning furnace created new responsibilities for them. For example, iron stoves could rust, and so in addition to removing ashes and fused particles of impurities—known colloquially as "clinkers"—from the stove, women were expected to clean the stove's interior and exterior surfaces and polish it with a blackening agent. This was hard, dirty, but necessary work. On the surface, then, the outdoor/indoor division of labor based on gender seemed to hold firm through this major energy transition.[6]

MAKING THE INDUSTRIAL HEARTH THROUGH STOVES

8 Adapting existing domestic spaces to mineral fuel required both physical and economic changes in the household. In smaller fireplaces for heating individual rooms, a cast-iron grate for burning either bituminous or anthracite coal could be installed a small cost. Wealthy families might continue to burn wood in open fireplaces, mostly for its aesthetic appeal, but by the 1830s and 1840s the coal stove became a common sight in homes across the American North. Most homes, whether purchased, constructed, or rented, would have had existing fireplaces built into the space; stoves offered an innovation for the American home as the nation's first real consumer durable and as a product secured by men in the antebellum marketplace. Iron stoves, although simple, were expensive, with many models costing the equivalent of a few weeks' wages for many working-class families. Producers responded by creating a diversity of home heating devices aimed at various levels

5 For a good overview of how this energy transition took place and how domestic use led the way, see Christopher Jones, "The Carbon-Consuming Home: Residential Markets and Energy Transitions, "*Enterprise and Society*, 12, 2011. The larger story of the "industrial hearth" and the ways that it connected homes to national network of coal distribution is covered in Adams, *Home Fires*, 65-92. Jeremy Zallen expands the connection between households and energy systems to encompass global systems of work and exploitation for home illumination in *American Lucifers: The Dark History of Artificial Light, 1750-1865* (Chapel Hill: University of North Carolina Press, 2019).

6 For more on the gendered division of labor in early American households, see Jeanne Boydston, *Home and Work: Housework, Wages, and the Ideology of Labor in the Early Republic* (New York: Oxford University Press, 1990) and Suellen Hoy, *Chasing Dirt: The American Pursuit of Cleanliness* (New York: Oxford University Press, 1995). For the integration of coal-burning apparatuses in the American home, see Priscilla Brewer, *From Fireplace to Cookstove: Technology and the Domestic Ideal in America* (Syracuse, NY: Syracuse University Press, 2000) and Adams, *Home Fires*.

of income and needs—combination cooking and heating stoves, elaborate self-feeding stoves, and simple six plate designs aimed at economy and thrift. The increasing use of coal-burning stoves in American homes extended the domestic economy into the more public areas of the marketplace in unprecedented ways by the 1840s. By 1845, the U.S. patent office estimated that there were more stove patents issued from their office than for any other kind of invention. The stoves themselves were sold in a variety of forms, first as novelty items at general merchandise retailers, and eventually the stove dealer became a specialized merchant in the field.[7]

9 Purchasing a stove put families directly into contact with one of the vanguards of American industrialization. The historian Howell J. Harris estimates that by 1860 one stove was sold for every five American households and argues that stovemakers "developed methods of product differentiation, began to establish valuable brand identities, reached out to their consumers and built their own direct-sales networks." As the market for stoves expanded, the location of selling points moved from domestic to commercial settings. Stove foundries eventually opened their own showrooms close to their production facilities and hired jobbers to install showroom models in more distant locations.The stove industry shifted the point of sale from a tinker or peddler approaching the home directly—where they would have had direct contact with both male and female members of the household—to specialized retail centers more likely to serve as male spaces devoted to back and forth bargaining. As a result, urban households were removed from most of the retailing aspect of stoves, which allowed for a deepening of gendered divisions between consumers and users. Men might purchase and install them, while women were expected to adapt them to heating and cooking practices. As in other areas of the rapidly developing market for industrial goods, the practice of "sharp dealing" in stoves required male consumers to be wary of false promises of quality, the upsale of certain models, or prices far removed from the wholesale cost. In 1844 the Boston stove dealer, L.V. Badger, printed an almanac with helpful hints for consumers beleaguered by the "infinite variety" of stoves and noted that "Often has a person to lament his sad mistake in getting a poor stove." Of course, Badger's almanac promised to enlighten his customer: "now for 6 ¼ cents the whole story is told, and who is there so unwise as to be without such a valuable acquisition to their daily enjoyments."[8]

Stove retailers dealt mainly with upper and middle-class consumers. Philanthropic organizations hastened the transition to stoves among the nation's working poor by subsidizing the cost of the transition from wood to coal. The suffering of families during the cold winters of the American North triggered a rise in fuel philanthropy aimed at making all urban residents into consumers of coal. In part, these initiatives were aimed at protecting the most vulnerable families without male breadwinners. Tales of single women with children shivering in the cold accelerated the use of stoves among the urban poor. For example, during a particularly brutal winter in 1831, Philadelphia's newspapers teemed with stories of mothers burning furniture in order to stay warm at the same time that the Lehigh Coal and Navigation Company advertised a $1.50 anthracite cooking stove under the heading "Economy and solid comfort for the poor." Philadelphia's Fuel Savings Society purchased one hundred stoves from a local dealer and sold them to the "deserving poor" at a discount rate of $5.50. The Union Benevolent Society, another philanthropic society, sent out nearly 400 stoves to poor families for winter seasons. Overall, these programs developed into as a substantial subsidy for new fuel technology, as cheap coal stoves sold for about $15 to $20 dollars during the 1830s, with most models averaging about $30. During the antebellum years, similar initiatives in which charities distributed both fuel and the means to burn it to households appeared in cities across 10

7 Brewer, *From Fireplace to Cookstove*, 64, 85-86.

8 Howell Harris, "Inventing the U.S. Stove Industry, c. 1815-1875: Making and Selling the First Universal Consumer Durable," *Business History Review*, 82, 2008, 702; *Stove Almanac for 1844* (Boston: L.V. Badger, 1844), 1, 19.

the American North, as philanthropy and fuel markets merged to encourage technological change in working-class households.[9]

11 Stove production facilities clustered around industrial nodes such as Troy, New York, which was the nation's leading center for the manufacture of stoves. After fabrication, stoves moved through an extensive network of wholesalers and retailers based in American cities and towns. These production and distribution functions were exclusively the province of male manufacturers and merchants, even as advertisements stressed the utility of stoves for domestic purposes. As the primary decider for large purchases, American men acted as *consumers* in the market for stoves, while women represented the primary *users* of them. In other words, once the stoves crossed the threshold of the domestic space, their use and care became subject to female oversight. Eventually designs became so sophisticated that in 1878 Catharine Beecher proclaimed that the modern coal-burning stove "can be used satisfactorily even when the mistress and maid are equally careless and ignorant of its distinctive merits." Beecher admitted that she used the coal stove herself, proof that "even without any instructions at all except the printed directions sent with the stove, an intelligent woman can, by due attention, though not without, both manage it, and teach her children and servants to do likewise."[10]

"SHARP DEALING" AND THE MANLY ASPECTS OF COAL

12 Anthracite coal, the preferred mineral fuel in eastern cities such as Boston, New York, or Philadelphia, needed more kindling and early attention than traditional wood fires. Once lit, an anthracite fire required regular attention and, according to one domestic manual, "should always be punctually replenished at the stated hours." Careful attention to the amount of fuel insured that the fire would not extinguish itself or, more ruinously, melt the iron grate that separated it from its ashes. "Injudicious poking and stirring will put it out," Eliza Leslie advised in 1840, "instead of improving it." Domestic servants found coal fire maintenance an essential part of their portfolio. "Very few servants at first understand the method of kindling and continuing a fire of Lehigh coal, any will never learn, and many more from erroneous instructions, whilst they think they understand it, make but a bungling piece of work of it," Robert Roberts argued in his 1827 guidebook, *The House Servant's Directory*. "As our book is intended to be useful to servants," Roberts concluded, "it must be granted that a knowledge of how to make a Lehigh [anthracite] coal fire, when it is becoming so common in this country, is quite an acquisition."[11]

13 As urban households converted to mineral fuel over the course of the antebellum period, they relied more heavily upon a national network of coal distribution. Anthracite, the preferred fuel of most households, shipped from Eastern Pennsylvania to major urban centers of the East Coast. Bituminous coal served as the main household fuel in the northern regions west of the Appalachians. Regardless of rank, coal traveled via canals and railroads to urban distribution centers,

9 *Philadelphia Gazette and Advertiser*, 19 January 1831; *Niles' Register*, 16 July 1831; *A History of the Fuel Savings Society of the City and Liberties of Philadelphia: From its Organization to 1871* (Philadelphia: Collins, 1875), 9; *Union Benevolent Association, 1831-1881: Fifty Years of Work Among the Poor of Philadelphia. Historical Sketch of the First Half-Century of the Union Benevolent Association* (Philadelphia: Chandler Printing House, 1881), 25. Estimates on the cost of stoves come from Priscilla Brewer, who notes the "sticker shock" that most antebellum consumers faced when purchasing a stove. Brewer, *From Fireplace to Cookstove*, 79. For more on fuel philanthropy, see Sean Patrick Adams, "Warming the Poor and Growing Consumers: Fuel Philanthropy in the Early Republic's Urban North," *Journal of American History*, 95, 2008.

10 Howell J. Harris, "Conquering Winter: U.S. Consumers and the Cast-Iron Stove," *Building Research and Information*, 36, 2008; Catharine Beecher, *Miss Beecher's Housekeeper and Healthkeeper: Containing Five Hundred Recipes for Economical and Healthful Cooking* (New York: Harper & Brothers, 1873), 188.

11 [11]Eliza Leslie, *The House Book: or, a Manual of Domestic Economy* (Philadephia: Carey & Hart, 1840), 132-133, 135; Robert Roberts, *The House Servant's Directory, or A Monitor for Private Families* (Boston: Munroe and Francis, 1827), 159. For more on the struggles of users in everyday technology, see Joseph J. Corn, *User Unfriendly: Consumer Struggles with Personal Technologies, from Clocks and Sewing Machines to Cars and Computers* (Baltimore: Johns Hopkins University Press, 2011).

where it diffused out to local coal yards. These retailers then secured orders from urban households, which was accompanied by some intense haggling over the price per ton, then delivered their product to the purchased. For upper and middle-class households, this entailed the loading in of several tons of coal into a "coal hole" in front of their dwelling, or a coal cellar. Less affluent consumers purchased much smaller amounts, at a high markup in in price. If they could not afford to deal directly with a coal dealer, poor families and individuals likely purchased their fuel by the bushel or bucket from a local grocer. Whatever the size of the order, coal dealers, emerged as the major contact point between households and the American mineral fuel network in the decades following the Civil War.

14 For the most part, the world of the coal dealer, in which "sharp dealing" and cutthroat competition ruled the day, was dominated by men. As the national market for mineral fuel allowed highly competitive railroads and coal companies to dump vast amounts of bituminous and anthracite coal into urban markets, competition was fierce and profit margins thin—usually less than ten cents on the ton—and so some dealers succumbed to the temptation to cheat their customers. They viewed this as a necessary tactic in a highly competitive, easy entry/easy exit business and were shielded by the spirit of *caveat emptor* shaping American common law. This behavior was reinforced by the structure of the industry. In 1873, the president of the Philadelphia Coal Exchange estimated that about four hundred coal dealers worked in his city, and that "Any one who commands trade and capital can enter the business, and securing any Coal for sale is simply a matter of private bargain between himself and the producer who chooses to have his Coal disposed of in that way." A year later, the *Chicago Tribune* proclaimed that "the sooner it is understood that your neighborhood petty coal merchant swindles you inevitably and of necessity, the better it will be for coal consumers."[12]

15 Male consumers and dealers seemed most at odds when dealing with weight. Although most cities had a small number of public scales and inspectors on hand to ensure standard weights, these officials were overwhelmed. Philadelphia, a city of nearly 675,000 inhabitants, had three coal inspectors in place by 1871 to oversee a trade that saw between 200,00 and 500,000 tons sold every month. Male customers could demand that dealers send their wagonload loads to public scales, but in doing so they appeared incapable of "sharp dealing" themselves. More often than not, purchasers eyeballed the coal wagon and proclaimed it a fair deal. Dealers purchased "long" or "gross" tons of coal measuring 2,240 pounds from wholesalers and coal companies but sold "short" or "net" tons of 2,000 pounds to their customers. As waste rock and slate did make its way into wholesale shipments of coal, dealers argued that they needed this discrepancy to break even. Consumers often complained that they were sold tons of coal that were well short of the 2,000-pound mark. Investigative reports tended to support this accusation. In New York, a set of dealers used eighteen and nineteen hundred pounds delivery wagons and pocketed the excess coal. In 1869 the state investigated sixteen dealers and found that fourteen of them were well short of 2,000 pounds. At the same time, samples of a "ton" of coal sold to consumers in Philadelphia found them from three hundred to two hundred pounds short.[13]

16 These very public complaints about coal dealers and weight wound their way into the daily routine of urban life in late 19th century America. The unscrupulous coal dealer, for example, became a stock character in popular humor as their "sharp dealing" took a dark turn. Jokes focused on the dealer's propensity to cheat consumers at every turn and in this case, humor blunted what was a very large concern for American households. The

12 *The Coal Monopoly. The Coal Trade of Philadelphia in Reply to the President of the Philadelphia and Reading Railroad Company* (Philadelphia: A.T. Ziesing & Co., 1873), 4; *Chicago Tribune*, 15 Nov. 1874.

13 *Journal of the Common Council of the City of Philadelphia*, vol. 2 (Philadelphia: King and Baird, 1874), 355-356; R. G. Healey, *The Pennsylvania Anthracite Coal Industry, 1860-1902: Economic Cycles, Business Decision-Making and Regional Dynamics* (Scranton, PA: University of Scranton Press, 2007), 227; *Gray's New England Real Estate Journal*, 15 Feb. 1869; *Saward's Coal Trade Journal*, 15 Dec. 1875, 10 Jan., 16 May 1877.

humor magazine *Puck* reprinted an article from a Philadelphia newspaper that reported "The only thought that troubles a coal-dealer when he reads of a terrible colliery explosion is to know whether he shall clap fifty cents or a dollar on the price of a ton." Not only does this joke establish the coal dealer's love of profit; it also paints this figure as lacking basic human emotion. In both interpretations, the profession does not fare well in the public eye. In 1888 *Puck* printed two coal dealer jokes in subsequent issues: one had Col. Colcart, the famous dealer, building a yacht that measured "eighty tons coal measure, sixty tons ordinary," and another reported that "Strange as it may seem, a ton of feathers is heavier than a ton of coal, as every coal dealer and consumer well knows." A joke entitled "The Honest Dealer" featured a dealer who asks his employee how much they sent Mrs. Goodheart for the last ton she bought. The worker answers "1700 pounds" and the dealer retorts, "That's right. Now come and paint these pebbles black." Finally, a joke published in 1900 features a city merchant asking a coal dealer, Mr. Brown, if the people in his town take any interest in athletics. The coal dealer answers yes, and when asked what kind, he says ("unconsciously") that "I am the champion light weight." The principal actors in these jokes were almost always male; more significant is their common theme that reflected an aggressive atmosphere of sharp-dealing and swindling. As the stock character of the dishonest coal dealer became more ingrained in everyday life, the need to insulate the American family from their predatory behavior was all the more pressing; humor could blunt this impact, but never quite remove it.[14]

WOMEN AND THE HOUSEHOLD FUEL ECONOMY

17 There is little evidence that American women spent a great deal of time haggling with coal dealers over the price of a ton, but they were involved in fuel economy once it crossed the front door. The proscriptive view of the home and hearth as the realm of women held firm in the wake of coal's adoption, but the notion that women were absolved of being economical users of fuel did not. They might not confront dealers in stoves or coal on their own turf, but female users of coal nonetheless were aware of fluctuations in energy markets. In fact, evidence suggests that female housekeepers kept well abreast of coal prices even as they were expected to remain insulated from rapacious dealers. *Frank Leslie's Ladies Magazine* published a fictional account of a young housewife who reminded her husband, when he complained about the chill in the air, that coal was $12/ton and they must economize. For example, Elizabeth Ellet's advice to female housekeepers in 1872 was to check fuel bills regularly, and "thus she will detect, and can check, any inaccuracy on the part of the tradesman, or extravagance on the part of her servants." *Everyday Housekeeping* recommended that women actively learn about their local fuel markets: "The different names by which the various kinds and grades of coal are known are liable to be a source of some perplexity to the house keeper until she becomes acquainted with the supplies of her market, and with the customs of the dealers there."[15]

18 In addition to staying in tune with price movements, housekeepers needed to adjust to various types of coal in their stoves and grates. By the 1870s, coal dealers offered a dizzying array of choices named for location, size, and rank: Peach Mountain, Grey Ash, Sub-bituminous, Nut, Pea, and other descriptive names dotted the newspapers and broadsheets. Male consumers might act on price alone in making their purchase, but as the agent for coal dealing firm Meeker & Dean wrote in *Saward's Coal Trade Journal* argued in 1874, "Such people seldom see beyond the end of their noses; they save at the spigot, but lose at the bung-hole." But even the savvy consumer might find it difficult to balance

14 *Puck*, 28 November 1877; 4 April 1888; 23 May 1888; *Judge's Library: A Monthly Magazine of Fun* 54 (January 1894): 40; *Sis Hopkin's Own Book and Magazine of Fun* (New York: Judge Publishing Company, 1900), 19.

15 *Frank Leslie's Ladies Magazine* 17 (December 1865), 422; Elizabeth Ellet, *The New Cyclopedia of Domestic Economy, and Practical Housekeeper* (Norwich, CT: H. Bill, 1872), 33; Charles White, "Household Fuels and Their Economic Uses," *Everyday Housekeeping*, 10, November 1898, 52.

price and quality in the marketplace, as subterfuge from unscrupulous dealers. In 1880 the Philadelphia Retail Coal Dealers Association sent around a circular asking dealers to list best quality coal at the top of their broadsheets and list prices for inferior coal going downward. "This policy is rendered essential by reason of the numerous advertisements of low priced coal fictitiously set forth, as 'best Lehigh' whereby the public are deceived," the Association argued, "and led to believe that they are being imposed upon by the reasonable charge of honest dealers." As a result, many women in urban households might have a preference for their type and rank of coal, but that by no means guaranteed that they could secure it. Making do with various fuels was an important part of homemaking, and knowledge of the comparative strengths and weaknesses of each fuel once it crossed the threshold could save time and money. The image of a housekeeper or servant making do with inferior fuel became a trope in some domestic guides; the notion that women needed to "make do" with what the marketplace offered became an argument in favor of electricity by 1900. Helen Campbell argued that removing coal stoves altogether might remedy the "millions of hours spent by millions of women and an occasional man in tending fires, wrestling with poor coal and wet wood." Campbell's chosen ratio in describing this struggle offers an insight into the gendered aspect of making fires in nineteenth-century America.[16]

19 The issue of weight, so pervasive in the public aspect of coal purchases, had a household dimension that fell under the purview of women. Elizabeth Ellet described the difference between male and female responsibilities as such: "Many heads of families are exceedingly particular about the *price* of their purchases, who are utterly regardless whether or not they have the *weight* they paid for." In fact, the physical space that coal occupied in the home proved much more significant than its weight in tons. In 1878 Marie Ackley Marshall recommended that families not only measure the size of their coal bin, but that they also secure a box that could hold exactly a bushel. Twenty years later, *Everyday Housekeeping* recommended the purchase of "coal-bins of known capacity" so that "the dealer's weights may be approximately corrected or verified." This hardly kept unscrupulous dealers from continuing their grift, as a cartoon in *Time* from 1889 suggests (fig. 2). In that image, a coal dealer recommends using empty boxes to fill up the bin. When his worker asks if that is theft, the dealer responds, "Of course not. They'll

Figure 2: The swindling coal dealer became a common character in American popular literature by the late 19th century. Here a crooked dealer invades the sanctity of the home in order to turn a profit.
Source: *Time*, Vol. 8, 23 February 1889.

16 *Saward's Coal Trade Journal*, 8 April 1874; "Confidential Circular of the Philadelphia Retail Coal Dealers Association, 15 October 1880," from Donaghy and Sons Accounts and Scrapbook, Historical Society of Pennsylvania, Philadelphia, PA; Marie Ackley Marshall, *The Home Guide: A Compendium of Useful Information Pertaining to Every Branch of Domestic and Social Economy: A Manual for Every Household* (Chicago: J. Fairbanks, 1878), 45; Helen Campbell, "As to Ashes and Rubbish," *Everyday Housekeeping*, 13, August 1900, 176.

find them in the Spring." Small swindles like this were all too commonplace in the American fuel economy.[17]

20 Of course, single women or those in less affluent households did not have much choice in regard to space. For renters of single rooms or small apartments, the idea of maintaining a separate space for fuel storage was out of the question. The Massachusetts Bureau of Labor Statistics surveyed Boston tenement apartments and found coal stored in cupboards, closets, and other small nooks and crannies. Poor families there purchased coal in sizes ranging from the "peck," or twenty pounds, to the eighty-pound bushel, which lasted a few days to a week in New England's harsh winter weather. The mark-up on these small quantities was outrageous, but less affluent consumers enjoyed neither the ready cash nor the storage space to "put in" a winter's supply of fuel. Proscriptive accounts from middle-class writers exacerbated this division by chalking up the management of fuel among America's urban poor to ignorance. Ida Branch Mills reported in 1888 that among the poor, "Coal is bought by the pail, thus making the cost to the consumer from eight to twelve dollars per ton for what could be purchased for four dollars at the yard." However, without the space to "lay up" their supplies, less affluent consumers had no choice but to purchase heating fuel intermittently and on these kinds of unfavorable terms.[18]

21 Once coal was in the domestic space, a shared division of labor still existed in building and maintain fires, although men often found their responsibilities limited to the hard physical work of carrying coal from storage space to the hearth. "The statement that the coal fields of the world will be exhausted in two thousand years," joked *Frank Leslie's Ladies Magazine* in 1878, "brings no permanent solace to the man who has to carry the present daily supply for the family up three pairs of stairs." The editors of *Good Housekeeping* were more direct in 1889: "No man worthy of the name permits his wife or any woman in his house to perform the heavy drudgery of carrying coal and wood, caring for furnaces and stoves, moving stoves or heavy furniture, beating carpets and so on." Although this work seemed necessarily male, both sides were not seem particularly satisfied with its execution in American homes. Mary Sargent Hopkins complained in *The Ladies World*, "It has been said of some men that it would be far easier for them to discover a new constellation than to see the coal-hod that needed replenishing." "Women still insist that men shall put coal into the cellar, then bring it up again, and then carry away the ashes," Edward Atkinson countered in the *American Kitchen Magazine*, "in order that they may burn two to two and a half pounds of coal to every pound of food that they badly cook." [19]

MORE WORK FOR MOTHER

22 It is safe to say that installing coal stoves intensified the work involved in home heating and cooking for women. For single women or those who could not afford domestic help, the day began by sweeping out the ashes and clinkers from the night's fire, piling kindling on top of coal, and then making sure the fire was lit—more often than not with icy breath and numb fingers from the cold morning hindering the effort. Once burning, the fire needed to be maintained. This entailed finding the right amount of coal to feed the fire and watching it carefully. In 1887, Hannah Lane referred to maintenance of a fire as "the most important item in household economy" as wastes of heat and fuel were expensive and uncomfortable: "If a coal fire is not properly regulated the temperature of a room will vary accordingly that is, it will be extremely hot one hour, and chilly the next perhaps, thus rendering its inmates liable to suffer from sudden change."

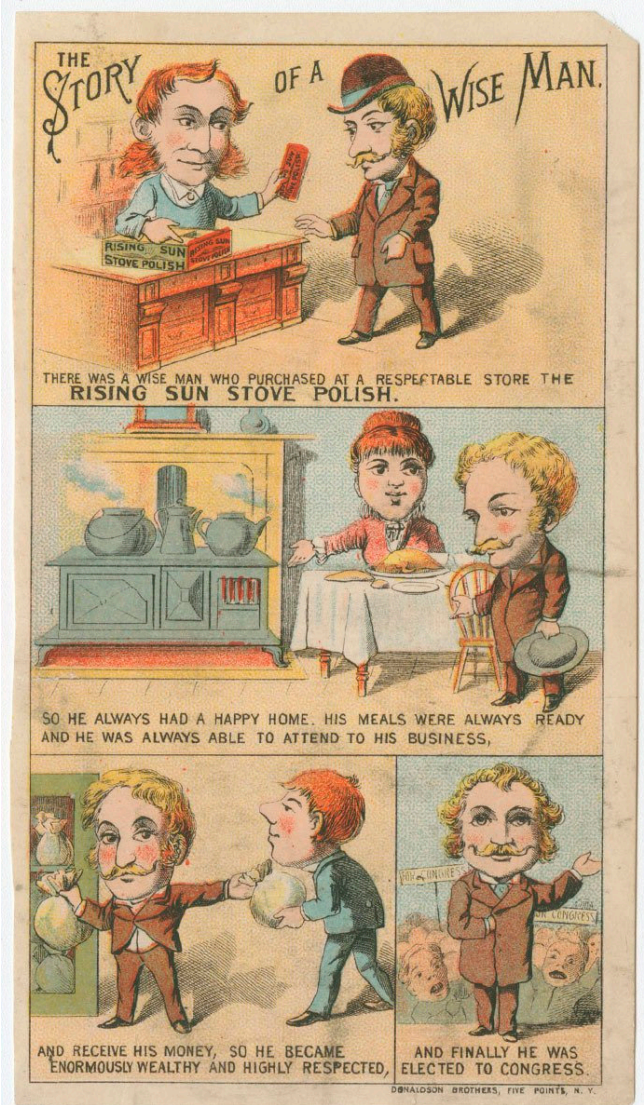
17 Ellet, *The New Cyclopedia of Domestic Economy*, 33; Marshall, *The Home Guide*, 50; White, "Household Fuels," 54.
18 *Report of the Massachusetts Bureau of Statistics of Labor, 1870* (Boston: Wright and Potter, 1870), 173, 176, 179, 246, 272; Ida Branch Mills, "Economy," *Good Housekeeping*, 12, October 1888, 276.

19 *Frank Leslie's Ladies Magazine*, 42, February 1878, 151; "A Man in the Kitchen," *Good Housekeeping*, 8, 16 February 1889, 178; *The Ladies World*, 17, January 1896, 10; Edward Atkinson, "Home Life. Why Not?" *American Kitchen Magazine*, 6, January 1897, 146.

Figure 3: Advertisers through the ages attempt to link the use of their product to domestic bliss. Stove polish was no exception, as unlikely as that connection might seem to modern consumers.
Source: Courtesy of the Alice Marshall Women's History Collection, Ephemera and Artifacts, Accession No. AKM 91/1.1. Archives and Special Collections at the Penn State Harrisburg Library, Pennsylvania State University Libraries.

Figure 4: According to the Rising Sun Stove Polish advertisers, use of their product made for an orderly domestic environment, which would translate into success in the traditionally male worlds of business and politics.
Source: Library Company of Philadelphia Digital Collection. https://digital.librarycompany.org/islandora/object/digitool%3A106440

Periodically, women were expected to "polish" the stove, not for aesthetic reasons, but to keep rust and cracks at a minimum. This meant mixing a black stove polish with vinegar and using a wire brush to scrape build up from the stove's surface. Hazel Webb Dalziel described it as a "horrible messy job" and noted that "it was always Mother who polished the stove." This vital maintenance work meant that the stove was not a labor-saving, but a labor-creating, device for most American women in the late 19th century. Advertising for particular polish brands like Rising Sun stressed the ease and time saved with their particular advice, as trade cards from the late 19th century promising domestic bliss and even financial success, demonstrate (fig. 3 & 4). Ellen Battelle Dietrick recommended in 1894 that "young women should begin to learn domestic science by going through every operation, from cleaning stoves and building fires, to the artistic arrangements of a parlor," preferably through formal courses in the field. For example, she praised one housekeeper who learned that scientific application of kindling saved $2 a month, in addition to the "saving of comfort and increase of pleasure" of having learned to do it correctly. Management of the hearth remained women's work, whether formally or informally learned.[20]



20 "Only a Husband. A Sketch for both Husbands and Wives," *Good Housekeeping*, 5, 3 September 1887, 215; Brewer, *From Fireplace to Cookstove*, 175-178; *Everyday Housekeeping: A Magazine for Practical Housekeepers and Mothers*, 1, June-July 1894, 199, 200.

23 Of course, expanding incomes among middle-class American households meant that hiring domestic servants could mitigate the physical work expected of women. The management of domestic labor was a big topic among housekeeping journals, and in particular the overseeing of home heating and cooking. Catharine Beecher's much reprinted guide to housekeeping argued that "an intelligent woman can, by due attention," learn to manage a coal stove quite easily, "and teach her children and servants to do likewise." In 1881, Beecher's niece Eunice wrote her own set of guidelines for managing servants. *Good Housekeeping* advised women to retrain their servants in which she stressed close supervision and warned against "the lavish expenditure of coal and wood in the laundry and kitchen" which "through mismanagement or indolence, is no unimportant drain in the course of a year if not stopped at an early date." Most domestic guides and proscriptive journals echoed the Beechers' sentiment, with a great deal of emphasis placed upon imparting knowledge of hearth maintenance throughout the entire staff. "For, although your maid *may* know how to get a mass of ignited coal in the stove," the editors of *Good Housekeeping* warned in 1886, "she may be far from knowing how to build a fire that it will burn up brightly and *quickly*, which has a great deal to do with getting to work easily and successfully."[21]

24 Whether a coal fire in a stove was lit and maintained by servants, wives, or daughters, the need for fuel economy reflected the values of the industrial marketplace. In the same way that spending too much money on a coal stove or paying inflated prices for a ton well short of 2,000 pounds represented a waste of hard-earned dollars for American men, the faulty maintenance of a fire or injudicious feeding of coal over the course of a day could take a lasting toll on the family budget. Even as new appliances such as central furnaces appeared in homes, the need for fuel economy persisted. In 1886 one family revealed their secrets for managing a furnace fire with servants in the pages of *Good Housekeeping*: build a fire and keep it going all winter, with a blend of one ton Cumberland coal at $5/ton and five tons of Plymouth at $6/ton. By starting the fire with the cheaper Cumberland coal and allowing it to self regulate "you will see what freedom there is from care, and how one can easily spend the day in town and return at night to a warm house, with no Bridget to watch your fires either." In offering advice to young women on household management, Eunice White Beecher praised the science of building a fire and economizing on coal, but warned about "the lavish expenditure of coal and wood in the laundry and kitchen, through mismanagement or indolence," which could cause "no unimportant drain in the course of a year if not stopped at an early date." The conservation of fuel added to the housekeeper's burden, which by the close of the nineteenth century had become considerable.[22]

CONCLUSION: SAME ROLES, DIFFERENT CHORES

25 The arrival of mineral fuel in American households fused well-established domestic roles of men and women into a new industrial model that depended upon a national network of energy distribution in order to maintain a decent standard of living. This allowed the "industrial hearth" to pave the way for additional innovations in household technology, without major disruption to the gendered division of labor in American homes. Instead, the adoption of coal as a domestic fuel in the United States extended these domestic roles into unprecedented places. For men, this meant securing cheap and effective stoves in the urban marketplace, as well as dealing with unscrupulous coal dealers intent on expanding profit margins at the fuel consumer's expense. American women did not find themselves shielded completely from the logic of the marketplace when burning coal; new dictates of

21 Catharine Beecher, *Miss Beecher's Housekeeper and Healthkeeper: Containing Five Hundred Recipes for Economical and Healthful Cooking* (New York: Harper & Brothers, 1873), 188; *Good Housekeeping*, 4, November 1886, 3.

22 "Steam Heat in the Household: The Economical Management of a Furnace," *Good Housekeeping*, 4, 11 December 1886, 57; Eunice White Beecher, *All Around the House, or, How to Make Homes Happy* (New York: D. Appleton and Co., 1881), 337.

fuel economy required fast learning on their part as well. And in affluent households this education extended into the indirect management of coal-burning hearths through their domestic servants. Coal thus connected the American to the industrial marketplace quite effectively by integrating the home with wider market practices.

26 By the close of the 19th century, gendered work in domestic energy persisted, but emerging trends in home heating threatened to replace the coal-fired version of urban domesticity. As the twentieth century unfolded, consumers and users confronted new innovations in home heating and cooking as gas, electric, and oil stoves and furnaces became common in the marketplace. Electricity and gas, in particular, allowed American homes to remove the need to build fires completely and instead tap into even larger utility networks. In 1900 Helen Campbell hoped that electricity "bring comfort to the housekeeper who looks beyond the difficulties with her own range and furnace, and plans for the general good," thus "not only bringing release from that form of labor but a cleanliness which today no man knows or can know." These innovations in new forms of energy eventually replaced the mineral fuel network and although they might represent major cost savings for male consumers, the use of coal did not reduce the amount of work required by female users to keep homes clean and warm and families well fed. In this way, the adoption of mineral fuel in households reinforced the gendered division of labor while altering the actual work done by men and women in bringing about this critical energy transition. The story of twentieth-century housework would present new challenges for American women and proved that an Atomic Eve dancing around a new set of energy-rich appliances was still an aspiration for the American home, not a reality.[23]

23 Helen Campbell, "As to Ashes and Rubbish," *Everyday Housekeeping*, 15, September 1901, 176.

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Networks of Power? Rethinking class, gender and entrepreneurship in English electrification, 1880-1924

Abstract

Traditional energy histories have treated electrification as an inevitability: the assumption has been that making cheap energy supply readily available for the masses required the energy efficiency uniquely attainable by large-scale networked electricity grids. While our account does not question that assumption, such a rationale can only explain the onset of electrification for contexts in which large scale electricity grids are already accessible to all. It cannot explain the earliest phase of electrification: what motivated the take up of electricity before such grids and their attendant economics actually existed to make it affordable and indeed competitive? We focus on the case of England before its National Grid was launched in 1926, a time when such alternatives as coal or its by-product coal-gas offered energy in a form that was cheaper or more convenient than stand-alone electrical installations and highly localised electricity infrastructures. Our initial aim is to survey a range of cultural rather than technocratic reasons for the early take-up of electricity in the 1880s to 1890s, treating it then as a luxury rather than a commonplace utility. In doing so, we return to Thomas Hughes' seminal *Networks of Power* (1983) to examine how far the growth of electrical power supply was shaped not just by engineers and politicians that predominate in his account, but by old-money inherited aristocracy that Hughes touches upon only briefly. Specifically we investigate how the nascent electrical industry looked to these powerful wealthy aristocratic technophiles, male and female, to serve as 'influencers' to help broaden the appeal of domestic electricity as essential to a desirable life-style of glamorous modernity.

Plan of the article

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INTRODUCTION: CHALLENGING THE 'INEVITABLE' IN PRE-GRID ENERGY HISTORY; HISTORIES OF CULTURAL PERSUADERS AND THEIR HOMES

1 Traditional energy histories have tended to treat electrification as an inevitable feature of industrial modernization, (over-)determined by economic imperatives for energy efficiency. Such accounts routinely invoke the significant economies of scale achievable by large-scale electricity distribution networks as a key factor in rendering electrical supply affordable to the majority of consumers.[1] But this reliance on rationalist economic explanations is somewhat misleading - while a necessary part of the explanation, it is insufficient. Economic explanations only work to explain electrification once a (nascent) National Grid already exists to supply it cheaply enough via a national network infrastructure. How then can we explain the take-up of electricity before such an affordable supply was actually available?

2 For this paper, we focus on this scenario for the case of England *prior* to the launch of its National Grid in 1926 –and its nationalisation as part of the Welfare State by the UK's Labour government in 1948.[2] The crucial (and previously unasked) question about the Grid is therefore not so much: at what point in the development of the Grid did the cost of electrical energy become competitive with that of its older rivals? Rather one might ask: given its prior unaffordability to the majority, what early factors supported the evolution of electrical supply so that it could survive long enough to *eventually* attain competitiveness?

3 While we do not examine every factor relating to that question, our paper addresses it by asking the smaller scale question: in the first decades of electrification (1880s-1890s) what – or rather who – persuaded at least some wealthier householders to become consumers of electricity, and how did they do so when electricity supply had no obvious economic benefits over its older rivals? After all this a time when, unless one was lucky enough to be in a city region powered by a new (private or public) electric supply, the only accessible source of electrical energy was the expensive and less than reliable dynamo that was powered by localised water flow or *in situ* steam generators, backed up for emergencies by accumulator batteries. Such considerations are barely touched upon in *Networks of Power*, in which Thomas Hughes documents the systemic growth of local civic electrical networks, but does not seek examples of electrical installations that do not fit into his systems historiography. While Hughes' analysis gives an indispensable starting point for comparative analysis of the growth of electrical supply in multiple countries, his grand teleological sweep into the mid-twentieth century obcures the economically necessary – yet harder to explain – persistence of electricity installations in less urban areas that lay outside of his systemic framework. Instead we look to a phenomenon only briefly touched upon by Hughes: the old money aristocrats, whose inherited wealth enabled them to be both sponsors and consumers of stand-alone installations of electric light while this particular illuminant was a luxury inaccessible and unaffordable to the majority.

4 In *Domesticating Electricity,* Gooday examined the significance of the stand-alone system installed at Hatfield House in the early 1880s by leading Conservative politician, Lord Salisbury. Far from fulfilling the stereotype of conservative, old-money aristocrat concerned primarily with

1 Leslie Hannah, *Electricity Before Nationalisation: A Study of the Development of the Electrical Supply Industry in Britain to 1948* (London & Basingstoke: Macmillan, 1979); William Hausman, Peter Hertner, & Mari Wilkins, *Global Electrification: Multinational Enterprise and International Finance in the History of Light and Power, 1878–2007* (Cambridge: Cambridge University Press, 2008); Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: Johns Hopkins University Press, 1983).

2 While the subsequent 'National grid' covered the entire United Kingdom, constituent nations had their own stories in preceding phases of electrification. Here we focus on the case of England; for Scotland and Wales, with comparative discussion on Canada and Sweden, see Paul Brassley, Jeremy Burchardt and Karen Sayer (eds.): *Transforming the Countryside: The Electrification of Rural Britain* (Abingdon: Routledge, 2017).

husbanding resources,[3] Salisbury was instead an active experimenter in electricity who sought to bring the new illuminant into Hatfield House even before the incandescent electric light of Swan and Edison was commercially available. Moreover, this country house installation, far removed from any local systems, was important as a much-reported locale for promoting the sociable value to fellow aristocrats of electric light via elite balls and dinner parties. As Gooday shows, however, owing to a workman's death by accidental electrocution in 1881, Hatfield House also raised lingering worries about the deadly risks of electricity far more than other contemporaneous electrocutions of workmen in Britain.[4] In two strongly contrasting ways, then, this particular country house electrical installation changed the cultural expectations of electricity far more than any of fleeting unsuccessful civic electrical systems discussed by Hughes for the early 1880s.[5]

5 What then does our work here add to the already substantial cultural history of electrification by Gooday and others? In previous cultural accounts of electrification, appeals have been made to 'modernity' as the alleged driving force,[6] while some French sources appealed to *la fée électricité* as a fantasy figure of enchantment and enablement that symbolically enticed consumers to try its magical powers.[7] But these ideological accounts simply beg the question; how do abstractions like modernity and fictional fairies actually do such persuasive work – where is their social agency? Our answer to this question instead concerns the cultural *persuaders* whose authority led this change of behaviour – the Victorian counterpart to the celebrity culture of 21st century actors and musicians who now lead campaigns for environmental change.[8] Although perhaps counter-intuitive to some, the work of persuaders only seems so because their role is quietly erased from advertisers' narratives to create the impression that consumption of a new product is natural and inevitable. While it might take a leap of imagination to appreciate this elusive empirical point, we can note that many of our 21st century common purchases started their career marketed as luxury goods, and only became mainstream mass-production items once the mass population was persuaded to adopt them as if they were necessities.[9]

6 This focus on celebrity endorsement for changing behaviours concerning energy consumption matters greatly since our paper considers a time when few civic consumers had ready access to electricity supply via a street mains. Indeed even for these consumers, it was not self-evident that the electrified home would or could furnish the optimal mode of domestic energy management. The appeal of gas-lit, coal-fired homes remained for many with conservative inclinations, unmoved by appeals to 'modernise' or oblige the electric fairy. The persistent growth in the supply and consumption of gas was of course a challenge for the proponents of electrification in many industrializing countries, including France. We thus draw our inspiration from accounts that focus on the persistence of pluralism in modes of energy management – rather than any uncritical acceptance of electricity. This is highlighted in Ruth Sandwell's important recent edited collection *Powering Up Canada* where she shows that, for largely rural Canada, the rationales for choosing

3 Mark Girouard, *The Victorian Country House* (Oxford: Clarendon Press, 1971), see particularly 18-19.

4 Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (London: Pickering and Chatto, 2008), especially chapter 3.

5 Hughes, 53-64.

6 Klaus Plitzner (ed.), *Elektricität in der Geistesgeschichte* (Bassum: GNT-Verlag, 1998).

7 Alain Beltran & Patrice Carré, *La fée et la servante: la société française face à l'électricité XIXe-XXe siècle* (Paris: Belin, 1991).

8 On the subject of 'cultural persuaders', see for example Philip Hammond, *Climate Change and Post-Political Communication* (London: Routledge, 2017) and Michael Goodman, Julie Doyle, and Nathan Farrell, 'Practicing Everyday Climate Cultures; Understanding the Cultural Politics of Climate Change', Special Edition of *Nature Public Health Emergency Collection,* 2020.

9 This theme of celebrity endorsement for environmental issues has been well-explored by a number of authors, most recently in the case of sustainable public transport. Paul Hanna, Joe Kantenbacher, Scott Cohen, Stefan Gossling, 'Role model advocacy for sustainable transport', *Transportation Research Part D: Transport and Environment,* Volume 61, Part B, 2018, 373-382.

energy supply from wood or coal encompassed domestic consumers' concerns for availability, sustainability, self-sufficiency and convenience.[10] Upholding these priorities often mattered more to householders than obedience to the technocratic regimes of efficiency espoused as the key value of electricity supply. It is to explain this phenomenon that we seek to rethink the social agency operative in choices for or against electricity in UK domestic settings prior to the introduction of the National Grid.

7 It is in this vein that we return to Thomas Hughes' seminal engineer-centred account to examine anew how far - for England at least – the development of electrical power was connected with the operations of social power, and gendered social power.[11] We thus explore the importance of an alternative set of significant figures for electrification, examining how (far) the main drivers for this process included groups and actors previously given only incidental significance in standard accounts: wealthy aristocratic technophiles, female and male. At least some of these wealthy and influential figures were willing, able and did invest in autonomous stand-alone (non-grid) electrical installations. These were consequential in demonstrating the qualities of electric lighting, even while early urban systems could not prove commercial viability.

REVISITING HUGHESIAN HISTORIOGRAPHY

8 In examining the agency of aristocrats, we now consider Thomas Hughes' treatment of them in his classic *Networks of Power* (1983), extending his treatment of the power politics of electricity.[12] The absence in Hughes' oeuvre of any reference to stand-alone generating plant in affluent Victorian countryside homes is a striking omission given Mark Girouard's documenting of such houses twelve years earlier. In *The Victorian Country House*, Girouard notes that representatives of both kinds of wealthy Victorian upper classes, those from old money and new, invested in domestic electricity in the early 1880s, using water-power dynamos remote from any metropolis: the 'new money' ennobled industrialist Lord Armstrong at Cragside, Northumbria, and at the seat of 'old money' Lord Salisbury at Hatfield House, Hertfordshire.[13] These early experimental country house installations lasted in place for decades, unlike the early electrical systems tried in civic locations which as even Hughes concedes could not muster a sufficient demand to survive beyond a few years: the city of London (as documented by Hughes), and the towns of Chesterfield and Godalming (as documented by Strange).[14]

9 Girouard held that country house electrification in this period was demographically most characteristic of the 'technologically minded' middle-class country house owners, citing such examples as Wright at Osmaston Hall (Derbyshire), Thorneycroft at Tettenhall (Staffordshire) and Walter at Bear Wood (Berkshire). Only being aware of two mansions belonging to 'old families' with early electrified homes (Hatfield and Eaton Hall, Cheshire), Girouard assumed that owners of inherited houses were under no great pressure to electrify them as long as 'labour to carry coals, water and candles remained cheap.'[15] Yet he did concede that further research might 'alter the balance' in his account of the relative significance of 'new' and 'old' money in early electrification.[16] In that regard it is salient that both Girouard and Jill Franklin among others, opened up the idea of the English country house not only as a space of elite history, but as an important site to examine class-based social

10 Ruth W. Sandwell (ed.), *Powering Up Canada; The History of Power, Fuel and Energy from 1600* (Montreal: McGill-Queens Press, 2016).

11 Hughes, *Networks of Power.*

12 This topic has been explored in Michael Thad Allen and Gabrielle Hecht (eds.), *Technologies of Power; Essays in Honour of Thomas Parke Hughes and Agatha Chipley Hughes* (Cambridge, Mass: MIT Press, 2001) and Wiebe Bijker, Thomas P. Hughes and Trevor Pinch (eds.), *The Social Construction of Technological Systems* (Cambridge, Mass: MIT Press, 2012).

13 Mark Girouard, *The Victorian Country House* (Oxford: Clarendon Press, 1971), 18-19.

14 Patrick Strange, 'Early Electricity Supply in Britain: Chesterfield and Godalming,' *Proceedings of the Institution of Electrical Engineers*, vol. 126, n°9, 1979, 863–868.

15 Girouard, *The Victorian Country House*, 18.

16 Idem, 19, footnote 56.

histories in the nineteenth century,[17] leading later in the 1990s to some transformative gendered histories of these microcosms of the structures of everyday life.[18] There has been very little analysis, however, that connects such historiographical re-examinations of the history of the country house and histories of electrification. We thus take up Girouard's direction and begin to explore *how far* a claim can be made for the importance of (inherited rather than ennobled) aristocratic agency in the early electrification of Britain, in order to argue that old money house owners were considerably more at the forefront of non-systemic electrification project than either Girouard or Hughes had imagined.

10 To be fair, of course, Hughes' account does note in passing the importance of aristocrats in two respects. The first concerns how they feature alongside scientists as a major audience for Edison's first attempts at securing financial support and personal interest in his direct-current electric lighting system in the UK. Edison's display at the Crystal Palace Exhibition in London in 1882 attracted considerable interest from Conservative politician Lord Alfred Churchill, the Duke of Westminster and the Duke of Edinburgh; although the Duke of Sutherland also admired Edison's work, he had nevertheless already made a decision to install the Brush alternate current system (apparently following Lord Salisbury's example) at his Stafford House residence in London. Hughes is explicitly clear why this aristocratic audience mattered: Edison's UK agent Edward H. Johnson sought to demonstrate Edison's technology not only in centralized city installations but also in small isolated plants in 'great homes and country estates'.[19]

11 Yet Hughes does not examine the latter issue any further – perhaps because the Edison company secured no contracts with the nobility. Instead Hughes focuses on the troubled career of the short-lived Edison supply station installed at Holborn Viaduct, which from 1882 supplied the City of London, ensuring that London's major financial institutions saw the displays of Edison electric lighting provided from Holborn Circus to St Martin's le Grand (location of the Post Office headquarters), as well as to private householders. Nevertheless, as Hughes reports, in order to compete with gas utilities on cost to the consumer, the Edison Company had to operate Holborn with loss-making price tariffs for electricity supply. After four years of such heavy financial subsidy without winning over long-term customers, the Edison company abandoned this project and the area reverted to gas lighting. Although he follows Edison in attributing this commercial failure to the adverse effects of new electrical lighting legislation in 1882, Hughes' evidence is clearly that Holborn customers preferred gas supply even when Edison supplied electricity at the same price per unit.[20] As we see below, however, Hughes' second comments on aristocratic sponsorship by Lord Crawford and Lord Wantage of electric lighting installation at the Grosvenor (Art) Gallery in London's West End, informs our argument about the *cultural* standing of electricity as a luxury for the elite. That, we maintain, can explain its early take-up when purely commercial considerations did not favour it.[21]

12 Another key point of reference on the standing of early electric lighting as luxury can be found in Adrian Forty's classic discussion of 'objects of desire'. Forty emphasises that technical innovations are not inevitably incorporated (or 'diffused') into everyday life: there must be a

17 Idem and *Life in the English Country House* (London: Yale University Press, 1978); Jill Franklin, *The Gentleman's Country House and its Plan* (London: Routledge, 1981).

18 Such as Alice T. Friedman, 'Architecture, Authority and the Female Gaze; Planning and Representation in the Early Modern Country House', *Assemblage*, n° 18, August 1992 and Dana Arnold, *The Georgian Country House; Architecture, Landscape and Society* (Stroud: Sutton, 2003).

19 Hughes, *Network of Power*, 53-54.

20 Idem, 55-64, Jack Harris, 'The electricity of Holborn', *New Scientist*, 14 January 1982, 88-90.

21 Following the work of I.C. Byatt, *The British Electrical Industry, 1875-1914* (Oxford: Clarendon Press, 1979) 21-28. Hughes notes that electricity was comparatively more of a luxury in Britain than in the USA, Hughes, *Networks of Power,* 64. For discussion of the Grosvenor Gallery see below and *Networks of Power*, 97, 244.

specific reason for their take-up. For the case of early electrical consumption, he notes that even by the onset of the First World War, the domestic consumption of electricity in the UK was still negligible by comparison to other industrial sectors, and had barely increased since 1895. He diagnosed this as arising from 'the high price of electricity and the considerable cost of wiring a house' which 'restricted the clientele to the well-to-do' along with fear of electricity, and its greater cost yet lower accessibility than gas. Forty notes that this required encouragment from marketing efforts of the supply industry.[22] In our exploration of some electrical industry advertising below, we show how this marketing was often taken in partnership with the aristocratic consumers. It was their ability to both afford electricity and also display its use in a spectacular way to both their peers and the publics who visited their country houses that was a crucial in persuading others to adopt this new form of energy supply in their homes.[23]

13 In this regard we follow David Cannadine in arguing that in the case of England the key cultural authorities in leading lifestyle choices remained the aristocratic upper classes, at least until the First World War.[24] That being said, we consider in somewhat more detail than Cannadine the gendered nature of aristocratic agency. The gendered nature of transformative social agency in technology is a theme only recently addressed in the literature on early electrification which was previously attributed largely to men.[25] Specifically we build upon Gooday's early research to explore some examples of elite women who were actively engaged in trialling and promoting electricity in England and analyse why their example was so important for middle class women, who were increasingly securing authority in our period to make major domestic decisions about such matters as lighting technologies. At a time when women were consistently made aware of the risks of 'getting it wrong' in terms of taste and behaviours, in a country that has always been dominated by questions of class prerogative, how far did the elites influence the turn to new forms of power in the home?[26]

Overall our evidence is beginning to show that 14
by agreeing to light their houses by electricity as very early consumers, British aristocratic elites, female and male, both publicised the new illuminant to the bourgeousie – who were sought to emulate them – and supplied opportunities for professional entrepreneurs and electricians to hone their skills in the initially very challenging business of electrical installations. They thereby supported the new electrical industry at a time when it could not offer the economies much later brought by modern 'grid' a.c. networks. Before then, we should highlight a point mentioned above that electricity seemed for many in the England to be both more expensive and untrustworthy than other energy media - a suspicion only enhanced by the lack of cost comparisons in literature directed at consumers.[27] According to one estimate, the average

22 Adrian Forty, *Objects of Desire; Design and Society since 1750* (London: Thames and Hudson, 1986), 182-85.

23 For a detailed discussion of the histories of country house visiting see Peter Mandler, *The Rise and Fall of the Stately Home* (New Haven and London: Yale, 1999); Jocelyn Anderson, *Touring and Publicizing England's Country Houses in the Long Eighteenth Century* (London: Bloomsbury Academic, 2018).

24 David Cannadine, *The Decline and Fall of the British Aristocracy* (London: Penguin, 2005).

25 Graeme Gooday, 'Illuminating the Expert-Consumer Relationship in Domestic Electricity' in A. Fyfe and B. Lightman (eds.) *Science in the Marketplace: Nineteenth Century Sites and Experiences* (Chicago: Chicago University Press, 2007), 231-68. For a more traditional view that grants only agency to expert males, see Carolyn Marvin, *When Old Technologies were New: Thinking About Electric Communication in the Late Nineteenth Century* (Oxford/New York: Oxford University Press, 1988).

26 See Abigail Harrison Moore, 'Agency, Ambivalence and the Women's Guide to Powering Up the Home in England, 1870-1895', in Harrison Moore and Ruth W. Sandwell (eds.), *In a New Light; Histories of Women and Energy* (Montreal: McGill Queens University Press, forthcoming 2021) for further discussion of the fear of 'getting it wrong' amongst middle-class Victorian women in England.

27 See for example Percy E. Scrutton, *Electricity in Town and Country Houses* (London: Archibald Constable and Co., 1898). While Scrutton does not provide costs for installing electric lighting, he does state that the annual running cost to light a country house with 200-250 electric lights, would be 'under £150'; thus demonstrating how expensive electric lighting was at this time, 143.

cost of a domestic electrical installation in 1890s England was £50 – roughly equivalent to the entire annual wage of an average worker.[28]

15 We can thus see why the late nineteenth electrical industry had to work hard to counter this impression of electricity as an (unnecessarily) great expense. As Brian Bowers has noted, 'Those who wanted to sell electric lighting needed to be very vigorous and persuasive in promoting their wares', and hence their advertising focussed on such themes as spectacle, attractiveness and patriotism, rather than cost.[29] In her handbook *Decorative Electricity* of 1891, a work dedicated to persuading middle-class women (and men) that electric lighting could be adopted in the home in an artistic and elegant fashion, Alice 'Mrs J.E.H.' Gordon - spouse of consulting electrical engineer James Gordon - admitted that the average hourly cost of operating an electric lamp was one farthing, twenty per cent greater than for its gas counterpart.[30] Nevertheless, she claimed that this extra cost was compensated by the economy which could be effected by immediately switching electrical lights on and then off as one entered and then left a room - a practice that was unfeasible for gas lighting in the period.

16 Notwithstanding Mrs Gordon's claims for potential parity with the costs of domestic gas consumption, the tone of *Decorative Electricity* was indeed distinctly to emphasise its *luxurious* potential for a wealthy social elite. Alice's advice was that consumers should budget not only for 'practical' everyday lighting, but also for luxuriantly aesthetic 'decorative' lighting to be used for special occasions: her own house was lit with 42 lamps for the former purpose and no fewer than 87 for the latter 'occasional' use![31] Unsurprisingly, such was the indifference or even distrust of less affluent female householders towards electric lighting, that the Electrical Association for Women was founded in 1924 - as a side project of the United Kingdom's Women's Engineering Society- in order to help *create* a domestic demand for electricity. This task was quite successfully accomplished by strategically deploying the authority of women - notably that of first EAW President, Lady Nancy Astor, MP, in building female consumers' trust in the new illuminant.[32]

17 We explore below the critical patronage of the aristocracy in early British electrification seen in the autobiographies of British electrical manufacturer and entrepreneur, R.E.B. Crompton and Lady Randolph Churchill. This case is important to highlight since it reveals how the entrepreneurs selling early electrical systems in England needed social elites to 'advertise' the new illuminant as glamorous luxuries. The alleged modernity or efficiency of electric lighting was irrelevant or commercially useless in this context. In particular, upper-class women were vital to the social normalisation of electricity as suitable for elite consumption – although they did not necessarily see their role in the same terms as the entrepreneurs that they dealt with.

28 See Graeme Gooday. *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (London: Pickering and Chatto, 2008), Abigail Harrison Moore and Graeme Gooday, 'Decorative Electricity: Standen and the Aesthetics of New Lighting Technologies in the Nineteenth Century Home', *Nineteenth-Century Contexts: An Interdisciplinary Journal,* vol. 35, n°4, 2013, 363-83, Graeme Gooday and Abigail Harrison Moore, 'True Ornament? The Art and Industry of Electric Lighting in the Home, 1889-1902' in Kate Nichols, Rebecca Wade and Gabriel Williams, (eds.), *Art Versus Industry? New Perspectives on Visual and Industrial Cultures in Nineteenth-Century Britain* (Manchester: Manchester University Press, 2015, 158-78) and our articles in Abigail Harrison Moore and Ruth W. Sandwell, (eds.), 'Off-Grid Empire: Rural Energy Consumption in Britain and the British Empire, 1850-1960', Special Issue of *The History of Retailing and Consumption*, vol. 4, n° 1, 2018. We thank one of our referees for observations on the relative cost of electricity installation to the annual working wage.

29 Brian Bowers, 'Scanning our Past from London; Advertising Electric Light', *Proceedings of the IEEE,* vol. 89, n°1, 2001, 116-8.

30 See Gooday, 2008.

31 Mrs. J.E.H. Gordon, *Decorative Electricity* (London, Sampson & Low, 1891) 14-16, 178.

32 See Graeme Gooday, 'Women in energy engineering: changing roles and gender contexts in Britain, 1890-1934', in Abigail Harrison Moore and Ruth W. Sandwell (eds.), *In a New Light; Histories of Women and Energy* (Montreal: McGill Queens University Press, forthcoming 2021); Carroll Pursell, 'Domesticating modernity: the Electrical Association for Women, 1924–86', *The British Journal for the History of Science*, vol. 32, n°1, 1999, 47-67.

We thus address next how domestic electricity was constructed initially as a luxurious enterprise, relating this to how aristocratic patronage became a valuable element in electrical engineers' practices of persuasion in the earliest phase of electrification.

THE ELECTRIC CULTURE OF THE CELEBRITY ARISTOCRAT CLIENT AND MIDDLE-CLASS EMULATION

18 As Gooday has shown, the early public identity of electricity supply in England in the 1880s was of a garish, risky, expensive luxury[33] with the fast-growing gas industry providing a more affordable - and more readily understood - energy alternative.[34] So to return to the question that we raised in the introduction: how can we explain the growth of demand for pre-grid electricity? We must look beyond purely technocratic parameters. Among a range of cultural factors which could be explored, we seek specifically to recover the critical role of aristocratic patrons in the first stage of the transition to widespread adoption of electric energy – not merely as customers for, but as active allies of, the electrical industry.

19 There is a broader pattern to this that relates to longer-term concerns about energy management. As noted above, numerous scholars in this field have observed the importance of the environmentalist cultural advocacy of 21st century celebrities who were not practictioners of Science, Technology, Engineering or Medicine [STEM] in music, television, sport and film which has been vital to changing public opinion about climate change.[35] Correlatively we explore how far and in what ways the celebrity pantheon of fin-de-siècle aristocrats supplied *cultural* leadership for changing energy consumption to the electrical mode among the wider public. When the immediate benefits of changed behaviour were unattainable or invisible to the wider populace, we show that leadership in the life-style change for electricity leaned heavily on the authority of aristocratic agency and personality. Since the advent of electricity supply alone cannot explain its take-up, we see here the prospect of a new kind of explanation for how demand for electricity was first nurtured, avoiding assumptions about the inevitability of the phenomenon we aim to elucidate.

20 In documenting eminent politicians' powerful support for electrical systems-building in London in the later 1880s, Hughes notes the catalytic role of Lord Wantage as a wealthy upper-class investor in early electrical supply technology. Specifically he shows the electrification of the Grosvenor (Art) Gallery in London was premised upon collaboration with Sir Coutts Lindsay's building construction and financial support from his wife as a member of the Rothschild family.[36] Yet Hughes' supplier-focussed study does not then go on to discuss systematically the class profile of the first consumers for this new technology: for us, it this class-profile of consumers that is crucial to understand.

21 Hitherto overlooked evidence of the significance of upper-class consumers is clearly present in early advertising by electrical installers. Instead of advertising electricity as an efficient system-based technological utility (as one might have expected from reading Thomas Hughes' interpretation), the countervailing associations of aristocratic patronage are most evident in the marketing of this very expensive new technology. Such publicity listing the nobility as their principal customers can be found in the front leaf and rear-leaf advertising introduced to the second (1892) edition of Mrs J.E.H. Gordon's *Decorative*

33 Gooday, *Domesticating* and 2018.

34 Anne Clendinning, *Demons of Domesticity; Women and the English Gas Industry 1889-1939* (London: Routledge, 2017).

35 See Philip Hammond, *Climate Change and Post-Political Communication* (London: Routledge, 2017) and Michael Goodman, Julie Doyle, and Nathan Farrell, 'Practicing Everyday Climate Cultures; Understanding the Cultural Politics of Climate Change', Special Edition of *Nature Public Health Emergency Collection,* 2020.

36 For Sir Coutts Lindsay, see Hughes, *Networks of Power*, 238-40. On Lady Lindsay as a daughter of the wealthy Rothschild family, see **https://www.victorianresearch.org/atcl/show_author.php?aid=1634 and https://family.rothschildarchive.org/people/38-hannah-mayer-de-rothschild-1815-1864**.

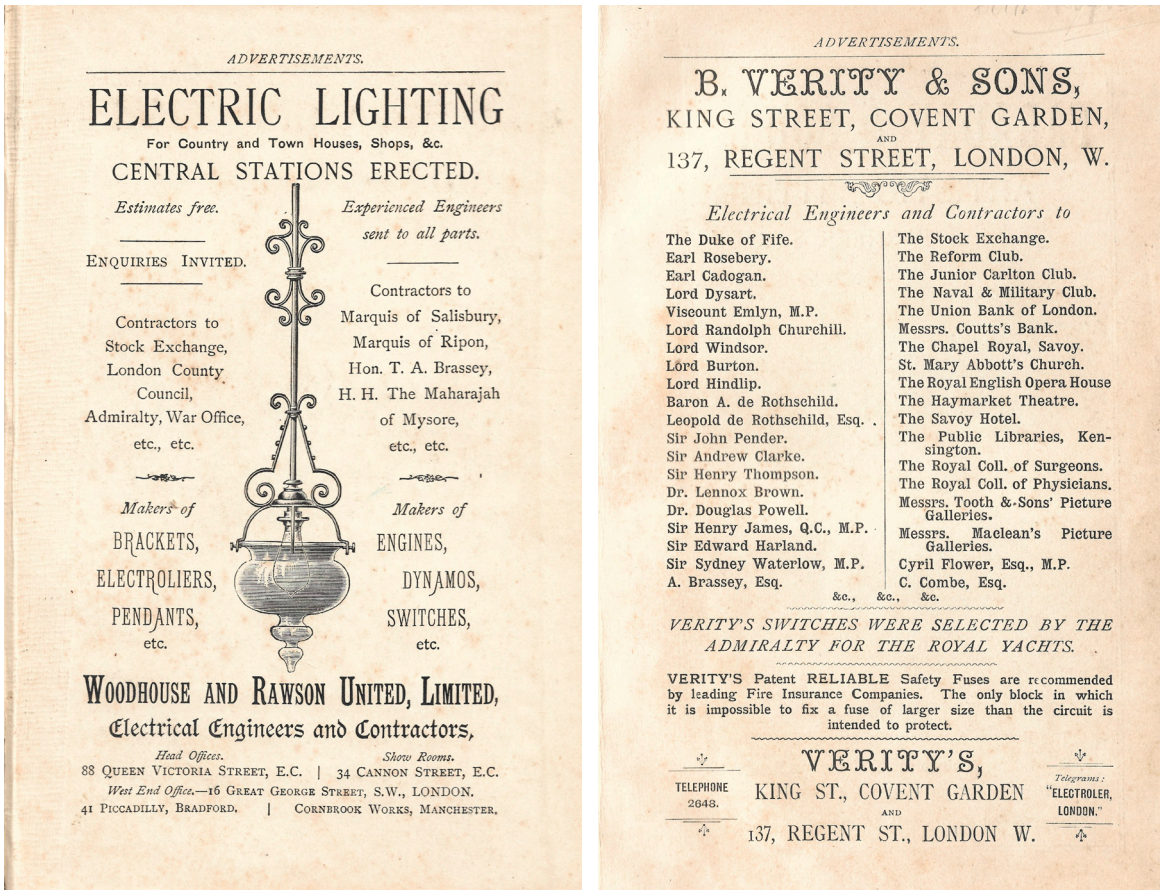


Figure 1: advertising material in the second edition (1892) of Mrs J.E.H. Gordon, *Decorative Electricity* (London: Samson and Lowe, 1892). (copyright free).

Electricity (first edition 1891).[37] See for example the advertising by Woodhouse, Rawson & Co at the front of this work, and Verity & Sons at the rear. The pre-eminence of powerful aristocratic male customers listed in these advertisements indicates that their households had been significant among the first domestic locations targeted for electrical installations, although the listing is a matter of social hierarchy rather than chronological sequence. Clearly while institutions in central London are also highlighted as customers for electric lighting in these 1892 advertisements, the preponderance of space is given to aristocratic consumers, and they are listed first (at least in the case of Verity and Sons):

22 For Woodhouse and Rawson we can see only the most elite are mentioned, the Marquises of Salisbury and Ripon on the right hand side, with the aristocratic Hon.Thomas Brassey (later Second Earl Brassey) to follow; listed last – with some evidently prejudicial ethnocentrism – the Maharajah of Mysore, an autonomous city-kingdom in Southwestern India lying outside the British empire. For Verity and Sons, if we look at the descending order of the aristocrats advertised, we see that they follow the conventional order of ranking: the Duke of Fife followed by the Earls Rosebery and Cadogan, all the way down to institutions, MPs, and Esquires. Later we will explore the significance of the 6th ranked aristocrat, Lord Randolph Churchill (with installations by another contractor, Crompton and Winfields) noting that in fact Lady Churchill was the chief figure of interest. Another point to note is that both companies attached considerable value to highlighting the clientele of prestigious (London) institutions, each claiming to have had the Stock Exchange as a client, but otherwise they were complementary in their track records of services. The very fact that these two companies advertised their services citing male aristocratic customers in a book written for (mostly) female middle-class consumers that highlights the

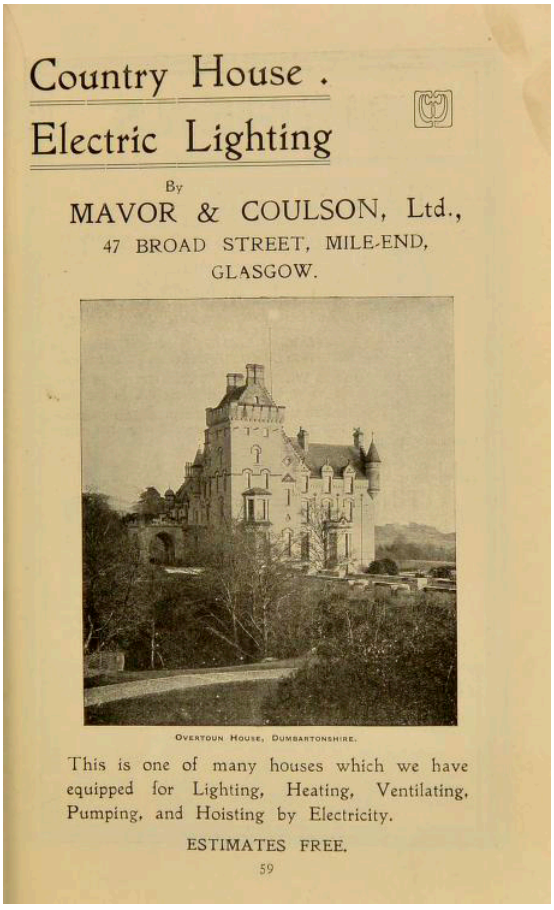
37 See Gooday, *Domesticating*.

gendered complexities of the issue. The aristocratic couples were implicitly fashionable leaders to follow.

23 Following this example, we can also turn to the text, frontispiece and end-piece advertising of later editions of Mrs Beeton to see how they echo these aristocratic preoccupations. The 1907 edition of her *Book of Household Management* declared that that 'cooking by electricity is now quite practicable, though for the present decidedly expensive', such cost meaning it was only in reach of those with the most money, i.e. the elites. Certainly the author of the 1907 edition of Beeton knew how to 'sell' electricity via association, citing the fact that 'the King's yacht (constructed for her late Majesty, Queen Victoria) is fitted up with a complete electric kitchen outfit, including soup and coffee boilers, hot-plates, ovens, grills and hot closets'.[38] Beeton's success drove the development of the mass market for cookery books, that we would see used to push the cause of gas or electricity in the late nineteenth century, for example Jenny Sugg's *The Art of Cooking by Gas* (1890), or Amy Cross and Alys Waterman's *How to Cook by Electricity* (c.1910).

24 Each of these books including later editions of Mrs Beeton, contained advertising material, aiming to persuade women to either adopt electricity or gas into their home, and we also can find examples of how the country house was used to evidence how the very best household's employed the newest forms of energy. For example, the 1910 Smoke Abatement Exhibition, held in Glasgow, advised on 'Lighting and Heating, Cooking and Power' by electricity using recreations of country house interiors complete with Chippendale-esque furniture supplied by Messrs A Gardiner and Sons of 36 Jamaica Street, under the heading 'Electricity means Cleanliness'. The exhibition catalogue included adverts for 'Country House Electric Lighting' by Mavor and Coulson Ltd. of 47 Broad Street, Glasgow, with a photo of Overtoun House in Dumbartonshire used as an example of 'one of the many houses which we have equipped for Lighting, Heating, Ventilating, Pumping and Hoisting by Electricity'.[39]

Figures 2 and 3: Illustrations of and advertising for electric lighting in the country house from *Electricity; Lighting, Heating Cooking and Power,* the catalogue of the 1910 Glasgow Smoke Abatement Exhibition (pp.3 and 59). (Reproduced with the permission of Special Collections & Galleries, Leeds University Library, Cookery A/GLA).



38 Mrs Isabella Beeton, *Mrs Beeton's Book of Household Management* (London: 1907), 56.

39 *Lighting and Heating, Cooking and Power,* Smoke Abatement Exhibition Catalogue (Glasgow: 1910), 59.

ARISTOCRATIC AND MIDDLE-CLASS ROLE MODELS OF WOMEN SHAPING THE HOME

25 As we can see from the advertisements from Verity and Woodhouse & Rawson above, the Duchesses and Dukes, Ladies and Lords – of old and 'new' money – adopted exemplary celebrity roles in setting a trend for adopting domestic electricity as a fashionable and elegant mode of consumption.[40] Their role, we suggest, thereby nurtured symbiotically the industry of electrical consultants and contractors, and the newly emerged profession of the professional female interior decorator. This is the only way that can we explain why the advertising of such contractors from the 1890s recurrently highlighted aristocrats as their principal clientele. Who else but these wealthy elite would have had the leisure and finance to invest in such a risky and controversial new technology as domestic electricity? And how else would electrical engineers have found the finance and opportunities for the early projects of electrification without noble patronage and finance – a topic not acknowledged in conventional engineering historiography.[41]

26 While this history of women as crucial for the growth in the consumption of electricity in the home has been lately focussed on the new role of the middle-class woman, we focus here on their aristocratic counterparts who had continued to offer the newly monied a long-lived example of how women could and should operate in their homes and the external world as members of a privileged social and political elite.[42] Electrification in England began at the end of a century which had seen a significant shift in the class systems with the development and enrichment of a newly monied 'middle' class. Economic transformation arising from industrial growth led to changing expectations of the roles of men and women in all social classes. With an increasing separation of home and work on gendered lines, society enabled and expected middle-class women to manage their homes in new and for some, more empowered ways.[43]

27 While we argue here that middle class women were being empowered by this new requirement to manage the home, including energy supply and use, they were concurrently made deeply aware via a growing range of advice and etiquette guides that to 'get this wrong' risked social exclusion for them and their families.[44] Empowerment came at a cost, with a set of very complex social challenges attached, hence the need to look to those who had always been

40 While we recognise that no women's names appear in the advertisement, domestic decisions in this period were taken by both members of a married couple, but gendered convention meant that only the husband's name would appear in print. On the impact of such conventions on historical assumptions about the active role of women in history see for example Deborah Cherry's work on the difficulties faced by women in 'the making of an author name', *Beyond the Frame; Feminism and Visual Culture; Britain 1850-1900* (London: Routledge, 2000), 157.

41 See, for example, Ben Marsden and Crosbie Smith, *Engineering Empires; A Cultural History of Technology in Nineteenth Century Britain* (London: Palgrave, 2005).

42 On this point see Eric Hobsbawm, *Industry and Empire* (Harmondsworth: Penguin, 1968). He reminds us that in this period, the aristocracy still held much of the England's wealth, necessary funds for technological transformation. They were little effected by industrialisation except for the better - 'One important effect of this continuity...was that the rising business classes found a firm pattern of life waiting for them. Success brought no uncertainty so long as it was great enough to lift a man into the ranks of the upper class. He would become a 'gentleman', doubtless with a country house, perhaps eventually a knighthood or peerage, a seat in Parliament...his wife would become a 'lady', instructed in her duties by a multitude of handbooks on etiquette', 80-82.

43 While Ruth Schwartz Cowan in *More Work for Mother* (New York: Basic Books, 1984) has argued for the US case that middle-class women were re-proletarianised by the rise of modern domestic technology, concurrent with the loss of servants, female authors in England in the 1870s and 80s proposed that women were or could be enfranchised by the ability to manage their homes and choose their interiors. For example Mrs H.R. Haweis in *The Art of Decoration* (London: Chatto and Windus, 1881) stated that 'the design of your home is not just about aesthetics and function, but about spirituality and care' (2) and while she expects a woman to employ a decorator, she commands that 'His province is to help you in that mechanical part which you cannot do yourself. He may guide you; he must not subjugate you' (350-1). See Harrison Moore (forthcoming 2021) for a longer discussion of women's enfranchisement and interior design.

44 See Elizabeth Langland, *Nobody's Angels, Middle-class Women and Domestic Ideology in Victorian Culture* (Ithaca and London; Cornell University Press, 1995) for an excellent analysis of such guides.

presented in British society as representing 'right and proper' practices - the aristocracy. As Thorstein Veblen argued in *The Theory of the Leisure Classes* (1899) the emulation of aristocratic patterns of consumption in the home offered one way for middle class women to meet the increased pressure accorded by their new roles as house wives and managers.[45] Veblen was examining American society with a class structure founded in wealth rather than birth: in the U.S. case the cultural leaders in electrification included the ultra-rich business couples Mrs & Mrs Cornelius Vanderbilt and Mr & Mrs J.P. Morgan.[46] For the case England, where the constant dance of class and reputation was determined by being seen to do, know and consume the 'right things', Veblen's concept of emulation is useful for explaining why middle-class English women would look to the aristocracy for examples of 'good' consumer decisions.

28 The development of the idea of the home as a legitimate sphere for women to take charge of, encouraged by the books and advice guides written by Victorian middle-class commentators, has been carefully documented by historians both in England and in the USA.[47] In John Ruskin's words, the mythical ideal of the 'Angel in the House' saw middle-class women as guardians of the home as 'a sacred place, a vestal temple' tasked with the role of managing all aspects of domestic life, including lighting and heating.[48] The ideological and practical expectations for aristocratic women were very different indeed from those of their middle-class counterparts. Kim Reynolds notes importantly that aristocratic homes and families were constructed 'in relation to an entirely different ideological model', and indeed a very different financial model. Aristocratic women were neither expected to confine their entire life's activities to the care of their husbands and children or their homes. They were 'not defined in strict contrast to the men of their own class' since neither aristocratic men or women went out of the home to engage in paid labour.[49] While their roles were assuredly gendered, it was not within the context of 'oppositional and mutually exclusive categories' widely thought to define the lives of late Victorian middle-class women'.[50]

29 As the mistress of an entire estate or a collection of town and country houses, an aristocratic woman was conventionally expected to fulfil specific social, spiritual and economic obligations. The aristocratic household in the nineteenth century continued the tradition of the country houses and London palaces of previous generations, so carefully mapped by Mark Girouard.[51] Far from being 'places of retreat', Reynolds emphasizes that these were the 'public arena' in which the aristocracy 'reinforced and reinvented its power'.[52] Most important of all, these were public spaces of spectacle which were presided over by aristocratic women. Thus in contrast to conventional middle-class homes, such households were 'sophisticated tools', used to uphold the status of the family. As Reynolds emphasizes, aristocratic households were 'political structures', their wealth-giving estates lending them an extensive economic role which had 'no counterpoint in the bourgeois home'.[53]

30 How much aristocratic women were responsible for the maintenance of the household varied according to the size of the home and historic traditions. In larger households, for example, Reynolds' case studies demonstrate that

45 Thorstein Veblen, *The Theory of the Leisure Class* (New York: Macmillan, 1899).

46 Marvin, *When Old Technologies Were New*, 178; Gooday, *Domesticating Electricity,* 99, 108, 202, 225, 241, 261. On this subject see also Harold Platt, *The Electric City: Energy and the Growth of the Chicago Area* (Chicago: University of Chicago Press, 1991), and David Nye, *Electrifying America: Social Meanings of a New Technology* (Cambridge, Mass.: MIT Press, 1990).

47 See for example, Langland, *Nobody's Angels*; Catherine Hall, *White, Male and Middle Class; Explorations in Feminism and History* (London: Wiley, 1992) and Patricia Branca, *Silent Sisterhood; Middle Class Women in the Victorian Home* (Carnegie-Mellon Press, 1975).

48 See John Ruskin, 'Of Queens Gardens' in *Sesame and Lillies* (London: George Allen, 1895), 95-158.

49 K.D. Reynolds, *Aristocratic Women and Political Society in Victorian Britain* (Oxford; Clarendon, 1998), 28.

50 Idem, 21-28.

51 Girouard, 1978.

52 Reynolds, 28.

53 Idem, 28.

daily superintendence was placed in the hands of an upper servant or agent (usually male); in such cases she likens the role of the aristocratic women to that of a company director.[54] Therefore, while we can see that aristocratic women had a different role to play in household management and patronage to their middle-class counter-parts, they continued to take on powerful leadership roles in the nineteenth century and acted as important role-models, persuaders and consumers, for our purposes, in the successful incorporation of electricity into the home.

31 This incorporation of electricity into the aristocratic home came in an increasingly anxious time for this privileged elite world when change was afoot. From the 1880s to World War 1, the authority and status of the British aristocracy were most effectively challenged by the economic dominance of rising middle classes at a time when the agricultural depression was sharply diminishing the income of the land-holding aristocracy. Thus finding (new) ways for the aristocracy to demonstrate its continued power, in town and country, remained and perhaps increased in importance. Their homes were vital spaces in which aristocratic women and men could express their dominance, taste and wealth, especially as they began to need to compete with the new builds of the *nouveau riches*.[55]

32 As Reynolds puts it, the 'exercise of hospitality' continued to demonstrate aristocratic social standing, so too did aristocrats' capacity to advance clients by offering them employment or the means of subsistence. That scope for offering patronage remained 'an index of the power of a noble family'.[56] At the same time as fulfilling the ancient prerogative of *noblesse oblige*, the behaviour of the glamorous upper classes was also scrutinised by many among the middle classes as a model for their socially upward aspirations, including the consumption of lighting. Within these twin contexts we later explore the relationship of aristocrats with the entrepreneurs of electrical engineering who sought to tap into this world of privileged patronage to promote their expensive new technologies.

33 Before that, let us note how women in the rising middle-classes were by no means exclusively reliant on upper-class models for the development of their domestic havens, and yet the influence was ubiquitous. Among the household manuals that became the key source of guidance for the aspirational middle-class woman in our period, the most famous and long-lived in England was *Mrs Beeton's Book of Household Management*.[57] While the aristocratic lady was certainly not the intended reader, and although it was specifically addressed to 'The Mistress' of the house, the aristocratic mistress could be seen very much as an inspiration rather than a consumer. Mrs Beeton, in her guidance, focuses on taste and society, and as Margaret Beetham says, in the text 'the way food was prepared, presented and consumed' by the women of the household became a marker of 'important social differences'.[58]

34 Mrs Beeton makes a clear distinction between raw and cooked food 'as the marker of the transformation of nature into culture', and the way that food is transformed, the energy source utilised for this in the kitchen, became an important part of her instructions to middle-class women either cooking themselves or managing servants and housekeepers.[59] Obviously in 1860 only a coal or wood fired stove for cooking could be imagined but as we have seen, later editions dealt with the possibilities of cooking using

54 Idem, 28.

55 See J. Mordaunt Crook, *The Rise of the Nouveaux Riches; Style and Status in Victorian and Edwardian Architecture* (London: John Murray, 1999).

56 Reynolds, 17.

57 Mrs Isabella Beeton, *Mrs Beeton's Book of Household Management* (London: Samuel Orchart Beeton, 1861).

58 Mrs Beeton's book ran into multiple editions and there is debate about the role of her husband in the creation of the book and its life post her death. Samuel Beeton was certainly an 'extremely sharp commercial operator with a talent for advertising and publicity', who recognised the value of a woman being seen to guide women. For an excellent discussion of Mrs Beeton's book see Margaret Beetham, 'Good Taste and Sweet Ordering; Dining with Mrs Beeton', *Victorian Literature and Culture,* vol. 36, n° 2, 2008, 392.

59 Idem, 392.

electric. But it was not just Mrs Beeton and similar household guides that inspired change among middle class women's behaviour: writers on the decorative aesthetics of lighting also played a key role in the campaigns lobbying for changing modes of energy consumption.

35 Harrison Moore's recent research on the first British women decorators and women authors on interior design has highlighted the importance of Mrs. Mary Eliza Haweis' *The Art of Decoration* (1881). Decorating was one of the first professions opened up to middle-class women in the 1870s, as it was quickly realised that as women started to have shopping opportunities greatly enhanced by the Married Women's Property Act of 1882, they were receptive to and often reliant on advice on how to decorate their homes.[60] Combined with the increasing pressure on middle-class women, as the 'angels in the house', to provide a moral, heavenly space for their families, was the need to demonstrate their knowledge and taste in interior design, and, consequently make lighting decisions in the home.

36 Haweis' text includes the first positive reference to lighting and heating the home by electricity written by a female author we have found to date. In recommending electricity as the best way 'to light adequately a large room without heating it,' Haweis makes specific reference to the electric lighting introduced by Lord Salisbury at Hatfield House, examined as a key site of electrical innovation and experimentation in Gooday's *Domesticating Electricity.*[61] *And as we saw previously, while Mrs Beeton's Book of Household Management* in 1907 used the example of a luxurious boat, a Royal yacht was at the apex of aristocratic examples of the domestic employment of electricity. Each of these types of text were crucial in framing these spaces and their aristocratic owners as exemplifiers of the most progressive sort of energy use, and we can see how this rhetoric helped to sell electricity even when it was by far the more expensive way to heat and light the home.

WOMEN OF POWER IN ELECTRIFICATION

37 In looking at how Verity and Woodhouse & Rawson cited aristocratic clients in their advertising, one might infer (wrongly) on a Hughesian reading that these upper-class consumers were entirely passive recipients of the new systems technocracy. After all British aristocrats, male and female, have long (falsely) been assumed to have made no significant innovations since enacting canals and agricultural improvements in the Georgian era.[62] Yet, building on Cannadine, we challenge this misguided caricature of fading aristocratic agency. Whereas Trentmann's analysis in *Empire of Things* (2016) treats aristocrats as leading consumers of new luxury goods only up to the early modern period, and only in non-European settings, we show that their engagement with innovative technologies was still crucial in Victorian and early Edwardian England.[63] Our new culturally inclusive approach to electrification is guided by Trentmann's more recent (2018) inter-disciplinary writings on 'Getting to grips with energy' that is informed by insights from cultural anthropology: [64] 'how people use energy relates to how they value it and thus what it enables them to accomplish'.[65] For early electricity, the accomplishment that we trace is the performance of luxury consumption. In that sense we follow Trentmann's injunction for future research on energy to tell a richer story 'with the people put back in it'. This involves focusing on both aristocrats and engineers, with aristocrats featuring among financiers, consumers and engineers. Most importantly it involves

60 On this point see Rachel Bowlby, *Carried Away; The Invention of Modern Shopping* (New York: Columbia University Press, 2002) and Frank Trentmann (ed.), *The Making of the Consumer: Knowledge, Power and Identity in the Modern World* (Oxford and New York: Berg, 2006).

61 Mrs H. R. Haweis, *The Art of Decoration* (London: Chatto and Windus, 1881), 353.

62 See Briony McDonagh, *Elite Women and the Agricultural Landscape, 1700-1830* (London: Taylor and Francis, 2018).

63 Frank Trentmann, *Empire of Things* (London: Penguin, 2016).

64 Frank Trentmann, 'Getting to Grips with Energy: Fuel, Materiality and Daily Life', editorial in *Science Museum Group Journal*, 'The Material Culture of Energy', Spring 2018, 8.

65 Sarah Strauss, Stephanie Rupp and Thomas Loue, *Cultures of Energy* (London: Routledge, 2013).

looking at how female aristocrats carried a significant persuasive power in their innovative use of electricity. Although we see that the language of agents and agency adopted was not commonly agreed between the parties concerned, we can understand perhaps how it was the promotional work of Jenny, Lady Churchill rather than Lord Randolph Churchill who accrued the epithet of 'advertising agent' from the electrical contractor-entrepreneur Crompton.

38 The case in point is the electrification c.1884-85, of Lord and Lady Churchills' town house at 2 Connaught Place, in the elegant Marble Arch area of West London, over-looking the north side of Hyde Park. Looking back to their occupancy of this house for the decade from c.1883, with sons Winston and John, in her 1908 autobiography, Lady Churchill presents this as a matter of her own pioneering agency as the 'first private house in London to have electric lights'. Nevertheless, she also notes in passing late in her narrative that this was 'gift of an installation' and served as 'an advertisement' for the company which had 'offered to put into our house free of cost'.[66] She makes no explicit mention of the gifting manufacturer and contractor, Crompton. Instead she looked back on this heyday as when the Churchills were so fashionable that it was only natural that any entrepreneur wishing to promote a novel commercial enterprise would come to their family, and offer this novelty *gratis* in order to show it to the rest of their elite social circles. And their innovation was certainly noticed by neighbours. As Lady Churchill writes of an era well before any local grid networks were available, and at a time when the first electricity supply legislation was passing through the House of Commons, their only supply of electricity was from a (presumably coal-fired) basement electricity generator:

> We had a small dynamo placed in a cellar underneath the streets, and the noise of it greatly excited all the horses as they approached our door. The light was such an innovation that much curiosity and interest were evinced to see it, and people used to ask for permission to come to the house.[67]

39 The recurrent fallibility of this dynamo, however, necessitated fetching lamps and candles from the same basement to keep dinner their parties illuminated (see discussion in *Domesticating Electricity).* More than that, however, there were legal and financial complications arising from having this as a gift:

> The electric light did not prove to us an unmitigated blessing, inasmuch as Randolph having spoken enthusiastically in the House of Commons in favour of an Electric Lighting Bill,[68] felt he could no longer accept the gift of the installation which by way of an advertisement a company had offered to put into our house free of cost. Unfortunately, there being no contract, we were charged double or treble the real price.[69]

40 A somewhat different view of this installation is apparent in the writings of Rookes Evelyn Bell Crompton, a veteran mechanical engineer and military veteran of the Indian Empire. His mechanical engineering company based in Chelmsford, Essex, quickly adapted to electrical engineering when the commercial opportunities for Swan and Edison lighting emerged in c.1882. Using his imperial connections to gain access to the gentry, he sought out upper class patrons to promote the expensive and rather hazardous innovative dynamos that his company manufactures. While it was male aristocrats who had the

66 Mrs. George Cornwallis-West, *The Reminiscences of Lady Randolph Churchill, by Mrs. George Cornwallis-West* (New York: Century, 1908), 139.

67 Idem, 138.

68 For information on Lord Randolph Churchill's activities in Parliament in relation to the promotion of electric light in the House of Commons, see **https://api.parliament.uk/historic-hansard/commons/1883/apr/17/the-house-of-commons-the-electric-light** and this related debate in 1883 about the House of Commons electrification: **https://hansard.parliament.uk/Commons/1883-05-10/debates/639fff12-fd31-43b9-b5de-a63097f968d2/ClassI%E2%80%94PublicWorksAndBuildings.**

69 Cornwallis-West, 138-9. The correspondence on this issue between Lady Churchill and R.E.B. Crompton is dated 19-21 January 1885. See Churchill papers at Churchill College, Cambridge, CHAT 28/99/31-33.

financial resources to pay for such indulgences it was evidently the social caché of the female aristocrats that was most important in such situations. Indeed writing his autobiography seven years after Lady Churchill's death in 1928, he cast her role as that of 'advertising agent' – a representation which she herself would not have accepted – and highlighted details of her boudoir arrangements that would doubtless have been less acceptable to publish 40 years earlier:

> Both Lord and Lady Randolph Churchill took great interest in our electrical work, and Lady Randolph became most useful as an advertising agent. She delighted in showing off to her friends of the fashionable world our various electrical appliances, among them a pear-shaped switch, christened 'the Randolph', which enabled her ladyship to light up or switch off without leaving her bed... [70]

41 Such was the effectiveness of this advertising by Lady Churchill that Crompton's soon gained other affluent customers:

> We also put in installations at [Attorney-General] Sir Richard Webster's in Hornton Street, Kensington; at [chemist and journal editor] Sir William Crookes' house and laboratory in Ladbroke Square; at [Sir William Schwenk] Gilbert's, the well-known dramatists in Harrington Gardens; and in many other private houses and shops. Siemens and other rival manufacturers soon began to copy us, but I claim that we, 'Crompton's,' introduced the arrangement, and that these private installations were the chief means of popularising the electric light, and caused the demand for its use which now began to arise. [71]

42 Crompton's citation of Lady Churchill as his 'advertising agent' highlights the persuasive agency of women, as epitomised in Mrs Gordon's well-selling *Decorative Electricity* in 1891: although we have no circulation figures for that first edition, the cheaper second edition was produced in 1892, just six months later. By this time, Mrs Gordon could declare in her preface that the economics of electrical lighting had been greatly improved, so that is was by then prudent for consumers who could afford only five electric lamps not to install them in their home.[72]

43 Nevertheless, our research wishes to look beyond Crompton's account since Lady Churchill's *Reminiscences* (1908) gives a different view of her role in domestic electrification, emphasizing her autonomy. The significance of aristocratic women in the histories of electricity is further evidenced in later decades where we see aristocratic women still leading in related technological enterprises: the Women's Engineering Society was founded by Lady Katharine Parsons in 1919[73] and the Electrical Association for Women adopted Lady Nancy Astor as its first President in 1924.[74] Drawing on Reynolds' *Aristocratic Women and Political Society* (1998) we want to situate this electrical activity in the period when, as the broader socio-economic power of the aristocracy was coming under strain, upper-class women's role as patrons in domestic, social and political matters was ever more visible and significant. The role of the wife, both of the engineer and consumer of electricity is a key but often missing part of a gendered history of electricity.

44 Having seen the importance of the gendered aristocratic role in electrification of the town house, what then of the other major residence of the upper classes: the country house?

THE COUNTRY HOUSE AS A STRATEGIC SITE OF PATRONAGE AND ELECTRICAL DISPLAY

45 As Girouard influentially pointed out, the country house is an important site to examine class-based social histories, and therefore it is vital that we turn to this as a strategic site

70 R.E. Crompton, *Reminiscences* (London: Constable Co 1928), 109.

71 Idem, 110.

72 See Gooday, *Domesticating*; Mrs J.E.H. Gordon, *Decorative Electricity,* 2nd edition, 1892, iii-iv.

73 Carroll Pursell, '"Am I a Lady or an Engineer?" The Origins of the Women's Engineering Society in Britain, 1918-40', *Technology and Culture,* vol. 34, n° 1, Jan 1993, 78-97.

74 See references above to Gooday, 'Women in energy engineering', Pursell, 'Domesticating modernity'.

of aristocratic electrical display.[75] Investigation of how traditional upper-class homes served as sites of technological innovation was given recent impetus by Barnwell and Palmer's (2012) *Country House Technology*, and Palmer and West's (2016) *Technology in the Country House*.[76] These works explore how the selective introduction of new technologies changed country house life in the nineteenth century, while noting that not all homeowners chose to invest in new technological systems. This research, when read alongside David Cannadine's influential narrative of aristocratic adaptation and survival during their alleged decline as a class following the 1880s agricultural depression,[77] requires us to move beyond Girouard's assumption that old money aristocrats were largely too conservative for electricity.[78] Especially original is his focus on aristocratic support for new industries of power and mobility, including automobiles and aeroplanes, as a bulwark against declining income and influence. Our class-sensitive narrative follows Cannadine and Edgerton[79] in challenging the controversial yet still popular and republished declinist allegations of aristocratic opposition to technoscientific innovation.[80] Extending that critique to the history of electrification, we build upon exploration by Gooday of two electrical engineers who inherited aristocratic titles: James Swinburne as Baronet and the militarily credentialed Kenelm Edgcumbe.[81] We thereby extend Cannadine's key point that younger male members of aristocratic families often took up engineering, thus working at the intersection of the networks of nobility and technology.

46 So what were the broader driving forces that brought modern engineering into England's older aristocratic households? Cannadine has examined how aristocratic males helped to develop railways, automobiles and aeroplanes, and we extend his study to the emerging electrical industries of lighting and power, highlighting collaborations forged between entrepreneurs and professional engineers. While important studies, neither Hughes nor Cannadine gives a systematic and symmetrical account of how the gentry collaborated with technical experts in accomplishing early electrification. So the challenge remains of examining how they interacted, and how far their respective contributions were essential to the enterprise. We can find parallels in historical accounts of how scientists and aristocrats in comparably fruitful interaction in research activities.[82]

47 It is key in our work to distinguish between old and new forms of money involved in supporting these extremely expensive ventures. This is especially significant given the previous analyses that have cast English aristocrats as if they were reactionary electrophobes, who rejected the adoption of this new-fangled technology as being only modern play-things of the *nouveau-riche*. We have already examined the importance of Hatfield as an aristocratic house that evidenced both the spectacle and the dangers of electricity.[83] Fear of the new might also explain why, at Chatsworth, Drake and Gorham, one of the leading companies of electrical

75 Mark Girouard, 1978 and 1971 and Franklin, 1981.

76 P.S. Barnwell and Marilyn Palmer, *Country House Technology* (Oxford: Rewley House Studies, 2012) and Marilyn Palmer and Ian West, *Technology in the Country House* (London: Historic England, 2016), of particular use is Ian Watt's chapter, 'Worthy of a Palace of Aladdin; The Introduction of Gas and Electricity to the Country House'.

77 See David Cannadine, *Aspects of Aristocracy; Grandeur and Decline in Modern Britain* (New Haven and London: Yale, 1994) and David Cannadine, *The Decline and Fall of the British Aristocracy* (London: Penguin, 2005).

78 Girouard, 1971, 18.

79 David Edgerton, *Science and Technology and the British Industrial 'Decline' 1870-1970* (Cambridge: Cambridge University Press, 1996).

80 Martin J. Wiener, *English Culture and the Decline of the Industrial Spirit, 1850-1980* (Cambridge: Cambridge University Press, 2004).

81 Graeme Gooday, *The Morals of Measurement; Accuracy, Irony and Trust in Late Victorian Electrical Practice* (Cambridge: Cambridge University Press, 2004).

82 Simon Schaffer, 'Physics Laboratories and the Victorian Country House' in Crosbie Smith and Jon Agar (eds.), *Making Space for Science* (London: Palgrave, 1998); Donald Opitz, 'The House is a Temple of Research; Country House Centres for Late Victorian Science' in David Clifford, Elizabeth Wadge and Alex Warwick (eds.), *Repositioning Victorian Sciences* (London: Anthem Press, 2012) and Annette Lyknnes, Donald Opitz and Brigitte Van Tiggelen (eds.), *For Better or For Worse? Collaborative Couples in the Sciences* (Basel: Birkhauser, 2009).

83 Gooday, *Domesticating*, chapter 3.

engineers of the day, worked hard to balance the newest of technologies with the historic decoration in a house that dated back to 1553. In articles announcing the installation of electricity in 1893 at the country house in Derbyshire, the firm worked hard to reassure readers that the new electric fittings perfectly harmonised with the pre-existing decoration; 'with such consummate skill has the electric light been introduced, where hitherto candles and lamps had reigned… Indeed, whenever possible all the existing standards, brackets and chandeliers and so forth have been utilised, and where there were none the incandescent lamp has been introduced to look as if it had been there from the beginning'.[84]

48 While they may have emphasised the way that they fitted electricity into historic interiors, it was perfectly clear from this and other reviews of the electrification of Chatsworth written in the 1890s, that the ambition was to also celebrate the innovative and forward-looking nature of the family in their home. The author of 'The Electric Light at Chatsworth' concludes that, all 'who see the house with its new illumination will see a thousand excellences that they never suspected to exist'. As Marina Coslovi has noted, when the 'era of electricity' arrived, Chatsworth was among the very first of country houses to install electric lighting; she also reminds us, that as a very significant aristocratic family, in a house that represented generations of inherited land-ownership and power, they did this at a time when some looked down on electrification as 'a "nouveau-riche" indulgence'.[85] As Jocelyn Anderson observes, Chatsworth was one of the grand country houses which had powerful public identities and had become ever more accessible to tourists since the Eighteenth century, and by the time of its electrification, visiting such houses had indeed became a very important part of the cultural life of England. While we do not have the numbers of visitors who visited specifically to see the electrical innovations in the house, we can surmise that electrifying a country house ensured a significant audience for this new technology.[86]

49 Baedecker's eponymous guide said in 1890 that Chatsworth was 'redolent of modern'[87] and the electrification of the house was widely reported on. Coslovi confirms that 'electricity was introduced into country house with much more enthusiasm than gas had been', as it had clear practical advantages, especially in terms of the impact of gas fumes and dirt on interiors, textiles and art. The electric lighting of Chatsworth was followed with interest by the local press, with the *Nottinghamshire Guardian* and the *Sheffield and Rotherham Independent* both featuring articles in December 1893 as the project was revealed to the public. The writer from the *Nottinghamshire Guardian* concluded that all 'who see the house with its new illumination will see a thousand excellences they never suspected to exist'.[88] The archives at Chatsworth show that the cost for consumption of oil and candles dropped to zero in 1894, which Ian Watt uses to suggest that electrification had won the day there.[89]

50 It is useful to consider the different roles of the aristocratic country and town house in the introduction of electricity. Both had key roles to play. From a marketing standpoint, town houses were highly visible sites of technical demonstration, since they were located in populous cities. In contrast, country houses could be seen as being less visible, since they were geographically isolated, but as we have demonstrated, the importance of these houses as public spaces of display was equally valid in the history of electrification because of the long histories of tourism and

84 'The Electric Light at Chatsworth', *Nottinghamshire Guardian,* 16 December 1893, 5.

85 Marina Coslovi, 'Chatsworth, a Modern English Mansion' in Rosella Mamoli Zorzi and Katherine Manthorne, *From Darkness to Light; Writers in Museums 1798-1898* (Cambridge: Open Book, 2019), 199.

86 Anderson, 2018.

87 Karl Baedecker, *Great Britain Handbook for Travellers* (Leipzig; Karl Baedecker Publishers, 1890), 501.

88 'The Electric Light at Chatsworth', *Nottinghamshire Guardian,* 16 Dec, 1893, 5.

89 Ian Watt 'Worthy of a Palace of Aladdin; The Introduction of Gas and Electricity to the Country House', in Palmer and West, *Technology of the Country* House, 114. See also Coslovi, 198.

country house visiting. Within the peer groups of the wealthy, aristocratic or nouveau, the culture of balls and dinners, so vital in patterns of social class and respectability, ensured that those invited would travel long distances to be entertained in the shining homes of the elites. This was precisely why Lord Salisbury chose a ball as the perfect way of showing off electrification at Hatfield, while advancing and confirming his political credentials (see above).

51 As an example of the influential significance of electric lighting in country houses, at Chatsworth there was an interesting relationship between the early electrification of Chesterfield, the town closest geographically to the House. Chesterfield was very much a part of the Devonshire family estates and holdings, then and now. This town experimented with and subsequently adopted electric street lighting in 1881 using the engineering firm of Hammond and Co., 12 years before Chatsworth was electrified internally by Drake and Gorham in 1893. The town reverted to gas again in 1884.[90] Street lighting, however, is a very different type of electrification to domestic lighting, and one might imagine involves less of a concern over potential risk, given it is outdoors and not in the home. The Dukes of Devonshire, including the 8th (1833-1908) and 9th (1868-1938) Dukes, were actively involved in Chesterfield, and the town's coal mines were part of the family holdings.[91] Both Dukes were MPs for West Derbyshire, the 9th Duke became Mayor of Chesterfield in 1911 and the family took an active interest in the management and governance of the town. Therefore, it is possible to conclude that the experiments in electric street lighting and the role of the town as a pioneer in the history of electrification would have been of great interest to them and, despite ultimately proving unsustainable in the 1880s, may have influenced the decision to electrify Chatsworth. Whereas the Chesterfield experiment was short-lived it was significant and as Patrick Strange concludes 'served to bridge that important gap between experiment and commercial reality' in street lighting, that Chatsworth helped bridge in terms of lighting the home.[92]

52 Looking beyond the immediate topic of electrification, such country house case studies offer a new perspective on technological change in fin-de-siecle England that recovers the agency of upper-class innovation at a time when the House of Lords was still largely the national seat of power. Challenging myths lingering since Wiener's allegations of British high culture's hostility to innovation, we have revealed a broader vista of co-operative networks of aristocratic and entrepreneurial agency which can be expanded in future research.

CONCLUSION: MAPPING THE NETWORKS OF SYMBIOSIS

53 Our new research project is at an early stage, but we have begun to map the co-evolving worlds of aristocratic influence and engineering agency that are a hitherto-unexplored characteristic, we argue, in facitiliating the early stages of electrification in England. Of course, we do not claim that it was *solely* aristocratic patronage which faciliated this change: the participation of old-money aristocracy is only one factor in the broadening system of new electrification. But as part of a longer project we have identified which elements of social power have been missing from the classic narrative of Hughes.

54 While there is much left still to do, we have specifically brought together for the first time: i) the aristocratic networks of developing electricity consumption at client country houses ii) and the four major early entrepreneurial agents of electrification: Cromptons, Drake & Gorham, Verity & Sons, and Woodhouse & Rawson for whom the aristocrats were clients.[93] As we have seen

90 Patrick Strange, 'Early Electricity Supply in Britain', 863.

91 A 24 ton piece of block of coal from the Duke of Devonshire's mine at Stavely, near Chesterfield, was placed outside the engine house display at the Great Exhibition in 1851, Asa Briggs, *Victorian Things* (London: B.T. Batsford, 1988) 63.

92 Strange, 868.

93 We thank one of our reviewers for pointing out that Woodhouse & Rawson's publicity strategies do not seem to have been as successful as those of other electrical lighting companies. After a dispute with the Edison

Cromptons relied on Lady Churchill to 'advertise' their wares, in preference to the more *declassé* practice of advertising in popular literature. Indeed in mapping out the growth of early electrical lighting in country houses we have begun to clarify how far pre-existing social interactions between country houses led to a successful 'word-of-mouth' model of securing new clients without paper advertising. This appears to have been the means by which Drake and Gorham, for example, secured social patronage. As we showed above, the two other entrepreneurs that we study clearly did rely on the newer methods of advertising to capitalise upon their upper class connections in the second edition of Alice (Mrs J.E.H.) Gordon, *Decorative Electricity* (1891).

55 Future research in our project will looking at how such companies published company reports of their aristocratic clients e.g. in the *Times, Electrician* etc. to reassure shareholders that their support of new electrical businesses like theirs was a good investment. Rather than being autonomous and self-sufficient, as assumed by Thomas Hughes classic account, we aim to show how these entrepreneurs needed the custom of prestigious aristocratic families to build their careers. In turn, this symbiotic mapping will show how those aristocrats benefited from showing themselves able to demonstrate to their guests the most exciting new technologies. In an age when aristocratic power was waning (through the weakening agricultural industry of the time), we will highlight further how owners of the great houses needed the symbolism of success and innovation that electricity in high class houses could bring.

Looking to the agency of women as a key part 56
of the future research avenues at the crossroad of Gender studies and Energy history, we will look for more stories like those of Lady Randolph Churchill 'showing off to her friends of the fashionable world' the new electrical appliances given to them for demonstration purposes by ambitious entrepreneurs such as Crompton. Future research will look, for example, at how Queen Victoria's interest in the spectacle of electric light at Waddesdon was piqued when one was turned on and off when she visited this house in 1890.[94] Focusing on the role of such powerful women as Lady Churchill and Queen Victoria will enable us to rethink the balance of the key factors of class, gender and entrepreneurship in seeking to explain afresh how early electrification occurred in England. More than that, the international and imperial connections of such eminent figures will be a starting point to considering who led the take up of electricity in other countries other than the United Kingdom.

company, Woodhouse & Rawson was liquidated in 1893. Verity & Sons, in contrast, was a more sustained success, especially after moving from its early elite Covent Garden site in London to industrial Birmingham. See **https://gracesguide.co.uk/Woodhouse_and_Rawson_Electric_Contract_and_Maintenance_Co and https://gracesguide.co.uk/B._Verity_and_Sons**. Our future research will compare in more detail these two companies' strategies for citing aristocratic patronage in their advertising in relation to their differential success in securing new clients.

94 Michael Hall and John Bigelow Taylor, *Waddesdon Manor; The Heritage of a Rothschild House* (New York: Harry M. Abrahms Inc., 2002), 172.

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Commercial strategies to promote domestic gas and electricity consumption, and the role of women (Lisbon, 1891-1970s)

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Abstract

By the 1870s the gas industry had no competitors for lighting, turning it into a near monopoly. However, by the 1880s the possibility of using electricity for street lighting changed the equation and the threat for gas industry was huge. This new promising competitor caused some people to forecast the end of the gas industry. In this context, in 1891 by the fusion of two gas companies, the *Companhia Reunidas de Gás e Electricidade* (CRGE) was created to produce and sell gas and electricity to Lisbon and its outskirts. In this paper we analyse the marketing strategies of this company as a particular case in which the introduction of electricity was made in complementarity (and not competition) with the gas industry. The company marketing strategies of these new energies reinforced genre stereotypes of housewives and husbands and their roles in the home. They also developed and consolidated the idea that a modern house should be equipped with gas and electricity appliances. We will show that the promotion of these new appliances was made through press advertisements, warehouses, stands and cooking courses, among others.

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Plan of the article

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INTRODUCTION

1 From a 1946 article in the *Eva* magazine, containing several photos of an American kitchen designed by Jerry Fairbanks, we can perceive housewives' desire to have a modern kitchen "as if they lived in America":

> When will we have this? (...) How many inventions contributing to the housewife's wellbeing (...)
> Pity us, still working with utensils identical to those from the Middle Ages (save for the vacuum cleaners, the flatirons and the electric stoves which only millionaires can afford) (...)
> When will our electricity suppliers decide to provide us with electric power at a price fitting civilized people, who need it not for luxury but for making life easier, instead of issuing charges at every opportunity?[1]

2 The sentence above illustrates well how the American household propaganda influenced the way in which in other countries household gas and electricity consumption was looked upon as progress in terms of welfare. Nevertheless, to understand why in 1946 *Eva* magazine published this article, we have to understand how this symbolic universe that articulates issues of modernity, energy consumption, gender roles and domesticity was constructed.

3 When studying the use of gas and electric domestic appliances of Lisbon's households, we consider it essential to analyse the role played by the city's gas and electricity distribution company in the rise observed in their domestic consumption, through its marketing strategies aimed at promoting "modern energies" and the appliances which would facilitate women's chores and improve life in the home.

4 However, an approach to the use of domestic appliances at home must take into account a series of factors, such as the availability of the energies that power those appliances; the supply of running water; the spatial reorganization of the kitchen/bathroom to receive new equipment; a commercial framework to enable their purchase; and the engineers, technicians, and industrialists who ensure the smooth operation of all the preceding elements. This is why Ruth Schwartz Cowan defends that "the concept of technological system becomes important in understanding the processes by which the American home became industrialized".[2]

5 Ruth Schwartz Cowan's book, which looks at how advances in technology and the use of new forms of energy translate into new ways of organising domestic work, can be considered a classic.[3] The links between women and the use of different energy sources within the domestic space have also been analysed in works from other countries. In particular for the case of Barcelona we can highlight Mercedes Arroyo's book on the gas industry until the 1930s,[4] and for France the book by Alain Beltran and Patrice A. Carré, which among other aspects refers to domestic electricity consumption.[5] In these two books the commercial strategies followed by the companies to promote domestic consumption of gas and electricity are also addressed. This theme had already been explored in 1987 by Jeanne Boin.[6] In the same decade, Jane Busch analyses these strategies for the American case.[7]

6 In recent years several works have contributed to these themes. Anne Clendinning focuses on the British gas industry and analyses the role of

1 *Eva*, August 1946, 22-23.

2 Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983), 13.

3 Idem.

4 Mercedes Arroyo, *La industria del gas en Barcelona, 1841-1933* (Barcelona: Ed. del Serbal, 1996).

5 Alain Beltran, Patrice A. Carré, *La fée et la servante. La société française face à l'électricité XIXe-XXe siècle* (Paris: Belin, 1991).

6 Jeanne Boin, "L'utilisation domestique de l'électricité. Soixante ans de conseils à l'utilisateur", in *L'électricité et ses consommateurs*. Actes du quatrième colloque de L'Association pour L'Histoire de L'Électricité en France (Paris: PUF, 1987).

7 Jane Busch, "Cooking Competition: Technology on the Domestic Market in the 1930s", *Technology and Culture*, Vol. 24, N° 2, 1983.

women as gas workers and energy consumers.[8] Also in recent years there has been a growing interest in energy consumers. The article by Yves Bouvier refers to the diversified approaches that can be made to energy consumption, even if the concepts of energy or consumers are not always clear.[9]

7 For the Portuguese case, electricity consumption is analysed in the book by Ana Cardoso de Matos et al. between the end of the 19th century and World War II, with Lisbon as the central case.[10] Also for Lisbon, Diego Bussola, analyses the participation of *Société Financière de Transports et d'Entreprises Industrielles* (SOFINA) in *Companhia Reunidas de Gás e Electricidade* (CRGE) and the regulation of electricity throughout the 20th century.[11] Concerning the domestic use of the energies sold by CRGE, one can refer to the book *As imagens do gás* where an approach is made to the evolution of gas consumption connected to domestic applications in the city of Lisbon and the strategies to encourage consumption until World War II.[12] For the later period Diego Bussola addresses the issue of household appliances linked to electricity consumption, focusing on electricity tariffs.[13]

8 However, to the present day there has been no study for the Portuguese case on CRGE's marketing strategies focusing on the place given to women and relating it to the evolution of household consumption of the energies sold by the company. Thus, in this article we seek to: analyse the marketing strategies directed mainly towards women; demonstrate that the strategy of promoting domestic consumption of gas and electricity was not competitive, but complementary, which was reflected in the marketing itself.

9 Two sets of documents were used for this study. On the one hand, the documentation of the company CRGE that is available at the EDP Foundation Documentation Centre (CDFEDP) - CRGE Collection: Annual Board Report, Management Board Minute Book, Statistical Elements and pictures; and, on the other hand, magazines and newspapers: *EVA*, *O amigo do lar*, *Crónica feminina*, *Banquete* and *Diario de Notícias*. On this documentation we performed a quantitative analysis of the production and consumption of gas and electricity, and a qualitative approach oriented towards the analysis of the commercial strategies and use of these energies in the domestic space, which enabled us to address gender issues related to the use of energies.

10 In the first part we analyse the household consumption of gas and electricity in the city of Lisbon from the creation of the company (1891) until the 1930s. We then discuss CRGE's marketing strategies to sell gas and electricity to domestic consumers until the 1930s and the stereotypes reinforced by its advertising. Then, we show how the Second World War conditioned and modified domestic consumption of gas and electricity. In the fourth part, we examine the marketing strategies of the CRGE in the post-war period. Finally, we show how the post-war advertising of the CRGE reinforced family stereotypes and adjectivized the domestic use of gas and electricity.

THE CRGE COMPANY AND ITS MONOPOLY OF THE PRODUCTION AND DISTRIBUTION OF GAS AND ELECTRICITY IN THE CITY OF LISBON

11 The company CRGE was created in 1891, resulting from a merger of the two companies which exploited the production and distribution of gas in the city of Lisbon - the *Companhia Lisbonense*

8 Anne Clendinning, *Demons of Domesticity: Women and the English Gas Industry 1889-1939* (New York: Routledge, 2004).

9 Yves Bouvier, "Energy consumers, a boundary concept for the history of energy", *Journal of Energy History* [Online], n°1, 2018, consulted 7 May 2021, URL : energyhistory.eu/en/node/86.

10 Ana Cardoso de Matos *et al.*, *A electricidade em Portugal. Dos primórdios à 2 Guerra Mundial*, (Lisbon: EDP, 2004).

11 Diego Bussola, "A luz do capital. Sofina e a regulação da electricidade em Lisboa e Buenos Aires, no século XX" (Ph.D diss., University Institute of Lisbon, 2012).

12 Ana Cardoso de Matos *et al.*, *As imagens do gás. As Companhias Reunidas de Gás e Electricidade e a produção e distribuição de gás em Lisboa* (Lisbon: EDP, 2005).

13 Diego Bussola, "A modernização dos lares lisboetas: consumo de energia e electrodomésticos na Lisboa de após guerra (1947-1975)" (Master thesis, University Institute of Lisbon, 2005).

de Iluminação a Gás, founded in 1846, and the *Companhia do Gás de Lisboa*, founded in 1887 -, and by the contract established with the Lisbon City Hall, by which it committed to introducing electricity to the city of Lisbon.

12 From 1891 onwards, then, the distribution of these two kinds of energy was exploited as a monopoly. This fact prevented competition by other players, but also forced CRGE to find different markets for these two energy types, and the marketing policies developed throughout the years always took this into account. In fact, the contract signed by CRGE with the Lisbon City Hall, in 1892, gave it the concession to supply gas for public lighting and to private customers, to introduce electric lighting on the Avenida da Liberdade and, later on, in other areas of the city, and finally to supply electricity to private customers.

13 On the other hand, the fact that CRGE had an important proportion of foreign capital namely French and Belgian, led foreign stakeholders to intervene in defining the company's management – especially after 1913, when SOFINA became the owner of a large portion of the capital. Thus, many of the strategies for promoting the consumption of gas and electricity, namely in the home, saw direct or indirect intervention by SOFINA, by the transfer of publicity models.

14 For a more global understanding of the dimension of domestic gas consumption, we have to consider it within the global evolution of gas consumption in Lisbon and relate it to the size of the capital's population.

15 From the moment when CRGE started to supply gas to Lisbon and its outskirts, consumption saw a rising trend until the eve of World War I, at which time there was a sharp drop due to the scarcity of the fuel necessary to keep up production.[14]

2 At the end of the 19th century, public and private lighting still accounted for a large proportion of

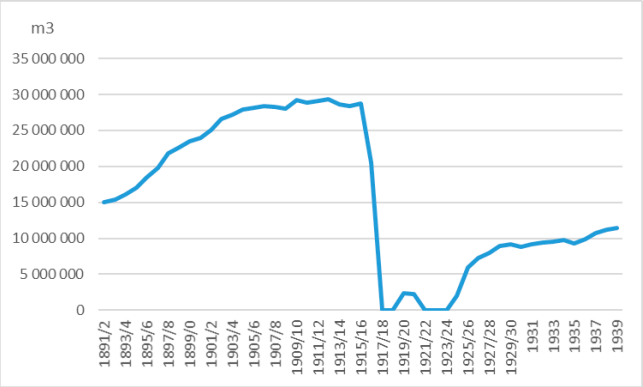

Figure 1: Evolution of gas consumption (Lisbon, 1891-1939). Source: CDFEDP, CRGE *Annual Board Reports*, 1891-1939.

total gas consumption, leading CRGE in 1898-1899 to assign to the company *Sociedade de Incandescência – Bec Rationel* the exclusive rights, in Portugal, to utilize their nozzle which, according to that year's board report, "so effectively contributed to the development of our consumption".[15] This rise in private consumption had been helped by the spread of kitchen stoves and the installation of new industrial engines, which in that year consumed 477.297m3 of gas.[16]

16 A wider utilization of gas-powered engines and stoves was essential to secure gas consumption during daytime, in order to make production profitable, since the use of gas for lighting was mainly reserved for the night-time hours.[17] In 1905, due to the increase in gas consumption, both domestic and industrial, CRGE installed a new gasholder, with a 20,000m³ capacity.[18]

17 At that time, however, and until the 1930s, gas production was essentially directed to public and private lighting. *Per capita* consumption remained very low – there was even a reduction in the 1930s (fig. 2).

18 Rising coal prices during World War I made it necessary to raise the price of gas in the city of Lisbon, and to impose restrictions on its

14 Cardoso de Matos, *As imagens do gás*, 122.

15 CDFEDP, CRGE, *Annual Board Report*, 1898-99, 5.

16 Gas for engines was sold at a lower price.

17 It would be interesting to present a chart with gas consumption, however there´s no data available.

18 CDFEDP, CRGE, *Annual Board Report*, 1892-93 and 1904-05.

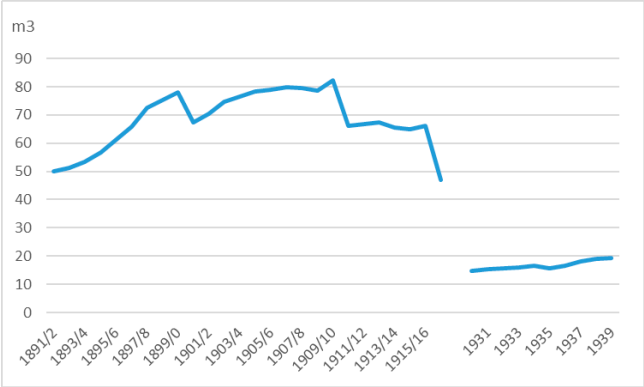

Figure 2: Evolution of gas consumption *per capita* (Lisbon, 1891-1939). Source: CDFEDP, CRGE *Annual Board Reports*, 1891-1939.

consumption, e.g. by reducing commercial opening hours and delaying the time for turning on public lighting lamps[19]. This resulted in a 28% cut in gas consumption, although there was actually a rise in the number of consumers.[20]

19 In the war years, losses from gas supply were so big that in the economic year of 1917/1918 CRGE decided simply to cut it.[21] The option to close down the gas plant was only possible because the contract signed with the City Hall allowed for gas lighting to be replaced by electric light, and CRGE exploited both energy distribution networks in Lisbon. Besides, some areas in the city were already being served by electric lighting. When gas production was reinitiated, in 1925, private consumers adhered almost instantly, causing a trend toward higher gas consumption, even though throughout the 1930s the figures stayed below those registered before the war (fig. 1).[22]

Per capita consumption, on the other hand, remained low for almost two decades, and could not climb back even to the figures reached in 1916 (fig. 2). Even if we consider that the figures before the interruption were in large part coming from public lighting, this fact still illustrates the low gas consumption levels seen from the end of World War I to the beginning of World War II.

From the moment when the production and distribution of electricity in the city of Lisbon began, its inhabitants showed great interest in this novel form of energy and lighting. Despite the difficulties experienced by the company since the start of World War I, the number of electricity consumers rose - from 1,085 in 1908/1909 to 6,814 in 1916/1917 (fig. 3). 20

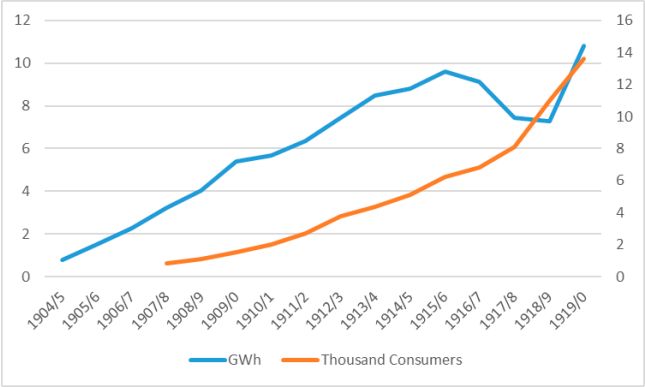

Figure 3: Evolution of electricity consumption and consumers (Lisbon, 1904-1920). Source: CDFEDP, CRGE *Annual Board Reports*, 1904-1920.

Even though data on the number of consumers was available only from 1907 to 1920, the different figures reflect growth both in the quantity consumed and the number of consumers. While in 1917 there were 8,127 consumers accounting for a 6.55 GWh consumption, by 1929 those figures had risen to 77,409 consumers and a 45.48 GWh consumption. Throughout this decade, however, electricity in the home was above all used for lighting. As a matter of fact, due to World War I restrictions electricity replaced gas for home lighting. 21

In the period between the wars, CRGE went from being essentially a gas producer to an electricity producer. In 1936, the central government decided to allow declining block rates to come into use, with the aim of promoting 22

19 In December 1915, the scarcity and steep price of coal forced the company to raise the price of gas for lighting and engines, and to suspend the promotion by which private consumers were able to pay for cooking gas at lower rates. CDFEDP, CRGE, *Management Board Minute Book*, nr. 8, 1915-1922, 24.

20 CDFEDP, *CRGE*, *Annual Board Report, 1916-1917*, 5.

21 In that economic year, the company suffered losses of 767.627$614, due to the price of coal and its transportation, and to the increase in salaries and other expenses. CDFEDP, CRGE, *Annual Board Report*, 1917-1918.

22 Until the end of the 1930s the domestic use of electricity was very low, the iron being the only electric appliance with some relevance. In 1930 iron accounted for 13.1% of electrical consumers. Maria Helena de Freitas, Fernando Faria, *Electricity and Modernity* (Lisbon: EDP, 2000), 63.

electricity consumption.[23] In January 1937, CRGE started to apply these rates to private consumers who requested them. The first and highest rate (1$89.6 escudos) was charged for lighting; the second (1$20 escudos) for small home appliances; and the third (0$50 escudos) for high-consumption electrical home appliances.[24]

23 The number of homes with electricity rose considerably in the 1930s, from 60% in 1935 to 73% in 1939, although consumption was essentially linked to lighting, at an average rate of 200kWh/year.[25]

"GAS AND ELECTRICITY FOR EVERYONE": MARKETING STRATEGIES FOR ENCOURAGING HOME CONSUMPTION OF GAS AND ELECTRICITY, UP TO THE LATE 1930S

24 Right from the start, CRGE developed a marketing policy aimed at encouraging the use of gas, by increasing quantity but also by diversifying utilization modes. This strategy was essential to ensure the consumption of gas in the daytime, when its use for lighting was next to zero.

Display to publicise

25 To encourage the use of gas in stoves and other domestic appliances, and in the industry as well, at the end of the 19th century CRGE opened in its warehouse on *Rua da Boavista* an exhibition "in order to let everyone know about the numerous and important uses that gas can be put to, letting people see and appreciate the best lighting, heating and ventilation appliances. Burners of the most perfect types, kitchen stoves, bath water heaters, and many other appliances can be seen, all of the greatest usefulness".[26] Other undertakings had already established a showroom to promote the usage of gas, as was the case of the English enterprise William Sugg & Cª, that had established one showroom in Liverpool and, with the aim of attracting consumers, in 1887 organised the Liverpool School of Cookery.[27] In Paris also, since the 1870s, the company that explored the gas created a showroom, edited manuals for consumers and from 1892 requested the services of a cook to lead culinary conferences.[28]

26 Since most of the city's inhabitants lacked the resources to purchase this kind of equipment, especially if the whole price had to be paid at once, CRGE decided, as early as 1892, to create "a special service to pay for the appliances in instalments, thereby giving everyone access to them".[29] With the aim of promoting the usage of gas-powered kitchen stoves, too, the company lent these appliances to its clients, even taking care of their maintenance without charge. These marketing policies made it possible to make gas stoves common in Lisbon households. In June 1893, the number of gas stoves functioning in the homes of private customers had risen to 4,970.[30]

27 Sales figures for this warehouse exhibition are not known, but the fact is that in 1912 the Board of Directors decided that the service of displaying the gas-powered home appliances was "costly" and that "the usefulness it had some years ago has now become doubtful.", thus considering it "opportune to supress this complementary service".[31] However, in the 1930s, with the appearance of new gas appliances, this warehouse exhibition

23 With the same purpose the *Compagnie parisienne de distribution de l'électricité* (CPDE) lowered the rates by 43% for electricity. Beltran, Carré, *La fée et la servante*, 256.

24 Bussola, "A modernização dos lares lisboetas", 27. Converting the rates from escudos to francs (fr.) and comparing with those in Paris: CPDE (Paris): 1° fr. 1.37; 2° fr. 1.00; 3° 0.237. CRGE (Lisbon): 1° fr. 3.06; 2° fr. 1.94; 3° fr. 0.81. CDFEDP, CRGE, "Commentaires sur les décret-lois concernant les nouveaux tarifs d'Energie électrique, en France", 8 March 1939.

25 Sofia Teives, Diego Bussola, "O consumo doméstico de energia" in Nuno Madureira (ed.) *A história da energia, Portugal 1890-1980* (Lisbon: Horizonte, 2005), 121.

26 CDFEDP, CRGE, *Annual Board Report*, 1892–1893, 6.

27 Francis Goodall, *Burning to Serve: Selling Gas in Competitive Markets* (Derbyshire: Landmark, 1999), 142.

28 Jean-Pierre Williot, Serge Paquier, "Stratégies entrepreneuriales et évolution des marchés des années 1840 aux années 1930", in Serge Paquier, Jean-Pierre Williot (eds.), *L'Industrie du gaz en Europe au XIXe et XXe siècles. Innovation entre marchés privés et collectivités publiques* (Bruxelles: Peter Lang, 2005), 59.

29 CDFEDP, CRGE, *Annual Board Report*, 1892–1893, 6.

30 In Lisbon, at that point there were 13,848 gas consumers, so 36% had kitchen stoves. CDFEDP, CRGE, *Annual Board Report*, 1892–1893, 6-7.

31 CDFEDP, CRGE, *Management Board Minute Book*, 1907-1915, 132.

Figure 4: Warehouse exhibition in Boavista (Lisbon, 1934).
Source: *O amigo do lar*, November 1934, 8.

reopened to the public with a more appealing presentation of the appliances (fig. 4).

28 The 1920s saw exhibitions linked to the electricity congresses organized in that decade to discuss the main issues surrounding the electrification of the country, which played a very important role in affirming electrotechnical engineering and the electricity industry in Portugal. During the 2nd Electricity Congress, held in the city of Porto from August 31st to September 4th 1924, there was an *Exposição de Maquinismos e aplicações da electricidade* [Exhibition of Mechanisms and Applications of Electricity], in which were displayed several products for domestic use such as dust suction devices; machines for making ice at home; mechanical kneading machines; electrical irons for clothes; coffee machines, heaters, ventilators; electric stoves, curling tong iron heaters, cigarette lighters and telephones. [32]

29 As currently practised in other countries[33], in 1930 was held the *Exposição da Luz e da Electricidade Aplicada ao Lar* [Exhibition on Light and Electricity Applied to the Home]. It opened on the 22nd of November and was open to the public for 15 days. Its goals were: to show people from trade and industry the effectiveness of light as an element in advertising, by presenting adverts and illuminated billboards, and to tell the general public about the advantages of using electricity at home.[34] This exhibition brought together, side by side, the stands of electricity producers and distributors, those of companies which made electrical installations, and those of electrical home appliance retailers, clearly demonstrating the way these three sectors were connected and interdependent. While selling more electrical home appliances

32 The first Electricity Congress was held in Lisbon in 1923 and its organisation came from the electricity section of the *Associação Comercial de Lisboa* (Lisbon Trade Association). At the end of this congress the organising committee for the 2nd congress was created and it was held in Oporto in 1924. Two other congresses were held in Coimbra in 1926 and Braga in 1930. On the subject see Ana Cardoso de Matos, "Formation, carrière et montée en puissance des ingénieurs électriciens au Portugal (de la fin du XIXe siècle aux années 1930)", Marcela Efmertova, André Grelon (eds.), *Des ingénieurs pour un monde nouveau. Histoire des enseignements électrotechniques (Europe Amériques) XIXe-XXe siècle* (Bruxelles: Peter Lang, 2016), 400-402.

33 Beauchamp points out: "Shows in New York, in 1930s and 1940s, provided comprehensive exhibitions of electrical heating, refrigeration, air conditioning, cooking and laundry equipment, as well as radio and television" and "In the period up to 1939 a large number of small local exhibitions covering domestic appliances were held in London and the provinces". Kenneth George Beauchamp, *Exhibiting Electricity* (London: IEE, 1997), 245-246.

34 Ana Mateus Malveiro, "Expor para divulgar. A memória das Exposicões de eletricidade e rádio e eletricidade realizadas em Portugal nas décadas de 20 e 30 do século XX" (Master thesis, Evora University, 2014), 92.

was essential to increase electricity consumption levels, and thus to make this business profitable, the converse was equally true. On the CRGE stand, several panels presented diagrams showing electricity consumption beside illuminated billboards and adverts.[35]

30 As we mentioned, one of this exhibition's goals was to promote the new usage of electricity among merchants and general public. Thus the stand of *Electro Reclamo Lda*, for instance, showed advertisements lighted by electrical power. The various exhibitions organized throughout the 1930s, in which CRGE participated, were important to spread the new utilization modes of electricity, including the domestic ones, although these were often presented in the background.

CRGE's advertising strategies

31 By the end of the 19th century, printed advertising had already taken a meaningful role, both as a way of making known the products each company offered and as a form of incentive to consumption. As the *Almanach da Agencia Primitiva de Anúncios* [Almanac of the Primitive Agency of Advertisements] put it, in 1873, "Nowadays it cannot be denied that advertising is a necessity of society's economic life, being indispensable to the branches of trade, arts, and industry. An advertisement will propagate, diffuse, enlighten, describe, and allow everyone to cater to their needs, and as a consequence it enables the products relevant to the economy to become well-known".[36]

32 Seeing clearly how important advertising could be in encouraging gas consumption, CRGE regularly posted adverts in several newspapers. As Anne Clendinning points out, gas managers directed their campaigns to female consumers, and doing so "helped to feminise the market for domestic technology by underscoring the point that (...) women were responsible for domestic labour, and, therefore, should be trusted with making important consumer choices for the home".[37]

33 Pursuing the goal of promoting domestic use of gas in the 1890s, CRGE published a brochure called "O GAZ"[38] in which, through the use of drawings of gas appliances and colloquial language, the various advantages of using gas were praised. This brochure maintained that by using gas stoves "The fire is always ready, kitchen utensils are always clean, and the servants have no excuse for any lack of cleanliness in the kitchen". To the question "Is gas cooking expensive?", the brochure replied "It is not. It is more economical than any other" [39], and went on to suggest that its readers visit CRGE's exhibition on its *Rua da Boavista* warehouse, where they could observe how the various devices worked while the company's employees explained their functioning. As mentioned above, to encourage the consumption of gas in the kitchen, the company supplied gas stoves, at no cost, to all its customers. The brochure also expounded the advantages of several domestic appliances powered by gas, such as a small "toillete" stove, made for heating water for tea and other drinks; coffee roasters; bathwater heaters; flat irons; washing machines; devices for heating dishes; heaters; and ventilators. In the opening decades of the 20th century, nevertheless, the use of these devices continued to be very rare.

34 The marketing initiatives by CRGE, begun in the 1930s, contributed to generalize the diverse uses of gas[40], which remained limited to those social

35 Among the various equipment representatives, we can mention the following: Singer showed electric sewing machines; Electrigia showed its Ormuz lamps; Casa Denis & Almeida exhibited the Frigidaire fridges; Siemens showed several electrical home appliances (irons, stoves, fans, loudspeakers, among others); Electro-lux exhibited its vacuum cleaners and floor polishers; Stubs & Guedes showed its cinematographic projection device Duoskop; Sampaio Baptista Lda. showed a model of an Otis elevator, just to name a few. Ibid., 93.

36 *Almanach da Agencia Primitiva de Anúncio*s, Lisbon, 1873, 3.

37 Clendinning, *Demons*, 4.

38 Although the exact publication date of this brochure cannot be known for certain, it fell between 1895 and 1900. In the archives of the EDP Foundation there is a photocopy of the original, annexed to the work by Cunha Santos entitled "Informação sobre a Empresa", s/d, a worksheet utilized in the company's training initiatives.

39 *O GAZ*, Lisbon, CRGE, s/d, 2.

40 As Jane Busch argues "Electric ranges had not had the technological capability to compete seriously with gas until the 1920s." Busch, "Cooking Competition", 224.

groups with a better financial situation.[41] Those campaigns suffered a clear influence from contemporary practices in France, where the pioneering advertising campaigns on electricity had been initiated in 1928 by the *Compagnie parisienne de distribution d'électricité* (CPDE). They were later transferred to CRGE through SOFINA. In fact, since 1928 the French company created an *Agenda de l'Électricité*, a very well-illustrated publication that gave lots of advices, and the first number of it sold 60,000 copies.[42]

35 The company's advertising services, supported by French know-how[43], implemented a series of actions[44]: sale on credit of all gas and electricity-powered appliances in cooperation with retailers; a more systematic use of advertising through billboards, illuminated adverts, printed ads, films, radio talks[45], shop windows in its sale outlets; the offer of appliances through contests; consumption bonuses or discount coupons for gas on the purchase of appliances; and cooking courses.[46] As Jane Busch suggests "advertising campaigns introduced the ranges to the public at large and translated technology into desirable consumer values" as well as "the social status of owning the most modern appliance",[47] whether it was the use of gas in the kitchen or the use of electricity that was sought to promote.

36 The cooking courses,[48] starting in 1932, were part of a strategy for fuel substitution in the kitchen, where up to that point coal and wood had been the main fuels used, replaced during the World War II by gas. The advertisements for these courses sought to draw in upper-class housewives by saying that "Thanks to our Cooking Courses, ladies will be able to cook with gas in an economical, safe and clean way", and offering housewives a course for their maids on "Careful handling and economical cooking processes with gas", upon whose completion they would earn a "certificate", attesting to the maid's ability to safely and economically utilize the new energy and technology.[49] This example lays out very clearly the differences in tasks and social status among the women in the household.

37 On March 28th, 1925, the newspaper *Diário de Notícias* advertised *Eva*, a new magazine dedicated to women, saying that "among us, the purely feminine interests have not been properly considered: we don't have a newspaper for the Woman", adding that in this magazine "our readers will find the thousand secrets of those little details which complete and enhance the education of the household companion".[50] The magazine's first issue came out on April 25th of that year and quickly sold out. The issues that followed met with equal success.[51] In the beginning, *Eva* was directed by a woman, although its editor was a man.

38 Well aware of the technical improvements and new level of comfort which the use of gas and

41 As in other European cities too. For the Barcelona case see: Arroyo, *La Industria del gas en Barcelona*.

42 Beltran, Carré, *La fée et la servante*, 254.

43 On these campaigns in France see: Boin, "L'Utilisation domestique de l'électricité".

44 Similar strategies were followed in other countries, such as the United States, where companies like General Electric, sought radio or film campaigns "were educational as well as entertaining", Busch, "Cooking Competition", 238.

45 From the 1920s onwards, the number of radio sets in Portugal experienced an upward trend, rising from 20,000 in 1933 to around 100,000 in 1940. Ana Cardoso de Matos, Gonçalo Rocha Gonçalves, "A gravação sonora e a TSF em Portugal" in Nuno Luís Madureira (ed.), *A História da Energia. Portugal 1890-1980* (Lisbon: Livros Horizonte, 2005), 214.

46 Cardoso de Matos, *As imagens do gás*, 153-154.

47 Busch, "Cooking Competition", 244.

48 As Scott suggests: "women were indeed present in the business world although they have been absent from the dominant narratives about it." Joan W. Scott, "Comment: Conceptualizing Gender in American Business History," *Business History Review*, vol. 72, n° 2, 1998, 244. Although it is not a central issue of our paper the female working staff of the CRGE, we can point out that the cooking courses that were part of the CRGE marketing strategies included women as a central part of promoting gas consumption: "Practical cooking courses by a specialized lady", *O amigo do lar*, December 1932, 2.

49 *O amigo do lar*, January 1933, 8.

50 *Diário de Noticias*, 28th March 1925, 1. Quoted by Tânia Vanessa Araújo Gomes, "Uma revista feminina em tempo de guerra: O caso da "Eva" (1939-1945)" (Master thesis, Coimbra University, 2011), 5.

51 Ibid., 7. Although we do not have information about the print run for the whole period, we do know that the success of *Eva* continued and the print run of the Christmas special number grew from 50,000 (1939) to 120,000 (1967-1973). Bussola, "A modernização dos lares lisboetas", 136-138.

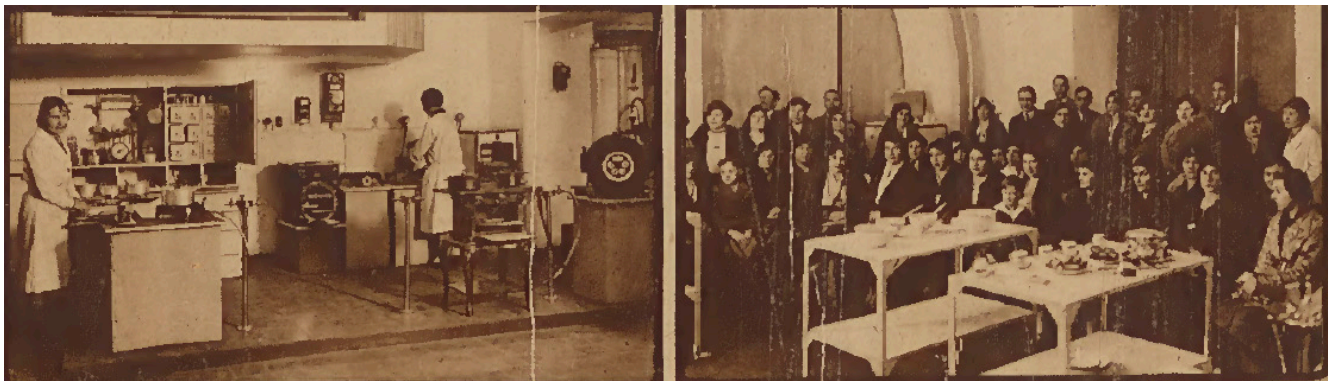

Figure 5: CRGE's cooking courses (Lisbon, 1932). Source: O amigo do lar, December 1932, 2.

electricity could offer women at home, notably in the kitchen, at the end of 1932 the magazine *Eva* set up a salon for cooking courses, which would see a great development from March 1933 onwards. This strategy was part of a new concept of women-oriented services, with the magazine stressing: "It will not merely be a secure and authoritative guide in the matters of elegance, home decoration, etc.; in this way, *Eva*'s Practical Courses aim to train and perfect housewives, in a modern and elegant ambiance, providing all technical requisites such as sewing, tailoring, hats, etc., all the way to cooking".[52]

39 CRGE took part in this initiative, and the magazine mentioned that "the project, decoration, and equipment of the kitchen" of the salon where the courses were given belonged to the company.[53] The innovation represented by giving cooking courses to the women charged with household chores, pioneered by CRGE (November 1932)[54] and also developed by the best-selling magazine among housewives (March 1933), was a way of spreading the possibilities of gas, leading housewives to replace traditional fuels with kitchen gas, namely in the stove and in the oven.

40 Besides collaborating with *Eva*, CRGE also began to publish its own magazine – *O amigo do lar*. *Edição mensal dos Serviços de Propaganda das Companhias Reunidas Gaz e Electricidade* [The Household Friend. Monthly Magazine of CRGE's Advertising Services]. Its first issue, in December 1932, made clear that its purpose was "to establish between this company and its clients a closer bond of relationship", and that the publication would be "the tribune from which we will tell our clients about current progress in these two fields of prodigious activity – gas and electricity."[55] This magazine displayed the latest uses of gas and electricity in the home, with the goal of winning over new consumers to these energies. Thus, it was directed at a feminine audience from Lisbon's urban haute bourgeoisie, the one which could really afford to acquire these novelties. As we can see from the pictures, these courses were attended by ladies of Portuguese high society and their servants (fig. 5).

41 By 1936, the group of appliances linked to the kitchen (ovens and stoves) accounted for almost 70% of domestic consumption, while water heating made up the remaining 30% (since home heating was negligible, at only 0.2%).[56]

42 In the pages of *O amigo do lar*, CRGE played out its strategy of publicizing the use of the energies it sold – gas and electricity – indirectly, through the explanation of how the appliances which used those energies worked. In most cases, texts were limited to a few short notes, accompanied by pictures – expounding the advantages of this

52 *Eva*, December 1932, 47. It is worth stressing that the cooking courses, both those organized by *Eva* and those by CRGE, enjoyed a significant turnout.

53 Ibidem.

54 *O amigo do lar*, January 1933, 8. Some months before Eva's cooking lectures, CRGE offered the same type of lectures in the *Rua de Boavista* at November 1932.

55 *O amigo do lar*, December 1932, 5.

56 Cardoso de Matos, *As imagens do gás*, 168.

or that appliance. In those informative notes, care was taken to show that using those energies posed no dangers or hazards, using slogans such as "cooking with gas, in an economical, safe and tidy manner".[57]

43 Some of these texts resort to fictional stories representing domestic everyday life scenes. In "O mundo não se fez para tôlos" [58] [The world was not made for the foolish], for instance, we read a fictional dialogue between husband and wife, with the former showing the latter how much would have been saved if they had adhered to the new tariff scheme. The woman is represented as someone who does not care for the information received from the company, and so does not relay it to her husband, who just got to know about it at a café, "in a chat with his friends". Male ascendance in terms of technical knowledge is represented by the fact that the husband gives his wife a lesson, while she appears as a fragile person, afraid of the unknown. The husband´s dominance in the home is also demonstrated by his having to request the new tariff scheme, since the service is subscribed by the "head of the family". This aspect of the situation is laid out in a text in which the husband, holding power and authority, explains to his wife, inattentive and fearful, CRGE's tariffs for using electricity.[59]

44 This kind of advertisement is rich in information and tries to approach the reader using rational explanations. Its target reader is the well-off housewife, who is projected as being rational in the management of her household. For instance, an article on refrigerators includes two pictures with the housewife using them and says: "Maybe she is inclined not to give this subject the attention it deserves. But, after a little reflection, she will surely change her mind." (fig. 6).[60]

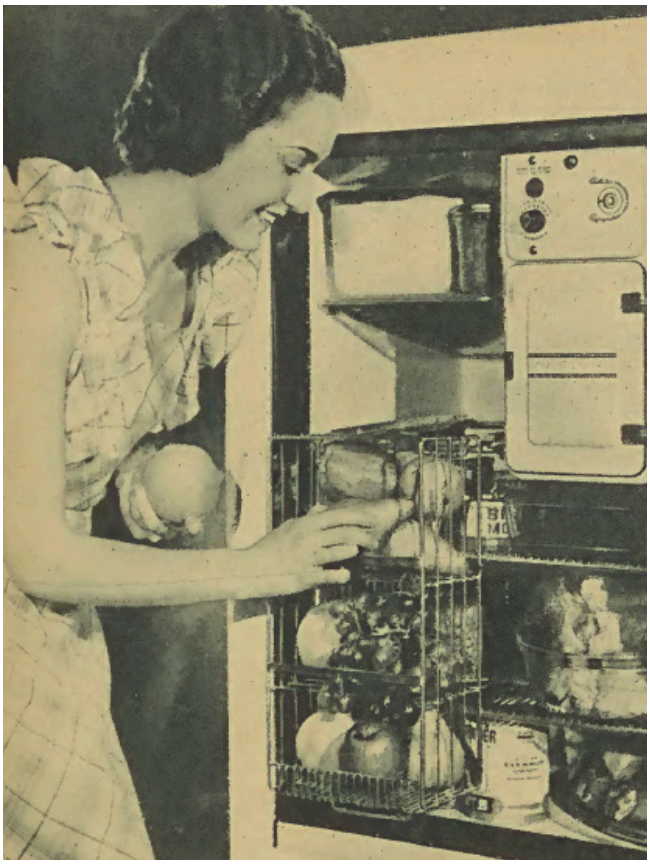

Figure 6: Refrigerator at home. Source: *O amigo do lar*, July 1937, 15.

45 Publishing this magazine was part of a strategy by CRGE, influenced by SOFINA, aimed at increasing domestic consumption of electricity, so as to compensate for the break in industrial consumption brought on by the 1929 crisis. The fundamental goal at that time was to make consumers start using electricity for other purposes, not just for lighting, such as home radios, for instance.[61] Some of these ideas and strategies had been presented in the *Union Internationale des Producteurs et Distributieurs d'Energie Électrique* (UNIPEDE) congresses, where in 1932 it was stated that the use of radio broadcasting had made the private consumers raise their electric consumption by 30% in Strasburg and by 24% in a town in Tuscany.[62]

46 The head of marketing services at SOFINA, Michel Deutsch, took part in the 1934 congress

57 *O amigo do lar*, January 1933, 8.
58 *O amigo do lar*, June 1937, 3-4.
59 As Joan Scott points out: "There's something going on (...) that needs thinking about in terms of how sexual difference is affirmed and produced through the creation and the service of consumer demand." Scott, "Comment: Conceptualizing Gender", 245.
60 *O amigo do lar*, July 1937, 16.

61 In 1936, 20% of electricity consumers had radios. See Freitas, *Electricity and Modernity*, 63.
62 *UNIPEDE*, 1932, 619-620. These were two case studies evaluating the usage of radio broadcasting.

– in the *Comité V, Applications, Propagande* – which dealt with issues concerning instalment sales. This committee stressed the fact that electricity distributors should guarantee the quality of the electric home appliances they sold to the public. In the 1936 UNIPEDE congress, Michel Deutsch added that they should also sell these appliances, not excluding those with low energy debit, as a strategy to give the consumer the habit of using electricity in other ways, inside the home. He added that electric utilities should organize special campaigns, on a seasonal basis, promoting the intensive sale of certain appliances,[63] e.g. the *Campanha do Frio* [Cold Campaign] in the summer, when refrigerators would be sold at lower prices and in instalments, or the *Campanha do Ferro Eléctrico* [Flat Iron Campaign], with irons for sale at discounted prices, in instalments.[64]

47 CRGE incorporated all these ideas into its marketing strategies from the 1930s on, in its promotion of both gas and electricity.[65] Actually, the adverts ended up helping shape the social stereotypes of the day: the husband as the "homo economicus" and his wife as a delicate, feminine and stay-at-home figure, a spouse who ensures the good harmony of the household.[66]

GAS VERSUS ELECTRICITY CONSUMPTION IN THE POST-WORLD WAR II PERIOD

48 During the war period, gas consumption figures rose exponentially. In the war's first phase (1939-42), that rise was due to the lack of alternative fuels for home use, such as firewood, hard coal, oil, or vegetal charcoal, which led to gas becoming almost their natural substitute for heating and cooking. In the second phase of the war, starting in April 1942, the lack of mineral charcoal and other energy sources led the government to impose restrictions on electricity consumption. At that stage, gas became its replacement, benefiting from the end of declining block rates and those restrictions on electricity consumption. In this context, CRGE alerted to the fact that the only cheap and available fuel would be gas, making its growing consumption easily predictable: "Currently, only one kind of fuel can be obtained in unlimited amounts, and at the same price it had before the war: gas. We should therefore expect its consumption to rise significantly".[67]

These predictions were confirmed in 1943: there was in fact, starting in 1942, a steep rise in gas consumption, a trend which would hold throughout the period we are considering (fig. 7). 49

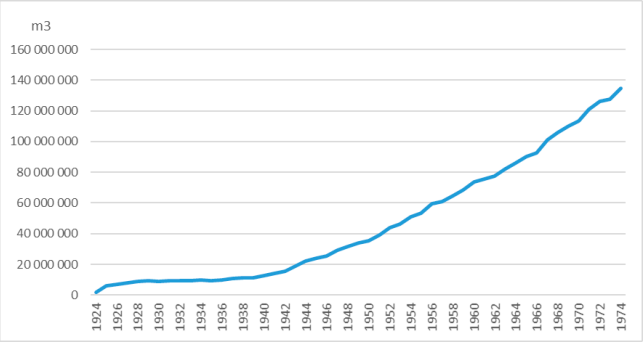

Figure 7: Evolution consumption of gas (Lisbon, 1924-1974). Source: CDFEDP, CRGE *Annual Board Reports*, 1924-1974.

The rise in gas consumption had a considerable contribution from domestic use – and in this process the increase in consumer numbers was more relevant than the rise in *per capita* consumption. In 1943, for instance, the 27% increase in domestic consumption was partly due to a significant rise in new consumers (12.1%). These figures prove that those who had gas installed probably used it for most of their household activities. Average home consumption rose by 20% every year, from 1941 to 1944, and gas became the only solution used, in Lisbon, for some domestic purposes: cooking and water heating.[68] *Per capita* gas consumption remained 50

63 *UNIPEDE*, 1936, 208.

64 *O amigo do lar*, July 1937, 3-12.

65 For SOFINA strategies and the role of domestic consumers see Bussola, "A luz do capital", 145-149.

66 Jonas Frykman, Orvar Löfgren, *Culture builders: A Historical Anthropology of Middle-class Life* (New Brunswick: Rutgers, 1987), 127.

67 CDFEDP, CRGE, *Management Board Minute Book*, N°959, 27-3-1942.

68 Bussola, "A modernização dos lares", 71-73.

very low for many years, however, and only in the 1950s did it reach more significant levels.

51 The picture of specific gas uses, from 1941 onwards, shows that in that period domestic consumption was the most important, all other types being marginal. The growth in gas utilization until 1965 is directly linked to the rise in domestic consumption (fig. 8).

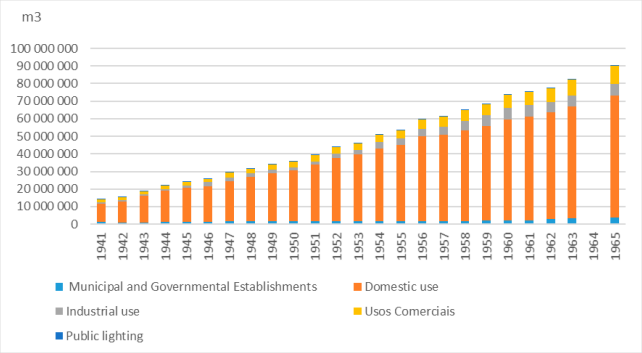

Figure 8: Specific gas consumption (Lisbon, 1941-1965). Source: CRGE *Annual Board Reports*, 1941-1965.

52 The rationing of electricity consumption during World War II lasted until October 1947. In its report of that year, CRGE considered this to be very detrimental to the company, since it had altered the previous trend to increase domestic electricity consumption and created a habit of reducing electric lighting and suppressing the use of appliances, "which will be felt for a very long time".[69]

53 In 1951, the government decided to reintroduce declining block rates as part of its policy to make cheap electricity available, enabling consumers to electrify their homes. These rates promoted the use of electricity by lowering the average price in inverse proportion to the level of consumption and caused electricity consumption in the home to grow at an average annual rate of 11.67% from 1947 to 1975.[70]

54 Starting in the 1950s, even as electricity gained importance in the home, gas managed to keep its position due to the fact that the same company exploited both energies and so sought to find non-competing markets. Nevertheless, from the 1950s on, the gas business began to lose relevance among the various activities of CRGE (fig. 9): in 1974, the revenue from gas sales was less than half of what it had been in 1955.[71] This decrease was helped by the emergence of *Empresa Gazcidla* [Gazcidla Company], a supplier of bottled gas for domestic use.

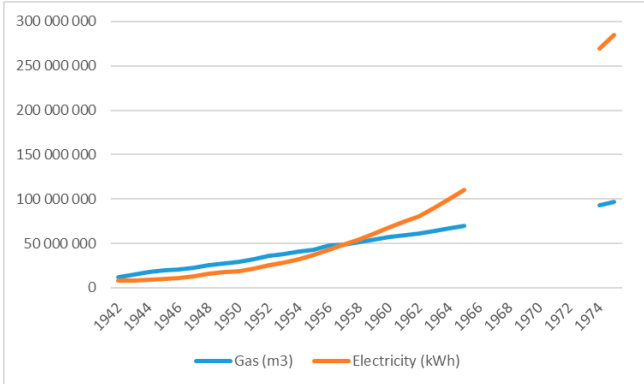

Figure 9: Domestic consumption of gas and electricity (Lisbon, 1942-1975). Source: CDFEDP, CRGE *Statistical Elements*, 1942-1975.

	Gas	Electricity	Ratio
1951	55,155	116,765	2.12
1952	59,697	121,232	2.03
1953	64,331	130,728	2.03
1954	69,082	130,961	1.90
1955	73,443	136,808	1.86
1956	77,743	140,730	1.81
1957	81,430	146,707	1.80
1958	84,995	149,505	1.76
1959	89,075	154,732	1.74
1960	92,367	157,779	1.71
1961	95,168	160,772	1.69
1963	97,755	164,659	1.68
1964	101,082	170,506	1.69

Figure 10: Domestic consumers of gas and electricity (Lisbon, 1951-1963). Source: CDFEDP, CRGE *Statistical Elements*, 1951-1963.

55 Only in the 1960s did the use of gas for commercial and industrial purposes assume greater importance, and CRGE's campaigns in the 50s and 60s were essentially directed toward industrial uses and big commercial establishments.

69 CDFEDP, CRGE, *Annual Board Report*, 1947, 9.
70 CDFEDP, CRGE, *Statistical Elements*, 1947 and 1975.
71 Cardoso de Matos, *As imagens do gás*, 181-182.

STRATEGIES FOR THE DEVELOPMENT OF NON-COMPETING GAS AND ELECTRICITY MARKETS AFTER WORLD WAR II

56 CRGE's advertising strategy underwent changes in the post-World War II period. The publication of the magazine *O amigo do lar* was ended, and there was a push for promoting domestic consumption through a more widespread use of gas- and electricity-powered appliances. Although exhibitions and shop-window contests had been produced before, it was at this time that exhibitions gained added importance. Still under restrictions to electricity consumption, CRGE in 1947 set up a stand at *Feira Popular de Lisboa* [Lisbon Fair], which was then a major leisure and amusement space for Lisbon's bourgeois families. In that stand were displayed different divisions of a residence with their respective electrical home appliances: living room (vacuum cleaner and floor polisher), small table (flatiron, fan, toaster, etc.), bathroom (shaver, radiator). The central spot belonged to the kitchen, fully equipped, under the slogan "A cozinha moderna a gás" [The modern gas-powered kitchen] (fig. 11).

Figure 11: CRGE's stand at *Feira Popular* (Lisbon, 1947). Source: CDFEDP, CRGE FNI 13324, 77-78. ©Centro de Documentação da Fundação EDP

57 The central position of gas in this stand bore witness to CRGE's adaptation to wartime conditionings, promoting gas as a symbol of modernization while avoiding any reference to electricity. Since restrictions on electricity consumption were still in place, electrical appliances were relegated to a secondary position.

58 In the 1950s, CRGE put up a stand every year in *Feira Popular*, always displaying electrical appliances and gas-powered equipment. Beside the slogans "O gás e tão moderno como a aparelhagem que o utilizar" [Gas is only as modern as the equipment that uses it] (1951); "O gás, chama doctil e potente, é uma fonte de calor incomparável na economia doméstica" [Gas, that docile and potent flame, an incomparable source of heat in the household economy] (1951), were those connected to electricity: "Viva com toda a comodidade que a electricidade lhe pode dar" [Live with all the comfort that electricity can give you] (1953); "Rodeie-se da comodidade eléctrica. Tudo a electricidade" [Surround yourself with electrical comfort. All running on electricity] (1957). The character *Faísca* [Spark][72] became

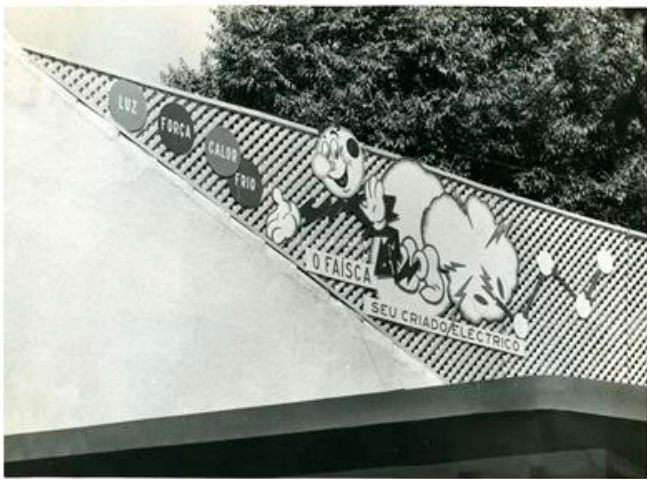

Figure 12: *Faísca* on CRGE's stand at the *Feira Popular* (Lisbon, 1954). Source: CDFEDP, CRGE, FNI 13324, 42. ©Centro de Documentação da Fundação EDP

72 This campaign was contracted by CRGE to the firm Ready, from the USA.

present in CRGE's billboards and shop windows, with the slogan "Spark, your electrical servant", enjoying great visibility at the entrance of the company's shop in *Feira Popular* (1954) (fig. 12). All these changes were directly connected to the goal of promoting electricity consumption based on the utilization of electrical home appliances.

59 From 1957 onwards, CRGE's advertising division was reorganized and its campaigns started to be designed for one-year periods. Aiming at a higher level of professionalism, CRGE in 1949 hired instructors for staff training courses.[73] At that time, faced with competition from bottled gas, the character *Faísca* introduced "Dona Chama de Gás da Companhia" [The Company Gas Flame Lady] as part of its commercial strategy.

60 The fact that CRGE exploited gas and electricity in a market which avoided competition resulted in all advertising being made around these two different brand names - *Faísca* and *Dona Chama* -, usually appearing in billboards, adverts and brochures hand in hand or working together, so as to convey to consumers the idea that these two modes of energy were complementary, not mutually exclusive (fig. 13). Although energies are represented by different genders (electricity man, gas woman) these representations were more connected to an articulated modernization between two kinds of energy, than to a division between modern and traditional. On the other hand, reacting to the appearance of bottled gas in the 1950s, CRGE developed a strategy to identify the city with the gas that it supplied, repeatedly using the slogan "Gás da Companhia – O combustível de Lisboa" [Company Gas – the Fuel of Lisbon].[74] Other, less direct forms of promoting electricity consumption were developed in the Cold Campaign at Cinema Tivoli – a refrigerator exhibition made in partnership with several different brands (Westinghouse, General Electric, Siemens, Kelvinator, etc.), with refrigerators being sold in instalments. In addition, CRGE was present at other exhibitions: the *Salão das Artes Domésticas* [Domestic Arts Show]

Figure 13: *Faísca* and *Dona Chama*. Source: CDFEDP, CRGE, Publicity, Box 10.

(1957 and 1958) organized in *Junqueira*, and the Exhibition at the José Alvalade Stadium[75] (1958).

61 In 1960, the magazine *Crónica Feminina* [Women's Chronicle] showed both the adverts of CRGE and those of some refrigerator manufacturers (Frigidaire and Siemens), complementing one another. While the CRGE ads spoke of refrigerators – with no mention of brands – and *Faísca* appealed to the housewife's rationality by indicating that, with these appliances, they could buy the turkey when it was cheap and then eat it when they chose to, the ads by manufacturers in turn sometimes used information regarding the advantages of electrical home appliances, and never failed to stress the quality of their products, pointing out their brand as synonymous with quality: "Para quem exige o melhor" [For those who demand the best] (Siemens) and "Um

73 Cardoso de Matos, *As imagens do gás*, 182.
74 *Eva*, January 1959, 6.
75 This is the stadium of the *Sporting Lisboa* Football Team.

produto da General Motors" [A General Motors product] (Frigidaire).[76]

62 In the 1960s, a significant rise in electricity consumption was accompanied by a growing use of electrical appliances in the home. CRGE's commercial strategy of exhibitions and the Chiado showroom, plus an ever-expanding network of electrical appliance retailers - who in effect advertised these goods - contributed to a high percentage of electrified households.

WASHING MACHINES AND TV SETS AS SYMBOLS OF MODERNITY, AND THE NEW ROLE OF WOMEN UP TO THE 1970S

63 CRGE's housewife-targeted advertising highlighted the increased speed and quality in meal preparation, easier cleaning and lower energy consumption, in the kitchen space. In the bathroom, the water heater was the main recipient of praise, while throughout the whole house the advantages of gas were publicized.

64 The cooking courses developed by *Eva* magazine and by CRGE in the 1930s sought to stress the idea that, thanks to the modernization of the kitchen by the use of gas, "diets became more varied, so cooking was more complex".[77] The existence of these courses confirms that housewives were expected to deliver increasingly elaborate meals, supposedly made easier by the use of gas stoves. From 1930 to 1959, *Eva* magazine kept in line with the principles propagated by the *Estado Novo* regime[78], headed by Salazar, which upheld the traditional family and assigned to the wife "the sole responsibility over everyday family dynamics, through the timely preparation of meals, clothes maintenance and cleaning of the living spaces".[79]

65 It is worth noting that the strategy developed by CRGE was copied by the bottled gas supplier GAZCIDLA, which from 1960 to 1977 published the magazine *Banquete - Revista Portuguesa de Culinária* [Banquet – *Portuguese Culinary Magazine*], which became a reference in Portuguese cooking. Thus, the companies that supplied energy helped construct the stereotype of the Portuguese housewife, who was supposed to devote a large amount of time to cooking meals, through the association between the utilization of modern energies and increasingly refined cooking.

66 In 1951, the application of declining block rates to electricity enabled a more widespread use of electrical appliances in Lisbon, and CRGE's advertising shifted its focus to insist on tying the modernization of households to the use of both energies – gas and electricity.

67 From 1960 to 1973, the Portuguese economy experienced exponential growth, with GDP *per capita* rising at an average of 6.9% a year.[80] CRGE's efforts to promote gas and electricity were directed at housewives and insisted on the use of electrical appliances as crucial to the "modernization" of their homes. This idea came across very clearly at the *Feira Popular*, one of the leisure spots most frequently attended by the middle class, where electricity was presented under the slogans "Electricidade, o nervo da vida moderna" [Electricity, the nerve of modern life] (1964) and "Lar electrificado, lar moderno" (An electrified home is a modernized home) (1965).

68 Some years earlier, in September 1956, the first television broadcast trials had taken place – not surprisingly, from a studio set up in Feira

76 *Crónica Feminina*, 4-8-1960, 14; *Crónica Feminina*, 21-7-1960, 69; *Crónica Feminina*, 2-6-1960, 65.

77 Cowan, *More Work for Mother*, 99.

78 The "Estado Novo" was the political regime that existed in Portugal from the approval of the Constitution in 1933 until 25 April 1974. This regime also known as Salazarism, in reference to António de Oliveira Salazar, its founder, was characterised by being authoritarian, nationalist and corporatist.

79 Francisco Rodrigues, "O discurso da Eva: posicionamentos de uma revista feminina perante a condição social da mulher no Estado Novo (1930-1950)" (Master thesis, Porto University, 2017), 35.

80 In this period, Portugal's PIB *per capita* as a percentage of OECD´s rose from 25% in 1960 to 37% in 1973. Edgar Rocha, "Crescimento económico em Portugal nos anos de 1960-73: alteração estrutural e ajustamento da oferta à procura de trabalho", *Análise Social*, vol. 20, nº 84, 1984, 621-625. This was, therefore, a period of convergence of Portugal relative to OECD.

Popular.[81] From that moment on, the TV became the star among domestic electrical appliances, quickly surpassing both vacuum cleaners and washing machines. As a consequence, the symbol of the home's modernization was an appliance dedicated to leisure, instead of being designed to spare housewives some of their workload.[82]

69 Another paradigmatic example of the spread of electrical home appliances was the washing machine. In 1941[83], when the engineer José Ferreira Dias – the State Secretary for Trade and Industry who was the greatest promoter of the country's electrification –carried out the experiment of "modernizing his home" with electrical appliances, he left out the washing machine, because it was too expensive.[84] Price was indeed a factor that slowed down the diffusion of the washing machine; but the fact that washerwomen - who descended from old peasants and gardeners in the outskirts of Lisbon who came to town to sell bread and vegetables and took care of laundering[85] - remained in existence until very late, made it possible to solve the issue of washing one's clothes in a more economical way.

70 In May 1961, the CRGE shop window in the Chiado district advertised the washing machine using the slogan "O pior da lida da casa acabou-se! A máquina eléctrica lava a roupa depressa e bem" [The worst household chore is now over! The electrical machine washes your clothes quickly and efficiently].[86] Despite these advertising efforts[87], in 1966 only 1% of Portuguese families were in possession of this machine. The rising level of attention that this appliance got from advertising, coupled with the gradual disappearance of the traditional washerwomen, implied a very significant increase in washing machine purchases, so that by 1976, 21% of households already possessed one. Thus, only as late as the 1970s – with a delay of ten years relative to most European countries[88] - the washing machine progressively made its way into middle-class homes.[89] Towards the end of the century, almost every family counted one unit among its electrical appliances (fig. 14). Although these figures refer to the whole country, the fact is that Lisbon, being its capital city, had a particularly high concentration.

	1956	1966	1976	1987	1997
TV	-	13%	46%	83%	96%
Washing machine	0.7%	1%	21%	44%	79%
Vacum Cleaner	2%	5%	28%	43%	59%

Figure 14: Portuguese household with electric appliances (%). Sources: for 1956-1976, Instituto *Nacional de Estatísticas* (Statistics National Institute), *Comércio Exterior* (Foreign Trade); for 1987-1997, António Barreto, *A situação social em Portugal, 1960-1999* (Lisbon, ICS, 2000), 165.

81 Fontes Carlos, "Feira Popular de Lisboa: diversão e poder" (Master thesis, University Institute of Lisbon, 1999), 137.

82 Bussola, "A modernização dos lares".

83 In 1941, in the United States, 52 percent of the households had washing machines, and 47 percent had vacuum cleaners. Cowan, *More Work for Mother*, 94.

84 José Ferreira Dias, "Uma casa electrificada", *Boletim da Ordem dos Engenheiros*, vol.50, 1941, 87.

85 Graça Índia Cordeiro, "Trabalho e profissões no imaginário de uma cidade: sobre os tipos populares de Lisboa", *Etnográfica*, vol. 5, nº1, 2001, 18.

86 Note that the use of the name *máquina de lavar roupa* [clothes washing machine] wasn't yet incorporated into everyday talk.

87 In 1953, an ad by Hoover showed the singer Amália Rodrigues using her washing machine. *Eva*, December 1953, 2.

88 In Barcelona, introduction of the washing machine was hindered by its high price. A generalized use of this appliance had to wait until the 1950/60s, "when the Barcelona marketplace saw the first automatic, Spanish-made machines, such as Tedi, Otsein, and Balay, as well as the various models of the pioneering Barcelona-made Bru washing machine", Mercedes Tatjer Mir, "La electricidad en el lavado de la ropa doméstica y colectiva. Un lento proceso desde las lavadoras manuales hasta la difusión de las lavadoras eléctricas: Barcelona 1880-1990", Capel Horacio, Zaar Miriam (eds.), *La electricidad y la transformación de la vida urbana y social* (Barcelona: UB/Geocrítica, 2019), 451. This phenomenon also took place in the 1960s in Britain when "the sale of domestic washing-machines also rose, to the extent that commercial laundries started to go out of business", June Freeman, *The Making of the Modern Kitchen: A Cultural History* (Oxford: Berg, 2004), 45. As we mentioned, in these decades Portuguese families chose to buy television sets instead of washing machines.

89 An important aspect was the number of women per household. In Lisbon, taking into account housewives, servants and female relatives, in 1970 there was 0.92 women per household while in 1940 there was 1.5 women dedicated to housework per home. Bussola, "A modernização dos lares", 84.

71 The change from 1% to 79% in a 30-year timespan tells us that there was enough consumer desire for the washing machine. However, the quick incorporation of the TV set a decade earlier shows that first came the man's wish to possess appliances for leisure and information, and only then, in second place, came those appliances which spared housewives some work.

Figure 15: Advertisement 1967. Source: *Eva*, June 1967, 19.

72 Advertising records are also very explicit regarding the new reality of many Lisbon homes where, starting in the 1960s but especially midway through the 70s, housemaids were becoming scarce, a luxury only affordable by the haute bourgeoisie. This is why the maid was no longer featured in the ads, unlike previous decades whose ads showed her working with gas stoves or vacuum cleaners. Instead, the housewife herself could now be seen, in a pose of rest or ready to go out. From the 1960/70s on, a new vision of woman emerged in advertising – a sophisticated woman who carried out her household duties while at the same time dressing up impeccably, and often complementing those duties with some professional activity (fig. 15). The stronger affirmation of feminist movements, the May 1968 revolution, rising levels of schooling and professionalization, all contributed to the appearance of some ads, as early as the 1960s, in which the husband collaborates, side by side with his wife, in performing household chores in perfect family harmony.

CONCLUSION

From 1891 onwards the distribution of gas and electricity in Lisbon was exploited as a monopoly by CRGE, which in order to increase gas consumption has developed a marketing policy creating a showroom, payments of appliances instalments and publishing advertisements in journals and magazines. However, until the 1920s the use of gas was mainly for public and private lighting and domestic gas appliances remained restricted to social groups with greater financial means, becoming an attribute of social status. 73

The marketing initiatives by CRGE developed in the 1930s, contributed to generalize the diverse uses of gas. Those campaigns suffered a clear influence from contemporary practices in France and led to the public's embrace of new consumer values expressing the desire to have a modern kitchen "as if they lived in America". 74

All these campaigns contributed to the very significant upward trend of the gas consumption after the World War II, and even, from the 1950s onwards, when electricity became more significant in domestic uses, gas managed to maintain its position. 75

The rationing of electricity consumption during World War II altered the previous trend to increase domestic electricity consumption. The text quoted in the first page of this paper, asking for lower electricity prices for "civilized people, who need it not for luxury but for making life easier", should be understood as the effect of all the CRGE's campaigns suggesting that a "modern home" should be equipped with "modern energy appliances" (gas and electricity). 76

From 1951 onwards, decreasing electricity prices made it possible to spread the use of electrical appliances widely, the TV set being the symbol of 77

the Portuguese modern home. This was a local adaptation of the modern American home, that shows a nonlinear relationship between publicity and consumption. This opens up a path to study the diverse relationships between, on the one hand, the goals of the campaigns of gas and electricity companies and, on the other hand, public adherence to appliances powered by these energies.

78 The analysis of gas and electricity consumption in households in Lisbon, the capital of Portugal, led us to conclude that this consumption was not in competition but complementary, which is explained by the fact that the same company exploits the production and distribution of these two energies. This situation of complementarity is a particular case, both in Portugal and in the rest of Europe, since it does not occur in other cities in that country or in most European capitals.

79 This complementarity determined that marketing strategies to promote the consumption of energy in the home were oriented towards a division in which gas was mainly connected to the kitchen and bathroom and electricity was reserved for the home office space and the living room, where the radio and later the television had a prominent place oriented towards family leisure.

80 Thus, in symbolic terms, gas was associated with domestic chores, such as cooking and domestic hygiene (washing clothes, washing dishes and bathing the children), and is therefore represented by a female figure -*Dona Chama*-, while electricity was associated with lighting for reading and with information and leisure (radio and television). This complementarity is reflected in the campaigns launched simultaneously in the

Figure 16: CRGE's campaigns. Source: *O amigo do lar*, May 1936, 2.

1930s for the sale of electric irons, water heaters and gas cooking (fig. 16).

81 This reinforced the stereotype of the housewife in charge of managing the home. Simultaneously, CRGE's advertising promoted – by the adjectivisation – the idea that the use of gas and electricity symbolised a modern and comfortable home, contrary to what historiography has traditionally considered by placing the domestic use of electricity as progress in relation to the use of gas.

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Electricity and the Changing Contours of Masculinity in Los Angeles, 1900–1930

Abstract
The electrification of households in Los Angeles provides an instructive window through which to study the changing contours of masculinity between 1900 and 1930. By examining advertising materials for electricity and electrical appliances by the two major power utilities in Los Angeles (Southern California Edison Company and the municipal Bureau of Power and Light), this article discusses to what extent notions of masculinity became increasingly complex, multilayered, and contradictory with the advent of home electrification. Drawing on insights from the histories of technology and gender, as well as from urban history, this article highlights the mutual constitution of energy infrastructures in domestic spaces and consumers' social identities.

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Plan of the article

INTRODUCTION

1 Busy Buttons was not a real person. He was a character in a brochure that the Southern California Edison Company (SCEC) published in 1925. "The Story of Busy Buttons" presents a narrative of stunning urban growth in the once-tiny Spanish pueblo called El Pueblo de Nuestra Señora la Reina de los Ángeles, whose growth was facilitated by the provision of water and electricity. The narrative aimed to familiarize readers with the significance of hydro-generated electricity for urban and industrial growth in Los Angeles. One year before publication, Los Angeles had crossed the threshold of 1 million residents, and this gave SCEC a reason to highlight electricity's importance for the growing city. Providing a short sketch of Los Angeles' history, the brochure claimed that the region needed water, transportation facilities, and electric power to grow. It detailed how Busy Buttons:

> scurried around, way back into the High Sierras, where the water was, and he found power there, too, for water was power in the rough. [...] And pretty soon all that tumbling water, or most of it, high up in the mountains, was put in harness, and the power it produced was brought miles and miles down into the valleys where people needed it, to pump water, and turn wheels, and do chores for them. That was the start of [t]he Southern California Edison Company, which is Busy Buttons, and the beginning of [...] that wonderful community prosperity which the whole world admires and envies.[1]

2 These lines from "The Story of Busy Buttons" are a good starting point from which to consider the nexus of technology, gender, and the far American West (fig. 1).

3 Bursting with self-confidence, the brochure celebrated the electrification of Southern California as a feat of engineering and as the clearest indicator of Los Angeles' modernity.[2] Not only were Busy Buttons' tales a story of urbanization in an inhospitable land ("How the Desert Became a Paradise and What Busy Buttons Had to Do With it"), but also one of how electric power transformed the American household and remade social relations in the domestic sphere ("How Busy Buttons Brings His Magic to You"). Gender relations featured prominently in this brochure, which asked: What did it mean

Figure 1: "The Story of Busy Buttons" (Los Angeles: Southern California Edison Company, 1925). Source: The Huntington Library, San Marino, CA, Southern California Edison Company Records, Box 323, Folder 9.

1 "The Story of Busy Buttons" (Los Angeles: Southern California Edison Company, 1925), The Huntington Library, San Marino, CA, Southern California Edison Company Records (henceforth: SCEC Records), 323:9.

2 It is crucial to take into account that "electrification" is a problematic historiographical concept. For more on this: Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880–1914* (London: Routledge, 2016), 14.

to be male or female in the age of technology? The answers it provided reflected the Roaring Twenties' intricate search for suitable gender archetypes. Tellingly, the brochure departed from older representations of electrification as a benign, fairy-like female being and portrayed Busy Buttons instead as a young boy. On one page, he is depicted spreading electric lightning from a watering can onto a suburban settlement. Urbanization, and urban electrification in particular, is presented as a male accomplishment. Furthermore, electrification was described as an age-specific achievement by a young generation.

4 The questions that the brochure raised are at the center of an ongoing scholarly exploration of technology and gender within the fabric of domestic spaces. Several groundbreaking studies have argued that the introduction of new household technologies profoundly changed gender relations and roles in the domestic sphere.[3] Focusing on electrical appliances' effects on women, Ruth Schwartz Cowan famously pointed out the numerous additional burdens that electricity imposed on housewives and the implications that this process had for their role and status in the household.[4] Most literature so far has focused on electricity, women, and femininity.[5] Tying in with this exploration, this article considers the intersection of domestic infrastructures with representations of masculinity. More specifically, this article examines how advertising materials produced by SCEC (the largest privately owned utility serving Los Angeles County) and the Bureau of Power and Light (the municipally owned utility serving the City of Los Angeles[6]) depicted the typical male user of electrical power and how they sought to influence his behavior, paying particular attention to the making and remaking of gender. The article uses Los Angeles as an exemplar because the city was a front-runner in electrification, and because household electrification was central to the city and its residents' self-understanding as an epicenter of urban modernity on the West coast.

5 Rather than providing a comprehensive account of how Los Angeles became electrified and how this changed household life in the city, the article will focus on a specific aspect of this process: contested representations about what it meant to be a man. Rich discourse on masculinities in the history of the 19th and 20th C already exists.[7] Scholars have argued that ideas about manhood are constructed socially and change over time.[8] In his groundbreaking sociological study, R. W. Connell points out that there was never just one singular concept of hegemonic masculinity, but that several competed with each other at different times.[9] These concepts often were in conflict with each other or were self-contradictory. Adding to Connell, Todd Reeser emphasizes that they were "fluid or unstable."[10] As a result

3 As examples, Mark H. Rose, *Cities of Light and Heat: Domesticating Gas and Electricity in Urban America* (University Park, PA: Pennsylvania State University Press, 1995); Ruth Oldenziel, *Making Technology Masculine: Men, Women and Modern Machines in America 1870–1945* (Amsterdam: Amsterdam University Press, 1999); Gooday, *Domesticating Electricity* (cf. note 2); Enrica Asquer, "Domesticity and Beyond: Gender, Family, and Concumption in Modern Europe", *in* Frank Trentmann (ed.), *The Oxford Handbook of the History of Consumption* (Oxford: Oxford University Press, 2012), 568-584.

4 Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983), esp. 63-68, 151-191.

5 Susan Strasser, *Never Done: A History of American Housework* (New York: Pantheon, 1982); Judy Wajcman, *Feminism Confronts Technology* (University Park, PA: Pennsylvania State University Press, 1991); Martina Heßler, *"Mrs. Modern Woman": Zur Sozial- und Kulturgeschichte der Haushaltstechnisierung* (Frankfurt am Main: Campus, 2001).

6 In 1937, the Bureau of Power and Light and the Bureau of Water Works and Supply were consolidated into the Los Angeles Department of Water and Power (LADWP).

7 As examples, Thomas Kühne (ed.), *Männergeschichte – Geschlechtergeschichte. Männlichkeit im Wandel der Moderne* (Frankfurt am Main: Campus, 1996); Frank J. Barrett, Stephen Whitehead (eds.), *The Masculinities Reader* (Cambridge: Polity Press, 2001); Jürgen Martschukat, Olaf Stieglitz, *Geschichte der Männlichkeiten* (Frankfurt am Main: Campus, 2008).

8 Michael S. Kimmel, "Masculinity as Homophobia: Fear, Shame, and Silence in the Construction of Gender Identity", *in* Harry Brod and Michael Kaufman (eds.), *Theorizing Masculinities* (Thousand Oaks, CA: SAGE, 1994), 119-141.

9 R. W. Connell, *Masculinities*, 2nd ed. (Cambridge: Polity Press, 1995), 185.

10 Todd W. Reeser, *Masculinities in Theory: An Introduction* (Malden, MA: Wiley Blackwell, 2010), 39.

of these considerations, historians have emphasized that we should not conceive of masculinity as contrary to femininity, and that masculinity includes non-male characteristics.[11] This leads right to the heart of this article's focus.

6 The article proposes that the promotional work done by the two main water and power providers in the city and county of Los Angeles tried to popularize conceptions of masculinity that differed from more traditional ones. These conceptions no longer focused on masculinized qualities such as strength, assertiveness, and mastery of technology, but rather on more inclusive ones. First, I will argue that these conceptions in advertisements stressed a man's responsibility for safety training and the necessity to acquire knowledge about the proper handling of electrical devices, such as cooking stoves, vacuum cleaners, water heaters, or washing machines. Second, I will argue that these conceptions were at once complex, tense, and contradictory because they included feminine qualities, such as care and affection toward other household members, as well as support for female emancipation. As a result, these ads promoted a tamed or domesticated masculinity. My argument unfolds in three steps: First, I will provide a brief overview of Los Angeles' electrification, setting this case study in the historical context of American history. Second, I will investigate promotional campaigns to sell electricity to Los Angeles residents. Third, I will analyze conceptions of gender and masculinity in more detail.

ELECTRIFYING LOS ANGELES

7 The Busy Buttons brochure mentioned at the beginning of this article explains how Los Angeles' urban growth depended on water, transportation, and electricity. This explanation is certainly well-founded, but cheap land and big-money investors were no less important. From the very beginning, Los Angeles was a land speculators' project.[12] One of the most prominent figures from this "booster era" was Charles Fletcher Lummis, an influential journalist and owner of large lands, who introduced Southern California as a romantic place beyond the urban-rural divide.[13] Attracted by magazine and newspaper ads promoting abundant and inexpensive land, as well as business opportunities and a healthy climate, Midwesterners with high-flying business ideas, wealthy retirees from the East Coast, and health seekers from wet states—among others—came by the thousands to Southern California in the 1880s. As a consequence, the population exploded from roughly 5,000 in 1870 and 50,000 in 1890 to 100,000 in 1900.[14]

8 Existing scholarship reveals to what extent the city's attractiveness was based on the availability of plentiful water and cheap electricity.[15] In framing this story as one of stunning urban expansion in an environmental setting that was hostile to life and profoundly altered by man-made technologies, prior research has well-established the close connection between Los Angeles' rise as a metropolis, its water systems,

11 As an example, Miguel Vale de Almeida, *The Hegemonic Male: Masculinity in a Portuguese Town* (Providence: Berghahn, 1996).

12 Michael F. Sheehan, "Land Speculation in Southern California: The Roles of Railroads, Trolley Lines and Autos", *The American Journal of Economics and Sociology*, vol. 41, n° 2, 1982, 197-209.

13 Lawrence Culver, *The Frontier of Leisure: Southern California and the Shaping of Modern America* (Oxford: Oxford University Press, 2010), 17.

14 Robert M. Fogelson, *The Fragmented Metropolis: Los Angeles, 1850–1930* (Berkeley: University of California Press, 1993), 21, 78.

15 Like many other regions west of the 14-inch rainfall line, Los Angeles suffered from droughts as a consequence of huge population numbers, a lack of precipitation, and hot summer temperatures. On Los Angeles and its waters: William Deverell, Tom Sitton, *Water and Los Angeles: A Tale of Three Rivers, 1900–1941* (Oakland: University of California Press, 2016), esp. 1-18; Marc Reisner, *Cadillac Desert: The American West and Its Disappearing Water* (New York: Viking, 1986), esp. 3-6; Blake Gumprecht, *The Los Angeles River: Its Life, Death, and Possible Rebirth* (Baltimore: Johns Hopkins University Press, 1999); Steven P. Erie, *Beyond Chinatown: The Metropolitan Water District, Growth, and the Environment in Southern California* (Stanford: Stanford University Press, 2006); William Deverell, Greg Hise (eds.), *Land of Sunshine: An Environmental History of Metropolitan Los Angeles* (Pittsburgh: University of Pittsburgh Press, 2005).

and its electric power.[16] The same massive 215-mile aqueduct (inaugurated in 1913) that diverted the waters of the Owens River to Los Angeles and fueled urban growth, also generated hydropower on a large scale long before the booming city received a further surplus of electric power from the Hoover Dam (completed in 1936).[17] The first arc lamps were installed in December 1882 at a busy intersection of what is today central Los Angeles, just a year after New York turned on its first electric lights.[18] The first electric trolleys began to drive through the town in 1887, providing the basis on which, after 1901, railroad magnate Henry Huntington built his empire of privately owned mass transit between Los Angeles and San Bernardino.[19] Rivalling Chicago and New York's Great White Way, city boosters praised the brilliance of Los Angeles' lights and its electric trolleys' reach.[20] Utilities in Los Angeles offered particularly low rates for electric power (22.5 percent lower than rates charged by San Francisco's utility[21]), and they had a major industrial customer—the film industry—which settled at the gates of the city, in Hollywood.[22] Therefore, residents soon were familiar with electricity, laying the groundwork for its remarkable triumph in Los Angeles after 1920. As an advertisement from the Bureau of Power and Light phrased it, "Electricity helps 'make' Los Angeles."[23]

Not only did Los Angeles have the world's largest system of electric street lighting in the 1920s, it also can be viewed as a pioneer in household electrification.[24] Appliances such as water heaters and cooking stoves sold well in Los Angeles relatively early in the 1920s. Air conditioning systems were also installed in places open to the public, such as department stores and movie theaters.[25] However, the breakthrough for household electrification in the U.S. only came with federal programs introduced under the New Deal in the 1930s and early 1940s.[26] The 1920s, nonetheless, with its economic upswing and relative prosperity, were a time of condensed change. As mass consumer society in the U.S. grew in the 1920s and 1930s, more and more products became affordable for more and more Americans. This development depended on increasingly sophisticated

16 For a broader perspective on water and power in the American West: Carl Abbott, *How Cities Won the West: Four Centuries of Urban Change in Western North America* (Albuquerque: University of New Mexico Press, 2008), 150-161; Carolyn Merchant, *American Environmental History: An Introduction* (New York: Columbia University Press, 2007), 114-115.

17 William L. Kahrl, *Water and Power: The Conflict over Los Angeles' Water Supply in the Owens Valley* (Berkeley: University of California Press, 1982).

18 Sandy Isenstadt, "Los Angeles: Light's Ephemeral Centers", *in* Sandy Isenstadt et al. (eds.), *Cities of Light: Two Centuries of Urban Illumination* (New York: Routledge, 2015), 51-57; Eddy S. Feldman, *The Art of Street Lighting in Los Angeles* (Los Angeles: Dawson's Book Shop, 1972).

19 Franklin Walker, "Pacific Electric", *in* John Caughey and Laree Caughey (eds.), *Los Angeles: Biography of a City* (Berkeley: University of California Press, 1977), 218-222; Spencer Crump, *Ride the Big Red Cars: How Trolleys Helped Build Southern California* (Los Angeles: Crest, 1962).

20 As this book vividly demonstrates, using the Los Angeles Times as an example: Robert Gottlieb, Irene Wolt, *Thinking Big: The Story of the Los Angeles Times, Its Publishers, and Their Influence on Southern California* (New York: Putnam, 1977).

21 Comparison of Rates of the City of Los Angeles, Bureau of Power and Light with Rate Schedules of Southern California Edison Co. For Southern California District Outside City of Los Angeles And Rate Schedules of Pacific Gas % Electric CO. For the City of San Francisco, December 20, 2019, Los Angeles Department of Water and Power Records Center, Historical Records Program (henceforth: LADWP Records Center), WP05-26:10.

22 David Robinson, *Hollywood in the Twenties* (London: The Tantivy Press, 1968); Tom Sitton, William Deverell (eds.), *Metropolis in the Making: Los Angeles in the 1920s* (Berkeley: University of California Press, 2001).

23 Bureau of Power and Light for Economy [Advertisements], LADWP Records Center, WP05-44:13.

24 Isenstadt, "Los Angeles: Light's Ephemeral Centers", 56 (cf. note 18).

25 However, air conditioning did not become affordable for private households until the 1950s. On the history of air conditioning in the United States: Salvatore Basile, *Cool: How Air Conditioning Changed Everything* (New York: Fordham University Press, 2014); Marsha E. Ackermann, *Cool Comfort: America's Romance with Air-Conditioning* (Washington: Smithsonian Institution Press, 2002); Gail Cooper, "Custom Design, Engineering Guarantees, and Unpatentable Data: The Air Conditioning Industry, 1902–1935", *Technology and Culture*, vol. 35, n° 3, 1994, 506-536; Raymond Arsenault, "The End of the Long Hot Summer: The Air Conditioner and Southern Culture", *The Journal of Southern History*, vol. 50, n° 4, 1984, 597-628.

26 Ronald C. Tobey, *Technology as Freedom: The New Deal and the Electrical Modernization of the American Home* (Berkeley: University of California Press, 1996), 111-119.

production methods and simplified access to credit, which enormously increased middle class purchasing power and transformed societal expectations of domestic comfort.[27] Advertising also developed into an industry in its own right.[28] The Depression of the 1930s caused a sharp dent in mass consumption, but it could not stop its continued rise after the end of World War II.[29]

10 The "domestication" of electricity took place in micro-spaces of everyday life, but also was embedded in a global history of technological adaptation occurring in most parts of the Western Hemisphere and in colonial spaces through the early to mid-20th C.[30] Historians such as Julia Tischler and David Arnold have shown how this appropriation of technological devices produced both regional variances and global similarities in Central Africa and India.[31] It was also at this time that electrification became associated with globally circulating ideas of modernity and progress—and the promise of more freedom, prosperity, and equality.[32] As a consequence, electricity's boosters and the utilities' advertising departments promoted Los Angeles as the paradigmatic modern city.[33] We should recognize, however, that electricity's promise was deceptive, given that its availability was limited to those who could afford it. These were Euro-American middle-class and upper-middle-class residents.[34] It is important for any understanding of electrification to note that many people remained excluded from accessing electric power, specifically poor people and immigrants from Mexico, China, and Japan—the largest minorities in Los Angeles at the beginning of the 20th C. To the extent that they could not benefit from supplied electricity due to multiple levels of discrimination, this modernization was confined to the Euro-American and affluent middle classes.

SELLING ELECTRICITY AND A LIFESTYLE TO LOS ANGELES

11 With regard to how electricity was brought into the household, Los Angeles did not differ much from other major cities in North America or Western Europe. One important factor to note, and which was common to all these places, was that electrification was not inevitable.[35] The attempt to domesticate electricity coincided almost everywhere with other technologies that already had been established in the household. In particular, domestic natural gas was used widely for lighting, cooking, and heating in homes in cities as diverse as London, Berlin, Boston, and New Orleans.[36] Los Angeles was

27 Frank Trentmann, *Empire of Things: How We Became a World of Consumers, from the Fifteenth Century to the Twenty-First* (New York: Harper Perennial, 2017), 222-271; Meg Jacobs, *Pocketbook Politics: Economic Citizenship in Twentieth-Century America* (Princeton: Princeton University Press, 2005); Kathleen Donahue, *Freedom from Want: American Liberalism and the Idea of the Consumer* (Baltimore: Johns Hopkins University Press, 2004); Lizabeth Cohen, *Making a New Deal: Industrial Workers in Chicago, 1919–1939* (New York: Cambridge University Press, 1990).

28 James D. Norris, *Advertising and the Transformation of American Society, 1865–1920* (New York: Greenwood Press, 1990); Frank Luther Mott, *A History of American Magazines, 1885–1905* (Cambridge: Harvard University Press, 1957).

29 Lizabeth Cohen, *A Consumers' Republic: The Politics of Mass Consumption in Postwar America* (New York: Alfred A. Knopf, 2003), 111ff.

30 On the concept of domestication: Gooday, *Domesticating Electricity*, 3 (cf. note 2); Rose, *Cities of Light and Heat* (cf. note 3).

31 Julia Tischler, *Light and Power for a Multiracial Nation: The Kariba Dam Scheme in the Central African Federation* (Basingstoke: Palgrave Macmillan, 2013); David Arnold, *Everyday Technology: Machines and the Making of India's Modernity* (Chicago: University of Chicago Press, 2013).

32 S.M. Kennedy wrote in 1912, "I believe that progress only means more light. That in the world today electricity leads the van of progress, and is the greater agent for doing the greatest amount of good to the greater number of people. That in advocating the use of electrical service I am helping to make life more cheerful, hopeful, healthful[,] and useful." S.M. Kennedy, "Credo!", *Edison Current Topics*, September 1912, Huntington Library, SCEC Records, 308:1.

33 David Alan Karnes, "Modern Metropolis: Mass Culture and the Transformation of Los Angeles, 1890–1950" (Ph.D diss., University of California, Berkeley, 1991). To contextualize, Culver, *The Frontier of Leisure*, 5-6 (cf. note 13); Richard L. Bushman, *The Refinement of America: Persons, Houses, Cities* (New York: Knopf, 1992).

34 David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880–1940* (Cambridge: MIT Press, 1991), 239.

35 Gooday, *Domesticating Electricity*, 1 (cf. note 2).

36 As examples, Frank Trentmann, Anna Carlsson-Hyslop, "The Evolution of Energy Demand in Britain: Politics, Daily Life, and Public Housing, 1920s–1970s", *The Historical Journal*, vol. 61, n° 3, 2018, 807-839: 12; Timothy Moss, *Remaking Berlin: A History of the City through Infrastructure, 1920–2020* (Cambridge: MIT Press, 2020), 80-82.

no exception in this regard. Connected to the persistence of rival energy forms, prevalent cultural fears of electricity were a second major obstacle to the domestication of electricity in Los Angeles, as they were elsewhere.[37] Even if electricity became vital in creating the image of a truly modern city over the course of the first half of the 20th C, a large number of inhabitants remained wary of this new form of energy. Homeowners feared electricity's alleged threat to their physical health, and they perceived electric lighting as an "aesthetic provocation" to their established sense of brightness.[38] Female homemakers in particular were reluctant to accept electric lighting in their homes.[39] As a result, the domestication of electricity was a contingent process, and this becomes abundantly clear when we examine Los Angeles more closely.

12 Just like in other major cities, power utilities tried to sell electricity to Los Angeles' affluent upper-class and upper-middle-class residents through newspaper and magazine ads, as well as through model electric houses.[40] These selling campaigns started in the 1890s, but gained significant momentum after 1910, when electrical appliances became more affordable for wealthy homeowners. Of course—given the fact that Los Angeles is located in a geographical area characterized by abundant sunshine and year-round mild temperatures—advertising for heating systems was hardly important, but advertising for air conditioning systems was omnipresent.

13 Who were the people driving these campaigns? Subaltern workers (including salespeople, technicians, meter men, demonstrators, and maintenance workers) did a significant amount of the utilities' promotional work and functioned as go-betweens, mediating utilities' promotional work and consumers' needs. To be sure, selling electricity to the upper middle classes and educating them in the proper handling of electrical appliances did not reveal much about how homeowners actually received and used these new appliances. Even if a focus on the adaptation to electricity in the domestic sphere goes beyond this article's scope, it should be mentioned that recent scholarship on user behavior has made it clear that no causal link existed between conventional views on intended use, and the creative and productive ways in which users from various social and ethnic backgrounds adapted (or rejected) electricity.[41]

14 An early SCEC ad in March 1914 presented to readers "Twenty Reasons for Using Electric Light" in the household.[42] Among the reasons mentioned were the affordable cost of electric lighting, as well as its cleanliness, safety, convenience, and odorlessness. In addition, the ad highlighted how electric lighting was "modern and stylish" and "[a]dvertises a progressive spirit."[43] Such terms marked a semantic word field that denoted what was important to the emerging middle classes. The desire for a clean, convenient, and comfortable home indicated "entitlement thinking," which characterized the self-confident citizen at the beginning of the 20th C.[44] In this context, Meg Jacobs refers to "economic citizenship," a term that precisely captures the nexus of consumption, economics, and politics in the U.S.[45]

37 On this and the following: Linda Simon, *Dark Light: Electricity and Anxiety from the Telegraph to the X-Ray* (San Diego: Harcourt Brace Jovanovich, 2004), 70-95.

38 Gooday, *Domesticating Electricity*, 10 (cf. note 2).

39 Ibid., 154.

40 On advertising's rise in magazines: Norris, *Advertising and the Transformation of American Society, 1865–1920* (cf. note 28); Roland Marchand, *Advertising the American Dream: Making Way for Modernity, 1920–1940* (Berkeley: University of California Press, 1985); Mott, *A History of American Magazines, 1885–1905* (cf. note 28).

41 Nelly Oudshoorn, Trevor Pinch, "Introduction: How Users and Non-Users Matter", *in* Nelly Oudshoorn and Trevor Pinch (eds.), *How Users Matter: The Co-Construction of Users and Technologies* (Cambridge: MIT Press, 2003), 1-25; Trentmann and Carlsson-Hyslop, "The Evolution of Energy Demand in Britain" (cf. note 36).

42 "Twenty Reasons for Using Electric Light", *Edison Current Topics*, March 1914, Huntington Library, SCEC Records, 308:3.

43 Ibid.

44 Frank Trentmann, Vanessa Taylor, "From Users to Consumers: Water Politics in Nineteenth-Century London", *in* Frank Trentmann (ed.), *The Making of the Consumer: Knowledge, Power and Identity in the Modern World* (Oxford: Berg, 2006), 53-79: 65.

45 Jacobs, *Pocketbook Politics*, 2 (cf. note 27).

15 Similar lines of reasoning can be found in numerous other ads, directing prospective consumers' attention to electrically wired model homes. For instance, a 1915 report published in *Edison Current Topics* introduced readers to the upper-class luxury home inhabited by Anita M. Baldwin, owner of the Santa Anita Ranch, 15 miles east of Los Angeles.[46] The Baldwins were a well-known and affluent family in the region who were among the first to electrify their residence. To the extent that they readily took part in the advertising campaign for electricity, they can be understood, like Lummis, as city boosters. Trying to make electricity attractive to others in the region, SCEC's outreach workers singled out exemplary residences to showcase the benefits of electric lighting, cooking, and heating.

16 In a similar vein, Albert Warren Atherton, a faculty member at Los Angeles' Polytechnic School, shared his desire to have his home wired with fellow readers of *Edison Current Topics*:

> One thing that so determined us, was our visit to a friend whose kitchen was fully fitted with electrical appliances. [...] Here was a kitchen, done in spotless white, airy, fresh, and scrupulously clean. At one end stood an electric range[,] and, set candidly about on shelves, were the electrical appliances, mysterious to me, but very useful, as I was soon to learn. She pushed a button here, turned down a switch there, put in requisition some shining pots and pans[,] and, almost before we knew it, without heat, or smoke, or fuss, or noise, and without ruffling her delicate plumage, put up as fine a lunch as I have eaten—and I've bought them all.[47]

17 Women featured prominently in these ads and reports. In 1912, the Corona Gas and Electric Light Company ran a newspaper ad displaying an affluent upper-middle-class house with two women in the front. With one of the two praising the social status of the household, the other replied, "Yes—electric light makes a house so cheerful, you know, and our friends cannot resist the attraction."[48] Linking electricity to domestic sociability, the ad presents socializing as a predominantly female activity, and it epitomized women as among the prime beneficiaries of electrified homes (fig. 2).

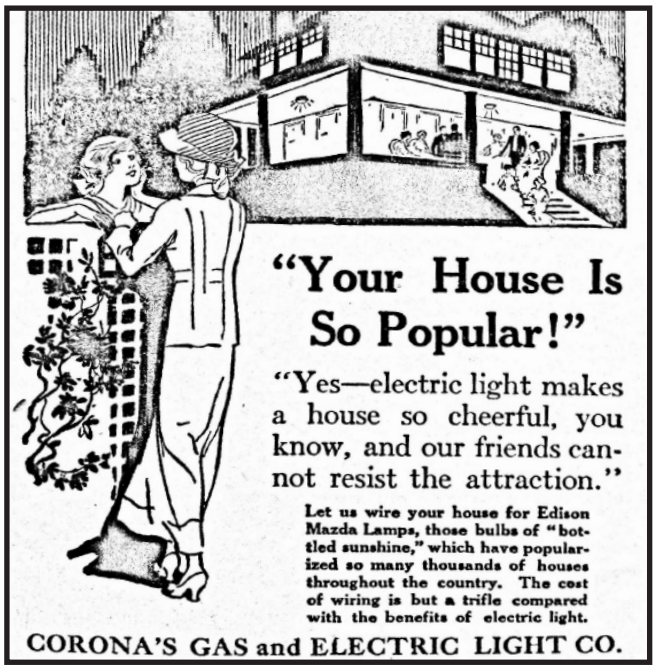

Figure 2: "Your House Is So Popular!" 1912, [Advertisement Corona Gas and Electric Light Company]. Source: The Huntington Library, San Marino, CA, Southern California Edison Company Records, Box 300, Folder 13.

18 Gender relations were an important issue that was brought into focus by household electrification. The municipal Bureau of Power and Light celebrated electricity, and the electrified kitchen in particular, as technology for women to free themselves from household work. Quoting the old phrase, "A man's work is from sun to sun, but a woman's work is never done," an op-ed in 1933 claimed that electricity "has removed one burden after another from the lives of millions of homemakers."[49] The authors publishing in *Edison Current Topics* proved to be particularly creative,

46 Frederick Schwartz, "An Electrified Home", *Edison Current Topics*, February 1915, Huntington Library, SCEC Records, 308:4.

47 Albert Warren Atherton, "The Ultimate in the Kitchens", *Edison Current Topics*, January 1917, Huntington Library, SCEC Records, 308:6.

48 "Your House Is So Popular!" 1912, [Advertisement Corona Gas and Electric Light Company], Huntington Library, SCEC Records, 300:13.

49 "Modern Kitchen for the Modern Women", *City-Owned Department of Water and Power Official Bulletin*, February 1933, vol. 1, n° 2, LADWP Records Center, WP05-45:9.

colorfully describing electricity's benefits for the domestic sphere. For instance, Emmett D. Cheesman promised that female homemakers would have more leisure time at their disposal, "more time to be given to the whims and fancies," so that "work becomes part of the day's pleasure, and happiness and health prevail where the strain of the old methods of housekeeping are relics of 'olden times.'"[50] Upper-middle-class women in Los Angeles were bombarded with information about electrical kitchen appliances' benefits. This occurred with regional variations throughout the industrialized part of the world, but in Los Angeles, this discourse was particularly strong. The promise of liberation from household work—and the associated progress in terms of equality between women and men—was a main selling point for electricity in the early 20th C. However, as Ruth Schwartz Cowan convincingly has shown, this promise was an elusive one.[51] The numerous materials alone—ranging from suggestions on how to prepare an "electric breakfast" to recipes for the electric stove[52]—indicate that electrical equipment certainly meant "more work for mother."[53]

19 This campaign for electricity thus tried to sell a whole lifestyle associated with the use of electricity. In almost every major urban center in North America and Western Europe, the introduction of electric power into the domestic sphere came hand-in-hand with specific notions about how men and women should work and spend their leisure time.[54] Scholars have provided ample evidence as to how this played out in such places as Paris, London, and Berlin.[55] Los Angeles can be seen as part of this entangled history in which transregional and transcontinental connections were involved profoundly in the domestication of electricity. Nevertheless, the advertising campaign for electricity in Los Angeles did take on a specific form. The film industry in Hollywood and numerous cinemas across the city made electricity omnipresent in urban everyday life. This new energy form consequently developed into one of the central vectors with which urban dwellers in Los Angeles negotiated their self-understanding. Without falling into stereotypes, one can state that the promotion of electricity was closely linked to the promotion of values such as autonomy, freedom, and self-determination.[56] Electrical equipment companies promised that electricity would make households more autonomous and independent, and—outside the city—electricity was advertised for its potential to help aspiring inhabitants realize their business dreams. This corresponded to the development of socio-cultural preferences among people in the early 20th C's far American West.[57] Aiming at domestic comfort, convenience, and increased leisure time, the promotion of electric power and appliances also nurtured values such as safety, economy, and efficiency. As David Nye has put it, the salespeople and demonstrators' advertising work fostered a specific conception of domestic "modernity."[58] Essential to this notion of modernity was

50 Emmett D. Cheesman, "Triumph of Electricity in Modern Architecture: West Adams Villa Apartments: Acme of Convenience", *Edison Current Topics*, December 1917, Huntington Library, SCEC Records, 308:6.

51 Cowan, *More Work for Mother*, 210-216 (cf. note 4).

52 As an example, H.B. Fletcher, "When Home Has all the Comforts", *Edison Current Topics*, December 1913, Huntington Library, SCEC Records, 308:2; see also recipes in *City-Owned Department of Water and Power Official Bulletin*, January 1933, vol. 1, n° 1, LADWP Records Center, WP05-45:9.

53 Cowan, *More Work for Mother*, 62 (cf. note 4).

54 As an overview: Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge: Harvard University Press, 2014), 220-226; Nye, *Electrifying America*, 238-286 (cf. note 34).

55 A few selections out of a number of studies, from which I have learned most: Daniel Roche, *A History of Everyday Things: The Birth of Consumption in France, 1600–1800* (Cambridge: Cambridge University Press, 2000), 106ff; Trentmann and Carlsson-Hyslop, "The Evolution of Energy Demand in Britain" (cf. note 36); Moss, *Remaking Berlin* (cf. note 36); Nina Lorkowski, *Warmes Wasser – Weiße Ware: Energiewende im Badezimmer 1880–1939* (Paderborn: Verlag Ferdinand Schöningh, 2020); Andreas Killen, *Berlin Electropolis: Shock, Nerves, and German Modernity* (Berkeley: University of California Press, 2006); Leif Jerram, *Streetlife: The Untold History of Europe's Twentieth Century* (Oxford: Oxford University Press, 2011).

56 A historiographical approach to values in the American West can be found in Nathalie Massip, "The Role of the West in the Construction of American Identity: From Frontier to Crossroads", *Caliban*, vol. 31, 2012, 239-248.

57 For the bigger picture: Eric Foner, *The Story of American Freedom* (New York: W. W. Norton, 1998).

58 Nye, *Electrifying America*, 284 (cf. note 34).

a binary gender order. This article now shifts the focus to a more thorough analysis of the representations of masculinity featured in the utilities' promotional materials.

HOUSEHOLD ELECTRIFICATION AND THE DOMESTICATION OF MASCULINITY

20 The ads, alongside reports about model electric houses, clearly displayed (and reinforced) gender dichotomies. Representations of men and women as opposites were conspicuous in most of the promotional materials. Men were depicted as producers and as superior both in knowledge and practical skills. Conversely, women were portrayed as consumers who, because of their knowledge deficit, relied on male expertise. To some extent, these ads took up traditional gender attributes: male roles were associated with being dominant, active, and rational, whereas female roles were characterized as submissive, passive, and irrational. For instance, a 1926 Bureau of Power and Light news release told the fictional story of a Los Angeles woman who was unfamiliar with electrical appliances.[59] Assuming that the woman lacked essential knowledge about available types and sizes of electrical appliances, the bureau's outreach workers advised her to visit one of the display stores that the utility operated:

> If this woman goes to the Power Bureau's Domestic Service Section[,] she will be shown every sort of reliable vacuum cleaner by expert attendants. No one will try to sell her any particular make of vacuum cleaner because nothing is for sale. But she will be given accurate information on the cost of each cleaner, the cost of operating them and the most efficient method of using them.[60]

21 The moral of this story was that women had to entrust themselves to sales experts whose expertise was represented as objective ("accurate information") and whose practical know-how was for the women's benefit. Several promotional articles recounted situations in which the (male) salesperson or technician explained to the prospective (female) consumer how to use electrical appliances properly in her household, assuming that there was an insurmountable difference in knowledge and skills between men and women.[61]

22 In the early days of the attempt to domesticate electricity, masculinity very much remained associated with superior rationality and knowledge. Addressing maintenance workers and repairmen, a 1916 article by W. L. Frost in *Edison Current Topics* spoke of the "electrical man" whose "[e]lectrical education has broadened his scope of knowledge."[62] Central to the trope of the "electrical man" were qualities such as "common sense, hard work, and an enthusiastic desire to learn," which Frost branded as male. As vague as these traits might have been and linked as they were to well-established gender differences, they indicated a partial problematization of traditional conceptions of masculinity. The ability to hold one's ground, which could go as far as the brute assertion of one's own interests, was no longer regarded as the primary characteristic of manliness. Rather, male superiority, more strongly than before, was associated with refined skills, knowledge, and an acquired rationality. Subaltern technicians, such as maintenance workers and repairers, best embodied these notions of masculinity. The gradual departure from the model of the "brutish man," who most clearly embodied the core idea of being masculine, can also be seen manifested in broader societal transformations. Elizabeth Pleck has pointed out how the rise of American social policy against physical violence committed by men in the household transformed gender relations between the 1880s and 1930s.[63] The

59 "News Release", September 2, 1926, LADWP Records Center, WP05-27:1.

60 Ibid.

61 "Los Angeles Homes Have More Electrical Devices Than Any Others", *Public Service Bulletin*, December 1919, vol. 3, n° 12, LADWP Records Center, WP05-45:13.

62 W.L. Frost, "The Modern Electrical Man", *Edison Current Topics*, September 1916, Huntington Library, SCEC Records, 308:5.

63 Elizabeth Pleck, *Domestic Tyranny: The Making of American Social Policy Against Family Violence from Colonial Times to the Present* (Urbana: University of Illinois Press, 2004), 108-163.

contemporaneous shift in attitudes toward manliness is thus very clearly reflected in the change in acceptance regarding domestic violence that took place in the United States in the late 19th and early 20th C.

23 However, it is crucial when examining these transformations to acknowledge that a significant number of salespeople were women. The advertising and sale of electricity encompassed a field that was particularly open to female employment in the 1920s and 1930s.[64] Furthermore, there is plenty of archival evidence indicating that female electrical appliance demonstrators held shows in the municipal bureau's display rooms on Van Nuys Boulevard. In these demonstrations, they prepared meals on an electric stove or weighed in on the advantages of electric power *vis-a-vis* other fuels, such as wood, oil, and gas.[65] Often, these demonstrators were travelling salespeople, moving across the country sharing their know-how and advertising their products. For instance, as another news release by the Bureau of Power and Light announced, Harriet Langworthy came from Hamilton, Ohio, and provided a free demonstration on an electric stove in Los Angeles in 1930.[66] With Ann Martin serving as the chief home economist at the bureau, women even climbed into top management positions. It is hard to overestimate the role of upper-class and upper-middle-class women in promoting domestic electricity.[67] This indicates that technical rationality was not viewed as being limited to men—which further complicates gender representations—but that women played an important role in the dissemination of electricity and actively participated in the co-constitution of technology and gender.

24 Even if the ideal of masculinity constructed by promotional articles visibly centered around knowledge and expertise as the decisive traits of men, other emerging, contemporaneous notions of masculinity were more inclusive. This gave rise to novel masculinities that would encompass many traits previously thought of as feminine: emotionality, intimacy, nurturing, and caring.[68] Macho masculinity was not replaced as the hegemonic image of man by these new conceptions, but it was made more complex and multilayered. Several ads presented men not only as knowing home managers, but also as caring husbands and fathers. Male roles were no longer envisioned as centering only around working lives and economic contributions to the family's well-being. Rather, promotional materials showed men as emotionally affective, with private space as their prime (or at least a legitimate) field of concern. This change certainly paralleled similar transformations in the fields of consumption, politics, and warfare, as some extant studies have demonstrated.[69] In this regard, the 1920s and 1930s were a time of condensed social change, in which traditional conceptions became increasingly fluid.[70]

25 An ad for water heaters that the Bureau of Power and Light published in 1939 addressed the male head of a household, stating that a water heater would increase "family health and hygiene," as well as the "happiness of your home."[71] This was a long way from older conceptions of masculinity, when male activity was bound to public spaces. Adding to the text, the ad had an illustration showing a middle-age family father lacking any traditional male attributes, almost appearing androgynal. Wearing an elegant, if not extravagant, bathrobe, his manly body is depicted as standing in front of the bathtub, checking

64 Carolyn M. Goldstein, "From Service to Sales: Home Economics in Light and Power, 1920–1940", *Technology and Culture*, vol. 38, n° 1, 1997, 121-152.

65 Veda M. Ebert, "Electric Range Way: Its Vantage Points", *Edison Current Topics*, January 1917, Huntington Library, SCEC Records, 308:6.

66 "News Release", February 28, 1930, LADWP Records Center, WP05-27:1.

67 Goldstein, "From Service to Sales: Home Economics in Light and Power, 1920–1940" (cf. note 64).

68 R. W. Connell and James W. Messerschmidt, "Hegemonic Masculinity: Rethinking the Concept", *Gender and Society*, vol. 19, n° 6, 2005, 829-859.

69 As an example of the study of masculinities in the warfare of Nazi Germany: Thomas Kühne, "Protean Masculinity, Hegemonic Masculinity: Soldiers in the Third Reich", *Central European History*, vol. 51, n° 3, 2018, 390-418.

70 Trentmann, *Empire of Things*, 260-262 (cf. note 27).

71 "No Need to Skimp on Hot Water", 1939, LADWP Records Center, WP21-6:6.

on the water temperature. He looks pleased and relaxed. This portrayal of domesticity and intimacy ran counter to traditional masculine attributes, behaviors, and roles, such as dominance, strength, and independence. Certainly, social differentiation and class structure played an important role in this ad, as only the middle-class man could afford to buy into this kind of masculinity; the worker was more likely to remain associated with traditional masculine traits.

26 In the utilities' promotional campaigns, masculinity appeared to include feminine qualities. Male traits seemed to have been tamed and controlled. In other words, promotional campaigns advertised new expectations of masculinity in order to nudge men into new consumption habits. Historically, the campaigns for consumerism must be linked to processes of broader socio-cultural change that increased receptivity to new masculinities. This connected to the ads' emphasis on safety rules. It has been well-established by prior research that the call for "Safety First" was a running theme in early ads for electricity.[72] However, it is less known whether this safety campaign implicitly aimed to tame male traits. For instance, a notice to maintenance workers and repairers that SCEC sent out in 1915 claimed that safety was:

> the foremost thought of an efficient workman. His skill, knowledge[,] and experience must be exercised at all times in the proper handling of tools and in the use of the proper safeguards. [...] Reckless, careless, thoughtless workmen endanger themselves, their fellow-workmen[,] and oftentimes cause hundreds of dollars damage. The good man, the trusted man, the go-ahead man is the "Safety First" man.[73]

Interestingly, this campaign against traditional27 masculinity not only addressed the heads of households, but also the company's own staff. Urging technicians to not be "[r]eckless, careless, [and] thoughtless," this notice rejected some of the most central qualities traditionally attributed to men. Behaving like a "good man" involved an apparent redefinition of manliness. In the age of electricity, they should always act responsibly: "Think[,] then Do It!" insisted another warning, in a similar vein.[74] According to these notices, this was the only way for men to retain their masculinity personas. Certainly, these safety campaigns had their origins in the dangers that emanated from careless use of electricity. The potentially life-threatening characteristics of electricity thus contributed to the transformation of notions of masculinity in the 1920s and 1930s.

Finally, the advertising work by SCEC and the 28
Bureau of Power and Light pushed men to support female empowerment. When the ads and promotional articles encouraged male consumers to ease their wives' household work by buying electrical appliances such as vacuum cleaners and stoves, they attempted to exploit them as collaborators in this early women's movement.[75] Speaking of appliances as "faithful electric servant[s]," the municipal utility's *Official Bulletin* in May 1933 urged husbands to ease "terror for the housewife."[76] The next month, the same periodical pressed male heads of household to "Marry Your Sweetheart but Not Your Kitchen."[77] Demanding that men help their partners free themselves from household work certainly implied an act of complicity with female empowerment—even though in the end, these appliances did not relieve the housewife of gendered work. The messages that

72 Gooday, *Domesticating Electricity*, 91-118 (cf. note 2). About campaigns to fight the dangers of industrial work, Mark Aldrich, *Safety First: Technology, Labor, and Business in the Building of American Work Safety, 1870–1939* (Baltimore: Johns Hopkins University Press, 1997).

73 "Safety First", *Edison Current Topics*, November 1915, Huntington Library, SCEC Records, 308:4.

74 "Safety First!", *Edison Current Topics*, April 1915, Huntington Library, SCEC Records, 308:4.

75 Gayle Gullett, *Becoming Citizens: The Emergence and Development of the California Women's Movement, 1880–1911* (Urbana: University of Illinois Press, 2000).

76 *City-Owned Department of Water and Power Official Bulletin*, May 1933, vol. 1, n° 5, LADWP Records Center, WP05-45:9.

77 *City-Owned Department of Water and Power Official Bulletin*, June 1933, vol. 1, n° 6, LADWP Records Center, WP05-45:9.

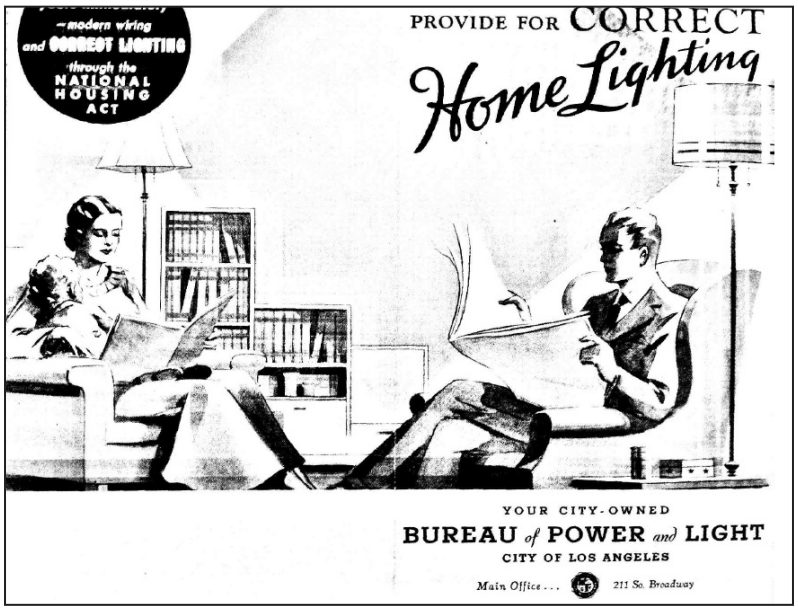

Figure 3: "Let Modernization Plans Provide for Correct Home Lighting" [Bill Insert, ca. 1934]. Source: Los Angeles Department of Water and Power Records Center, Historical Records Program, Communications Division, Consumer Relations Publications, WP05-45:8.

the promotional articles conveyed further subverted traditional notions of masculinity, encouraging men to develop a greater understanding of the problems that women face. Perhaps the ideal form of gender relations envisioned by the SCEC and Bureau of Power and Light's outreach workers is expressed best in a bill insert from around 1934 (reference in the image to the National Housing Act) promoting proper home lighting. This graphic shows a young, fashionable couple sitting in armchairs on equal terms while reading a newspaper (man) and a magazine (woman). Neither needs to do any housework, and both enjoy the same educational and recreational activities (fig. 3).[78]

29 Even if the vision articulated here went further than the zeitgeist, the ad is evidence that dichotomous gender conceptions were transformed in early 20th C advertising. This process certainly did not dissolve traditional masculinities, but made them more inclusive, more complex, and perhaps more contradictory.

CONCLUSION

The introduction of electricity into households is a significant case study through which to research the changing contours of gender and masculinities in the domestic sphere. This was particularly true in the case of Los Angeles, where the household was promoted as a key site of the modern city. As electric power was something new, both public and private utilities tried to sell this energy form to households as the highest proof of a convenient, safe, and modern home. In this regard, there was little difference between public and private utilities in Los Angeles. 30

The New Deal was ultimately responsible for the final breakthrough of electricity in U.S. households, and electric power would profoundly change how people lived and worked. Electricity providers assured female users that electrical appliances would liberate them from tiresome housework, and they attempted to popularize transformed notions of masculinity. Against the backdrop of rising consumerism, an increasing number of available electrical appliances, and changing socio-cultural value systems, these notions tended to include traits that previously 31

78 "Let Modernization Plans Provide for Correct Home Lighting", [Bill Insert, ca. 1934], LADWP Records Center, WP05-45:8.

had been associated with women. Men were no longer to be only strong and assertive, and prove themselves in public places, but rather should take responsibility for the private sphere and appreciate values such as caring and nurturing. This was accompanied by the fact that these masculinities were combined with an emphasis on rationality and safety rules in the handling of technology. In short, the manliness that power utilities encouraged can be described as tamed or domesticated.

32 It is crucial to note that all this still says relatively little about the user side. While the fact that the utilities' promotional campaigns encountered considerable resistance underlines the openness and contingency of household electrification (with many gas users suspicious of the advantages of electricity), the question of how men and women have constructed their own gender roles is largely unexamined by the analysis presented in this article. Additional research must be conducted to assess whether masculine identities changed in the wake of these promotional campaigns, or whether these campaigns reflected social change. Examining the appropriation of gender is complicated further by the fact that notions of masculinity and femininity were complex and fluid, and could differ significantly from one household to another, as well as between people having different social, economic, ethnic, cultural, political, or educational backgrounds. This suggests that further studies are needed to determine if there were expressions of masculinity that were specific to the urban space of Los Angeles. There is a strong case to be made that specificity has less to do with Los Angeles as a whole than with the micro-spaces of homes and neighborhoods.

33 To this end, this article indicates that we should move away from any dichotomous juxtaposition of "male" and "female" attributes. Investigating gray areas and nuances can reveal that an individual's gender identity moved along a fluid continuum between masculine or feminine characteristics. It is the uncertain and ambiguous that are historically interesting. This is particularly true of gender as a social construct that largely escapes disambiguation. What this article further underlines is that gender roles should not be viewed as abstract concepts detached from the reality of everyday life. Rather, they are something very tangible—formed and negotiated in local contexts, such as homes and neighborhoods, as well as through interactions with quotidian technological artifacts, such as vacuum cleaners, water heaters, and cooking stoves. In rethinking energy and gender, we should more strongly adopt such a praxeological micro-perspective.

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What a housewife should know: popularising electric devices in the Barcelona of the nineteen-thirties

Abstract

In the advanced countries, the electrification of houses was one step further in the wave of modernization resulting from the sudden arrival of electricity in all areas of daily life at the beginning of the 1930s. However, in the case of Spain, this process did not occur in a generalized way until the late 1950s. Reasons for this delay were diverse: a peripheral position, a fragmented market, or a heterogeneous distribution of supply over Spanish territory, among others. Nevertheless, some initiatives were launched in most populated areas like Barcelona, where showrooms flourished in the city centre. This article analyses one of the most relevant initiatives to popularize electric devices, the specialized magazine *Electricidad Industrial y Doméstica* (*Domestic and industrial electricity*), launched by an independent group of professionals between 1930 and 1933. The aim of *Electricidad Industrial y Doméstica* was to popularize domestic devices and the proper way to light the home. Contents included experts' opinions about new devices and advice about their proper use, translations of popularization articles from abroad, novelties and unexpected applications, answers to questions formulated by the readers, and comic strips about domestic devices. One of the aims of the journal was to show "what women should know about electricity". Although electricity made women the person in charge of electrical knowledge in the home, and women were the ones who used the majority of electrical devices, electricity became the vehicle of a profoundly patriarchal society, perpetuating the subordinate position of women and sentencing them to remain in the home doing domestic chores.

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Plan of the article

INTRODUCTION

1 Spain's electricity consumption increased continuously in the years preceding the Civil War. The consumption in 1931 was almost 35% higher than in 1927, while 1934 was more than 58% higher than in 1927 and 16% higher than in 1931.[1] However, the electrification process was far from being homogeneous. Catalonia was one of the most electrified areas of the country, and around 1930 it is considered that the industry was electrified.[2] The large hydroelectric plants of the Pyrenees were in operation, and some thermal plants were running in the Barcelona area.[3] The tramway and the first subway lines, both operated with electricity, spread their tentacles all over the city. Barcelona and its surroundings had an established and operating electricity network, and electricity illuminated the houses at night in this area.

2 In the aftermath of the Barcelona International Exhibition of 1929, electric lighting flourished in the city. Some companies launched several initiatives to increase both the number of subscribers and the consumption of existing subscribers: showrooms, neon lights in public spaces, press announcements or demonstration trucks, among others.[4] However, despite the increase in aggregate consumption and being the most electrified area in Spain, Catalonia's household consumption was still far from that of the countries pioneering household electrical appliances.[5] If we add to this delay the effects of the Spanish Civil War and the tough post-war period,[6] it follows that the social and economic changes that electric devices could introduce in domestic life did not have a significant impact until the mid-1950s.

3 The literature, the cinema and the people's memory describe life in Spanish cities in the 1940s and 1950s as having electric light and radio, but no electric refrigerators or vacuum cleaners, and without any of the small electrical appliances that had been available for twenty years. This article explores the first attempt to popularize electricity for domestic uses in Spain, which was suddenly interrupted by the civil war before it achieved its objectives.

4 The paper is structured in three sections. In the first one, we will discuss how life in an electrified home is envisioned by the influencers who analysed the situation and established the framework of the popularization initiatives. The following section will analyse one of these initiatives in depth, the journal *Electricidad Industrial y Doméstica* (Industrial and Domestic Electricity), published in Barcelona between 1931 and 1933. Finally, the last section before the conclusions analyses how the journal contents try to make women feel key players while placing them in a subsidiary role.

1 The average annual consumption per inhabitant was estimated at 92 kWh in 1927, at 125 kWh in 1931 and 146 kWh in 1934. Jordi Maluquer de Motes, "Cataluña y el País Vasco en la Industria Eléctrica Española, 1901-1935", in Manuel Gonzalez Portillo et al (eds.), *Industrialización y Nacionalismos: análisis comparativo* (Bellaterra: Servei de Publicacions de la Universitat Autònoma de Barcelona, 1985), 242.

2 Jordi Maluquer de Motes, "L'électricité, facteur de développement économique en Espagne: 1900-1936", in Fabienne Cardot (ed.), *1880-1980. Un siècle d'électricité dans le monde* (Paris: Presses Universitaires de France, 1986), 63.

3 According to Alayo, by the end of 1930, Power Companies had built 12 large hydroelectric plants in Catalonia. By 1936, 15 had been built, and 48 remained to be made. However, only 29% of the available power was in operation, and even then, there was a surplus. There was also a surplus of energy during the hours of low industrial consumption. Joan Carles Alayo, *L'electricitat a Catalunya. De 1875 a 1935* (Lleida: Pagès Editors, 2007), 865.

4 To know about strategies related to lighting, see Jordi Ferran Boleda and Agustí Nieto-Galan, "The city of electric light: Experts and users at the 1929 international exhibition, and beyond", in Agustí Nieto-Galan and Oliver Hochadel (eds.), *Barcelona, an Urban History of Science and Modernity, 1888-1929* (Oxon: Routledge, 2016), 223-244.

5 Sintes Olives indicated that the average annual consumption of Spanish households was between 100 and 300 kWh, far from the consumption volume of the most advanced countries such as the United States (between 500 and 600 kWh) and even further from the average consumption of a fully electrified household (between 6,000 and 8,000 kWh). Francisco F. Sintes Olives, *La electrificación del hogar doméstico* (Madrid: Espasa-Calpe, S.A., 1934), 13. The source did not identify the year of the data he mentioned.

6 Mercè Tatjer Mir, "La industria de material y aparatos eléctricos en Barcelona, 1981-1970", in Miriam H. Zaar, Magno Vasconcelos P. J., and Horacio Capel (eds.), *La electricidad y el territorio. Historia y futuro* (Barcelona: Universidad de Barcelona, Geocrítica, 2017), 9.

THE EXPERTS' ANALYSIS

5 "In general, Spanish Electrical Companies have not given modern and rational publicity the relevance it deserves until now." This sentence opens the last section of the chapter about Electrical Advertising in an in-depth book about the Electrical Industry situation in Spain published in 1933 by Francisco Sintes Olives and Francisco Vidal Burdills.[7] The study compared several strategies that foreign companies, specifically from the United States, used to increase electricity consumption and electric devices' sales, with the one carried out in Spain.

6 Francisco F. Sintes Olives,[8] an engineer and lecturer, and Francisco Vidal Burdills,[9] a lawyer working in the electric industry were two of the experts leading popularization initiatives on domestic electrification. From their perspective and as members of the electricity sector, the home was ideal for increasing electricity consumption once lighting-related initiatives had started and were working reasonably well. They replicated the model developed in countries like the United States, Switzerland and Germany, where this electrified home model represented the highest comfort level. They even dared to theorize about what an electric home should be like, quantifying both the number of appliances a household should have and the increase in consumption that their installation and use would entail.[10] According to their estimations, a fully electrified household would have a twenty-fold increase in electricity consumption compared with a household using electricity only for lighting. Such a scenario would represent an extraordinary opportunity for the electricity companies, even if it required a readjustment of the prices to ensure that a significant number of families could bear this cost. The Power Companies would welcome any increase in consumption that would better return on their investments.

7 Although they do not provide accurate or contrasted data, Sintes Olives and Vidal Burdills believe that there were many households with an acceptable level of electrification in some Spanish cities, which they estimate to be around ten electrical appliances.[11] Nor do they make explicit what these ten devices are. Furthermore, they did not clarify either how the economic level influenced the incorporation of electricity in the home, although the appliances' price may give us some clues, as we will see below. Experts believed that the main reason for not achieving the "maximum" comfort that the "fully-electrified home" could provide was the lack of information. For this reason, popularization campaigns were crucial to increasing devices' sales and electricity consumption.

7 Francisco F. Sintes Olives and Francisco Vidal Burdils, *La industria Eléctrica en España. Estudio económico-legal de la producción y consumo de electricidad y de material eléctrico* (Barcelona: Muntaner y Simón, 1933), 838.

8 Francisco Faustino Sintes Olives (n1900) was an engineer, a lecturer on the Escola Industrial and the Universitat Autònoma de Barcelona (the University of Barcelona during the Second Republic period).

9 Francisco Vidal Burdils (1901-1955) was a lawyer and publicist working on the company *Fuerzas Eléctricas de Catalunya, S.A.*

10 They described two stages in the process of electrification. The first stage, the "half-electrified home," had seven electrical appliances (lighting, iron, sewing machine, vacuum cleaner, heated pillow, bread toaster and fan). The second stage was the "fully-electrified home," which they set at 20 electrical appliances ("a maxim that is, in a way, the quintessence of domestic electrification"), despite recognizing the difficulties of reaching these figures. The second stage list expanded those in the first one with the following ones: coffee maker, stove, washing machine, pot, massage machine, hairdryer, dishwasher, foot-warming pad, curling irons for hair, fridge, stove, oven and water heater. It seems that they chose the appliances on each list to cover a wide range of domestic tasks rather than an honest assessment of the processes of incorporating these appliances in the home. Otherwise, it is not clear what would be the reason for including in the first list elements such as the sewing machine or the vacuum cleaner, which are much more expensive and therefore more challenging to incorporate than, for instance, electrical kitchen utensils. Sintes Olives and Vidal Burdills, *La industria eléctrica en España*, 722 (cf. note 7).

11 Differences between urban and rural environments were huge in terms of socio-economic development and consumption patterns, and lifestyles. Javier Tusell, *Historia de España en el siglo XX*. Vol. II (Madrid: Taurus, 1999), 5. In 1930, Spain's rural population was 62.9% of the total population. Xavier Tafunell, "Urbanización y vivienda", in Albert Carreras and Xavier Tafunell (eds.), *Estadísticas históricas de España. Siglos XIX-XX* (Bilbao: Fundación BBVA, 2005), 486.

8 We do not have enough data to determine who the potential customers of these electric devices were. Besides, there are no statistics on the distribution of electrical appliances in Catalonia in the first half of the twentieth century.[12] However, indirect sources provide some context. For instance, an advertisement mentions that more than four thousand water heaters were already installed in Barcelona in May 1929.[13] In the same way, an ad for General Motors' *Frigidaire* reported about six thousand refrigerators in operation in Spain in 1934.[14] In both cases, these figures represented a negligible proportion of households.[15]

9 Without further information, the prices can also explain the population segment to which each device was addressed. According to the advertisements published in the conservative newspaper *La Vanguardia*, it was possible to buy an iron from 7 Pesetas (28 December 1930, 35); a fan from 22.5 Pesetas (14 June 1931, 31); or a heater from 45 Pesetas (17 November 1929, 37). A light bulb, the cheapest electric appliance, could be found for 2 Pesetas (10 May 1932, 35). In contrast, a refrigerator could easily reach prices close to 1,000 Pesetas (25 May 1935, 38). Considering that the basic wage of a textile worker in Catalonia in 1935 was between 37 and 41 pesetas a week,[16] we can infer that beyond lighting or ironing, the target of the information campaign about electrical appliances was the medium-high class.

10 Obsessed with the need to establish a handbook of advertising for the Power Companies, Sintes Olives and Vidal Burdills suggested that young women be sales agents. They pointed out two reasons: they could convince the women of the use of electric devices easily, and they would receive lower salaries than the male salesmen. As we will see in the following sections, women were the target of most advertisement messages. Newspapers or magazines delivered generic ideas such as "Electricity means comfort,"[17] or more focused ideas such as "the comfort in their home is the most vehement yearning of all family mothers eager to contemplate the joy, well-being and health of their family."[18] Therefore, electricity had to become women's yearning. As for the discourse experts delivered, women would want to obtain electrical appliances because electricity was synonymous with prosperity, made life pleasant, and facilitated housework. A splendid summary of what this policy of diffusion of electricity meant was one of the leading slogans of the time: "Electrify your house. Make it home."[19]

THE JOURNAL ELECTRICIDAD INDUSTRIAL Y DOMÉSTICA

11 Despite the complaints about the lack of efforts to educate users about the benefits of domestic appliances discussed in the previous section, some relevant initiatives did take place. For example, some of the power companies introduced spaces devoted to electrical appliances in their lighting showrooms and some manuals,

12 A paper on *EID* considered the iron, the heater and the fans as the most widespread appliances in domestic use. Bozal, A., "La electricidad en el hogar moderno", *Progreso Eléctrico*, nº 33, 1933, 3. Capel considers that the iron and the fan were introduced to homes in the 1920s, the radio and the hairdryer in the early 1930s and the vacuum cleaner and the refrigerator in the mid-1930s. Horacio Capel "La electricidad en Cataluña, una historia por hacer", in Horacio Capel (eds.), *Las Tres Chimeneas. Implantación industrial, cambio tecnológico y transformación de un espacio urbano barcelonés* (Barcelona: FECSA, 1994), vol. 3, 165-216. Tatjer has the same problem in her analysis of the introduction of washing machines. Mercè Tatjer Mir, "La electricidad en el lavado de la ropa doméstica y colectiva. Un lento proceso desde las lavadoras manuales hasta la difusión de las lavadoras eléctricas: Barcelona 1880-1990", in Horacio Capel and Miriam H. Zaar, *La electricidad y la transformación de la vida urbana y social* (Barcelona: Universidad de Barcelona/Geocrítica, 2019), 444-459.

13 Advertisement for water heaters "IRIS" published in *La Vanguardia*, in May 16th, 1929, 10.

14 Advertisement for"Frigidaire" refrigerators published in *La Vanguardia*, in 23 November 1934, 1.

15 The estimated number of urban dwellings in Barcelona's province in 1930 was 353,000, and in Spain in 1930 was 2,644,700. Tafunell, "Urbanización y vivienda", 490 (cf. note 11).

16 Montserrat Llonch Casanovas, "Jornada, salarios y costes labores en el sector textil catalán (1891-1936)", *Revista de Historia Industrial*, 26, 2004, 101-139.

17 Advertisement, *Progreso Eléctrico*, nº 29, 1932, 12.

18 Francisco Vidal Burdills, "El confort en el hogar por la electricidad", *Electricidad Industrial y Doméstica*, nº 2, 1930, 4.

19 J. A. Corcovan, "Electrifique su casa. Conviértala en hogar", *Electricidad Industrial y Doméstica*, nº 3, 1930, 22.

Electricidad Industrial y Doméstica

Tiraje Garantizado 30 000 ejemplares al mes. Solicite nuestras garantías

Revista Mensual dedicada al fomento de la Electricidad en el hogar, la Industria y el Comercio

ANUNCIOS. Pida tarifas especiales. Puede anunciar bien y por poco dinero

Subscripción: 6 Ptas. año | Redacción y Administración: Aragón, 60, pral., 2.ª - Teléf. 31994 - Barcelona | N.º 13 | 1.º de Agosto de 1931

Cálculo teórico del consumo de los aparatos utilizadores de fluido eléctrico

COSAS DE HOY

Figure 1: Cover of the journal *Electricidad Industrial y Doméstica*. Source: *Electricidad Industrial y Doméstica*, nº 13, 1931, cover.

books, magazines and pamphlets praising the electric home that started to emerge appeared. In addition, broadcast conference series emphasized the message in an attempt to reach a wider audience.

12 One of the best examples of the strategies used to promote the benefit of electricity among domestic users is the journal *Electricidad Industrial y Doméstica* (Domestic and industrial electricity) (EID). Launched in Barcelona in 1930, the magazine was an independent initiative created with no support from the local Electric Companies even though they shared the same objectives (Figure 1). Several EID articles pointed out that the journal could impact electricity consumption positively and encouraged investing in it by employing advertisements.[20] As a consequence of its success, Companies participated in journal distribution, and some of them used to buy copies each month to distribute the journal for free among their customers.[21] Through these networks of complicity, the magazine distributed almost 30,000 copies per month.[22]

13 The journal aimed "to increase electricity consumption through its use in the common housework."[23] EID contributors were indeed heterogeneous: from university professors to lawyers; from engineers to salespeople. Also, consumers participated with articles and letters. The diversity of contents ranges from news on the opening of a showroom in Barcelona to news of unexpected uses of a particular appliance. From a recipe elaborated with an electric oven to the precise technical description of an electric kitchen. In some cases, it is difficult to discern whether what we read is a corporate advertisement, the unconditional support of an electric devices fanatic, an instruction manual, a scientific popularization article or a domestic educational textbook.

14 Considering the references made in the articles regarding questions from readers and the calls for reader participation, the editors intended to involve the public in the magazine's contents. For example, as part of a new format, a competition was launched among readers to change the title. The prize was a fan. The new title was *Progreso Eléctrico* (PD) (Electric Progress), the magazine's name from September 1931 onwards. As reported in the notice announcing the new title, two people agreed on the proposal.[24] The link between electricity and progress, which the editors did not dare to include in the original title, emerged some time later at the readers' suggestion.

20 "Cooperación Necesaria", *Electricidad Industrial y Doméstica*, nº 2, 1930, 2; "El éxito de nuestro primer número", *Electricidad Industrial y Doméstica*, nº 2, 1930, 22.

21 "Una labor intensa", *Electricidad Industrial y Doméstica*, nº 3, 1930, 3.

22 "La Transformación de nuestra revista", *Electricidad Industrial y Doméstica*, nº 7, 1931, 1.

23 "El éxito de nuestro primer número", 22 (cf. note 20).

24 "Redacción", *Electricidad Idustrial y Doméstica*, nº 13, 1931, 7.

15 *Electricidad Industrial y Doméstica* participated in the tradition developed in the first stages of electrification that connected electricity and modernity.[25] Its discourse insisted that the home had been apart from these advances until then, and it was time to change things. Electricity was like a goddess that promises a spectacular future, predicting applications that would take nearly 70 years to become available: "our newspaper will be published in our home, and news will be known in any remote place immediately after being published."[26] All these messages were technologically optimistic and left no space to criticize electricity's ability to improve the users' quality of life.

16 Whereas modernity came along with an optimistic message with limited interest in technological contents, the journal also focused on electricity efficiency and economy. In contrast to what Sintes Olives and Vidal Burdills thought, the magazine's editors focused on the cost of the devices and the electricity supply making it difficult to achieve a rapid and massive expansion. Consequently, much effort was devoted to changing the perception of the high cost of the electricity supply. The journal explained technical terms such as kilowatt or kilowatt/hour and introduced some examples of particular costs, such as ironing for two hours (0,20 pesetas) or preparing two cups of coffee (0,02 pesetas).[27] It was a way to convince potential users that electricity was affordable. Power companies also adopted this strategy, which had a clear gender bias: for instance, when addressing the women, such costs were compared to the price of the sandwiches for a party;[28] while when addressing the men, the comparison was against the cost of a newspaper, a pack of cigarettes or a box of matches.[29]

17 In terms of number and content, one author rises above all the others. Manuel Vidal Español published a monthly section in EID entitled *"Las aplicaciones domésticas de la electricidad"* (Electricity domestic uses). Vidal Español worked as an engineer in a Power Company, but he was highly regarded as a popularizer because of his radio talks. From the mid-1920s, he participated in electricity popularization activities through the Catalan Lighting Committee, a community of experts who had carried out numerous initiatives to promote electric lighting in factories, workshops, schools and different public spaces.[30] His articles on EID introduced irons, fridges, food processors and heaters, among others.[31]

18 *La mujer y el hogar* (Women and the home), a specific section, targeted women and tried to balance the magazine's objective with the editors' view of women's interests. Their ultimate goal was not hidden as they were "convinced of the fact that the introduction of domestic technologies in the home required women, because

25 Shelley W. Cordulack, "A Franco-American Battle of Beams. Electricity and the Selling of Modernity", *Journal of Design History*, 18, 2, 2005, 147-166.

26 "¿Qué debe esperarse aún de la electricidad?", *Electricidad Industrial y Doméstica*, nº 12, 1931, 1.

27 Francisco F. Sintes Olives, "Coste de entretenimiento de los aparatos eléctricos de uso domestico", *Progreso Eléctrico*, nº 19, 1932, 7.

28 A brochure from the Spanish Lighting Association (Asociación Española de Luminotecnia) compared the cost of home lighting during a party (300 W, around 0.63 pesetas) versus the value of the different dishes that might be served (31.50 pesetas). It concluded that having the house well illuminated during the party would cost the same as one of the sandwiches served. *La luz en casa racionalmente empleada proporciona alegría, bienestar, belleza y economía* (Madrid: AEL, Gráficas Reunidas, S.A., 1933), 2.

29 The number 2 of EID explained the contents of a promotional card published by an electric company. It compares the price of *La Vanguardia* (0.10 pesetas), the cigarettes (0.40 pesetas) and the matches (0.5 pesetas) with the cost of one day home lighting (0.40 pesetas) "Tarjetas", *Electricidad Industrial y Doméstica*, nº 2, 1930, 24.

30 Around the Comité we could find most of the experts working on electricity popularization during this period, included Vidal Español, Sintes Olives and Vidal Budills. They started working on the Barcelona International Exhibition of 1929 and remained active until the Civil War.

31 Among others, Manuel Vidal Español published the next articles: "El motor de cocina", *Electricidad Industrial y Doméstica*, nº 12, 1931, 3-5; "Cuidados que requieren las instalaciones y aparatos", *Progreso Eléctrico*, nº 15, 1931, 4-6; "Hornillos y cocinas", *Progreso Eléctrico*, nº 19, 1932, 1-3; "Como funcionan las neveres", *Progreso Eléctrico*, nº 22, 1932, 3-4; "El calefactor de agua por acumulación", *Progreso Eléctrico*, nº 26, 1932, 2-3; "La plancha eléctrica servidor indiscutible del hogar", *Progreso Eléctrico*, nº 39, 1933, 3-4.

women were the ones who, actually thinking of themselves, must do their best to modernize domestic practices."[32] Therefore, the section included articles about decoration based on electrical lighting and appliances for women's hygiene and beauty. However, it also included some articles not related to electricity, such as fashion or perfume subjects. The publishers offered a considerable sum of 15 pesetas per article to those women who submitted proposals for publication.[33]

19 There are some remarkable aspects in the articles women authored. An example is an article entitled *"La dulce vida del hogar"* (The Sweet Life in the Home), which defends the use of household appliances to eliminate the need for domestic servants.[34] The author used the first person to explain how cooking, cleaning, washing clothes or ironing "are now a child's game" thanks to the electrical kitchen, the electric iron or the vacuum cleaner. To her, electricity took the role of "Fairy Godmother," an argument previously used in documents promoting electrical lighting linked to the French tradition of *La Fée Électricité*.[35] Also, for the social standards of that time, having a woman explaining the time required to prepare a rump steak or a fish in an electric oven was assumed to be much more credible.[36]

20 The efforts to reach out to female users were significant but with hidden agendas. As a result, the magazine's pages include technical notions, price considerations, and precautions to remember. Also, scenarios presenting women's future including more free time, better health for their families and more aesthetic beauty for themselves. We will see this in the following section.

WHAT THE HOUSEWIFE MUST KNOW

21 This section steals the title of the article *"Lo que la señora de la casa debe conocer"* signed by Ernest Greenwood, a National Electric Light Association (NELA) member.[37] Although we do not know if it is a translation or an exceptional collaboration for the magazine, we would like to emphasize that criteria established in North America are taken into account in this matter. The article highlights some points related to understanding the electrical magnitudes and appliances that women should know about to deal with electricity use scenarios. First, it referred to the need to know the electrical vocabulary. Then, to illustrate this need, it stated that users bought electricity in kilowatt-hours and, therefore, they should know the relationship between this magnitude and an electrical appliance that has its power expressed in watts.

22 The article also discussed the possibilities and limitations of the domestic electricity system. Inadequate facilities limited the possibilities of introducing more devices. The article encouraged the housewives to get to know the electrical installation capacity of their homes to appropriately decide on the lighting and the appliances to install, knowing the circuit's distribution in the house. In addition, the housewives had to identify the reasons for service interruption, if it was caused by a power company outage, a malfunction of an appliance, or an overload of the system. For this reason, they should know how a fuse works and how to replace it if necessary.

23 Women should also know how meters work and how much electricity they are using at any given moment for monitoring consumption. Existing regulations allowed consumers to complain if the meter took readings with errors over 5%.

32 "Proyectos", *Progreso Eléctrico*, nº 15, 1931, 5.

33 Id.

34 Cecilia Artigas, "La dulce vida del hogar", *Electricidad Industrial y Doméstica*, nº 4, 1930, 8-9. Cecilia Artigas published some articles in the magazine, but unfortunately, we do not know anything about her.

35 A promotional document published shortly earlier due to an exhibition about electric lighting explicitly stated the Fairy Godmother and electricity identification. L. Splendor, *Alegrías de la Luz. Un cuento de invierno* (Madrid: AEL, Gráficas Reunidas, S.A., Novela Luminosa, 1, 1930).

36 Nuria Millet, "El hogar moderno", *Progreso Eléctrico*, nº 21, 1932, 13.

37 Ernest Greenwood, "Lo que la señora de la casa debe conocer", *Progreso Eléctrico*, nº 16, 1931, 8. (It was published again on the number 37, August, 33, 4). NELA was a national United States trade association, the forerunner of the Edison Electrical Institute.

Consequently, the housewives needed to know how to do a precise reading to calculate their consumption for a given period to compare it with the actual consumption of the different household appliances used.[38] The purpose of this kind of article was to allow readers to quickly become familiar with the new concepts and "talk about their volts, ohms and amps, as today they [already] talk about meters, litres and kilograms."[39]

24 In this discourse, women cannot express their views about the knowledge that the experts assumed they needed. Experts decided what knowledge was relevant to make decisions about new devices. Women played the role of an expert on electrical devices in the home, knowing, for instance, if it was possible to connect more devices in their home installation or if it should be upgraded due to lack of capacity. However, they could not decide to buy an appliance, as this was the responsibility of their husbands, although they were actively involved in this process. In this sense, a text published by the manager of the sales promotion department of General Electric Co is very eloquent. It described the formula to achieve success in door-to-door sales of electrical appliances:

> "The house owner is the one who will ordinarily receive the salesperson She will be the first to listen to his explanations; he should not lose sight of the fact that she is the one who benefits most from the installation [of the appliances]. However, you will want to check with the rest of the family before you make (the sale) no matter how enthusiastic she is about the electric service."[40]

25 The salesperson, mainly a salesman, had to convince the housewife in order to put her on his side, but the woman was not in charge of the purchase decision. Therefore, the text continued by advising the salesman to return to the home at dusk, at dinner time when he would find the whole family, that is, the husband, to whom the woman would have already given a prior explanation of the advantages of the product. Men had the leading role due to society's patriarchal structure, which assigned them the final decision of the purchase. For this reason, salesmen transferred to women the task of convincing their husbands of the benefits of electricity.

26 Promotional features also reflected such gender bias. Men appeared in advertisement images, but they were never displayed using the devices in the home, unlike women. Men did not appear managing such housework devices as vacuum cleaners, irons or kitchens, but they appeared in the fan's role (Figure 2). In the case of refrigerators, a man could appear eating or drinking something that the fridge had been cooling. These men used the appliances without making any effort. They were not used for any active tasks. A paradigmatic case is that of the water heater, for which male users were represented benefiting from their function, for example, by taking a bath, while female users were portrayed using the hot water for washing dishes or caring for children. In contrast, they tended to be

Figure 2: Westinghouse's advertisement. Source: *Electricidad Industrial y Doméstica*, nº 11, 1931, 7.

38 Francisco F. Sintes Olives, "La lectura de los contadores eléctricos al alcance de todos", *Electricidad Industrial y Doméstica*, nº 11, 1931, 1.

39 Manuel Vidal Españó, "Las aplicaciones domésticas de la electricidad. Algo sobre las unidades electricas más corrientes". *Electricidad Industrial y Doméstica*, nº 9, 1931, 3.

40 Corcovan, "Electrifique su casa", 2 (cf. note 19).

Figure 3: Public Demonstration of Appliance Utilities (Barcelona, 1934). Source: Arxiu Nacional de Catalunya [National Archive of Catalonia]. Collection: Fuerzas Eléctricas de Cataluña (FECSA) [Electric Forces of Catalonia]

depicted when the couple was in the exhibition room attending the salesman's explanations. [41]

27 Experts took advantage of the housewife's role by strategically defining them as the home experts on electricity because this was beneficial for their interest. They also suggested instructing and employing ladies to make door-to-door sales or to conduct demonstrations.[42] Unfortunately, data on such promotional activities is minimal, although most advertisements for electrical appliances referred to such demonstrations in the companies' showrooms. Nevertheless, as shown in Figure 3, the proposal was taken into account in at least one case. In the showroom of the *Compañía Barcelonesa de Electricidad, S.A.,* located in the central *Plaça de Catalunya* in Barcelona, a woman carried out the demonstrations of some of the domestic appliances.

28 The popularization discourse became educational when it entered the kitchen. New electrical appliances need detailed explanations because they change the way of cooking. Claiming a so-called attraction of women for the kitchen, "in contrast to the other heavy household tasks that they did not like to perform, all women felt comfortable with cooking,"[43] the experts made this a personal challenge. If the woman who cooks felt like experimenting or looking for new tastes, it would be easy to convince her to buy the new appliances that would allow her to achieve new textures or new challenges. Some magazines considered the modern kitchen as a pleasant place to work.[44] Thus, for such a

41 Some of the advertisements published the reference for an exhibition room. It appealed to the consumer to go to the shop to see the running demonstration of the device.

42 Sintes Olives and Vidal Burdills, *La industria eléctrica en España*, 821, (cf. note 7).

43 Manuel Vidal Español, "Las aplicaciones domésticas de la electricidad. Los utensilios y la electricidad." *Progreso Eléctrico*, nº 24, 1932, 2.

44 An illustration of such publications is the report published in the illustrated magazine *D'ací i d'allà*, in which there were pictures of some famous actresses and singers cooking. The story had the title "Four stars in the kitchen" and included a highlighted subtitle: "Will the modern kitchen stop being the temple where youth and beauty are sacrificed?" "Quatre estels a la cuina", *D'ací i d'allà*, Vol. 20, nº 160, 1931, 138.

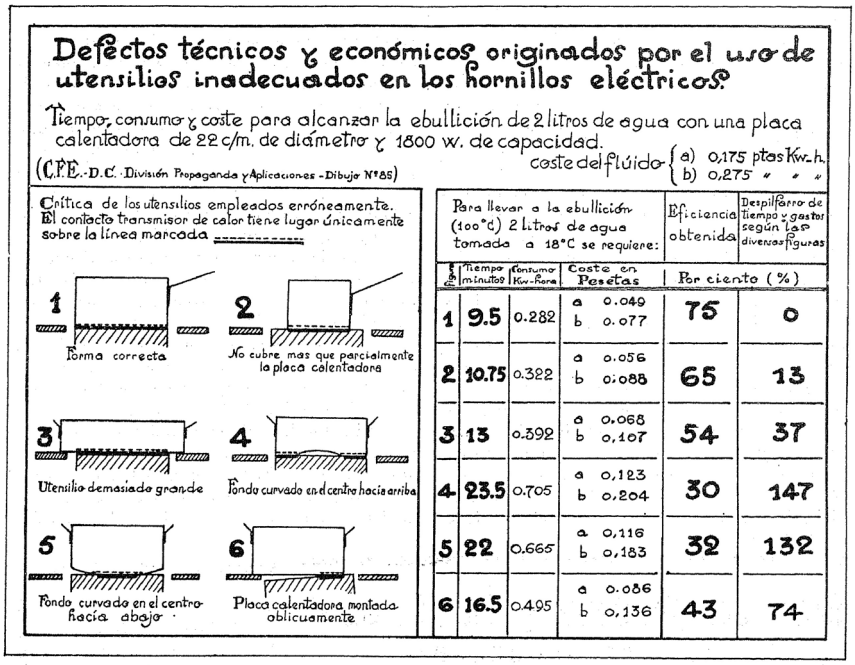

Figure 4: Technical and economic deficiencies caused by the use of inappropriate equipment on electric cookers. Source: Manuel Vidal Español, "Las aplicaciones domésticas de la electricidad. Los utensilios y la cocina eléctrica". *Progreso Eléctrico*, nº 24, 1932, p. 3.

discourse, cooking ceased to be a sacrifice and became a hobby, as the new appliances eliminated any associated inconvenience or difficulty. The electrical kitchen turned cooking into pleasure, so cooking time was no longer work time but leisure time for housewives.

29 EID emphasized security aspects such as the absence of gas leaks or fire risks and cleanliness to promote the kitchen electrification. In addition, the journal provided advice on the kind of electrical kitchen most appropriate for different family sizes or explained practical tips, like turning off the power before finishing the cooking to profit from the residual heat of the electric stovetop.[45] The article entitled *"Los utensilios y la cocina eléctrica"* (The utensils and the electric stove) explained that the recipients for cooking on an electric stove had to have the same diameter as the burners, and they had to be flat to increase the contact surface between the recipient and the burner.[46] Figure 4, included in the article, was the drawing number 58 of the advertising and applications division of the *Compañía de Fluído Eléctrico*, the department that the author of the article, Manuel Vidal Español, headed.[47]

The article introduced the benefits of electricity 30
in terms of efficiency, but electricity benefits appeared concerning the food quality in other cases. The ease of adjusting the temperature in both the hotplates and the ovens granted excellent results, but also, slow cooking meant better conservation of nutrients and improved the food appearance.[48] In short, a more significant benefit for the family. Compared with coal or wood-burning stoves, the simplicity and safety of use should encourage mothers to "let their daughters use the electric oven for their first cooking trials. They will not expose them

45 F. Volta, "La cocina eléctrica", *Electricidad Industrial y Doméstica*, nº 5-6, 1931, 6.

46 Vidal Español, "Los utensilios y la electricidad", (cf. note 43).

47 Even though the collection of drawings has not been conserved and it is not possible to define the goal of such collection, the fact that Vidal Español regularly collaborated with the journal and conducted numerous scientific popularization activities, we can assume that this Power Company valued electrical education.

48 Ángel Bozal Roman, "Algunas ventajas de la cocina eléctrica", *Progreso Eléctrico*, nº 30, 1933, 5.

Figure 5: Advertisement of the *Compañía Barcelonesa de Electricidad*. Source: Elecricidad Industrial y Doméstica, nº 5-6, 1931, back cover.

to burns or dirt."[49] In doing so, they were able to pass on the responsibility for cooking tasks to the new generations of women from a very young age, with total ease, as shown in the iconography of advertising (Figure 5).

31 The association between electric cooking and user-friendliness also had consequences for the processes that took place in the kitchen. The heat was uniform, not subjected to changes in intensity, and therefore stirring or moving the food was no longer an aleatory process. These actions could be systematized, making explicit the times at which each manipulation had to be conducted, eliminating the result's uncertainties.[50] The standardization of cooking processes can be understood as a form of mechanization of the kitchen.

32 Depicting the kitchen as a place for pleasure was probably the most sophisticated example of manipulating women in the strategy of popularising electrical appliances. In the cases we will see below, it was clear how a housewife ought to be a good housewife in a man's eyes and how electrical appliances might help them achieve this goal. The experts required the perfect housewife who took care of the family's health, kept the household clean and looked beautiful. The aim of the articles is none other than to create a sense of guilt feelings in women who do not use electrical appliances to reach these objectives.[51]

33 The risk of illness in children after eating unsafe food made the mother irresponsible if she neglected to provide an electric refrigerator in her home. Likewise, those who did not use hoovers to clean the dust were encouraging the transmission of disease. Combining all these messages aimed to create the idea that electricity and new electrical appliances were necessary, and lack of them would inevitably lead to a deterioration of family life.

34 All in all, the electrified house proposed by EID had a solution for every home task, always simpler, cleaner, faster and less traumatic for women than any available alternative, which therefore provided women with free time. However, the experts were not honest because they compared two different standards. The advent of electricity was accompanied by significantly higher standards for food quality, cleanliness and health, with results impossible to achieve manually or with more traditional

49 Advertisement, *Electricidad Industrial y Dométíca*, nº 12, 1931, 4.

50 "La cocina eléctrica", *Electricidad Industrial y doméstica*, nº 9, 1931, 3.

51 These kinds of psychological strategies aimed at blaming mothers and wives if their kitchen is not safe enough, if the house is not clean enough, or if the clothes are not in excellent wearable condition, started to be used in the United States after the First World War. Pamela W. Lurito, "The message was electric", *IEEE SPECTRUM*, 21, 9, 1984, 92.

technologies. The use of electricity facilitated many tasks and improved results, but it also generated new tasks[52] without a significant decrease in the time devoted to them.[53]

35 The "Women and the Home" section introduced before included articles demonstrating how to improve hygiene and personal care with electrical appliances. In the Spanish case, to be "better housewives"[54] looking more beautiful, not because of a personal desire, more as a way of satisfying their husbands. Electricity could also help them to this end. Beauty is described as a woman's obsession, and electricity is her best friend to achieve it. The new devices shaped their bodies, working on the muscular fibres and eliminating the excessive fat,[55] and facilitating the curling or drying of the hair.[56] The case of ultraviolet lamps was especially significant. They allowed them to get a tan, inducing all their friends to think that they had been to the beach or the mountains.[57] Women would use them both for aesthetics and medical reasons. However, they could also be beneficial to children for medical reasons, used as growth stimulants for vulnerable children or directly as a treatment to fight rickets.[58] Because of that, women who did not use these products would be bad wives and bad mothers. Again, experts became the necessary allies of the electric appliances seller in generating such a pang of guilt among women.

36 The underlying idea was that women should devote themselves to the time saved by using electrical appliances for the household chores. The journal tried to catch women's attention while, at the same time, contributing to stereotyping them by reinforcing the idea of the lady of the house. The same idea appeared in advertising, as we can see in Figure 6. The woman became, thanks to electrical appliances, an idle queen. The message is aimed at the upper social strata, where women were expected not to do any paid work outside the home.[59] Unlike other contexts,[60] we have no evidence of feminist movements opposing such discourses.

52 Ellen Lupton, *Mechanical Brides: Women and Machines from Home to Office* (New York: Cooper-Hewitt National Museum of Design, Smithsonian Institution, and Princeton Architectural Press, 1993), 15.

53 MacKenzie and Wajcman consider that working time has remained constant. Donald Mackenzie and Judy Wajcman, "Introductory Essay", in Donald Mackenzie and Judy Wajcman (eds.), *The Social Shaping of Technology* (Milton Keynes: Open University Press, 1985), 2-25. Cowan believes that the time of dedication had not decreased; on the contrary, it had increased. Ruth S. Cowan, *More Work for Women. The Ironies of Household Technology from the Open Hearth to the Microwave* (London: Free Association Books, 1989). On the other hand, Worden believes that the reason it would have risen is that they increased the standards that are in place for the family. Suzette A Worden, "Powerful Women: Electricity in the Home, 1919-1940", in Judy Attfield and Pat Kirkham (eds.), *A view from the Interior. Feminism, Women and Design* (London: The Women's Press, 1989), 131-150. Bowden and Offer considered the problem was that tasks until that time were done out of the house, paying for a service, from the introduction of electrical appliances were made in the home. Sue Bowden and Avner Offer, "Household appliances and the use of time: the United States and Britain since the 1920s", *Economic History Review*, XLVII, 4, 1994, 725-748. Also, in the Worden line and the washing machine's specific case, they point out that although the device reduced the time spent washing clothes simultaneously, it made it easier to clean more often.

54 Sue Bowden Sue. and Avner Offer, "The Technological Revolution That Never Was. Gender, Class, and the Diffusion of Household Appliances in Interwar England", in Victoria De Grazia and Ellen Furloughf (eds.), The sex of Things: gender and consumption in historical perspective (Berkeley: University of California Press, 1996), 268.

55 Lola Argüelles, "La bellesa y la electricidad", *Electricidad Industrial y Doméstica*, nº 2, 1930, 13.

56 Octavia, "Tenacillas y calienta tenacillas eléctricas", *Progreso Eléctrico*, nº 16, 1931, 5.

57 "La electricidad en el tocador". *Progreso Eléctrico*, nº 26, 1932, 14.

58 "Los niños, en la casa, tanto en invierno como en verano, necesitan el sol. La lámpara de luz solar reemplaza a aquel. En las frías mañanas de invierno, un poquito de 'sol casero' es como una bendición de Dios" ["Children in the house, both in winter and summer, need the sun. The sun lamp replaces the sun. On cold winter mornings, a little bit of 'home sun' is like a blessing from God"]. Cecilia Artigas, "El sol en casa", *Progreso Eléctrico*, nº 15, 1931, 9.

59 In this sense, the process of household electrification in Spain differed significantly from that in Germany, where married middle-class women freed from household chores were encouraged to work outside the home. Mary Nolan, "'Housework Made Easy': The Taylorized Housewife in Weimar Germany's Rationalized Economy", *Feminist Studies*, 16, 3, 1990, 550.

60 Laurel D. Graham, "Domesticating Efficiency: Lilliam Gilbreth's Scientific Management of Homemakers, 1924-1930", *Sings*, 24, 3, 1999, 634.

Figure 6: Advertisement of the *Cooperativa de Fluido Eléctrico* Showroom. Source: *Elecricidad Industrial y Doméstica*, nº9, 1931, 4.

CONCLUSION

37 Figure 7 is an excellent summary of the message of the journal *Electricidad Industrial y Doméstica*. As Nye points out,[61] electricity still suggested radical changes in the 1930s because the protagonists had the memory of pre-electric times. The joke compared the neatness, simplicity, ease of use and joy of a family that used electrical equipment with the dirt and moodiness of a family that, 20 years earlier, did not use it. The character most benefited by the electric devices was the woman as if breakfast in the 1930s had been prepared alone. Not only did electricity not enter the home in the

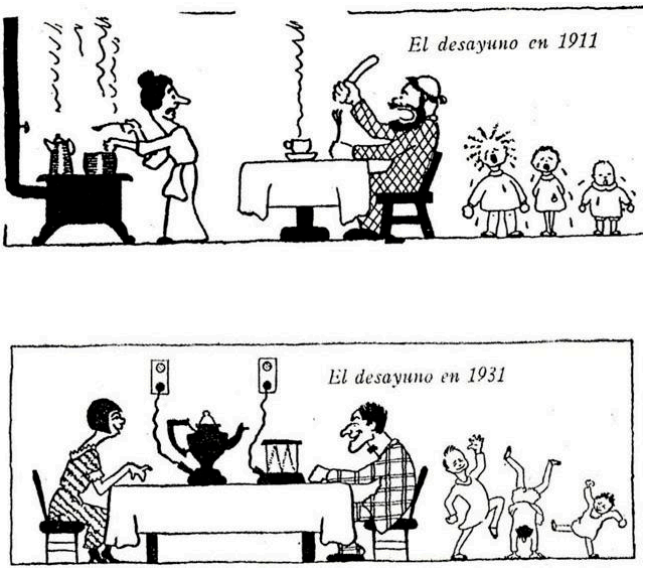

Figure 7: Cartoon. Source: *Progreso Eléctrico*, nº 17, 1931, 3.

way shown in the image, but the actual situation was the opposite for many women. As it happened in the countries the experts tried to imitate, the wealthy classes' women who could afford to buy many appliances moved from managing the service staff to taking care of the manual tasks by themselves.[62] They ceased to be managers and became workers who handle modern, efficient and clean tools.

Spanish experts introducing electric devices in 38
the 1930' showed a firm commitment to increasing home technology. We found no trace of the discourse of industrialization proposed in interwar Germany – with outsourcing of the household chores – or collectivization of these as in the Swedish model. Instead, the model was the US. In their discourse, we recognize the same ideology Landström describes regarding the emergence of domestic technologies into the United States homes.[63] Perhaps because the advertising model was American, as part of the offer was, the experts aimed to turn the home

61 David E. Nye, "Electrifying America: Social Meanings of a New Technology, 1880-1940" (Cambridge: The Mit Press, 1990), 337.

62 Ruth S. Cowan, "The 'Industrial Revolution' in the Home: Household Technology and Social Change in the 20th Century", *Technology and Culture*, 17, 1, 1976, 12; Worden, "Powerful women" (cf. note 53), 139

63 Catharina Landström, "National Strategies: The Gendered Appropriation of Household Technology", in Mikael Hard and Andrew Jamison (eds.), *The intellectual appropriation of technology: discourses on modernity, 1900-1930* (Cambridge: The MIT Press, 1998), 163-188.

into a miniature factory where most processes were machined thanks to household electrical appliances.

39 Expert educational work done through journals such as *Electricidad Industrial y Doméstica* represented an exciting attempt to import modern domestic mechanization into a peripheral society. Their efforts to introduce electrical magnitudes, tariffs, caution in the use of equipment, and other technical contents, constituted a corpus of knowledge that should make a significant contribution to making electricity and the use of electricity in the home an ordinary everyday event.

40 The research conducted from the journal's contents illustrates how modernization determined a happy future where both men and women enjoy home electrification benefits. To achieve this objective, the magazine used half-truths and false promises of free time and intended to create a guilty feeling in women who did not use electrical appliances. In such an imagined future, gender roles at home would remain unchanged, and women would carry out all the household chores, and they would be happy to do them with the help of the new devices. Therefore, even though we cannot consider its contents as a novelty compared to other countries, we should consider them in intensity and duration. Also, we can highlight the inclusion of some female voices in an intensely sexist society, if only to obtain notoriety in the group of upper-class housewives.

41 At the beginning of the 1930s, there were numerous refrigerator showrooms in cities such as Barcelona, even though most of the population could not afford them. It is difficult to say if the reason because this did not substantially affect adoption, was that the experts failed to show electricity as a necessity, the lack of a joined strategy of power companies, the high price of the devices and the service or the particularly turbulent period the country experienced in those years. However, most of the population stayed away from these innovations. Probably it was a combination of all those factors. After the Civil War, the foreign origin of most of the appliances was an insurmountable barrier. Post-war testimonies record refrigerators' arrival, washing machines, and the first household appliances in Barcelona in the 1960s, when the Spanish economy started to recover from the Civil War's impact.[64] The experts' enthusiasm for explaining the benefits of using electrical appliances in the home did not substantially affect adoption. The mechanization did not have time to prosper, but the home's gender role distribution was a success. The Spanish Civil War and a long post-war period stopped any attempt to popularize electrical appliances, and Francoism subordinated women's roles in all public and private spheres. Twenty-five years later, some of the same people that explained the benefits of electricity in the thirties repeated the same arguments in the fifties, another popularization history that deserves to be explained.

64 Raymond Carr, *España 1808-2008*. Edited and revised by Juan Pablo Fusi (Madrid: Arial, 2009. Original: Spain 1808-1975. Oxford: Claredon, 1982).

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Relieving the Housewife: Gender and the Promise of Geothermal District Heating in Reykjavík, 1930s–1970s

Abstract
Between 1939 and 1944, the City of Reykjavík in Iceland built a geothermal district heating utility that enabled the inhabitants to transition from coal to geothermal heating. One of the promises that geothermal proponents made to the inhabitants was that the utility would relieve the housewives of their coal stoking duties. In this article, I examine the gender and energy justice implications of the changes in residential energy use in Reykjavík between the 1930s and 1970s. In particular, the role of women in the use of local biofuels and imported coal for household energy needs, the use of hot springs for laundry, and how the introduction of geothermal heating changed the lives of the inhabitants. Housewives mattered for the geothermal transition, which improved their work and lives. Yet the geothermal transition also created new challenges, new injustices among connected and unconnected households, and did not necessarily reduce the workload for women or revolutionize their societal roles.

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Plan of the article

INTRODUCTION

1 In 1943–1944, the City of Reykjavík completed one of the largest infrastructure project in its history: the construction of a city-wide geothermal district heating utility. District heating infrastructures to transmit hot water or steam via a grid were built in many cities in the late 19th and early 20th C., for instance New York or Copenhagen, and later spread even to the smallest villages.[1] Today, millions of people rely on district heating, especially in Eastern Europe, the Baltics and Scandinavia, where more than half of the population is connected to district heating, topped by Iceland, with about 90 percent of the population.[2] Those district heating utilities were generally built and operated by communal governments or publicly owned utility companies, and intended to replace individual heating with coal ovens, which were labour-intensive in handling and caused alarming smoke pollution in residential areas. District heating served to increase energy efficiency in urban heating, and to provide equal access to reliable and affordable heating. Most district heating utilities burn fuel (and waste) to heat up water, whereas Icelandic systems are unique because they are generally supplied with hot water from geothermal wells.[3] During the 1930s, the proponents of district heating in Reykjavík also made a special promise to the housewives: that it would relieve them of their coal stoking duties. Those tasks were indeed disliked among women and made the geothermal project highly popular with them. Its proponents even framed the geothermal project as a "housewives' cause" – or rather a "housemothers' cause" (*málefni húsmæðranna*), as Icelanders called it at the time.[4]

2 Iceland is often considered a model country in renewable (or low-carbon) energy use. Today, 9 out of 10 houses – particularly in Reykjavík and the surrounding Capital Area – are supplied by geothermal district heating utilities, and the remainder is heated with electricity. In addition, nearly all of the island's electricity is supplied by hydroelectric and geothermal power plants.[5] Most Icelandic households therefore benefit from relatively cheap communal energy services, as geothermal energy has generally become much cheaper than fuel-based heating. The annual cost of heating in Reykjavík, for example, is much lower than in other Nordic Capitals, only one third of that in Oslo, Stockholm or Copenhagen, and one fifth of that in Helsinki.[6] The historical shift to geothermal heating is generally thought of as having been beneficial for Icelanders, as has been argued with calculations of the accumulated savings of fuel imports and CO_2 emissions avoided in the space heating sector.[7] Iceland is also often considered a model country in terms of gender equality. Iceland was fairly early to introduce female voting rights in parliamentary elections in 1915 and elected Vigdís Finnbogadóttir as president in 1980, who was the world's first female and democratically elected head of state at the time.[8] Nowadays, Iceland

1 On the cases of New York and Copenhagen, see: "The Distribution of Light and Heat in New York City", *Scientific American*, vol. 45, n° 21, 1881, 319–320; A.K. Bak, Johannes Hansen, "District Heating in Copenhagen", *District Heating*, vol. 44, n° 4, 1959, 143–147.

2 Euroheat and Power, "Statistical Overview: TOP District Heating and Cooling Indicators 2013", euroheat.org, 03/2016. Url: **http://www.euroheat.org/wp-content/uploads/2016/03/2015-Country-by-country-Statistics-Overview.pdf** (accessed 06/07/2021). For an international comparison, see Sven Werner, "International Review of District Heating and Cooling", *Energy*, vol. 137, n° 15, 2017, 617–631.

3 For an overview, see Svend Frederiksen, *District Heating and Cooling* (Lund: Studentlitteratur, 2013).

4 The most commonly used terms were "housemother" next to "húsfrú" (house-wife) or "húsfreyja" (house-keeper/mistress).

5 For current numbers, see: Orkustofnun, *Húshitun eftir orkugjafa*, OS-2018-T010-02 (Dataset, 2018). In terms of total heated space in 2016, 89,2 % were heated with geothermal district heating, 3,6 % with district heating based on electric/oil-fired heat plants, 7% with electricity, and 0,2 % with oil. On electricity production, see Orkustofnun, *Uppsett rafafl og raforkuframleiðsla í virkjunum á Íslandi*, OS-2019-T006-01 (Dataset, 2019).

6 See a 2016 comparison of utility heating costs: Samorka, "Húshitunarkostnaður langlægstur í Reykjavík", samorka.is, 16/08/2016. Url: **https://www.samorka.is/hushitunarkostnadur-langlaegstur-i-reykjavik/** (accessed 06/07/2021).

7 See e.g. Ingimar G. Haraldsson, Þóra H. Þórisdóttir and Jónas Ketilsson, *Efnahagslegur samanburður húshitunar með jarðhita og olíu árin 1970–2009* (Reykjavík: Orkustofnun, 2010).

8 For an overview, see: Erla Hulda Halldórsdóttir et al., *Konur sem kjósa: aldarsaga* (Reykjavík: Sögufélag, 2020).

often ranks first regarding equal pay, women's rights and participation of women in the workforce.[9] What exactly was it that the city's engineers and politicians – all male, of course – were promising to the female population of Reykjavík in the 1930s? Did geothermal district heating serve the goal of emancipating women in society? What was the role of women in the introduction of geothermal heating?

3 In dealing with those questions, I draw from two strands of scholarly inquiry: the historiography of residential energy use and the social scientific study of energy justice. The international historiography of energy has long tended to represent production and distribution of energy more than consumption perspectives, as most research has been done on energy companies and supply policies, but less about the consumers of energy. The relatively little work that has been done on district heating is a case in point. Most works on the history of (geothermal) district heating in Iceland, for instance, are typical utility histories, commissioned to document the history of a particular utility company.[10] In doing so, they deal with mayors, engineers and infrastructure projects, but devote less attention to consumers of geothermal heating and even less to women as energy consumers.[11] Internationally, there has been considerable research on consumers of energy, and with it the role of women in different forms of residential energy use and their role in transitions. Gender aspects of energy history have thereby been explored for various forms of residential energy use with electric appliances as well as space heating practices.[12] As that work has shown, the agency of women – like that of consumers in general – might not be obvious, and harder to trace in the historical evidence, but should nevertheless be included in historical analysis. The most essential sources for this case study are contemporary newspapers and magazines, and the Icelandic National Museum's questionnaires preserving memories of everyday life (mainly compiled in the 2010s). Those sources confirm that it is not only interesting but also necessary to examine the role of women in the history of geothermal heating. The introduction of geothermal heating changed the lives and work of housewives and the promise to relieve them of their unpopular coal stoking duties was an integral part of the campaign for the geothermal project.

4 The second strand I draw from is the literature on energy justice. This social scientific research field has highlighted the disparities in energy use, particularly distributive (in)justice, as not all members of society have equal access to

9 See e.g. the World Economic Forum's Global Gender Gap Index: Magnea Marínósdóttir, Rósa Erlingsdóttir, "This Is Why Iceland Ranks First for Gender Equality", weforum.org, 01/11/2017. Url: **https://www.weforum.org/agenda/2017/11/why-iceland-ranks-first-gender-equality/** (accessed 06/07/2021).

10 For instance Lýður Björnsson, *Saga Hitaveitu Reykjavíkur 1928–1998* (Reykjavík: Orkuveita Reykjavíkur, 2007). One of the few comprehensive studies of the socio-technical making of a district heating utility can be found in Jane Summerton, *District Heating Comes to Town: The Social Shaping of an Energy System* (Linköping: Linköpings universitet, 1996).

11 Beyond historiography, geothermal energy and district heating have been examined in energy studies and engineering sciences, albeit often with a contemporary viewpoint or a mainly documentary approach to including historical "backgrounds", which has rarely engaged with the role of geothermal consumers or gender relations. See e.g. the recent edited volume on geothermal "energy and society", which deals with many aspects of energy use but only marginally looks at consumers or gender aspects: Adele Manzella, Agnes Allansdottir, Anna Pellizzone (eds.), *Geothermal Energy and Society* (Cham: Springer, 2019).

12 To name a few: Ruth Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983); Shelley Nickles, "'Preserving Women': Refrigerator Design as Social Process in the 1930s", *Technology and Culture*, vol. 43, n° 3, 2002, 693–727; Karin Zachmann, "A Socialist Consumption Junction: Debating the Mechanization of Housework in East Germany, 1956–1957", *Technology and Culture,* vol. 43, n° 1, 2002, 73–99; Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880–1914* (London: Pickering & Chatto, 2008); Sophie Gerber, *Küche, Kühlschrank, Kilowatt: Zur Geschichte des privaten Energiekonsums in Deutschland, 1945–1990* (Bielefeld: Transcript, 2015); Vanessa Taylor, Heather Chappells (eds.), "Energizing the Spaces of Everyday Life: Learning from the Past for a Sustainable Future", Special Issue of *RCC Perspectives*, n° 2, 2019; Abigail Harrison Moore and Ruth Sandwell (eds.), "Women and Energy", Special Issue of *RCC Perspectives*, n° 1, 2020; and most recently: Abigail Harrison Moore and Ruth W. Sandwell, *In a New Light: Histories of Women and Energy* (Montreal et al.: McGill-Queen's University Press, 2021).

the same energies.[13] Gender injustices have been identified as an important issue next to class or ethnicity, but scholarship has mainly focused on the under-representation of women in energy companies and energy-related policy and decision-making, rather than energy use itself.[14] Similar to the historiography of energy, the historical evolution of district heating has been little represented in the energy justice literature, and with it questions of gender roles and inequalities regarding heating utilities.[15] In addition, energy justice scholarship tends to be normative, seeking to identify prevailing injustices and prevent them from being reproduced in ongoing and future energy transitions, thereby providing guides to make "better" energy policy.[16] An empirical analysis of historical energy use, however, can reveal the complexities of those questions and the role of historical path dependencies on specific energy technologies like heating equipment or utilities. I therefore propose to look at gender in energy history as an additional analytic category of energy (in)justice – next to distributional, procedural and recognition justice – that mattered and matters for energy constellations and transitions between them.

In this article, I examine the gender and energy justice implications in the changes in residential energy use in Reykjavík from the 1930s to the 1970s. The first part deals with the role of women in Reykjavík before the introduction of geothermal heating. The earlier uses of local biofuels, coal and hot springs for laundry as well as household electrification had many implications for women's lives and work as housewives and influenced the planning and early development of geothermal heating. The second part deals with the *promise* of district heating during the 1930s, when a small geothermal utility for public buildings and town houses was constructed, while engineers and municipal politicians planned the construction of a city-wide geothermal utility. Consumers and particularly women played a central role in the discussions about a city-wide utility. Housewives were the ones who handled coal on a daily basis on who the utility promised to relieve, and the utility users had to refund the public investments with their payments for the district heating service. The third part of the article deals with the *reality* of geothermal heating after the city-wide utility was completed in 1943–1944. Geothermal heating changed much inside the homes and did relieve the housewives, but not necessarily reduce their workload. At the same time, the utility created new injustices between connected and unconnected inhabitants in the new suburbs of Reykjavík, where people continued to use imported fuels for heating. Until the 1970s, the geothermal utility therefore had to be extended to eliminate those injustices, and continued to be framed as a housewives' cause. Finally, I will explore the question of whether or not the promise of relieving the housewife via an energy transition actually aided the emancipation of women in society.

13 See particularly on the three "tenets" of energy justice (distributional, procedural and recognition justice): Kirsten Jenkins, Darren McCauley, Raphael Heffron, Hannes Stephan, Robert Rehner, "Energy Justice: A Conceptual Review", *Energy Research & Social Science*, n° 11, 2016, 174–182; Darren McCauley, Raphael Heffron, Hannes Stephan, Kirsten Jenkins, "Advancing Energy Justice: The Triumvirate of Tenets", *International Energy Law Review*, n° 32, 2013, 107–110.

14 Jenkins et al. see gender differences as a "recognition justice" issue, as certain societal groups are underrepresented in energy decision making: Jenkins et al., "Energy Justice", 177–178. Cherp et al. similarly acknowledge "entrenched gender bias" as a justice issue in energy decision making: Aleh Cherp, Vadim Vinichenkoa, Elina Brutschin Benjamin Sovacool, "Integrating Techno-Economic, Socio-Technical and Political Perspectives on National Energy Transitions: A Meta-Theoretical Framework", *Energy Research & Social Science*, n° 37, 2018, 175–190. The unequal effect of "energy poverty" on men and women has also been documented by the UN and several scholars: Benjamin K. Sovacool, Matthew Burke, Lucy Baker, Chaitanya Kumar Kotikalapudi, Holle Wlokas, "New Frontiers and Conceptual Frameworks for Energy Justice", *Energy Policy*, n° 105, 2017, 677–691, here 588. For a study with a focus on gendered geographies, see: Susan Buckingham, Rakibe Kulcur, "Gendered Geographies of Environmental Injustice", *Antipode*, vol. 41, n° 4, 2009, 659–683.

15 For a study of Eastern European energy poverty and district heating, see: Sergio Tirado Herrero, Diana Ürge-Vorsatz, "Trapped in the Heat: A Post-Communist Type of Fuel Poverty", *Energy Policy*, n° 49, 2012, 60–68. In most studies of energy justice, however, district heating is little more than a side note. See e.g. Michael Carnegie LaBelle, "In Pursuit of Energy Justice", *Energy Policy*, n° 107, 2017, 615–620, here 618.

16 Jenkins et al., "Energy Justice", 174–182; Raphael J. Heffron, Darren McCauley, "The Concept of Energy Justice across the Disciplines", *Energy Policy*, n° 105, 2017, 658–667.

THE GENDER IMPLICATIONS OF RESIDENTIAL ENERGY USE

6 The current Icelandic energy reality, with seemingly abundant and cheap heating energy from geothermal and hydroelectric sources, is in stark contrast to the pre-industrial forms of energy use. Iceland has vast *hydroelectric* resources owing to high precipitation and large glaciers that feed meltwater rivers, as well as *hydrothermal* resources under the surface owing to the high volcanic activity, which heats up the bedrock and with it the rainwater that seeps into the ground and is turned into hot water and steam. Yet without suitable energy technologies and infrastructures like geothermal wells, electric pumps, hydroelectric power plants or transmission lines, those could rarely be turned into useful energy for the inhabitants. Through most of Iceland's history, the inhabitants used a variety of locally available solid fuels for their residential energy needs: peat was extracted from local fields; the dung of livestock like sheep and horses was collected and dried; brushwood, shrubs, seaweed, driftwood were gathered and burned; and in some areas also timber from the few forests or lignite coal from a few easily accessible mines.[17]

7 Biofuels were the mainstay of the Icelandic fuel economy into the 20th C., when imported coal – superior to Icelandic fuels in terms of energy density – took over as the main household fuel. Before the early 20th C., coal was a luxury fuel that was unaffordable to most Icelanders. Yet when British coal started being imported for steam ships and fish processing, it was likewise widely adopted as a household fuel.[18] In 1910, the municipality of Reykjavík also built a coal-based town gas plant and distribution grid, which supplied gas for outdoor and indoor lighting. Town gas predated the electric grid in Reykjavík, as the municipality did not build a centralized grid until the Elliðaár hydroelectric power station went into operation in 1920.[19] Town gas was soon marginalized by the electric alternative for lighting, but nevertheless persisted and was used for cooking with gas stoves in the connected households. Gas use in Reykjavík peaked in 1937, when roughly half of all households were connected to the utility,[20] while the other half continued to use coal and other solid fuels for cooking stoves.[21] For space heating, however, virtually all households used coal and solid fuels, as town gas was rarely used for heating in Reykjavík. By the 1930s, most houses were equipped with water-based central heating systems designed to burn coal, where a coal boiler was usually located in the cellar and hot water distributed through the house's pipes and radiators, while some older houses still used coal ovens in the apartments.[22] In the 1930s, almost all households in Reykjavík therefore relied on coal in one form or another; above all the coal-fired central heating systems that worked poorly with other fuels, but also the many forms of coal or gas stoves and ovens, wherefore coal was the fuel of choice but also mixed with domestic biofuels or whatever paper, wood sticks and household litter there was available.[23]

8 For women, most of whom worked as "housewives", the use of solid fuels meant hard work. It was typically women's work stoke the ovens and stoves during the day. While coal was considered

17 Ian A. Simpson, Orri Vésteinsson, W. Paul Adderley, Thomas H. McGovern, "Fuel Resource Utilisation in Landscapes of Settlement", *Journal of Archaeological Science*, n° 30, 2003, 1401–1420; Gunnar Bjarnason, "Höfum við gengið til góðs", *Búfræðingurinn*, vol. 14, n° 1, 1948, 106–119, here 108–109.

18 Helgi Skúli Kjartansson, Halldór Bjarnason, "Fríhöndlun og frelsi, 1830–1914", *in* Sumarliði Ísleifsson (ed.), *Líftaug landsins – saga íslenskrar utanlandsverslunar 900–2010* II (Reykjavík: Skrudda, 2017), 11–109, here 70–71.

19 Stefán Pálsson, "Af þjóðlegum orkugjöfum og óþjóðlegum: Nauðhyggja í íslenskri orkusögu", *in* Erla Hulda Halldórsdóttir (ed.), *2. íslenska sögupingið 2002* (Reykjavík: Sagnfræðistofnun Háskóla Íslands & Sagnfræðingafélag Íslands, 2002), 254–267.

20 "Gasstöðin hefir kol í 25 daga: 4462 heimili í bænum nota gas til suðu", *Vísir*, 28/09/1937, 3.

21 Guðjón Friðriksson, *Saga Reykjavíkur: Bærinn vaknar, 1870–1940* I–II (Reykjavík: Iðunn, 1991–1994), 381–383.

22 See the census data on household amenities for 1940 in *Hagskýrslur um húsnæðismál*, 1950, 59.

23 See numerous references to the use of multiple fuels even in central heating systems in the following questionnaire by the Icelandic National Museum (*Þjóðminjasafn Íslands*): Spurningaskrá 117: Híbili, húsbúnaður og hversdagslíf.

superior to peat or dung, there was still much work necessary to heat and cook with it. For cooking, the housewife needed to kindle coal in the stove each morning. During the colder months of the year, she also needed to kindle coal for heating. Central heating systems, which had been installed in many homes by the 1930s, changed much in that regard. Instead of burning coal in the kitchen or living room, the fuel was stored in the cellar and shovelled directly into a boiler to heat up water. Coal boilers were perceived as cleaner than ovens, as the coal dust was kept in the cellar, while they increased comfort by saving the housewives the work of carrying coal around the house. Coal stoking nevertheless remained women's work, as they had to attend to the coal boiler regularly to keep the system running.[24]

9 Be it for a stove, oven or boiler, getting coal to burn was everything but easy, as simply lighting matches was usually not enough. The housewife needed to find small sticks, or cleave them from a block of scrap timber, or other easily flammable kindling material like wood shavings or chips to bring the coal to glow. If they had them, they also used newspapers for kindling, or drowned a cloth in kerosene, which many households still kept for (backup) lamps even in the age of electric lighting.[25] If the coal chunks were too big, the women had to pound them into smaller pieces with a hammer. And before all that, they had to take out the ashes from the day before and clean out the oven, or else all kindling efforts would be for nothing. If the coal was kept in the cellar but the oven in the upstairs apartment, the women would have to carry the coal along narrow and steep stairways. Heating with coal also meant that homes were notoriously dusty and much women's work was required to keep them reasonably clean.[26] It was women who handled the coal during the day, and it was them who assessed the quality, as apparent from complaints by women to their coal merchants if the coal pieces were too small or too big, or produced too much soot and dust around the house. Coal advertisements therefore addressed the "housemothers" (and not the "housefathers") when promising to meet their needs for high-quality coal.[27]

Knowing that Reykjavík is located atop an extinct 10
volcano that still heats up the rock under the city and the water in it might suggest that it was inevitable that the inhabitants would sooner or later tap into that resource. But in reality it was a long process and not necessarily predetermined that the inhabitants would one day use geothermal water instead of fuels for heating. Natural hot springs are quite frequent in Iceland, for instance the springs at Laugarnes around 3 km east of central Reykjavík. The use of geothermal water or steam for space heating, however, required the construction of infrastructures to harness subterraneous hydrothermal reservoirs and distribute the water where it was needed. Many inhabitants were nevertheless users of geothermal energy and had been so for centuries. The hot springs near Reykjavík had been used for bathing and swimming by people living at nearby farms and the village of Reykjavík that took shape from the 18th century. For many women in and around Reykjavík, however, those hot springs were not for bathing but meant hard work. After all, they were not called "bathing springs", but known as the "Laundry Springs" (*Þvottalaugar*).[28] The "laundry women" (*þvottakonur*) carried the laundry on their backs or with carriages along the 3 km long "spring path" Laugavegur (today Reykjavík's main shopping street). There they washed the laundry in a

24 For a detailed description of women's kindling and stoking tasks, see: Anna Sigurðardóttir, *Störf kvenna í 1100 ár* (Reykjavík: Kvennasögusafn Íslands, 1985), 98–99. Sometimes the husbands help cleaving coal or the kindling sticks, but attending to the fire was mainly women's work.

25 On the use of kerosene to incinerate coal, see: Jón Þ. Þór, *Svartagull: Olíufélagið hf. 1946–1996* (Reykjavík: Olíufélagið, 1996), 56.

26 Kristín Marselíusardóttir, *'Ég hef engan svikið með mínum verkum, allt var þetta skóli': Vinnukonur í þéttbýli á 2.–4. áratug 20. aldar* (BA thesis, University of Iceland, 2019), 16.

27 See e.g. "K-O-L", *Verkamaðurinn*, n° 18, 1928, 4.

28 Sveinn Þórðarson, *Auður úr iðrum jarðar: saga hitaveitna og jarðhitanýtingar á Íslandi* (Reykjavík: Hið íslenska bókmenntafélag, 1998), 81–87 and 94–112.

basin with around 80°C hot water, rubbing it on their washboards in between.[29] These were both older and younger women who served others by doing laundry for relatively low wages, but also housewives who took their household laundry to the springs themselves. Most of those who did it professionally, however, were older women, who had few other choices of earning a living.[30] While some things could obviously be washed with cold water from other sources, the hot springs were essential for sterilizing laundry.[31]

11 In the early decades of the 20th C., the act of doing laundry was gradually transferred from the hot springs into the homes, as domestic laundry appliances spread. After freshwater became available from a utility in 1909, many homes in Reykjavík had coal-fired wash pots.[32] Those were often replaced with electric wash pots or washing machines from the 1930s, but also washing devices with oil burners in remote areas from the 1940s.[33] Despite the spread of washing appliances, many women still used the Laundry Springs, particularly those who could not afford wash pots and the fuel and electricity for them.[34] The introduction of washing appliances in the homes saved the housewives of Reykjavík the carrying to the Laundry Springs. Yet it did not mean that the women had no more work with laundry, as coal and electric washing pots were still not automated and required manual work.[35] Somewhat paradoxically, the shift from hot spring to indoor laundry meant more work for some housewives, since the profession of laundry women was slowly dying out in the 1940s, and better-off housewives could no longer hire them as easily. The household laundry with washing pots was so much work that some demanded public washing facilities where housewives could have their laundry done for low fees.[36]

12 The first infrastructures to utilize the hot spring water beyond bathing and laundry were not in Reykjavík, but by farmers and entrepreneurs in the countryside who laid pipes to use the water for indoor heating and cooking as well as for washing wool.[37] Ideas of using the hot springs near Reykjavík were put forward occasionally in the first decades of the 20th C., but concrete plans for district heating infrastructures were not made until 1926, when Icelandic engineers proposed to use the water to heat public buildings and possibly also residential houses.[38] To supply more hot water, the engineers started drilling wells around the Laundry Springs in 1928, which were connected to three public buildings – a school, hospital and indoor swimming pool – via a 3 km long pipeline from 1930. Due to the long history of the hot springs' use for laundry, the experimental utility for the public buildings from 1930 was called the "Laundry Springs Utility".[39] The boreholes were drilled around the two basins with hot water that the women used for washing, and had the effect that the water no longer flowed naturally into the spring, thereby drying up the laundry facility.[40] While the lower

29 Óskar Guðmundsson, "Þvottalaugarnar í Laugardal", *Þjóðlíf*, n° 9, 1990, 58–59; Gyða Gunnarsdóttir, "Þarna var einu sinni líf í tuskunum", *Vera*, n° 2, 1986, 20–21.

30 On the use of hot springs and laundry women, see: Þórðarson, *Auður úr iðrum jarðar*, 98–112; Sigurðardóttir, *Störf kvenna í 1100 ár*, 67–84.

31 Margrét Gunnarsdóttir, "Þvottalaugarnar í Reykjavík: heilsulind Reykvíking", *Vera*, n° 4, 1995, 14–15.

32 See frequent references to washing pots in the following questionnaire: Icelandic National Museum, Spurningaskrá 64: Hreingerningar og þvottur.

33 On electric washing machines, see: Sigrún Pálsdóttir, "Húsmæður og haftasamfélag: Hvað var á boðstólum í verslunum Reykjavíkur á árunum 1947 til 1950?", *Sagnir*, n° 12, 1991, 50–57, here 56. On coal and oil pots, see several references in this questionnaire: Icelandic National Museum, Spurningaskrá 117 Híbili, húsbúnaður og hversdagslíf; and advertisements like "Sparnaðar-Þvottapottur", *Fálkinn*, n° 20, 1934, 20.

34 "Þvottalaugarnar", *Fálkinn*, n° 34, 1934, 1.

35 Husbands sometimes offered a helping hand on the big laundry days once or twice a month, see the account of a woman (b. 1947) from Reykjavík, in the following questionnaire: Icelandic National Museum, Spurningaskrá 122: Aðstæður kynjanna.

36 María J. Knudsen, "Almenningsþvottahús", *Nýtt kvennablað*, n° 5–6, 1942, 1–3.

37 Benedikt Gröndal, "Hagnýting á hveraorku", *Tímarit VFÍ*, vol. 13, n° 4, 1928, 33–35.

38 See the lectures published in *Tímarit VFÍ*, vol. 11, n° 6, 1926.

39 *Hitaveitan frá Þvottalaugunum*, or in short *Laugaveitan*.

40 "Hneyksli, sem aldrei var afhjúpað", *Alþýðublaðið*, 17/07/1933, 2.

of the two basins was filled with concrete and no longer used after that, the upper basin was supplied with hot water from the boreholes, allowing the laundry women could continue their work there.[41]

13 Meanwhile, the experiment of heating the public buildings with geothermal water was successful. From 1934, the municipality extended the utility to nearby residential houses, which received a connection that allowed them to have geothermal water flow through the houses' central heating systems. Until 1937, a total of 50 private and 8 public buildings were supplied with geothermal hot water, while the rest of the city's ca. 3.000 houses continued to be heated with coal. As the existing utility reached its capacity limits and additional wells around the springs did not bring the desired additions, the engineers turned their focus to a much larger geothermal area at Reykir, 15 km outside of the city. Drilling there started in 1933 and soon promised substantially more hot water. The further discussions about district heating were therefore about building a city-wide utility, which required high investments in pipeline and grid infrastructures.[42]

14 The planning for a geothermal utility from Reykir, coincided with the construction of a hydroelectric power plant at the Ljósafoss waterfall in the Sog River around 30 km east of Reykjavík, which was built during 1934–1937. The project was intended to provide additional electric capacities for the growing city, and enable the use of electricity for manufacturing and household purposes beyond lighting.[43] The discussions about the construction of a large hydroelectric power plant had many implications for Reykjavík households, as well as similarities with the later district heating project. Like heating, cooking and other household tasks were women's work, and while a wide range of electric appliances would come into focus later on, the discussions in the 1930s concentrated on electric stoves. The promise that proponents of developing the Sog River for Reykjavík made to the housewives was that it would enable them to replace the unpopular coal stoves with electric stoves. In the 1930s, virtually all housewives in Reykjavík used coal for cooking, roughly half in the form of town gas stoves and the other half with coal stoves. As many already used gas for cooking, which was considered much cleaner and higher in comfort than coal stoves, the discussions about the advantages of electricity centred on the dusty, sooty and smoky coal stoves. Electric proponents promised the housewives that once sufficient electricity was available, they could replace the coal stoves with clean and reliable electric stoves. The project's most vocal opponent, Jónas Jónsson of Hrifla, Minister of Justice and one of the most influential politicians at the time, questioned just that promise. In 1931, his Progressive Party (*Framsóknarflokkur*) blocked a national government guarantee for the construction loan for the power plant. He did not consider electric stoves necessary: "It is most unlikely, that this question on whether women in Reykjavík would be able to cook with electricity and not with coal, is so important that it requires a 7 million loan with government guarantee."[44] Those comments were later held against him in a caricature, which shows a woman cooking with coal, waiting for that "blessed" electricity to arrive one day (fig. 1). The caricature had clear political aims, as it was published by the Conservative Party to highlight the Progressive Party's opposition at the time, but nevertheless reveals how the unpopularity of coal stoves was reinforced with promises of relieving the housewives with electric stoves.[45]

41 Þórðarson, *Auður úr iðrum jarðar*, 106–107.

42 *Skýrslur og áætlanir um Hitaveitu Reykjavíkur* (Reykjavík: Hitaveita Reykjavíkur, 1937).

43 Steingrímur Jónsson, "Sogsvirkjunin", *Tímarit VFÍ* vol. 23, n° 3, 1938, 21–50.

44 See the comments by Jónas Jónsson in *Alþingistíðindi*, 44. þing (aukaþing), C, Umræður um fallin mál á aukaþingi, 1931, 355: "Það er í mesta máta óliklegt, að þetta spursmál um það, hvort konur í Reykjavík geti soðið við rafmagn, en ekki við kol, sé svo stórt, að það þurfi að taka 7 millj. að láni með ríkisábyrgð."

45 Sumarliði Ísleifsson, *Í straumsamband: Rafmagnsveita Reykjavíkur 75 ára* (Reykjavík: Rafmagnsveita Reykjavíkur, 1996), 80.

Figure 1: "When will one get that blessed electricity to cook with?", this political caricature asked in retrospect. Source: Icelandic National Library, "Reykvískar húsmæður eldi við kol! Fjandskapur Framsóknar við virkjun Sogsfossa", *Morgunblaðið*, 13/05/1962, 23–24, here 24. Url: https://timarit.is/page/1343069?iabr=on (accessed 06/07/2021).

15 The promise to relieve the housewives of their coal stoking duties was one of the main reasons for the broad societal support of the Ljósafoss project. The housewives were also influenced by Reykjavík's electric utility, as additional residential consumption from cooking was an integral part of the business plan to repay the investment cost for the power plant and transmission system. The boom of electric stoves was also driven by the Icelandic electric equipment producer *Rafha* and retail salesmen, who promoted the electric stove as cleaner, safer and more convenient for housewives than coal and gas stoves.[46] With them, the housewife no longer had to handle coal or kindling sticks. It always worked and obeyed the housewife's wishes by the turning of a knob, unlike coal fires.[47] As it turned out, both those households that used coal stoves and gas stoves almost entirely switched to electric stoves within just a few years after the Ljósafoss plant started supplying electricity in 1937.[48]

THE HOUSEWIVES AND THE PROMISE OF GEOTHERMAL DISTRICT HEATING

Once the Ljósafoss plant was in operation, the 16
city-wide geothermal utility became the most important energy infrastructure project for Reykjavík. In 1937, after four years of exploration, the municipal engineers presented a plan for a utility from the geothermal area at Reykir.[49] It envisioned the construction of a 15 km long pipeline and an urban distribution grid to almost all houses in Reykjavík, which at the time was primarily the area within the Ring Road (*Hringbraut*). Much like with the hydroelectric project, the City of Reykjavík needed foreign know-how, materials and above all a loan in hard currency to implement the geothermal project. The following two years until the utility went into construction in 1939 would therefore mainly consist of a quest for a foreign currency loan and a suitable construction partner.[50]

To be built, however, the geothermal project 17
needed broad societal support. On the one hand, politicians, engineers and the inhabitants needed to agree on the public expenditures, since the

46 See advertisements for electric stoves: "Það getur sparað yður stúlku", *Sjómannadagsblaðið*, n° 1, 1939, 10; "Ný tegund af rafsuðuvélum", *Alþýðublaðið*, 30/04/1932, 3. See also numerous references to domestically produced electric appliances by Rafha in the following questionnaire: Icelandic National Museum, Spurningaskrá 96, Rafvæðingin I. Þegar rafmagnið kom.

47 See e.g. an advertisement: "Langþráð ósk, sem loks er að rætast", *Siglfirðingur*, n° 26, 1936, 4. On the popularity of household appliances among Reykjavík's housewives, see also: Nanna Ólafsdóttir, "Húsmæðurnar og miljónin og atkvæðin", *Melkorka*, vol. 5, n° 2, 1949, 67–69.

48 Árni Óla, "Úr sögu Reykjavíkur: Gasstöðin kveður", *Lesbók Morgunblaðsins*, 27/04/1958, 217–223. Ísleifsson, *Í straumsamband*, 143–153.

49 *Skýrslur og áætlanir um Hitaveitu Reykjavíkur*.

50 Lýður Björnsson, "Í lánsfjárleit 1937–1939", *SAGA*, n° 28, 1990, 63–85.

municipal government needed to take up a high loan in foreign currency. On the other hand, the inhabitants needed to be willing to abandon coal and become paying customers of the geothermal utility. It was them who would have to create a return on the investments by paying for the initial house connection and the hot water service according to the utility's tariffs. The prospective users therefore needed to be convinced both of the feasibility and the desirability of geothermal heating. Acceptance or demand for geothermal heating cannot be assumed a given; particularly not when it meant subordinating to a grid infrastructure, where the users have to trust the operators and the technological infrastructures to provide them with a reliable service. Transitioning from decentral heating with fuel to a centralized form of thermal energy distribution involved a major change for energy users. They had to be assured that the utility would provide them with comparable or better heating than if they continued to burn coal themselves.[51]

18 The proponents of geothermal heating – mainly politicians and engineers – promised that it would liberate the inhabitants from their dependency on dirty and expensive coal. Given that coal meant soot, dust and ash, geothermal heating was framed as a clean and smokeless alternative.[52] Proponents praised the project as an effort to make Reykjavík the cleanest and most liveable city in the world, without chimneys, soot and smoke.[53] It would also save the inhabitants millions of Icelandic kronas in foreign currency spending for imported coal, thereby liberating them from the uncertainty stemming from currency exchange rates. With widespread fears of coal supply disruptions in case of a new world war in the 1930s, the geothermal alternative was valued for the energy independence it promised.[54] The promise of equal access to reliable and affordable heating was especially popular with the poorer inhabitants of Reykjavík. The city's political Left therefore embraced district heating as a social justice issue during the 1930s and blamed the ruling Conservatives (who originally made geothermal heating a prestige project) for not building the city-wide utility.[55] District heating was expected to eliminate prevailing energy injustices related to coal,[56] as residential heating had become less affordable for working class households due to rising coal prices during the 1930s, causing many to despise coal merchants for their price policies. Geothermal heating would make adequate indoor heating affordable for everyone.[57] Owing to those high expectations, constructing a geothermal utility for the entire city became *the* prestige project, which both camps in municipal politics blamed each other for blocking or not implementing.[58]

19 The proponents of geothermal heating, particularly from the Conservatives, went beyond praising geothermal heating as a clean and cheap energy alternative. Similar to the promise of electricity just years earlier, they specifically addressed the female inhabitants and framed it as a "housemothers' cause". As with the demand for energy alternatives in general, women's demand for or even acceptance of a new form of energy distribution could not be taken for granted at the time (and should not be

51 For a detailed discussion on the creation of user demand, see Odinn Melsted, "Who Generates Demand for Sustainability Transitions? Geothermal Heating in Reykjavík", *RCC Perspectives*, nº 2 (2019), 31–38. The argumentation that builders of infrastructures have to help create demand for the energy alternatives draws from Christopher Jones, *Routes of Power: Energy and Modern America* (Cambridge, MA: Harvard University Press, 2014), 232.

52 "Reyklausi bærinn", *Morgunblaðið*, 28/12/1943, 6.

53 Árni Óla, "Hitaveita Reykjavíkur", *Lesbók Morgunblaðsins*, 07/06/1936, 177–181.

54 There were debates about whether Reykjavík should shift from coal to electric heating instead. Electric heating offered similar benefits over coal as a locally available and smokeless alternative, and did not require additional investments in transmission infrastructures. Yet proponents of geothermal heating succeeded with their argument that it would be more efficient and cheaper than electric heating in the long run. See the most vocal electric proponent: Sigurður Jónasson, "Hitun Reykjavíkur", *Nýja dagblaðið*, 21/08/1938, 1 and 4, and (cont.) 26/08/1938, 1 and 4.

55 For the Leftist position, see: "Hitaveitan á að vera þjóðþrifamál", *Þjóðviljinn,* 07/12/1937, 3; "Hvenær kemur hitaveitan?", *Verkalýðsblaðið*, vol. 7, nº 29, 1936, 4.

56 On fuel poverty issues in heating, see e.g. LaBelle, "In Pursuit of Energy Justice", 618.

57 "Kolahækkunin er hrein okurtilraun af hálfu verzlanna", *Alþýðublaðið*, 30/07/1937, 1.

58 "Hitaveitan á að vera þjóðþrifamál", 3.

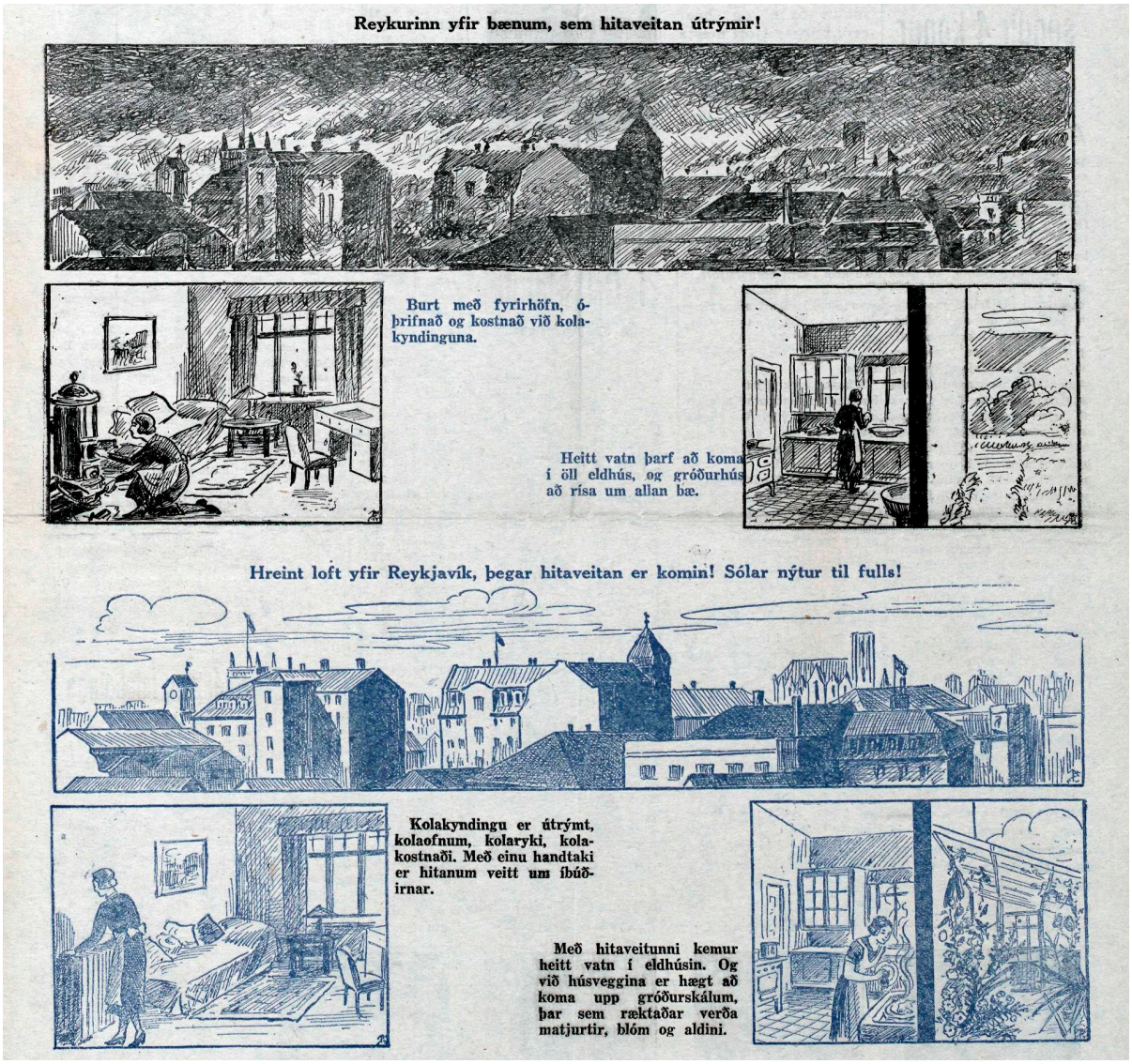

Figure 2: Captions from top to bottom: a) The cloud of smoke above town, which will be banished by the heating utility! b) Avoid the labour, filth and cost of coal heating. c) Hot water shall be brought into every kitchen, and greenhouses will rise around town. d) Clean air above Reykjavík, once the heating utility is here! The sunshine will be enjoyable to the utmost! e) Coal heating will be eradicated and so will the coal ovens, coal dust and coal cost. With the stroke of a hand, the heat will be spread around the homes. f) With the heating utility, hot water will come into the kitchens. And by the walls of the houses, greenhouses can be raised to cultivate vegetables, flowers and fruits. Source: Icelandic National Library, "Kjósið hitaveituna í dag", *Morgunblaðið*, 30/01/1938, 1. Url: http://timarit.is/view_page_init.jsp?pageId=1235245 (accessed 06/07/2021).

assumed a given by historians either). The housewives' overwhelming support was created in the context of the debates about a city-wide geothermal utility in the 1930s. Since it was typically housewives who had to stoke the coal ovens, the geothermal alternative was framed as a housewives' cause.[59] In a 1938 political campaign depiction, handling the coal oven is portrayed as dark, sooty, dusty and labour-intensive for the housewife. With district heating, which is portrayed as bright and blue, the housewife would only have to regulate the radiators and could devote her time and energy to other tasks, like cooking or cultivating exotic fruits, flowers and vegetables in geothermally heated greenhouses (fig. 2).

One of the most vocal public proponents of district heating was the women's organization of the conservative Independence Party 20

59 Soffía M. Ólafsdóttir, "Hitaveitan er málefni húsmæðranna", *Morgunblaðið*, 21/01/1938, 6.

(*Sjálfstæðisflokkur*). As prominent female party soldier Soffía M. Ólafsdóttir put it in 1938: "The heating utility is the housemothers' cause." Aiming to mobilize housewives to vote for the Conservatives in the 1938 municipal elections, she argued that the geothermal utility would change most for the poorer housemothers who had to carry coal over longer distances to get them into the oven. In those households, Soffía asserted, the utility would not only save money and the arduous work and trouble with coal, but also shorten housewives' working days. It would make their household heating and cleaning tasks much easier, both because there was less dust and dirt, and because they would always have hot water available. In the conclusion of her 1938 article, she condemned the Leftists for their alternative proposals that she believed sabotaged the project, making it clear that housewives should only trust her Independence Party to build the geothermal utility.[60]

21 The debate about the advantages of district heating for women went beyond the mentioned political campaigns in relation with the 1938 municipal elections. Many women replicated the promise of everything becoming better in Reykjavík when the geothermal utility would be built. This can clearly be seen in contemporary articles in the New Women's Magazine (*Nýja kvennablaðið*). In 1942, a woman by the name of María J. Knudsen wrote about her high expectations of the heating utility. The hot water would heat the homes, banish the coal smoke and clear the air, and put an end to all the work and dust of handling coal and ash. It would mean no less than "enormous work reductions and comforts", and in fact amount to a "revolution of household work".[61] Many others saw the advantage for housewives to always have hot or warm water ready on tap whenever it was needed to clean around the house.[62] In 1944, an unknown woman wrote to the magazine and expressed how much she was looking forward to geothermal Reykjavík. She found it exiting how the hot water would just flow into the houses, clean and clear. All the dirt from coal would vanish, and with it the coldness in the homes. She even speculated about the effect on humans in general: "Whether we would not also become better humans too?"[63]

Overall, the housewives of Reykjavík were an 22
essential part of the city's inhabitants – both as consumers and voters – who had to be convinced for the district heating project to be implemented. They were in charge of coal stoking and key to condemning coal and creating a societal demand for the geothermal alternative. While it was often their husbands who earned the household income, and thereby provided the funds to repay the city's investments through utility payments, women were the ones handling the coal during the day and had strong influence on household decisions. There is little evidence of husbands opposing the geothermal cause simply because it aided their housewives. By the time the City of Reykjavík obtained a foreign currency loan from the Danish Handelsbanken and partnered with the Copenhagen contracting firm Højgaard & Schultz to build the utility in 1939, there was overwhelming public support for the project. While the construction process was complicated and delayed by the events of the Second World War, the utility could nevertheless be completed in 1943–1944 (fig. 3). Thereby, around 3.000 buildings received a connection, and soon thereafter the first utility bills to help repay for the investments.[64]

60 Ólafsdóttir, "Hitaveitan er málefni húsmæðranna", 6.

61 Knudsen, "Almenningsþvottahús", 1–3: "Og nú síðast eigum við von á hitaveitunni, heitu vatni, sem hitar upp híbýli okkar, svo að við ekki þurfum að basla með kol og ösku, reykurinn hverfur úr bænum, en loftið verður hreint og tært. Þetta allt er geysilegur vinnusparnaður og þægindi, og svo mikil bylting á heimilisháttum, að þeir, sem ekki þekkja annað en nútímann, munu vart geta skilið þann mun."

62 "Hitaveitan", *Morgunblaðið*, 02/07/1933, 3.

63 "Úr öðru bréfi", *Nýtt kvennablad*, n° 4, 1944, 12: "Ætli við hljótum ekki að verða betri menn líka?"

64 Björnsson, *Saga Hitaveitu Reykjavíkur*, 79–139. For a technical description, see Sigurðsson, "Hitaveita Reykjavíkur", 26–39.

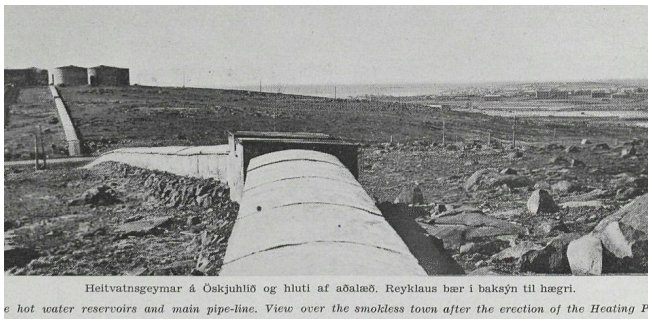

Figure 3: The main pipeline, storage tanks and "smokeless" Reykjavík. Source: Icelandic National Library, Helgi Sigurðsson, "Hitaveita Reykjavíkur", *Tímarit VFÍ*, vol. 32 , n° 2, 1947. Url: https://timarit.is/page/5457290?iabr=on (accessed 06/07/2021).

THE REALITY OF GEOTHERMAL DISTRICT HEATING

23 With houses connected to the geothermal grid, coal heating was indeed eliminated as the main form of heating in the utility area, and with it – at least at first sight – the fuel poverty and gender injustices that stemmed from the use of imported coal. Yet the historical reality was more complicated. Connecting to the heating grid meant major changes for energy consumers, as they transitioned from burning fuel individually to consuming heat from the utility. This socio-technical context of connecting to geothermal heating is essential to assess inasmuch the new system eliminated or reproduced prevailing injustices. In theory, district heating created a high potential for equalizing the distribution injustices and fuel poverty found in fuel-based individual heating. It also meant the end of housewives' chores attached to individual heating with coal, as it had generally been the housewives' responsibility to stoke the coal ovens to keep houses warm. How did that work out in reality in Reykjavík?

24 The geothermal utility did indeed relieve the housewives in connected houses of their coal stoking responsibilities. Keeping dwellings warm henceforth only involved regulating the radiators to control the hot water flow. Most households had transitioned directly from central heating with coal boilers to district heating, wherefore the geothermal hot water was simply pumped into the pre-installed coal-based heating system. Many still had functioning coal boilers when connecting to the heating utility. Some of those were kept and maintained as a backup heating option, others were disassembled and some just left to rust as the years went by.[65] Those households that decided to keep coal as a backup fuel could put them to good use, as the geothermal utility frequently failed during cold spells in the early years. Most days in the year, the utility worked, but when temperatures dropped too far, it tended to fail, as the hot water storage tanks were depleted and took time to fill up again. When that happened, the housewives called the utility director "frost man" (*kuldaboli*).[66] To prevent such cold spell failures, the utility started using oil-fired heating plants from 1948 to increase the temperature of the geothermal water when needed.[67]

25 Apart from those coldest days, however, the utility provided a reliable hot water service, which the housewives used both for the heating of their homes and a variety of other household uses. The work day changed as the housewives no longer needed to worry about stoking coal, but they had to find solutions to work with the

65 For accounts on coal heating being kept as a backup, see the following questionnaire, particularly the account of a woman (b. 1938): Icelandic National Museum, Spurningaskrá 117: Híbili, húsbúnaður og hversdagslíf: woman (b. 1938), 191.
66 For references to "kulaboli" see e.g.: "Á föstu kaupi", *Morgunblaðið*, 27/02/1966, 4; "Reykjavík mótmælir! Þolir hitaveitan ekki nema 6 stiga frost?", *Alþýðublaðið*, 08/12/1967, 1.
67 Steingrímur Jónsson, "Varastöð Rafmagnsveitu Reykjavíkur", *Tímarit VFÍ*, vol. 33, n° 3, 1948, 29–51.

mineral-rich hot water that came out of their taps. Particularly silver cutlery and jewellery had to be treated with care. Many had to find out in an unpleasant manner that the geothermal water damaged the silver coating of their fine Sunday dining cutlery. The only solution was to clean the silver cutlery with heated freshwater instead, as one housewife advised others in 1951.[68] With hot water always readily available on tap, many housewives were inclined to use the geothermal water also for tea and coffee. While opinions on that were divided – the geothermal water did have a slight but noticeable sulfuric smell to it – many did drink and cook with the utility water. The utility even encouraged people to drink and cook with the geothermal water, as it was classified as harmless and even healthy because it contained fluorine, which was said to strengthen the kids' teeth.[69] Those views towards the healthiness of geothermal water changed in the 1990s, as slight but traceable contents of heavy metals and potentially harmful concentrations of fluorine were discovered. Since the problematic minerals could not be filtered out of the water easily, the inhabitants were discouraged from drinking the geothermal water that came directly from the boreholes. From the 1990s, however, most of the utility started being supplied with geothermally heated freshwater, which made the utility water harmless again.[70]

26 The utility changed much for the housewives regarding bathing water. As mentioned, most homes already had central heating systems with coal boilers in which water could be heated for bathing, but depending on the size of those boilers, that water was limited as well as expensive. Some homes also still had kitchen stoves with small boilers for bathing water, or no central heating system at all. For the housewives, having steady and reliable hot water from the utility meant that they no longer had to worry about the availability and cost of bathing water. In the long run, the ample availability of hot water led to a culture of hot water abundance, as long showers, warm apartments and running hot water became negligible household expenses.[71] For the average household in the utility area, it did bring significant savings. The inhabitants also felt healthier due to less respiratory irritation from coal smoke and fewer colds, which were associated with more reliable indoor heating. The general perception that people got healthier with district heating is reflected in health statistics, which – coincidentally or not – reveal significantly lower rates of colds in Reykjavík from 1943, while those in the rest of the country remained similar.[72]

The geothermal water was used for cleaning 27
around the house and for (manual) dishwashing, which many started doing under running hot water, as there were few reasons to save the hot water anymore. Reykjavík's housewives also used the readily available utility water for handwashing the household laundry. For the big laundry days, however, they did not shift to the geothermal alternative, but continued to use coal, oil or electricity-based washing pots. In those pots, using the already hot utility water was not considered an issue, as the minerals in the water did not damage the pots.[73] As for the automated washing machines, which became common from the 1960s, most used freshwater, since the geothermal water could cause clogging or damages due to the minerals.[74] With

68 "Þetta var minn heimur", *Húsfreyjan*, n° 2, 1951, 25–29, here 29.

69 On encouragement to drink and cook with geothermal water, see: "Hitaveituvatn síður en svo óhollt", *Vísir*, 10/05/1976, 4; "Alvitur svarar bréfum", *Heimilistíminn*, n° 19, 1978, 3.

70 Hrefna Kristmannsdóttir, Halldór Ármansson, "Vinnslueiginleikar Hitaveituvatns," *Lesbók Morgunblaðsins*, 07/12/1996, 17.

71 See the account of a male (b. 1926) from Reykjavík in: Icelandic National Museum, Spurningaskrá 117: Híbýli, húsbúnaður og hversdagslíf.

72 See an overview of registered cases of colds in and outside Reykjavík during 1937–1948: "Hitaveitan og hvefið", *Heilbrigðismál*, n° 4, 1962, 10–11, here 11.

73 "Húsmæðraþáttur: í þvottahúsinu", *Freyr*, n° 4–5, 1954, 75–78.

74 Using geothermal water in electric dishwashers could damage machines and dishes: Anna Bjarnason, "Hitaveituvatnið eyðileggur bæði uppþvottavélina og leirinn", *DV*, 01/11/1978, 4. There were experiments with special dishwashers for geothermal water, which did not spread widely.

most households having washing pots and some already washing machines, the Laundry Springs – by then within the city – were no longer essential to housewives. They nevertheless continued to be used into the district heating age, especially by women from the unconnected outer districts of the city, and remained open for housewives to do their laundry into the 1970s.[75]

28 District heating, however, did not only have advantages for the housewives. The end of coal-firing created a new problem: what to do with all the trash? While few missed handling coal and ash, many did miss the fire, as they could no longer burn the household waste. Now the waste bins, then still called "ash bins" (*öskutunnur*), were no longer filled with ash but overfilled with trash. Instead of coal smoke, the inhabitants now had to endure the foul smell of rotting food scraps, which the lids of the overfilled bins could not contain.[76] What had never been an issue while all houses had coal fires became a problem that the public authorities had to deal with. A woman named Sigríður Arnlaugsdóttir proposed to build chicken stables all over town to put the food scraps to good use and receive eggs in return.[77] Yet this common practice on farms rarely became the reality in urban Reykjavík, as the authorities found solutions with larger trash bins.

29 Overall, the heating utility did relieve the housewives of their coal stoking tasks and the readily available hot water brought several other advantages for household work. Regarding the societal role of the housewife, however, the heating transition changed little existential, as it was not like there was no more work for the housewife. Instead, it resulted in shifting tasks within the home, thereby reproducing the prevailing gender roles of working males and stay-at-home females. With geothermal heating, housewives had more time to focus on other tasks like cooking, washing and cleaning – just as promised in the 1938 advertisement depicted above (fig. 2). Similar to electric household technologies, the innovations in heating had a revolutionary effect on the work of the housewife, but not on the role of the housewife itself. The societal gender injustices, above all unequal pay and unequal access to education and waged labour, remained and were not eradicated by electric appliances or district heating alone.

30 District heating could, on the other hand, resolve the energy injustices among those living in the utility area. Yet it also created new distribution injustices between those who were connected to the grid, and those who were not. In the 1930s, the utility had been planned for all inhabitants of Reykjavík, who mainly lived within the Ring Road, but not the new districts that spread outside of this area during and after the Second World War.[78] As a result, the geothermal utility soon excluded almost half of the city's inhabitants in the new and growing suburbs, as only 55 % of the city's dwellings received district heating in 1950 and still only 53 % in 1960 – and that despite the number of connected dwellings having increased from 7.025 to 9.437 in 1960 (fig. 4).

31 In those suburbs, like in most other areas of Iceland, coal was replaced with oil. Already before the 1940s, small kerosene ovens had been used to heat individual rooms or as a backup heating option.[79] Most oil heating systems installed from the mid-1940s, however, were central heating systems. Oil was stored in a tank and pumped automatically into a burner and water boiler, from where it was circulated

See the comments by two men (b. 1922 and 1932) on engineer Gísli Halldórsson's geothermal dishwasher: Icelandic National Museum, Spurningaskrá 97: Rafvæðing II. Raftæki.

75 By the 1960s, many housewives who had no laundry rooms in their homes came with their own washing pots and machines instead of the old washing boards, or kept them in a storage facility on site: "Nú koma þær í bílum með þvottavélarnar sínar", *Morgunblaðið*, 06/08/1960, 3.

76 The comment was published on the women's page (*kvennasíða*) of the newspaper *Þjóðviljinn*: Sigríður Arnlaugsdóttir, "Hitaveita – hænsnabú", *Þjóðviljinn*, 10/01/1945, 3.

77 Ibid.

78 My own family has a history of living outside the utility area, as my father (b. 1942) lived several years of his childhood in the 1950s in a "perpetually cold" house with a coal oven at Grímsstaðir in Western Reykjavík.

79 See e.g. an advertisement for kerosene ovens: "H.Í.S. Perfection steinolíuofnar", *Tímarit VFÍ*, vol. 8, n° 3, 1923, 14.

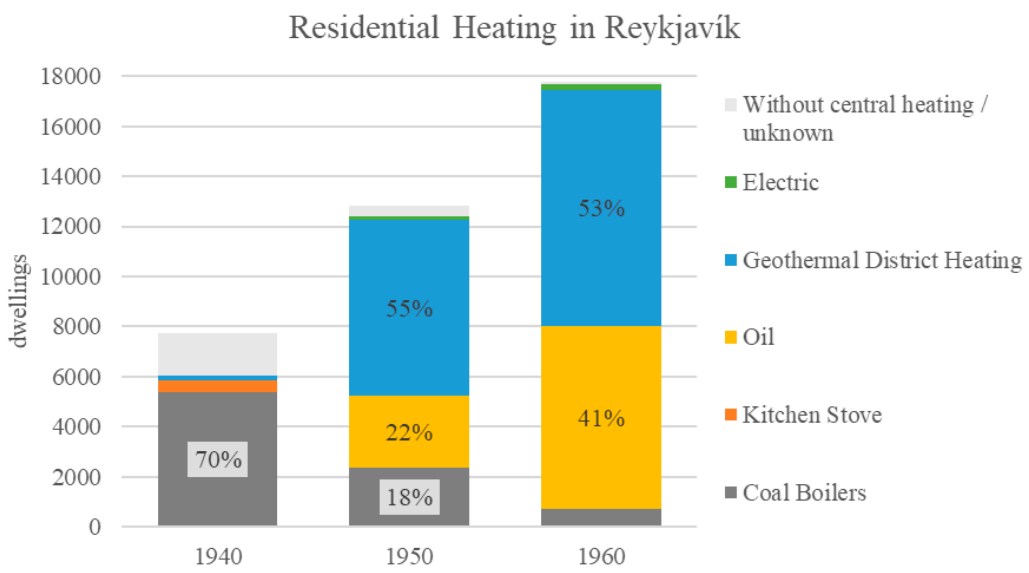

Figure 4: Residential space heating in Reykjavík per type and dwelling, 1940–1960. Source: Own graph based on census data in *Hagskýrslur um húsnæðismál*, 1950 and 1960.

through pipes and radiators.[80] Already by 1950, more than half of Reykjavík's fuel-heating households used oil-fired central heating (fig. 4).[81] Soon after the city-wide geothermal utility went into service, there were thousands of people living right next to it in the new suburbs, who continued to rely on imported fuels for heating.[82] Unlike coal, automated oil heating offered similar advantages in terms of comfort and cleanliness as geothermal district heating. The thermostat took over the labour of adding fuel to regulate the temperature and resulted in less heating-related work for the housewife.[83] The smoke was not as black and there was no soot, ash and dust left inside the house. Oil was fluid and had a higher carbon concentration and therefore energy density, which meant it required less space in transportation and storage than coal.[84]

Like with electric appliances and district heating, advertisements for oil heating were made with the coal-stoking tasks of housewives in mind, promising them unprecedented comforts. A 1946 advertisement for oil heating communicated the advantages as follows: "Why does everybody choose automated oil heating? It is clean; it is smoke-free, it is balanced and healthy, it is cheapest. It saves much work, it saves trips down to the cellar, it saves coal shovelling, it saves ash carrying, it saves coal storage room, it lowers the danger of fire."[85]

Given the higher cost of fuel heating compared to the geothermal utility, the inhabitants of unconnected districts complained about the situation and petitioned to receive access. They lamented that the utility created unequal living standards for the inhabitants because connected households enjoyed better and cheaper heating.[86] It was particularly from those unconnected suburbs that housewives would continue to use the Laundry Springs. The question for the utility

80 See advertising campaigns for oil burners: "Hvers vegna nota allir sjálfvirka olíukyndingu?", *Fálkinn*, vol. 19, n° 22, 1946, 16; "Olíukynding", *Morgunblaðið*, 06/03/1945, 3.

81 *Hagskýrslur um húsnæðismál*, 1950, 33.

82 On the primary form of heating in Reykjavík dwelling units, see census data as visualized in Figure 4.

83 What people valued most about oil heating was the thermostat. See the account of a male (b. 1939) in the following questionnaire: Icelandic National Museum, Spurningaskrá 117: Híbili, húsbúnaður og hversdagslíf.

84 "Hvers vegna nota allir sjálfvirka olíukyndingu?", 16. On the advantages of oil over coal heating, see also: Odinn Melsted, Pallua, Irene, "The Historical Transition from Coal to Hydrocarbons: Previous Explanations and the Need for an Integrative Perspective", *Canadian Journal of History*, vol. 53, n° 3, 2018, 395–422, here 411–416.

85 "Hvers vegna nota allir sjálfvirka olíukyndingu?", 16.

86 "Samskot fyrir borgarstjórnina", *Tíminn*, 01/11/1957, 6; Guðmundur Vigfússon, "Tryggja veður öllum Reykvíkingum afnot hitaveitunnar", *Þjóðviljinn*, 18/01/1958, 7–10.

managers was not *if*, but *how* and *when* the grid would be extended to the new districts. But since it was unrealistic to extend it to all at once, the closest districts to the present utility area in the Western half of the city were connected first (Melar and Hlíðar). Yet as the disparity between East and West in Reykjavík became ever more apparent, the politicians from Left and Right made "district heating for everyone" political campaign material and extending it became a prestige project for mayor Gunnar Thoroddsen (1947–1959) and his successor Geir Hallgrímsson (1959–1972).[87]

33 In the course of the 1960s, the unconnected districts of Reykjavík were gradually integrated in the utility grid, primarily funded with a World Bank loan from 1960. The extension could be implemented with additional drilling for hot water, efficiency improvements in the present production and distribution systems, and the strategic use of oil-fired heat plants to provide backup heating during cold spells. Owing to the extension of the utility grid during the 1960s, the number of geothermal users increased by around 30.000 to 74.000 by 1970, when only 4.000 inhabitants remained unconnected.[88] Yet while the disparity within Reykjavík grew less apparent, that within the greater Capital Area – by then seven municipalities that had practically grown together – became ever more apparent. Given that in 1970, the cost of heating from the utility in Reykjavík was only about half of what other inhabitants paid for electric or oil heating, there was much dissatisfaction among the inhabitants who remained unconnected.[89] For this reason, the governments of the seven municipalities established a joint committee in 1969 to plan for the extension of Reykjavík's heating utility to the entire Capital Area. While already prepared before, the extension was accelerated by the oil price increases from late 1973, which served as a powerful economic incentive to extend the utility as quickly as possible, since all involved assumed that oil prices would not decrease again in the near future.[90] Until 1979, all suburbs and neighbouring towns of Reykjavík – particularly the towns of Kópavogur and Hafnarfjörður – were integrated in one large geothermal utility for the Capital Area.[91] Already from 1976, most inhabitants in the Capital Area (92.5 % in 1976) enjoyed the comforts and the economic savings of geothermal district heating.[92] Thereby, distribution injustices within Reykjavík and the greater urban area were eliminated, and with it the fuel poverty associated with decentral coal and oil heating.

34 During all this time, geothermal heating continued to be framed not only as a social justice issue but also as a housewives' cause. As the ones who managed household work, women remained vocal proponents of extending the geothermal utility to the suburbs. It would improve their lives and lower household spending, even though it involved few actual changes for the housewife in terms of labour associated with space heating, as most unconnected houses were already heated with automated oil systems. In unconnected Hafnarfjörður, for instance, a local woman once called district heating the "dearest dream of all housewives", which would increase comfort and liberate them from having to attend the fires of their heating systems.[93] The promise to the "housemothers" can also be seen in a representation of two women inspecting the new pipeline being laid to their borough at Otrateigur in Eastern Reykjavík in 1962 (fig. 5). The article included a calculation that district

87 Already in 1954, Gunnar Thoroddsen declared "district heating into every house" as his party's main goal: "Hitaveita í hvert hús, er takmark Sjálfstæðismanna", *Morgunblaðið*, 24/01/1954, 1–2. See also: "Hitaveita í allri Reykjavík eftir rúm 4 ár", *Morgunblaðið*, 9/06/1961, 1–11; "Stærsta verkefnið næsta kjörtímabil að allir Reykvíkingar njóti hitaveitu", *Morgunblaðið*, 24/05/1962, 35–36.

88 See the chapter "Hitaveita allra Reykvíkinga" *in* Björnsson, *Saga Hitaveitu Reykjavíkur*, 169–167.

89 Reykjavík Municipal Archives, Hitaveita Reykjavíkur I-138, Samanburður á kostnaði við hitun húsa með hitaveitu og gasolíukyndingu, 11/1970.

90 "Skýrsla iðnaðarráðherra um nýtingu innlendra orkugjafa í stað olíu", *Alþingistíðindi* A, 1973–1974, 1766–1790, here 1767.

91 Björnsson, *Saga Hitaveitu Reykjavíkur*, 199–211.

92 Reykjavík Municipal Archives, Hitaveita Reykjavíkur I-134, Tölfræðilegar upplýsingar 1961–1980.

93 "Sjómannskonan sem situr í bæjarstjórn Hafnarfjarðar: viðtal við Elínu Jósefsdóttur", *Morgunblaðið*, 24/05/1959, 9.

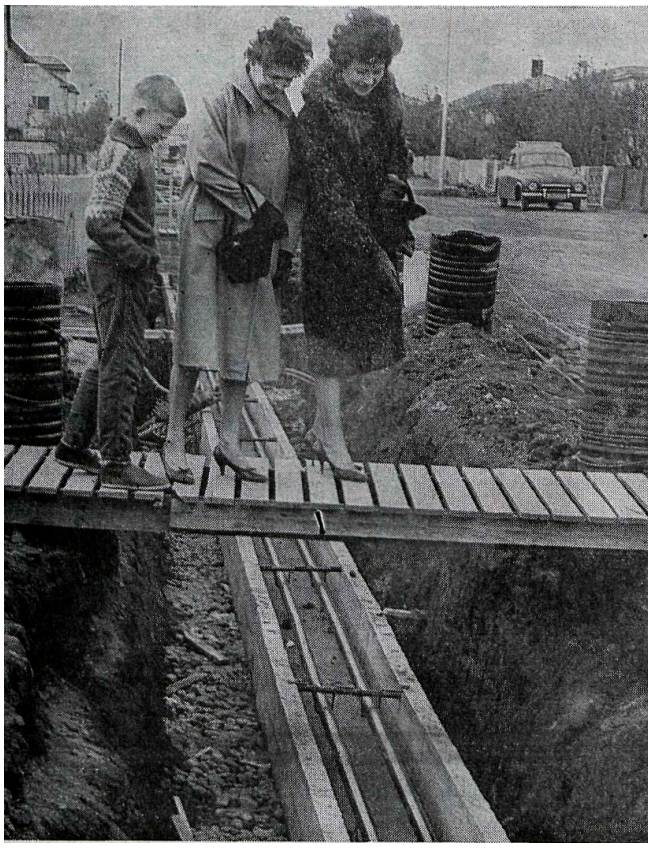

Figure 5: Reykjavíkian housemothers inspecting the utility construction process in 1962. Source: Icelandic National Library, "Sparar fjölskyldu 3200: Húsmæður og hitaveitan", *Vísir*, 25/05/1962, 16. Url: **https://timarit.is/page/2360492?iabr=on** (accessed 06/07/2021).

16 SÍÐUR

Morgunbladid

244. tbl. 62. árg. LAUGARDAGUR 25. OKTÓBER 1975 Prentsmiðja Morgunblaðsins.

Frá hinum fjölmenna fundi kvenna á Lækjartorgi í gær. — Ljósm.: Ól. K. M.

Útifundur kvenna á Lækjartorgi:

Figure 6: The frontpage of *Morgunblaðið* the day after the first "women's day off" on 24/10/1975. Source: Icelandic National Library, *Morgunblaðið*, 25/10/1975, 1. Url: **https://timarit.is/page/1467927?iabr=on** (accessed 06/07/2021).

heating for an exemplary apartment only cost half as much as oil heating (3.800 kronas compared to 7.000), which was considered a blessing for the housewives of Reykjavík.[94]

35 In the end, the socio-technical changes in the Reykjavík heating sector, with the transition from decentral heating with coal to geothermal heating, and the shifts from coal to oil in unconnected suburbs and later to geothermal heating, did relieve the housewives as promised. Yet the new forms of heating ended up reproducing the prevailing gender roles. While it would be compelling to attribute Iceland's high level of gender equality to the introduction of geothermal heating, the historical evidence suggests otherwise. With regard to geothermal heating, women had important roles as consumers as well as voters, but those roles need to be distinguished from their roles as citizens struggling for societal emancipation. The societal roles of women were not changed by heating technologies, but by political activism of the women's movement. Particularly from the mid-1970s, the Icelandic women's movement had brought about many advances for women's rights with iconic protests like the "Women's day off" (*Kvennafrídagurinn*) first held on 24 October 1975, where an estimated 90 percent of the female population went on strike for the day and turned out at public protests against unequal pay.[95] On that Friday in late fall, thousands of women (as well as men)

94 "Sparar fjölskyldu 3200: Húsmæður og hitaveitan", *Vísir*, 25/05/1962, 16.

95 Later known as "equal pay day", but generally seen more as a strike than a "day off". See: Kristín Svava Tómasdóttir, "24. október 1975 – kvennafrí eða kvennaverkfall?", *Sagnir*, vol. 29, n° 1, 2009, 19–25.

left their comfortable, geothermally heated homes and went to the smoke-free city centre of Reykjavík to demand equal pay and rights for women, which helped Iceland becoming a model country in gender equality over the following decades (fig. 6).

CONCLUSION

36 This article set out to examine the gender and energy justice implications of geothermal district heating in Reykjavík. Starting as an experiment with public buildings in the 1930s, geothermal heating became the primary form of heating with the construction of a utility for the central districts in 1939–1944, which was gradually extended to the suburbs until the 1970s. The adoption of geothermal district heating entailed a shift from decentral heating with fuels to a centralized form of heat distribution. Handling fuel around the house for heating, cooking, and washing – be it with coal, peat or other biofuels – had typically been the responsibility of the housewives. Similarly, the washing of laundry in the hot springs of Reykjavík had been women's work. It was therefore crucial for the proponents of geothermal heating, and similarly for those of large-scale electrification, to promise to relieve the housewives of their coal stoking duties and frame the geothermal project as a housewives' cause. To understand the history of the adoption of geothermal heating in Reykjavík, it is necessary to examine gender relations and injustices linked to the use of energy. Women not only mattered as consumers of energy, but also as voters and as managers of household energy use, whose negative views of handling coal and other fuels aided the transition to the geothermal alternative. They needed to be convinced of the geothermal cause, which depended on broad public acceptance and support to refund investments with utility payments.

37 The long-term view on the gender and energy justice implications of residential energy use, however, reveals a divergence between the promise and the reality of geothermal heating. The adoption of geothermal heating indeed changed many things for the housewives. They no longer needed to handle coal and could use the hot water for a variety of household tasks. Yet it also created new problems. Silver cutlery could be damaged by geothermal water and household waste could no longer be burned. And while district heating eliminated energy injustices related to the use of fuels in the utility area, it created new injustices between connected and unconnected districts (and housewives). Those injustices could only be overcome with the gradual extension of the utility to the suburbs between the 1950s and 1970s. Reykjavík's adoption of geothermal heating therefore had many implications for women and did relieve them in their work. Yet it did not by itself amount to a societal liberation of housewives. Geothermal heating did not revolutionize their societal roles but rather reproduced prevailing gender relationships. Housewives remained housewives, and the comforts of geothermal heating did not necessarily reduce the overall workload inside the home. The roles of women as consumers and voters, by which they influenced the geothermal history, need to be distinguished from their role as citizens striving for emancipation. Iceland becoming a model country for gender equality was the result of a broader societal process. Still, gender relations did play an important role in the history of geothermal heating that must not be overlooked.

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The uptake of new domestic energy technology in the 1950s-1960s: how women got involved in France and the Netherlands

Abstract
Access to clean and affordable energy services and technologies is a global concern as stated in global conventions and goals. Different energy needs and interests are identified between men and women. In the search for a just energy transition, the question emerges how to design an energy policy that reflects and needs of energy users. This paper aims to create insights based on a comparative gender analysis of household energy technology uptake in France and the Netherlands in the 1950s and 1960s when the households took up new electrical appliances in their homes. The analysis of this period in France and in the Netherlands shows that women were chosen as the target group in order to make the households' uptake of new technologies and uses successful. Lessons can be learnt from the history of electrification of households' demand in the Netherlands and France that put women at the centre of energy technology adoption in households, given that the uptake of the new technologies and behaviour change required by the current energy transition targets households as homogenous entities.

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Plan of the article

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INTRODUCING THE GENDER AND ENERGY NEXUS

1 This paper focuses on women's role in electrification and uptake of new energy household technology in France and the Netherlands in the 1950s and 1960s. To analyse the observations made in this historical perspective paper, we use gender analysis of the gender-energy nexus research rooted in development studies with empirical data mainly from the Global South. The clean cooking debate is an example of this type of research in a Global South context. Post-world war, electrification of the home was a promise to relieve women's burden in their everyday life referring to the same arguments as those framing the clean cooking debate in the Global South today. Gender approaches are developed and applied to analyse unequal access to energy and to reveal injustices in energy policy and programmes.

2 Considering free market economy and non-discrimination law, policymakers make the assumption that industrial countries have gender-neutral energy policies. In the definition of Khamati-Njenga and Clancy, a gender-neutral energy policy is based on the assumption that a good policy, programme or project will benefit women and men equally in meeting their practical needs. However, the few scientific publications on gender and energy policy in the North conclude the opposite.[1] Women and men reveal different preferences for energy policy options, especially when it comes to energy transition and the adoption of renewable energy. Furthermore, energy consumption is not gender-neutral.[2] Purchasing power, preferences, needs and everyday practices and routines are shaped by and shaping norms of social institutions.[3] To involve women in the uptake of new energy technology is essential towards a just energy transition. In order to stimulate women's role as agents in the domestic household energy use, gender should be reflected in the energy policy in order to engender the energy transition.

3 This paper aims to create insights on the role of women in energy transitions based on a comparative historical analysis of household energy through a gender analytical lens. After the Second World War in France and the Netherlands, national energy companies started promoting national energy sources for both commercial and household use. We take an energy systems approach in our perspective, meaning that we make a distinction between the different roles of the different actors in the different phases of the energy chain. We focus on three actors in our analysis: the electricity supplier in France, the manufacturers of electrical appliances in the Netherlands and the households in both countries. Energy transition means in reality that a new energy source is introduced in society often complementary to already existing energy sources[4] and is supported by institutions and public policies, public or private firms and technological supply chains as well as users and social demand.[5] We take the two supplier roles as illustrative for the process. The first one had

1 Joy S. Clancy & Ulrike Röhr, "Gender and energy: is there a Northern perspective?", *Energy for Sustainable Development*, vol. 7, n°3, 2003, 44-49; Joy S. Clancy, Viktoria Daskalova, Mariëlle Feenstra, Nicolò Franceschelli, Margarita Sanz, *Gender perspective on access to energy in the EU*, Study for the FEMM Committee of the EU Parliament, PE 596.816 (Brussels, 2017); Cornelia Fraune, *A gendered perspective on energy transformation* (IPSA World Congress, Poznan, Poland, 2016); Sarah E. Wiliarty, "Gender and energy policy making under the first Merkel government", *German Politics,* vol. 20, n°3, 2011, 449-463.

2 Clancy & Röhr, "Gender and energy: is there a Northern perspective?" (cf note 1); Riita Räty & Annika Carlsson-Kanyama, "Energy consumption by gender in some European countries", *Energy Policy,* vol. 38, n°1, 2010, 646-649; Alain Beltran, "Introduction: Energy in history, the history of energy", *Journal of Energy History/Revue d'Histoire de l'Énergie*, n°1, 2018.

3 Fraune, "A gendered perspective on energy transformation" (cf note 1); Beltran, "Introduction: Energy in history, the history of energy" (cf note 2).

4 Beltran, "Introduction: Energy in history, the history of energy" (cf note 2); Yves Bouvier, "Energy consumers, a boundary concept for the history of energy", *Journal of Energy History/Revue d'Histoire de l'Énergie*, n°1, 2018.

5 Frank W. Geels, "The Dynamics of Transitions in Socio-Technical Systems: A Multi-Level Analysis of the Transition Pathway From Horse-Drawn Carriages to Automobiles

interest in selling its appliances to equip the homes, the second one had interest in educating households in a proper usage of electricity. When electrical appliances penetrated households' homes and transformed their daily energy usage in France in the fifties, Électricité de France (EDF) sent female energy advisors to the households to stimulate the proper use of electric appliances addressing mainly women's needs. The Netherlands used a similar approach to promote the uptake of new energy technologies in households to secure domestic energy demand. Companies like Philips used their marketing of household appliances to stimulate access to electricity and the use of natural gas for heating and cooking. Marketing of these companies considered women as the main target group recognizing their role as the main users of household energy.

4 We aim not only to analyse how energy systems focused on women as agents of change, but also contribute to the current debate on energy transition. Do the lessons learned in the long energy history of France and The Netherlands provide policy recommendations for the recent uptake of new energy technologies? Stimulating more energy efficient energy sources and usages, was supposed to benefit especially the women who are traditionally responsible for household energy. However, traditional policy assumptions that switching to clean and efficient energy sources will save women time and contribute to their empowerment is contested. The European experience in the fifties and sixties when households equipped their homes with electrical appliances to relieve women from their domestic chores, left the question of freedom of choice by women for the equipment and energy sources.

5 We argue that lessons can be learnt from the history of electrification of domestic uses in the Netherlands and France that put women at the centre of energy technology adoption in households, while the uptake of the new technologies and behaviour change required by the current energy transition targets households as homogenous entities. We acknowledge that the two countries have different energy transitions histories and different socio-political contexts. We will focus in this article on two historical periods: the electrification of domestic uses in the 1950s -1960s and the uptake of renewable energy and energy efficiency technology today. At the time of electrification of households' usage in France in the 1950s the energy supplier put in place an organisation based on housewives' councillors who addressed the concerns of women. In the Netherlands, housekeeping schools and information campaigns for new household technology targeted women specifically. We see that addressing women as the main household energy user is missing in the current changes in the energy system towards more renewable energies, energy efficiency and sobriety which tends to overlook women as key domestic stakeholders of the current energy transition. We find conceptual anchors in the gender-energy nexus literature to develop our gender analysis for a historical perspective. We argue that the current challenge of how to increase the participation of households in the energy transition towards decarbonisation can be enhanced through the lessons learnt in the previous energy transition towards electrification.

6 The remainder of this article is divided into three parts: the first theoretical part introduces gender analysis of energy technology uptake by describing the needs-based approaches. The second comparative historical part is dedicated to a gender analysis of the historical uptake of new energy technologies in both France and the Netherlands. Two interviews were conducted with a key respondent in both countries to verify our findings from the literature review. Finally, we conclude on the lessons we can learn from both European countries to compare with the specificities of the gender roles in the current energy transition.

THE NEEDS OF FEMALE ENERGY USERS

7 In energy history, consumers are less studied than energy consumption, while differences of consumption patterns between consumers can

(1860-1930)", *Technology Analysis and Strategic Management*, vol. 17, n°4, 2005, 445-476.

be identified.[6] Gender analysis of interventions of energy transition over time shows a strong emphasis on households as a homogeneous entity, not reflecting the reality of a more fluid and diverse composition of households.[7] In both France and the Netherlands, single female-headed-households are increasing in the last decades due to demographic aging and they have needs and energy consumption patterns that are not considered within the policies.[8] As a consequence, energy transition policies may miss their targets in the end. Very few gender-disaggregated data on energy use are available to inform policymaking and track progress of implementation of interventions.[9] A policy, programme or project failing to recognise that the needs of men and women are different, can be considered gender-blind.[10] The question remains how to design such a policy that recognizes both women's and men's needs for energy services.

8 Over the past two decades, extensive research has shown the interdependencies between gender relations and energy policy targeting domestic uptake of new energy technologies.[11] The energy needs and interests of men are often given higher priority in energy policy than those of women.[12] The needs-based approach is predominantly used in gender and energy research in the Global South but provides equally a conceptual framework to understand energy needs in a Northern context.[13] Women's needs are categorized in a needs-based approach around their triple role in society: as reproducers and family caregivers, as producers and as community members. This results in three corresponding needs categories: practical needs, productive needs and needs to carry out community tasks. A further specification can be made in energy interests. These interests can be grouped in practical interests, meeting practical and productive needs, and strategic interests necessary to participate in society.[14] Table 1 illustrates this categorization of needs and interests with examples of electricity technology uptake from Europe in the 1950s. In needs-based approaches, an energy policy should reflect women's needs in order to enable them to fulfil their reproductive tasks in less labour-intensive and healthier ways.[15] It does not challenge the traditional division of tasks between men and women, but recognizes the needs and interests and calls for designing an energy policy that acknowledges the needs and interests.

9 The needs-based approach reflects the complexity of the energy system by focusing on the use and consumption of energy services. As demonstrated in Table 1, energy is an essential

6 Bouvier, "Energy consumers, a boundary concept for the history of energy" (cf note 4).

7 Clancy & al. "Gender perspective on access to energy in the EU" (cf note 1).

8 Ibid.

9 Ibid.

10 Beatrice Khamati-Njenga & Joy S. Clancy, *Concepts and issues in gender and energy* (Leusden: ETC Netherlands, ENERGIA working paper, 2002).

11 Joy S. Clancy, Tanja Winther, Margaret Njirambo Matinga & Sheila Oparaocha, *Gender equity in access to and benefits from modern energy and improved energy technology* (Leusden: ETC Netherlands, World Development Report Background Paper, 2012); Gunnar Köhlin, Erin O. Sills, Subhrendu K. Pattanayak & Christopher Wilfong, *Energy, gender and development: what are the linkages? Where is the evidence?* (Washington: The World Bank, Policy Research Working Paper 5800, 2011); Sarah E. Ryan, "Rethinking gender and identity in energy studies", *Energy Research & Social Science*, vol. 1, 2014, 96-105.

12 Elizabeth Cecelski, *Rethinking gender and energy: old and new directions* (Leusden: ETC Netherlands, ENERGIA/EASE, 2004); Joy S. Clancy, Margaret Skutsch & Simon Batchelor, *The gender-energy-poverty nexus: finding the energy to address gender concerns in development* (Leusden: ETC Netherlands, ENERGIA, 2002).

13 Cecelski, "Rethinking gender and energy: old and new directions" (cf note 12); Clancy & al. "The gender-energy-poverty nexus: finding the energy to address gender concerns in development" (cf note 10); Clancy & al. "Gender equity in access to and benefits from modern energy and improved energy technology" (cf note 11); Köhlin & al. "Energy, gender and development: what are the linkages? Where is the evidence?" (cf note 11); Shonali Pachauri & Narasimha D. Rao, "Gender impacts and determinants of energy poverty: are we asking the right question?", *Current Opinion in Environmental Sustainability,* vol. 5, n°2, 2013, 205-215; Jyoti K. Parikh, "Gender issues in energy policy", *Energy Policy,* vol. 23, n°9, 1995, 745-754

14 Clancy et al. "The gender-energy-poverty nexus: finding the energy to address gender concerns in development" (cf note 12)

15 Clancy et al., "Gender equity in access to and benefits from modern energy and improved energy technology" (cf note 11).

	Women's needs and interests		
	Practical needs	Productive needs	Community tasks
Energy Form	*Practical interests*		*Strategic interests*
Electricity	- Improved comfort and personal hygiene: hot water at home and heating - Domestic burden relief: use of washing machine, vacuum cleaner - Improved working conditions at home: lighting	- Increased possibility of activities during evening hours - Provided refrigeration for food production and sale - Power for specialised enterprises	- Street lights made streets safer allowing participation in other activities (e.g. women's group meetings) - Opening horizons through radio, TV and telephone

Table 1: Examples of electricity uptake in the 1950s addressing women's needs and interests using the needs-based approach
Source: based on Clancy, Skutsch & Batchelor, "The gender-energy-poverty nexus: finding the energy to address gender concerns in development", 2002 (cf note 12), examples own source.

source for food production and storage, (hot) water supply, lighting and housekeeping. With the extension of the electricity grid and the gas connections in France and the Netherlands, different kind of companies reached out to women and involved them in the decision making in the uptake of technologies, as explained in the next section. Practical interests were served when electricity became more affordable, technological interventions created household appliances and economic welfare provided the financial means to purchase those appliances to ease the burden of everyday time-consuming household tasks, like washing. The extension of electricity and natural gas network provided a cleaner and cheaper energy source for women to cook and heat their homes than the polluting biomass like coal and firewood they used before.[16]

10 Although women's practical energy needs might be met by the accessibility of energy services, the question is whether the strategic interests of female energy users are recognised by energy suppliers and other actors in the energy system. The history of energy system changes shows an evolution in the way women's needs and interests were taken into consideration in history. The 1950s and 1960s illustrate that it was possible to specifically target women in the uptake of domestic energy technology because of the behaviour changes required at home. The oil crisis in the 1970s places the energy policy at the technocratic level despite some energy saving campaigns. But since then, the education campaigns are gender neutral as illustrated by the ongoing energy transition. The needs-based approach lacks the enforcement tools to ensure a policy design that acts upon the identified needs. In search of an approach that can be used to integrate end-users' needs in an energy policy, recognizing needs of energy users emerged in gender and energy analytical frameworks.

INVOLVING WOMEN: ENERGY SYSTEM CHANGES IN FRANCE AND IN THE NETHERLANDS

11 In this section the electrification history of households' uses in France and in the Netherlands are described using a gender lens. We identify how women's practical, productive and community needs as domestic energy users are recognised in the energy interventions promoting demand electrification. The uptake of electricity and electrical appliances was aimed not only to benefit women but more generally to the benefit of welfare, economic development and utilities.[17] Over the years, new issues appeared in household energy policy

16 Cynthia Cockburn & Ruza Furst-Dilic, *Bringing technology home: gender and technology in a changing Europe* (Buckingham, United Kingdom: Open University Press, 1994).

17 Ibid.

such as decarbonisation and energy efficiency to address climate change impacts. Societies have been constantly experiencing energy transitions, in the understanding of energy system changes. In the 1950s and 1960s, electrification and the uptake of electrical appliances to facilitate housekeeping by households have been a key turning point in the economic and social development of Europe. The current energy transition towards decarbonization represents a steppingstone to tackle pressing issues such as access to clean and affordable energy for all citizens and reduce energy consumption through energy efficiency and sobriety/conservation. In order to be just, the current energy transition has to be inclusive and 'leave no one behind', as expressed in the Green Deal of the European Union[18]. The needs-based approach in gender analysis is instrumental to reveal the needs of different energy users and the role of different energy actors, like suppliers and manufacturers, in the energy system to recognise and address those.

12 Geels' investigation of the transitions (2005) shows that socio-technical system changes require an alignment of different elements to penetrate the existing socio-technical regime. The European energy sector has been through different transformations and crises over time. Starting from the electrification at the beginning of the 20th century based on hydropower and coal, the discovery of oil and gas in the North Sea at the end of the 1950s ignited another energy shift. The 1970s was characterised by the use of nuclear in the production of electricity in France and the oil crisis. The current energy transition aiming at switching the system form fossil fuels to low carbon energy sources. However, the transformation in the supply side also requires adjustments of the demand side.[19] Technologies are not the only drivers of these changes. Changes are also driven by the interests of different actors in the system, by the energy policies and also by the needs of society, including those of women.

18 European Commission, *The European Green Deal,* COM (2019) 640 final (Brussels: EU, 2019).

19 Vaclav Smil, *Energy Transitions: History, Requirements, Prospects* (Santa Barbara: Praeger/ABC CLIO, 2010).

Supply side actors: targeting women's demand for energy

France and the Netherlands were undergoing 13
strong societal changes through the electrification of domestic usages in the 1950s – 1960s. Electric appliances were made available to improve household welfare and specially to relieve women from burdensome household chores. Women were therefore targeted to take up new domestic equipment in their kitchen and adapt their behaviour to new energy uses. Where EDF, the French energy supplier – which was nationalised at that time – was the main actor of this process to help women to use their new appliances and electricity properly, the appliances manufacturers were at the forefront in the Netherlands in close collaboration with energy suppliers to stimulate domestic energy use.

The "fée electricity" (electricity fairy) is a note- 14
worthy gendered symbol in France of how electricity promised well-being and modernity to women and was associated with their emancipation.[20] As early as the end of the 1920s electrical devices slowly start penetrating the homes. Hot water from the tap as well as "vacuum cleaners and small appliances"[21] relieved housewives who could afford these appliances from burdensome chores. The electrification of the French homes required to boost the uptake of new electrical appliances and adjust energy consumption practices. The process started rather slowly. In the mid-fifties less than one household in ten had a refrigerator or a washing machine. In 1960, 25% of the households were equipped with a refrigerator and a washing machine. The sixties saw an acceleration in the investment of households in refrigerators, washing machines or vacuum cleaners and televisions.[22]

20 Bruno Foucart, "Les représentations de la femme électricité au temps des expositions universelles ou les métamorphoses d'une fée 1889-1937", *Bulletin d'histoire de l'électricité*, n°19-20, 1983, 7-20.

21 Françoise Werner, "Du ménage à l'art ménager: l'évolution du travail ménager et son écho dans la presse féminine française de 1919 à 1939", *Le Mouvement social*, vol. 129, 1984, 74.

22 Evelyne Renaudat, "La consommation domestique de 1950 à 1980", *Recherches et Prévisions*, n°18-19, 1989, 23-25.

15 Incentives and education were provided by the state and the market so that society and especially women, could adopt the new technologies and adjust their behaviours[23] and transform the traditional domestic behaviours.[24] The electrification of households' demand in France had to benefit all households and all members of the households. Since the introduction of electric household appliances mainly targeted the kitchen and aimed at easing the domestic chores, women had a key role to play in the uptake of the new technologies. As main user of electrical households' appliances in the home, women had high expectations on how this electrified equipment could make their life more comfortable.[25] But how to encourage women to change their habits related to their everyday domestic chores (heating water, bringing wood or coal to heat the stoves, hand-washing clothes etc.)?

16 Against this background, the French national energy supplier, EDF, stepped in and started developing the education of women in order to inform them on the proper use of electricity when equipped with electric household appliances in the 1950s. To achieve this task EDF created the position of housewives' councillors within the departments of the company as early as 1953. The company recruited women in the main distribution centres of the company and trained them to deliver knowledge about the company and the technical side of electricity (connections, energy tariffs etc.) as well as know-how on the use of electric household appliances. The company had up to 109 housewives' councillors among its staff between the 1970s and the 1980s following up the evolution of the electric household appliances and the changing practices (from hot water heaters and electrical stoves to washing machines and deep freezers in the sixties and the dish washers and dryers in the seventies).[26] Because of the quick evolutions of the technologies, housewives' councillors were offered continuous training to be kept up to date as confirmed by our interviewee who started as EDF housewives' councillor in 1954:

> "Every year we [housewives' councillors] also attended the Home Exhibition and training was offered to us for a week, we were also invited by manufacturers that wanted to show us their new appliances."

17 In the Netherlands, economic development, technological innovations and household welfare are the characteristics in the decades after the recovery of WWII in the Netherlands.[27] As mentioned by our Dutch interviewee, an expert in domestic history and housekeeping practices,

> "Owning household appliances, like washing machines and refrigerators, was an indicator of welfare and social status. It implied a relief of everyday drudgery of housewives and women working as professional cleaners and food processers, like employed housemaids."

18 The uptake of new appliances was enabled by different interventions both by the government and the market. The main actors in this Dutch process were the electric appliances manufacturers. Illustrative is the introduction of refrigerators in the Dutch homes. The Dutch law for liberation of retail establishment (*Vestigingswet*) from 1961 created the possibility for all retailors to sell dairy products. If supermarkets wanted to compete with the door-to-door retailors with dairy, it became necessary for households to refrigerate their food they would buy in bulk from supermarkets. Therefore, Albert Heijn, one of the leading supermarkets in the Netherlands, created a saving system for their customers and closed a deal with an appliance provider to enable households to buy a refrigerator with a discount, which was at that time the price of

23 Robert L. Frost, "Machine liberation: inventing housewives and home appliances in interwar France", *French historical studies*, vol. 18, n°1, 1993, 109-130.

24 Alain Beltran & Patrice Carré, *La vie électrique. Histoire et imaginaire (XVIIIè-XXIè siècle)* (Paris: Belin, 2016).

25 Danièle Faure, "La conseillère ménagère à EDF", *Bulletin d'histoire de l'électricité*, n°19-20, 1992, 199-213.

26 Ibid.

27 Ruth Oldenziel & Carolien Bouw, *Schoon genoeg. Huisvrouwen en huishoudtechnologie in Nederland 1898-1998* (Nijmegen, The Netherlands: SUN, 1998).

a month salary. In 1962 only 19% of the Dutch households had a refrigerator; ten years later this increased to 88%. The uptake of vacuum cleaners went even faster, 3% of the households owned one in 1957, while in 1964, 96% of the households owned an electric vacuum cleaner.[28]

19 The appliance that brought the most relief for women in daily drudgery is the washing machine. The family laundry would take women roughly two days' work every week (as reported by Dutch interviewee). Despite the much-needed support and ease of this time-consuming work, the first imported washing machines were extremely expensive, equalling almost two-month salaries.[29] An option offered by the appliances stores in the Netherlands was the possibility to lease a washing machine. If a couple of neighbours would share the costs, a leased washing machine was in reach of women from the working class. A Dutch plumber developed the Bico washing machine, more affordable than the American-imported Hoover.[30] Demonstration shows and cabaret performances were organised in the local theatres and community halls, to introduce and learn this new technology to the housewives with a separate meeting for their husbands to arrange payment schemes.[31]

Demand side actors: women talking to women

20 In the education and information campaign promoting the uptake of new energy technology in the 1950s and 1960s, we observe a similar approach in both countries; housekeeping schools played a key role to teach women how to use the new appliances and the energy properly. In addition to involving housekeeping schools, EDF in France gave a key role to housewives' councillors as part of EDF staff. EDF recruited and trained women to occupy the positions of housewives' councillors. The EDF housewives' councillors were ensigned with two missions as described below.

21 First, they were responsible for training female teachers from the housekeeping schools for girls that educated girls to become good housewives, who were then granted a recognized degree (CAP d'Arts ménagers). Attending these schools for all girls was made mandatory by a law in 1942 but the schools dated back to the end of the 19th century.[32] In the sixties, these schools adapted to the societal evolution and focused more on the education of the consumers, including the users of electricity and gas and of electric household appliances. As early as 1953, EDF signed a partnership with companies manufacturing electric household appliances and created training centres dedicated to the teachers from the housekeeping schools so that they could test the new appliances. The main aim of EDF training centres was to show teachers of housekeeping schools how to use the new kitchen equipment and how the new electric devices could improve the life quality of women and their satisfaction when using these new devices.[33] Housekeeping schools and their teachers were expected to have a multiplier effect on the diffusion of information regarding the proper of electric household appliances and electricity in the homes.

22 The second mission of the housewives' councillors was to welcome visitors in the distribution centres and inform them about the new energies and equipment, while showing them around the exhibitions. The housewives' councillors would also organise home visits and home conferences, especially in remote rural areas in order to encourage women to use electricity properly.[34] This practice was based on the experience in Sweden in the thirties to support rural electrification.[35] As quoted by the French interviewee:

28 Annegreet van Bergen, *De goede jaren: hoe Nederland in een halve eeuw steeds welvarender werd* (Amsterdam: Atlas Contact, 2018).

29 Annegreet van Bergen, *Een (ongewone) geschiedenis van doodgewone dingen* (Amersfoort: Historisch Nieuwsblad, 2019).

30 Ibid.

31 https://www.haagshistorischmuseum.nl/tentoonstelling/de-spinazieacademie-125-jaar-haags-huishoudonderwijs

32 Joël Lebeaume, *L'enseignement ménager en France. Sciences et techniques au féminin, 1880-1980* (Rennes : Presses Universitaires de Rennes, 2014).

33 Faure, "La conseillère ménagère à EDF" (cf note 25).

34 Ibid.

35 Sven-Olof Olsson, "Le ménage électrique et la « libération » des femmes suédoises", *Bulletin d'histoire de l'électricité*, n°19-20, 1992, 249-260.

> "in cooperation with the EDF commercial agent, we had a van equipped with a facsimile of a kitchen and went to all rural exhibitions at the end of the summer, when local people had the money from the harvest and were able to invest in the improvement of their homes and kitchens or of their farms with water pumps for example, and this was all made possible thanks to the electrification of the countryside."

23 Although they were not selling any electrical devices, they were advising women on the use of the right appliance adapted to their needs, on the electrical consumption of the devices and on their rational usage. Such advice could be delivered during home visits especially in social housing in urban areas or in rural areas. They then explained to housewives what electricity was for, how it was metered and billed, how to use electricity properly and how to adjust their behaviour to this new technology in order to improve their comfort at home and their satisfaction.

24 The role of "these women talking to women" (French interviewee) gradually disappeared by the end of the eighties when the domestic sphere and the support of the uptake of electrical appliances was no longer the focus of the EDF company. By the end of the eighties communication and public relations were given priority over the domestic sphere, which transformed the role of the housewives' councillors from educating women to more commercial and communication positions.[36] However, the history of housewives' councillors at EDF shows how women were targeted in their role of agent of change within the household consumption practices, in their role as decision maker regarding the household purchases of equipment and in their role of main energy users in the management of households. The diffusion of affordable electricity together with the development of cost-effective electric household appliances were combined with bank credit systems that allowed households to upgrade their homes and kitchens. Such a conjunction of factors created a lot of expectations among women to improve their daily life. The electrical usage helped women meet their practical needs through better lighting at home, easier cooking, facilitating domestic chores and saving time, while it did not modify the gender-balance among the household.[37] The time spent on the domestic chores may have diminished but the time saved was used for diversifying domestic tasks and looking after the children.[38]

25 In the Netherlands, the information campaigns for the uptake of new energy technologies in the 1950s was a joint effort of energy supply actors and the housekeeping schools. A unique role in the Dutch history is assigned to the housekeeping schools (*huishoudscholen*). These girls-only vocational training schools were established in 1888 and quickly spread through the country to become one of the main vocational educational institutions for girls after WWII until they disappeared in the 1970s. The housekeeping schools were founded to educate those that were responsible for cooking food and cleaning in households: girls as potential housewives and housemaids. After the WWII, fewer households had staff for their housekeeping. Nevertheless, the housekeeping schools remained popular. The modern household technology was considered as too technical and complex to be taught from mothers to daughters.[39] In the academic year 1976-1977 there were 629 housekeeping schools registered in the Netherlands with a total of 209.000 students (all girls).[40] New technologies, such as cooking on gas stoves, and using microwaves, vacuum cleaners and washing machines, were taught and salespersons of producers gave demonstrations and guest lectures.[41]

36 Faure, "La conseillère ménagère à EDF" (cf note 25).

37 Clancy, Skutsch & Batchelor, "The gender-energy-poverty nexus: finding the energy to address gender concerns in development" (cf note 12).

38 Olsson, "Le ménage électrique et la « libération » des femmes suédoises" (cf note 35).

39 Oldenziel & Bouw, *Schoon genoeg* (cf note 27).

40 https://www.digibron.nl/viewer/collectie/Digibron/id/498dbe3094fe9dc9c75542d968e324c0

41 Els Kloek, *Vrouw des huizes: een cultuurgeschiedenis van de Hollandse huisvrouw* (Amsterdam: Balans, 2009)

26 The feminist movement was a strong advocate for this educational opportunity for girls since it improved their possibilities to find a better position as a housemaid.[42] Women's groups advised housekeeping school on their curriculum and their members were frequent guest lecturers or even employees. One of the most influential women's organisations (*Nederlandse Vereniging van Huisvrouwen*, NVVV) was founded in 1912. They served as a trade union and formal representative of housewives and household labour both in corporate and political decision-making processes. Unique is their authority as certifier of household appliances. In close cooperation with designers and manufacturers, they advised on design, use and safety of household appliances. Their certificate "approved by the NVVV" is used extensively in marketing campaigns and promotion of many new household appliances that entered Dutch households in the last century.[43]

27 Despite the initial support of the feminist movement of the housekeeping schools, in the 1950s feminists criticized that the housekeeping schools supported the traditional cultural belief in the stereotypical Dutch breadwinner-model: the man works fulltime outside the house in a paid profession and his wife takes care of the housekeeping and raising the children.[44] The housekeeping schools professionalised housekeeping, without the financial independency and empowerment if women would work outside the house. This traditional cultural belief is among the reasons why the Netherlands has one of the lowest participation of women in the workforce within the EU and the popularity of part-time positions for women.[45] During the economic boost of the 1950s, women were discouraged from entering the workforce. On the contrary, the social status of families was decreased when the woman had to work, implying that the husband was not able to provide for his family.[46] This breadwinner-model is still persistent, with the average workweek being 36 hours for men and 26 hours for women.[47]

28 The educational and information campaigns in France and Netherlands both demonstrate how women were effectively targeted as energy users in households in the decades after WWII. Their role as housekeepers and managers of domestic energy use was recognised. Their needs to reduce the drudgery of time- and manual labour-intensive household tasks were acknowledged through rapid innovation and widespread introduction of household appliances. As Winther et al. (2020) demonstrate, appliances are highly gendered, demonstrating unequal power relations between men and women over purchase, use, custody and decision-making. They contest the assumption that the availability of appliances reduces women's drudgery to save their time, providing the opportunity for education and empowerment. It is however an enabling factor for women's empowerment and participation in society but it is not challenging socio-cultural gender relations, as was already addressed by Dutch feminist movements in the 1950s.[48]

The role of policy: are women becoming invisible in the current energy transition?

29 The deployment of electrical appliances in French and Dutch homes represents a striking example of how female needs were taken into consideration and addressed. At that time, they were acknowledged as stakeholders in the decision-making process at households' level. We observe in the current energy transition discourse an invisibility of women and the gendered needs. Women are not targeted, not involved, not addressed and current energy policies are not recognised their needs and as a result energy

42 Ibid.
43 Oldenziel & Bouw, *Schoon genoeg* (cf note 27).
44 Joke Kool-Smit, "Het onbehagen bij de vrouw", *De Gids*, vol. 9/10, 1967, 267-281.
45 EIGE (European Institute for Gender Equality), *Gender Equality Index 2017 - Measuring gender equality in the European Union 2005 -2015*, 2017 (**http://eige.europa.eu/gender-equality-index**).
46 Kloek, "Vrouw des huizes: een cultuurgeschiedenis van de Hollandse huisvrouw" (cf note 41).
47 Centraal Bureau Statistiek, *Verschil arbeidsdeelname mannen en vrouwen weer kleiner*, 2019. **https://www.cbs.nl/nl-nl/nieuws/2019/03/verschil-arbeidsdeelname-mannen-en-vrouwen-weer-kleiner.**
48 Kool-Smit, "Het onbehagen bij de vrouw".

policy are gender neutral.[49] In this section, we identify how women and their energy needs become invisible in the current energy system change in the Netherlands and in France.

30 Today the energy transition aims at decarbonising the supply side, at reducing energy consumption and decreasing the CO2 emissions. This is the new frame shaping the evolution of the socio-technical systems in both countries. The context of the twenty first century is undoubtedly different from the history of electrification of the households' practices in the 1950s and 1960s. It is no longer a matter of equipping the kitchen, but rather wider behaviour changes ranging from taking up new energy technologies, such as renewable energies and smart meters, to the fabric of the building (insulation, retrofitting) and to reduce energy consumption in the homes (buying energy efficient equipment, changing practices and behaviours, saving energy). We argue that unlike the electrification of domestic usages in the fifties and sixties, the current policy overlooks the role of women as agent of change in the urgent changes required.

31 A study carried out on the perception of the energy transition by the French showed a clear distinction between men and women: 79% of women considered that France should be more committed in the climate change policy, 87% of women thought that France should make more efforts towards energy saving, 78% of women prioritise investment in renewable energies.[50] Similar surveys in the Netherlands observed the same gendered difference.[51] Although these studies show a greater awareness of woman towards climate and energy transition issues, women' participation or recognition as decisionmakers in the energy transition is still limited. In 2017, 27.2% of energy jobs in France are occupied by women according to UFE[52] revealing discrepancies between men and women in the choice of education, professions but also wages despite incentives from the ministry of education and the ministry of gender equality. The Dutch government implements a combination of financial incentives and information campaigns to stimulate energy efficiency for home-owners through tax benefits and retrofitting subsidies aiming at zero-emission households and all-electric households to outsource the use of natural gas.[53] These policy interventions target homeowners or households, without acknowledging the diversity of households and the energy needs and rights of the individual household members.

DISCUSSION

32 The examples of the domestic energy technology uptake in France and in the Netherlands in 1950s and the 1960s, illustrate how women were targeted in order to make the electrification successful. This is a key lesson to draw for the current energy transition. The current energy system transformation requires an uptake of new energy technologies and a change in consumption behaviour to reduce the use of energy. Indeed, the decarbonisation of energy is a source of new technologies that need to be adopted by households. Energy policy design and implementation remain gender-blind, assuming that they benefit both men and women equally. However, the decisions are dominated by male professionals following the traditional segmentation of the labour market between technical male jobs and non-technical female jobs.[54] Even if the

49 Clancy & al., "Gender perspective on access to energy in the EU" (cf note 1); Mariëlle Feenstra & Joy S. Clancy (eds.), "A view from the North: gender and energy poverty in the European Union", *Engendering the Energy Transition* (Basingstoke: Palgrave Macmillan, 2020).

50 Heinrich Böll Stiftung, *Le rapport des français à l'énergie* (France : Une étude Harris Interactive, 2017).

51 Joy S. Clancy & Mariëlle Feenstra, *Women, gender equality and the energy transition in the EU*, Study for the FEMM Committee of the EU Parliament, PE 608.867 (Brussels 2019)

52 https://ufe-electricite.fr/actualites/edito/article/l-energie-une-histoire-d-hommes-et-de-femmes.

53 Ministry of Economic Affairs and Climate Policy, *Integrated National Energy and Climate Plan 2021-2030* (The Hague, The Netherlands, 2019).

54 Elizabeth Allen, Hannah Lyons & Jennie C. Stephens, "Women's leadership in renewable transformation, energy justice and democracy: redistributing power", *Energy Research & Social Science*, vol. 57 (101233), 2019, 1-11; Clancy & Feenstra, "Women, gender equality and the energy transition in the EU" (cf note 51).

renewable energy sector attracts more female employees than the traditional energy sector, they are still employed in positions with little decision-making responsibility, indicating a failure in recognizing unequal gender relations in the energy system and in the influence of women in policy-making decisions.[55]

33 Men are considered as the main decision-makers regarding the maintenance work at home leaving the women in the "routine reproductive" activities aiming at reducing energy consumption.[56] Motivations of women to participate in energy transition, e.g., saving the future generations, green responsibility, producing well-being at home, etc., are different from those of men, who tend to be more interested in energy efficient technology for innovation motivations and saving on energy expenditure.[57] That is also the reason why women can act as key drivers of innovations within the households to make the use of energy greener and more efficient in the home, thus serving their needs (improving the environment), interests (reducing the energy bills) and capacities (using a variety of technologies from low tech to high tech, including apps). Linking a gendered preference to energy sources, like women prefer renewable energy, requires systematic academic studies and are highly contextual.[58]

34 The first challenge towards engendering the energy transition concerns the lack of disaggregated-data on women's needs regarding access to adequate energy services. Such data would help decision makers recognize that women have different energy needs than men due to different economic, social or biological situations. Disaggregated data would contribute acknowledging that there is not *an* energy consumer but rather energy consumers.[59] Data on energy needs and access should be gender disaggregated to allow a better knowledge of these specificities. Without this first step, women's energy needs won't be recognized as a policy object and won't be put on the policy agenda.[60] It also requires acknowledging the fact that women have lower income than men and therefore face financial obstacles when it comes to invest in energy efficient appliances, retrofitting measures and/or renewable energies. Policy interventions, such as special tariffs and subsidies, should account for gender differentiations to ensure a just and inclusive energy transition. This also implies recognizing that women are more vulnerable to energy poverty and that energy efficiency measures and renewable energy programmes should target them to allow them to reduce their energy consumption and costs.

35 The second obstacle for a more gender just energy transition refers to the limitations of the current enabling framework to allow women to be part of the energy transition. As shown by the energy communities, participation of women is very limited because of the lack of time they have due to other tasks they have to carry out at home. In the Netherlands, social housing cooperatives invest in refurbishment of their housing stock and try to encourage the participation of tenants in stakeholder meetings and training of energy efficiency measures at home. Women rarely volunteer to participate in such meetings.[61] Besides the lack of available time, women often have the feeling that they don't have the adequate technical knowledge and as such consider that they are not legitimate to join these meetings.[62] Even energy communities, that are rec-

55 Clancy & Feenstra, "Women, gender equality and the energy transition in the EU" (cf note 51).

56 Saska Petrova & Neil Simcock, "Gender and energy: domestic inequalities reconsidered", *Social and cultural geography,* 2019, 1-19.

57 Nynke Tjalma, *Welke componenten van campagnes over energiebesparing zijn het meest effectief* (Amsterdam: AlphaOne, 2016)

58 Bouvier, "Energy consumers, a boundary concept for the history of energy" (cf note 4).

59 Ibid.

60 Clancy & al. "Gender perspective on access to energy in the EU", 2017, (cf note 1); Clancy & Feenstra, "Women, gender equality and the energy transition in the EU" (cf note 51).

61 Koen Straver, *Rapportage Energiearmoede: effectieve interventies om energie efficientie te vergroten en energiearmoede te verlagen* (Amsterdam: ECN-E—17-002, 2017).

62 Karina Standal, Marta Talevi, Hege Westskog, "Engaging men and women in energy production in Norway and the United Kingdom: The significance of social practices and gender relations", *Energy Research and Social Science,* vol. 60 (101338), 2020, 1-9.

ognized as being more open and approachable for community members, are far from showing gender equality. The lack of disaggregated date on their member profiles is a first challenge but on the other hand, women still face issues with their time management, financial restrictions but also their own self-imposed limitations and women do not express their voice in the matter of energy transition. They don't claim their participatory rights.

36 More generally, systemic factors, such as the institutional and political arrangements underpin the organisation of the energy sector. The permanence of business-government-consumer relations result in limited recognition of women's energy service needs and therefore the lack of adequate inclusive policies. It is not only a matter of equal energy access but more a matter of how to promote equal possibilities for each individual to guarantee a healthy and comfortable functioning in the daily life by ensuring the adequate level of energy services meeting their individual needs. The current political discourse of just transitions shows the necessity to guarantee participation, empowerment and choices of all in energy decision making at different levels, from households, to communities to national and EU policy making as well as ownership of energy production units by prosumers. Energy becomes an essential condition to allow the development and the achievement of other rights.[63] Hence, energy intervention needs a gender focus to go deepen the understanding of women as energy users in households and communities.

CONCLUSION

37 This paper analysed the uptake of electrification and the access to energy in households through a gender lens. Women as household managers receive little attention in current energy transition policies and their potential as change agents to scale up and implement energy efficiency measures in households is invisible. Given the ambition of national governments to comply with international conventions to provide clean and affordable energy to all citizens, the scholarly debate on just energy transitions gains momentum for integration in energy policy. The needs-based approach illustrated in table 1, demonstrates the relevance of gender approaches in energy policy promoting the domestic uptake of energy technology to meet practical, productive and strategic needs of energy users.

38 Despite their origins from empirical research in the Global South, the applicability of gender analysis of introducing new energy technologies resonate with the electrification process and access to energy for households in the Global North during the decades after the WWII. France and the Netherlands were chosen to illustrate the uptake of electrical appliances and uses in this discussion paper. They developed different pathways for the uptake of domestic electrical usages, yet both targeted women as household energy managers. Marketing campaigns, education and training, even home visits were used to promote the new technologies and the use of electricity. This historical example is not proceeded in the current promotion of energy technologies, such as retrofitting, energy efficiency measures, deployment of domestic renewable energies, smart meters and energy communities. The current energy transition has a male-oriented focus with limit recognition of women's energy needs. More research in different countries and including the uptake of different energy technologies for domestic use, could strengthen our hypothesis that there are essential lessons to learn from energy transitions in the past to be included in the current energy transition.

39 The elements of the current energy transition that entails consumption behaviour change at home are lacking the involvement of women. Because of their domestic role, women spend more time at home and therefore are more dependent on energy services which should give them a voice in the domestic energy choices. Since the uptake of renewable energies at domestic level as well as the energy efficiency and energy saving pillars

63 Stephen R. Tully, "The contribution of human rights to universal energy access", *Northwestern Journal of International Human Rights,* vol. 4, 2006, 518-548.

of the energy transition need to be promoted, women can be considered as key agents of change since they are still managing the domestic chores of the households despite the slight evolution of the distribution of roles between men and women. However, this gender aspect seems to be overlooked in the current information and promotion campaigns focusing on "households" rather than on specific members of households, thus illustrating the gaps left by the disappearance of the housewives' councillors. Involving both women and men in the uptake of domestic energy technology, could contribute to a more just energy transition in which 'no one is left behind' when promoting access to clean and sustainable energy sources.

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The breakthrough of the 21 degrees culture in Denmark. Undoing and doing gender in Danish home making after 1945

Abstract

The energizing of Danish homes after World War II introduced a new heating culture, which paved the way for new lifestyles. Modernist architects tried to implement the dwelling as an 'objective' or non-gendered space – in contrast to the Victorian home - or at least they pursued the possibility of freeing the housewife from her hard work of maintaining the home and thereby encouraging a more individual lifestyle. However, as I will show, the process of energizing Danish homes after WWII did not comply with this vision. Everyday life changed and so did gender roles, but the home did not turn into an 'objective' space.

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Plan of the article

INTRODUCTION

1 After World War II, in Denmark, the most pressing social problem was a substantial lack of modern dwellings. Consequently, the state launched a program supporting the construction of single-family houses and social housing stock. This gave rise to considerations of how to design the future home. Architectural competitions, newspapers, magazines, professionals, and energy companies all communicated their view on the home of the future to be built in the emerging suburban areas. They all agreed upon the need for energizing the modern home with central heating as one of the most important innovations and it paved the way for the establishing of a 21 degrees culture in most Danish homes.

2 Central heating based on fossil fuels (and from the 1960s, district heating) replaced the traditional hearth, and radiant heat was replaced with a constant and equable heat in all rooms. Central heating paved the way for a different way of designing the home and its separate rooms, i.e., it initiated a new lifestyle. Cold zones disappeared, furniture could be placed without considering the location of the source of heating, light textiles such as cotton became popular, etc. Gender-specific conditions, roles, wants, demands, wishes, and perceptions of the 'good life' influenced the framing of those radical changes of everyday life. Modernity and being modern – i.e., the continuous quest for improving the 'good life' - constituted the core of the discourses related to these changes and, mostly, these discourses were strongly gendered.

3 In this article, I will discuss the 21 degrees culture, the new lifestyle, the main actors, and the gendering of the energizing of Danish homes. Modernist architects, who in many ways framed the new and energized home after WWII, tried to implement the dwelling as an 'objective' or non-gendered space – in contrast to the Victorian home - or at least they pursued the possibility of freeing the housewife from her hard work of maintaining the home.[1] However, as I will show, the process of energizing Danish homes after WWII did not comply with this vision. Everyday life changed and so did gender roles, but the home did not turn into an 'objective' space.

THE CULTURAL TURN

4 In 1945, Europe was torn apart, but hope soon prevailed. Parts of Europe were in chaos, while countries like Denmark had come through a period of considerable adversity with fewer costs. The reconstruction of the West European countries, however, paved the way for a spectacular change in living conditions for ordinary people and in particular for the middle classes. Fossil fuels are indispensable to the narrative about this enormous and complex change.[2] A historical account of the triumph of fossil fuel cultures and a new heating culture must reflect the complexity of everyday life but also the transformation of the presence of energy from a visible materiality involving strenuous work – for instance coal – to something invisible, immaterial and without the need for the end user to perform any kind of work to get the right temperature. The transformation of domestic life produced new opportunities particularly beneficial to women.

5 In order to address this challenge, it is illuminating to have the cultural turn as a point of departure. Only recently, this turn has found its way into energy history by looking for systems of representation and different rhetorical strategies or voices in the source material. Those readings (see below) are of relevance not only when, for instance, digging into energy companies' efforts to sell their products and to convince potential customers to sign up to a modernization of their lifestyle and consequently of their way of heating,

1 Lynne Walker, "Home Making: An Architectural Perspective", *Signs*, vol. 27, n°3, 2002, 827; Claus Bech-Danielsen Claus, *Moderne arkitektur – hva' er meningen?* (Aarhus: Systime, 2004).

2 Bo Poulsen, Mogens Rüdiger, "The 1950s syndrome and Danish energy consumption and production", *in* Finn Arler et al (eds.), *Ethics in Danish Energy Policy* (London: Routledge, 2020).

but also when reading spatial plans, architectural layouts, advertisements, etc. The modern way of life is unthinkable without a sizeable and continuous consumption of energy because it reduces the impact of natural conditions of existence like heat, cold and darkness. Energy use has mitigated these menaces. Buildings maintain, for instance, a comfortable temperature of 21 degrees Celsius by use of either air-conditioning or heating, and light is turned on whenever needed.[3]

6 In particular, the cultural turn in energy history is an emerging field in the USA, France and Germany. David E. Nye's seminal authorship offers a broad social and cultural history of how electricity transformed American culture. Technology is the main driver in creating modern lifestyles and all the opportunities and conflicts related to modernity.[4] Two more recent books are less interested in technology. In *Routes of Power*, Christopher F. Jones convincingly argues that energy infrastructures, not the fuel in itself, facilitates the abundancy of cheap energy with a fossil fuel-based, energy-intensive culture as a consequence.[5] In *Carbon Nation*, Bob Johnson demonstrates how fossil fuels "remade the material and cultural conditions of life."[6] By looking at fiction and films as well as works by big energy's progressive critics and the energy industry's own efforts to vaunt the use of fossil fuels, Johnson explores how the nation became dependent on fossil fuels. Both Barrett and Worden and Wilson, Carlson and Szeman present a number of historical narratives about how oil has shaped modern life, economy and culture using films, fiction, and other cultural products.[7] In contrast to this article, the two volumes focus more on revealing how cultural products represent the fossil fuel cultures rather than shedding light on the creation of them.

7 For many, politics, technology and culture are closely connected. For good reason. Möllers and Zachmann provide a number of innovative studies of how energy has materialized in technical systems, in culture and in consumer practice.[8] Likewise, Oldenziel and Zachmann illuminate the role of the kitchen in shaping contemporary Western society as a space where the Cold War is embodied in the domestication of new technology, in gender issues, and cooking, etc.[9]

8 In this context, however, the contributions of Loehlin and Gerber are of special interest, where they discuss modernity and gender as the *Wirtschaftswunder* or the welfare state as materialized in the home.[10] My main source of inspiration, however, stems from Ackermann, who gives a compelling account of air-conditioning and the American dream.[11] To her, in spite of the climatic diversity in the country, air-conditioning provided a certain degree of uniformity to the modern American home, a "weatherlessness" which – in my view – is a precondition to the ongoing individualization of everyday life after World War II: in the new home, flexibility is based on standardisation. Subscribing to more

3 Mogens Rüdiger (ed.), *The Culture of Energy* (Cambridge: Cambridge Scholars Publishing, 2008), Introduction.

4 David Nye, *Electrifying America. Social Meanings of a New Technology* (Cambridge, Mass., London, England: The MIT Press, 1990/1997); David Nye, *Consuming Power. A Social History of American Energies* (Cambridge, Mass., London, England: Harvard UP, 1998/2001); David Nye, *When the Lights Went Out. A History of Blackouts in America* (Cambridge, Mass., London, England: The MIT Press, 2010).

5 Christopher F. Jones, *Routes of Power. Energy and Modern America* (Cambridge, Mass., London, England: Harvard UP, 2014).

6 Bob Johnson, *Carbon Nation. Fossil Fuels in the Making of American Culture* (Kansas: University Press of Kansas, 2014), xviii.

7 Ross Barrett, Daniel Wooden (eds.), *Oil Culture* (Minneapolis, London: University of Minnesota Press, 2014); Wilson Sheena, Adam Carlson, Imre Szeman (eds.), *Petrocultures. Oil, Politics, Culture* (Montreal & Kingston, London, Chicago: McGill-Queen's UP, 2017).

8 Nina Möllers, Karin Zachmann (eds.), *Past and Present Energy Societies. How Energy Connects Politics, Technologies and Culture* (Bielefeld: Transcript Verlag, 2008).

9 Ruth Oldenziel, Karin Zachmann (eds.), *Cold War Kitchen. Americanization, Technology, and European Users* (Cambridge, Mass., London, England: The MIT Press, 2009).

10 Jennifer Loehlin, *From Rugs to Riches: Housework, Consumption and Modernity in Germany* (Oxford, New York: Berg, 1999); Sophie Gerber, *Küche, Kühlschrank, Kilowatt Zur Geschichte des privaten Energiekonsums in Deutschland, 1945-1990* (Bielefeld: Transcript Verlag, 2014).

11 Marsha Ackermann, *Cool Comfort. America's Romance with Air-conditioning* (Washington and London: Smithsonian Institution Press, 2002).

or less the same narrative, Taylor and Chappells present a number of short articles discussing how energy has transformed spatial, material and social dimensions of life.[12]

9 The ethnologist Orvar Löfgren discusses everyday life by using three concepts: throwntogetherness, assemblage and entanglement. The approach signals a non-hierarchical interdependence between humans, things, habits and routines or "co-dependencies, often naturalised into invisibility."[13] It is useful because it indicates a way into the black box of everyday life - not in a pre-defined schematic way, but rather an open matrix or frame for analysing the important mundane trivialities.

10 A second turn - the practice turn - also addresses everyday life. Part of this sociological research understands practice in opposition to, or a least different from, the cultural approach,[14] while others see mundane practices and routines as sub-categori to the cultural perspective.[15] In this research, the social and the cultural are entangled in everyday life. Shove, for instance, delves into the dramatic changes of everyday life with a focus on the expectations of comfort, cleanliness and convenience, which in turn initiated a new normality.[16] In his huge study of consumption and material culture from the Renaissance to today, Trentmann is partly inspired by Shove's sociology of everyday life and gives a thorough and comprehensive historical account of cultures of consumption, including how energy is used in everyday life.[17] Gram-Hanssen discusses the role of technology in relation to changes in everyday life practices using transition theories and domestication theories applied to the move to single-family houses in the suburbs.[18] Mechlenborg and Gram-Hanssen focus on the relationship between gender and energy consumption as a core element in practice theory.[19]

WELL-BEING AND ENERGY

11 Inspired by cultural history, the methodological focus in this paper is on the interplay between material and immaterial well-being and comfort, and on the role of energy in the transformation of lifestyle. The narrative therefore revolves around three concepts - modernisation, 21 degrees culture and comfort or well-being.

12 Modernisation and modernity have been subject to many definitions. With regard to everyday life, energy use, the home and suburbs, I find that the core of these concepts relates to industrialization, rationalization and standardization not only of industrial production but also of domestic life, technology, (sub)urbanization and a high degree of social and geographical mobility.[20] In connection with energy, I understand modernisation as the outcome of the continuous quest for the 'good life' or at least a better life which, after 1945, unfolded in two specific developments, electrification and a new heating culture. However, experiences of modernity and domesticity were gendered as well as dependent on

12 Vanessa Taylor, Heather Chappells, "What Consumers in the Past Tell Us about Future Energyscapes", *RCC Perspectives*, n° 2, 2019, 11-21.

13 Orvar Löfgren, "The Black Box of Everyday Life. Entanglements of Stuff, Affects, and Activities", *Cultural Analysis*, 13, 2014, 77.

14 Theodore Schatzki, "Introduction: Practice Theory", *in* Theodore Schatzki, Karin Knorr Cetina, Eike von Savigny (eds.), *The Practice Turn in Contemporary Theory* (London/New York: Routledge, 2001).

15 See Daniel Welch, Bente Halkier, Margit Keller (eds.), "Introduction to the Special Issue: Renewing Theories of Practice and Reappraising the Cultural", *Cultural Sociology*, vol. 14, n° 4, 2020; Marlyne Sahakian, Henrike Rau, Grégoire Wallenborn, "Making Sustainable Consumption Matter: The Indoor Microclimate as Contested Cultural Artifact", *Cultural Sociology*, vol 14, n° 4, 2020, 417-434.

16 Elizabeth Shove, *Comfort, Cleanliness + Convenience. The Social Organization of Normality* (Oxford, New York: Berg, 2003).

17 Frank Trentmann, *Empire of Things. How we became a World of Consumers from the 15th Century to the 21st* (London: Penguin, 2016).

18 Gram-Hanssen Kirsten, "Understanding change and continuity in residental energy consumption", *Journal of Consumer Culture*, vol. 11, n° 1, 2011, 61-78.

19 Mette Mechlenborg, Kirsten Gram-Hanssen, "Gendered homes in theories of practice: A framework for research in residential energy consumption", *Energy Research & Social Sciences*, vol. 67, 2020.

20 Jennifer A.Loehlin, *From Rugs to Riches: Housework, Consumption and Modernity in Germany* (Oxford, New York: Berg, 1999), 21; Judy Giles, *The Parlour and the Suburb. Domestic Identities, Class, Feminity and Modernity* (New York: Sage 2004), 5.

social class. The change toward these new cultural tendencies took place against the backdrop of the Victorian home with its clearly defined gender roles, but also in the wake of the modernist clash with 'the good old days.' This clash as it materialized in the energizing of dwellings and the establishment of an 21 degrees culture forms the starting point for this article.

13 The breakthrough of modernism was entwined with increased use of fossil fuels. The concept of 21 degrees culture pinpoints this connection as it signals the transition from radiant heat from the stove to the elimination of cold zones, to an equable and constant heat in all rooms from the coal- or oil-fired central heating or district heating.[21] The architectural historian Reyner Banham coined it "the well-tempered home".[22]

14 Equally, electrification occupied a key role in the modernisation of the home. It took place as an entry of electric appliances, first into the kitchen, then into the rest of the home. It was not an accidental process: domestication signals that an innovation "will only gain permanent footing in the home if its role is made meaningful (...) to the household economy of values."[23] In which case, an important question to ask is to whom it was meaningful? When answering, it is worth stressing, that energy is not the only factor; rather, changes are the outcome of social, technological and cultural - including gendered and affective - processes, which make some things possible while other things are deemed unthinkable.

15 Comfort is a difficult concept to define as it is always relative to individual feelings: it is "a human invention rather than a measurable and invariable physiological response."[24] However, in a lengthy discussion of the concept, Shove states that "the achievement of comfort is here understood as a creative process of trading, juggling and manipulation whether of clothes, activity, and daily routine, or of building technologies like windows and heating systems."[25] I prefer the term well-being as an entwinement of mental and physical comfortability, wellness and being prosperous or, in other words, succeeding in turning a good life into a better life.

16 The roads to a resilient and dominant heating culture differ depending on a number of factors like climate, the previous (organic) energy system, access to resources or dependence on imported fuels, the way of life, infrastructure, (sub)urbanisation, industrialisation, etc. Thus, there were very different contexts as regards to climate, energy system, heating culture, energy infrastructure, fuel preferences, etc. However, in the late 1940s, most West European countries shared the characteristic of having a substantial lack of modern dwellings, which gave rise to considerations of how to design a better life in the future home communicated by the authorities, magazines, architectural competitions, doctors, etc.

THE INTERWAR PERIOD

17 The transformation of the heating culture began in the interwar period, but because of the economic crisis from 1929, it only affected a small part of the housing stock. A proportion of the new houses, especially bungalows in emerging suburban areas, were equipped with central heating and radiators. In 1939-1940, almost a third of the apartments in Copenhagen had central heating while the number for provincial towns was around 10% and less than 4% in the countryside. A third of the apartments in the capital was equipped with a bath (shower or bathtub), as only a fifth of the apartments in provincial towns and none of the dwellings in the countryside had a bath. In the cities, almost

21 Mogens Rüdiger, *Oliekrisen* (Aarhus: Aarhus Universitetsforlag, 2019); Ning de Coninck-Smith, Mogens Rüdiger, "Typehus, energi og familieliv i Danmark i 1950'erne og 1960'erne", *in* Niels Finn Christiansen, Kurt Jacobsen og Mogens Rüdiger, *Ole Lange – fra kætter til koryfæ* (Copenhagen: Gyldendal 2007).

22 Reyner Banham, *The architecture of the well-tempered environment* (London: The Architectural Press 1969).

23 Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (London: Pickering & Chatto, 2008), 3.

24 Ackermann, *Cool Comfort*, 4.

25 Shove, *Comfort, Cleanliness, Convenience*, 36.

everybody had gas, but nobody in the countryside.[26] All in all, modern heating based on fossil fuels was on its way, but when the World War II broke out, it was only in its beginnings.

18 The interwar period signalled a breakaway from the so-called Victorian home and the 'traditional' understanding of domesticity. This included the gendered design of the dwelling and the strict definition of some rooms as male and some rooms as female. Following Walker, "the Victorian home was feminized and endlessly depicted as "woman's place," [but] it was nevertheless heavily patriarchal in terms of territory, control, and meaning."[27] The modernist architects rejected not only the Victorian design to the advantage of a functional layout focussing on "space as the structuring principle," they also turned their back on the concept of home or domesticity.[28] Instead, they pleaded for an 'objective' dwelling, a non-gendered and non-hierarchical place to live a rational life framed by an opening up of the space and the deployment of technical resources to achieve maximum comfort and minimum drudgery.[29] To use Butler's terminology of gender performativity, their vision was to undo the gendered home by emancipating the housewife from the household chores by replacing the overcrowded Victorian home with functional rooms, and by introducing modern technology.[30] Hence the kitchen came into focus as a gendered room where the housewife spent a substantial part of her day taking care of the family.[31] However, although the modernist architects depicted the home as a rational and non-gendered house, the reality of the energized post-war home did not comply with the vision and continued – as I will show – to reproduce the gendered family life.

THE POST-WAR SCENE

19 The lack of dwellings was not only a result of the shortages amid the war and the occupation, but also a reflection of structural changes in the Danish society (as in all the West European countries). The mechanization of agricultural production combined with industrialization literally relocated job opportunities for the common woman and man. After the crisis of the 1930s and the war, economic growth was at the top of the agenda. The reduction of unemployment, of creating new jobs and thereby improving capabilities for creating a better life for the majority, were the goals of economic policy. Although economic growth encountered some limitations before 1958, the situation improved in Denmark, and from the late 1950s, growth surged during the so-called golden sixties, unemployment almost disappeared, and the size of the public sector relative to GDP expanded from one of the smallest in Western Europe to one of the biggest.[32] Women especially gained from this development. The percentage of women active in the labour market did not change during the first fifteen years after WWII, but from 1960 to 1973, women's employment rate rose from 40% to 54%. Double income families became the new norm in the 1960s and, for the majority, two incomes were necessary for the family to achieve the new standard of living.[33]

20 Against this background, the demand for energy increased. Consumption more than tripled from 1948 to 1973, and in the same period, coal was replaced by oil as the preferred fuel. In 1973, more than 90% of gross fuel consumption was oil. One reason for this strong dependence on oil was that the oil burner replaced the use of coal in central heating as well as in district heating, whose popularity increased from the early 1960s.[34]

26 Statistics Denmark, *Statistical Yearbook* (Copenhagen: Statistics Denmark, 1945).
27 Walker, "Home Making", 826.
28 Ibid, 827-828.
29 Banham, *The architecture of the well-tempered environment*.
30 Mechlenborg, Gram-Hanssen, "Gendered Homes", 5; Tine Damsholt, Dorthe G. Simonsen, "Materialiseringer. Processer, relationer og performativitet", *in* Tine Damsholt, Dorthe G. Simonsen, Camilla Mordhorst (eds.), *Materialiseringer. Nye perspektiver på materialitet og kulturanalyse* (Aarhus: Aarhus Universitetsforlag, 2009), 26-29.
31 Claus Bech-Danielsen, Mette Mechlenborg, Marie Stender, *Velkommen hjem. Tendenser i dansk boligarkitektur* (København: Politikens Forlag, 2018), 120.

32 Statistics Denmark, *60 år i tal. Danmark siden 2.verdenskrig* (Copenhagen: Statistics Denmark, 2008), 20-22.
33 Statistical ten-year review.
34 Statistical ten-year review.

21 As the 1950s and 1960s was a period with booming economies and soaring energy consumption establishing affluent societies and an unprecedented impact on the climate, the two decades witnessed what often is called 'the great acceleration.'[35] Modernity became energized, and oil replaced coal as the preferred fuel and electricity almost outstripped coal gas. The oil crises in the 1970s painfully ended the great acceleration and marked the beginning of the green transition and the end of the oil age.[36]

THE SUBURB

22 Amid the changes in the economic structure, people moved away from the countryside. Every year, 16.000 people moved from the countryside to provincial towns and 1.000 to Copenhagen and the surrounding suburbs (Greater Copenhagen). Greater Copenhagen also received 10.000 from the provincial towns, while 5.000 moved out of Copenhagen, where most industry was located.[37]

23 The two opposing movements met in the suburbs. A suburb is characterized by separation and distance. Historically, the town was a conglomerate of dwellings and buildings with all kinds of production, i.e., trade and small industry with environmental annoyances as a consequence. In contrast to this, the suburb separated work from home and leisure and made transportation unavoidable. The suburb offered much-coveted amenities like light, fresh air, and quiet and child-friendly surroundings. Those values were important in the ongoing debate on hygiene, but they were definitely not present in the bigger cities' tenement houses. Tenants - mostly workers - pushed for better dwellings and whenever possible they moved to the suburbs.

24 First, the escape from the dark and unhealthy apartments to the suburbs took place on bicycles or – in Greater Copenhagen - with the S-train (metropolitan and suburban electric train) until the private car took over most of the transportation during the 1960s.

25 The nuclear family in their new home in the newly established suburb changed consumption habits. In 1948, it spent almost 40% of income on food and only 5% on the home (rent, etc.). In 1970, the numbers were 28% and 12% respectively, while today they are 15% and 22%.[38] What did the family members get in return for the expenditure? Typically, in the morning, men left for the workplace outside the suburb, while women stayed in the home doing cleaning, shopping, childcare, food preparation, and maybe some gardening. The suburban single-family house probably improved the family's quality of life, but to the housewife it could be perceived as a gilded (more or less) cage. Her contact with the outside world amounted to the daily shopping trip or small talk over the privet hedge with the neighbouring housewife while hanging the laundry out to dry on the clothesline.

THE SINGLE-FAMILY HOUSE

26 As mentioned, in 1945, there was a substantial lack of dwellings. To address this, the Parliament decided to support the construction of social housing stock and small private single-family houses with government loans, which prompted several architectural competitions. Architects and other professionals had several opportunities to reflect on what a modern single-family house should look like and how to design the interior. Most architects were men, but a small number of women played a significant role. One was a kitchen designer, Ulla Tafdrup, who in the leading architectural journal, Arkitekten, discussed her experiences of building industrial kitchens as well as kitchens in dwellings. Among other things, she pinpointed the fact that a new kitchen did not eliminate the need for frequent cleaning. Furthermore, a couple of important co-operatives had women as leading architects.

35 Christian Pfister, "The "1950s Syndrome" and the Transition from a Slow-Going to a Rapid Loss of Global Sustainability", *in* Frank Uekoetter (ed.), *The Turning points of Environmental History* (Pittsburgh: University of Pittsburgh Press, 2010); John R. McNeill, Peter Engelke, *The Great Acceleration. An Environmental History of the Anthropocene since 1945* (Cambridge, Mass., London, England: The Belknap Press of Harvard UP, 2014).

36 Rüdiger, *Oliekrisen*, 45-55.

37 Ibid., 26-27.

38 Statistical ten-year review.

27 It is striking that architects were hesitant about the installation of, especially, central heating and bathrooms until the government loan act terminated in 1958, whereafter central heating, bath, refrigerator and washing machine became indispensable in new houses. The reason was probably that the act stated that only houses within a relatively narrow cost limit would qualify for a state loan, but it also signalled that in the early 1950s, modern amenities like a bath, central heating and hot water were looked upon as optional.

28 The state-loan houses were small in size. The first ones were 50-60 m², and at the end of the decade the typical house had expanded only to 80 m². Thereafter, i.e., after the state-loan act terminated in 1958, Denmark saw a steady increase in home size - up to more than 200 m² today, an increase only interrupted by the oil and financial crises.

29 Many things changed inside the dwellings, be it a single-family house or an apartment. In this context, it is relevant to note that all members of the family (maybe except the pet) were to have her/his own room and that a number of rooms with a special functionality were added like a bathroom, a second toilet, a scullery, a guestroom, etc. When they were asked, the Danes made personal hygiene a priority over central heating, but it was no longer an either-or, and – like electricity – heating is invisible and mostly of interest when absent.[39]

30 The suburb, the single-family-house, and the new social housing signalled a new way of living. Everyday life was modernized. It was a quest for light and fresh air, but also a wish for home ownership. It was - to a certain degree – an individualization based on standardization of the single-family house in order to support flexibility when designing the home. The modernist architects wanted to construct the dwelling as an 'objective' space, including un-gendering the home. Realistically, a first step would be to reduce or to remove women's daily grind in the form of washing, cleaning, cooking, etc.

39 Rüdiger, *Oliekrisen*, 34.

THE 21 DEGREES CULTURE

31 The new way of living was closely connected to the energizing of everyday life. Homes were filled with appliances and installations, all of them consuming energy. Dependence on energy increased. Electricity was progress and modernity, and the housewife could count on more and more electrical kitchen aids. Refrigerator, freezer, washing machine, hand mixer, coffee machines, dishwasher, etc. became a part of modern life. And for leisure time, the family could enjoy the radio and the record player, or watch television while enjoying TV-dinners prepared by the housewife, or take a ride in the car, or - from the late fifties - go by plane on a package tour to one of the popular warm countries.

32 The amount of energy used for heating increased considerably and became a substantial part of energy expenditure in the dwellings. This was primarily because of the increase in dwelling size, but also because of a tendency towards there being fewer members of a household, which meant that, on average, each Dane had more space at her disposal. The architect's vision of undoing the gendered home resulted in a new distribution of the square meterage: the home was divided into an adult section and a children's section, a bathroom was constructed in all new dwellings in addition to a guest toilet, the living room became more spacious, and, more commonly, it was combined with the dining room in a L-shaped configuration. The kitchen was very small and similar to the German Frankfurt-kitchen.[40] In Denmark, it was nick-named "the laboratory kitchen" - which also indicated that the housewife should be rational and work like a scientist. However, the open kitchen – called "the American kitchen" – grew more and more popular and became a must in new houses.[41]

40 Hessler Martina, "The Frankfurt Kitchen: The Model of Modernity and the "Madness" of Traditional Users, 1926 to 1933", *in* Oldenziel, Zachmann (eds.), *Cold War Kitchen*; Bech-Danielsen et al., *Velkommen hjem*.

41 Ibid.; Vyff Iben, "Hvilke amerikanske drømmekøkkener? Forhandlinger af USA i dansk køkkenkultur 1950'erne og 1960'erne", *in* Dorthe G. Simonsen, Iben Vyff (eds.), *Amerika og det gode liv* (Odense: Syddansk Universitetsforlag, 2011).

33 The welfare state also used more energy on social housing, new public institutions, kindergartens, schools, hospitals, etc. This caused a 75% growth in the number of heated square meters from 1959 to the first oil crisis.[42] In addition, neither the old nor the new dwellings were well-insulated. With the low oil prices of the sixties it was more convenient and cost effective to turn up the heat than to insulate the building.

34 One of the important breakthroughs for a convenient indoor climate came with central heating. It was attractive for several reasons. First, it replaced the traditional stove based on firewood, coal or coke, kerosene or coal gas. The stove was characterized by radiant heat, which almost made an even room temperature impossible and, additionally, they were unpleasant smelling when used and could be a safety hazard. Typically, the stove was placed in the living room as the principal room in which the family gathered. From the late fifties, new houses were no longer built with a stove.

35 Central heating was preferable to the old stove, even though a coal or coke fired furnace implied some work. In spite of this, central heating was perceived as a step forward, because it provided an even heat in the rooms, and it allowed for a more flexible floor plan. It also contributed to removing the cold room and zones, for instance the entrance, the corridors, and the parlour, used only for Sunday dinners or when having guests. An even and constant temperature became standard in all rooms. The 21 degrees culture was born. Twenty-one degrees must be understood as a minimum temperature as the temperature in many homes was probably even higher.[43]

36 Central heating changed "the notion of space and [...] enabled the spread of people and of energy-demanding practices around the home."[44] One of the limitations on everyday life disappeared and opened up to changed family patterns, including an increased individualization.

37 No doubt, the coal or coke based central heating improved everyday life. But it had a flip side. Coal or coke must be shovelled into the furnace once a day. It was hard work, undertaken by women as well as men. It was dusty, the coke was smelly and took up space. In the late 1950s and during the 1960s, the popularity of the coal/coke-based furnace decreased and the oil burner and district heating took over. Irrespective of whether the homeowners chose the collective solution - district heating - or the individual option - central heating - there was a double spin-off: the cumbersome work of getting heat in the dwelling disappeared and the dependence on oil rose steadily. The smell, however, vanished only with district heating. In 1970, 56.6% of all homes were heated by oil based central heating and 27% by district heating.[45] The rest used coke, kerosene or gas.

38 To sum up the benefits of the oil burner: it was more hygienic than the coal furnace because it did not emit dust and as it was cleaner and more convenient, it not only improved the well-being of all the residents, but it also removed some of the daily discomforts of the housewife, like shovelling coal and the resulting need for cleaning the space around the stove. The oil furnace was costly, but, when installed, it was cheaper and labour-saving and provided the family with more space. It signalled comfort, modernity and a casual lifestyle. It was – you could say - the welfare state transformed to the micro-level.

42 Rüdiger, *Oliekrisen*, 38.

43 'The 21 degrees culture' should not be understood as technical notion, but as signaling a heating culture with a constant and even temperature in dwellings (see Elizabeth Shove, *Comfort, Cleanliness and Convenience*, 21-42, for a discussion of the concept of comfort). In Denmark, the energy saving campaigns in the 1970s and 1980s urged the population to lower the temperature to 21 degrees. See Bo Poulsen, "Campaign Country Going Green? Danish Government Campaigns for Saving Energy and the Rise of Environmental Concern, c. 1973-1995", in Martin Dackling, Poul Duedahl, Bo Poulsen (eds.), *Reformer og ressourcer / Reforms and Resources : Rapporter til det 29. Nordiske Historikermøde / Proceedings of the 29th Congress of Nordic Historians* (Aalborg: Aalborg Universitetsforlag, 2017).

44 Olivier Coutard, Elizabeth Shove, "Infrastructures, practices and the Dynamics of Demand", *in* Elizabeth Shove, Frank Trentmann (eds.), *Infrastructures in Practice. The Dynamics of Demand in Networked Societies* (London and New York: Routledge, 2018), 19.

45 Statistical ten-year review.

39 The 21 degrees culture also contributed to the popularity of the use of lightweight textiles like cotton and synthetic fabrics, in preference to wool. With James Dean and Marlon Brando, blue jeans and t-shirts made of cotton became a spectacular part of the masculine youth culture, a fashion that was soon adopted by women. Cotton more than the other fabrics was casual and improved wellbeing.[46]

THE GENDERED HOME

40 As indicated, many actors took part in the shaping of the modern home and in the modernization of everyday life. First, the modernist architects translated their interwar interest in confronting the design of the feminized Victorian apartment into a more plain and non-gendered design for the postwar single family home, which reflected the needs of everyday life. In 1948, one of the strongest proponents of this transformation, the architect Ole Buhl, said:

> "... we must get rid of the fear of the rational. You cannot improve enough the kitchens, the living room, the closets, and the balconies. We cannot diversify enough the apartments, and the best way to do it is by standardization and a rational organization of the building process [...] The technology has rendered possible and further developed the idea of a collective lifestyle, which again improves the possibility of an individual and a more many-sided and well-balanced individual lifestyle."[47]

41 This was a manifesto for the modernization of everyday life, but it also became a guideline for the production of the single-family house after 1945. The 21 degrees culture fitted into this program, providing an even temperature in the entire home. The furniture was no longer 'locked' by the radiant heat, but rather was opened for a rational and flexible layout. Hand in hand with the electrification of the kitchen, the 21 degrees culture sent everyday life into a new epoch of wellbeing.

42 The modernist architect was not the only actor pledging a new balance between collective and individual lifestyle, but they sketched a new frame for home life. However, the question is if they successfully contributed to transforming the gendered 'design' of the family into a collective with gender equality?

43 If we look at women's employment activity, it was actually lower in 1960 compared to 1950. However, in this context it is striking that married women's activity rose from 16% to 21%. This trend continued in the 1960s. By 1965, 32% of married women were employed outside the home and five years later half of them were active on the labour market.[48]

44 This change, of course, was determined by a number of factors: it mirrored the economic boom in the 1960s, the focus on individualization and the incipient emancipation of women. The new home and the reduced load of the housewife's work assisted this process. But it was also related to the need for double incomes to finance the new home and the wish for more consumer goods like a TV-set, a car, etc. As emphasized innumerable times in the literature, the housewife did not end up with less housework, but rather with different work tasks.[49]

45 However, these structural changes were barely reflected in the commercial promotion of central heating and different types of burners: the breadwinner in the family was typically male while women still governed the home. The patterns of family life only changed slowly. Central heating contributed to this change.

Central heating reduced the housewife's dusty tasks of hauling coal or wood into the kitchen and other rooms equipped with a heating stove, and removing the ashes. As long as the burner in the central heating system was coal- or coke-based, it was still dusty to feed the burner, but now it was located in a separate room in the

46 Rüdiger, *Oliekrisen*, 40.
47 Ole Buhl, "Status over etagehuset", *Arkitekten U*, 1948, 5.
48 Henrik Nissen, "Kvindens kald", lex.dk.
49 For instance, Ruth Cowan, *More work for mothers: the ironies for household technologies from the open hearth to the microwave* (New York: Basic Books, 1983).

basement or in the outbuilding. Therefore, an oil burner constituted a fundamental shift of tasks as it reduced the work of achieving a comfortably heated home to simply ordering the fuel and paying for it, a typically male duty.

46 The flip side of central heating was that the installation of the burner, pipes and radiators was expensive. Therefore, it took time before the 21 degrees culture gained ground in all homes. In 1965, central heating was installed in 67% of all homes, half of them with oil burners, probably due to all new dwellings having central heating as standard since the middle of the 1950s. District heating made up less than 20%.[50]

THE FAMILY'S BEST FRIEND

47 In this section, I use advertisements to illustrate how lifestyles changed without phasing out gendered energy consumption. Commercials do not prove gender practices, but as the companies intend to sell their products, they aim to talk to actual ways of life as well as to the family's hopes and wishes for the future. By doing so they illustrate and articulate the perception of what it is to be modern and how the 'good life' could evolve into a better life.

48 Central heating was introduced in Denmark in the 1930s, but due to the economic crisis and WWII, it did not become common before the middle of the 1950s. The first-generation heaters were coal-based, but soon the oil burner took over as the preferred heating system. Both technologies were available before the war, but as Denmark at that time was a 'coal-country' and primarily imported coal, this fuel was closely connected to central heating.

49 Because central heating of single-family houses was an emergent market in the 1950s, several companies advertised the bliss of central heating and oil burners. In contrast to the modernist architects, they were more focussed on gender roles related to housework, but it is also striking that most of the commercials neglected genders and just praised technicalities and the overall improvement in quality of life when installing central heating and oil burners. From its very introduction to the market in the 1930s, the oil burner was promoted in opposition to coal, and it was marketed as a means to establish a comfortable life, from which the housewife especially would benefit. In contrast to unpleasant filthy coal, the oil burner was pleasant, clean, and inexpensive. The oil furnace signalled that the consumer was "modern" but also that the modern home gave room to a gendered life. For instance, a six-page leaflet published in 1932 named *Is Your Villa Modern -?* shows a young, dressed-up housewife managing the central heating with one finger stressing only that oil burners *Do the thinking for You.* The leaflet also promised that the man of the house no longer had to do the recurrent unpleasant task of cleaning the coal burner. Additionally, the couple could sleep one hour more in the morning, and that shaving would be comfortable due to the presence of hot water. The basement where coal had previously occupied the space would the perfect spot for the kids to play, the housewife could dry laundry because the rooms were no longer dusty, or the man of the house could enjoy his workbench. Or even better, he could make a party room, where his wife could serve drinks to close friends.[51]

50 In some of the commercials from the 1950s, male engineers highlighted that an oil burner "took care of itself," that you could be sure of having the right temperature in all rooms, and instead of storing coal, you could use the coal storage room for more interesting purposes. One brand, the Amanda stoker, repeatedly stressed that the oil burner was a friend of the entire family.[52]

51 Advertisements reflected the gendered work-home balance, especially when the oil burner became the "new norm" in the early 1950s. The commercials addressed to the man of the house either informed about technical functionalities or stressed the financial aspect and continued to

50 Statistical ten-year review, 1967 & 1974.

51 Royal Library, Småtryksafdelingen, file: Central heating.
52 Ibid.

Figure 1: Mom at work while dad and the kids are having fun in the new work room. The replacement of the old coal-based heater with the oil burner added a new room to the home – according to the commercial for the Salamander oil burner, 1955.

Figure 2: Party in the basement where the old coal burner is replaced by a Salamander oil burner (commercial 1955).

do so regardless of the changing gender roles in the 1960s. Two examples from 1970: "Mr. Hansen is so happy when he thinks of his nice house with all its well-heated rooms, the hot bath and all the comfort following from a modern heating installation for a reasonable amount of money." And: "Wow, the baker is having a shower once again (...) with a lot of hot water pouring down on him - and when he is done, there is plenty of hot water for his wife and kids.[53] The man was the breadwinner and as such predestined to be the first one to have the daily shower.

52 Commercials directed to the housewife highlighted that the oil furnace was not dusty like the coke burning furnace and consequently it was hygienic and clean. The 21 degrees culture was also healthy, improved the well-being of the family, and it was mild and gentle because it was possible to avoid cold zones in the home. And to top it all, the radiators provided the rooms a harmonious impression. The most expressive commercials were published in 1962 and showed a nicely dressed woman in a two-piece and high-heels embracing an oil furnace, with one hand on the shunt regulator: the best friend of the housewife! All in all, the housewife could not avoid loving the oil furnace and the 21 degrees culture.

53 The focus on gender was of no surprise. Until the late 1960s, the home was perceived as women's domain and workplace. Housewife was a job description, and not only in advertisements. In a popular exhibition in Copenhagen in 1950, the single-family house on display strongly signalled the architects' wish to rationalize the home. It would result in a more rational and flexible home, based on a confidence that a home like this would allot more status to housework and thereby contribute to a feeling of greater equality between the spouses.[54] The housework was perceived as a job in its own right, and consequently, the kitchen would be located to receive sun from the west rather than the old, small and dark kitchens facing north.[55]

54 Furthermore, the 21 degrees culture contributed to a changed understanding of hygiene. Although the bathroom continued to be small, very often it was equipped with both a shower and a bathtub. Surveys showed that a modern bathroom was on the top of most Danes' wish list. No doubt, the standards of personal hygiene increased, and it was the responsibility of the housewife to ensure that the family matched the new standards.[56]

CONCLUDING REMARKS

55 During the 1950s and 1960s, significant changes to everyday life took place. The breakthrough of the 21 degrees culture was closely connected to the success of the new single-family house located in one of many new suburbs. Why did this drastic change occur over such a short time span?

56 The abovementioned migration from the countryside to the suburbs entailed a shift in technology from the old heating stove to either central or - from the early 1960s - district heating. The shift, you could say, was simply an opportunity following from the building of new houses. However, at least in the first part of the 1950s, one could purchase a house without central heating, but it never became a hit with families in need of a new dwelling. Why not? Why did young couples and families living in condemnable and insanitary apartments in the cities insist on modern amenities?

57 An overall but also rather fluffy answer could be that they wanted a substantial improvement in quality of life and thus an everyday life freed from as much hassle as possible, with as much spare time as possible, and with as few boundaries as possible. The backdrop was an improved economy and the prospect of an even more prosperous economy. Suddenly, the 'American way of life' became meaningful to ordinary people.

53 Ibid.

54 Otto Norn, "Ny rækkehustype", *Arkitekten U*, 1950, 215.

55 Ole Buhl, "Det lille Køkken i den lille Lejlighed", *Boligen*, 6, 1942, 76-80; Poul Erik Skriver, "Kvinde og Hjem" Danske kvinders udstilling for rationel husførelse 1950", *Arkitekten U,* 1950, 213-214.

56 De Coninck-Smith, Rüdiger, "Typehus", 211; Rüdiger, *Oliekrisen*, 35.

58 Who carried these innovations for everyday life into the dwellings? A lot of people did - city planners, politicians, designers, physicians, engineers, etc., mostly men. In this context, I have focused on architects and especially on the housewife, who in the 1950s and 1960s gradually managed to leave behind her traditional role as housewife and become a more independent woman with a yielding interest in sheltering in the suburbs. The man remained breadwinner even if the woman worked outside the home, and in double-income families this typically meant that the housewife had a second job to take care of. Most of the professionals' visions and messages were addressed to the housewife as she was the one responsible for the home. The patriarchal Victorian home was replaced by a 'modern' home, but the vision of undoing gender roles and turning the home into an 'objective' space did not materialize in Danish homes in the 1950s and 1960s. Gender roles changed, but they did not evaporate with the modern dwelling as the modernist architects anticipated. The breakthrough of the 21 degrees culture was one of the most conspicuous elements in this restructuring of domestic space, and in combination with electrification, it provided the foundation of the making of modern homes.

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Local perspectives of national energy projects: reconstructing the impact of post war nuclear power stations in north Wales from archival sources

Abstract

While national energy infrastructure projects possess significant reach and scale in supply terms, they are focused on a smaller number of power generation sites and have a significant impact on those specific localities. Britain's post war nuclear power programme was no different. Emblematic of government confidence and optimism in technological progress, nuclear sites also shaped community identities, languages, and attitudes to modernity, and affected the lives, routines, and prospects of residents. This article outlines available historical sources linked to nuclear power station construction and its wider effect on north Wales, demonstrating the economic, social, cultural, and political impact of the industry on a variety of local groupings and communities.

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INTRODUCTION

1 This article draws on a scoping project conducted by historians and archaeologists at Bangor University for a 2018 research that evaluated potential or future historical and interdisciplinary research into communities created or affected by the construction of two power stations in north Wales.[1] Through greater understanding of the impact of major energy infrastructure projects, such as nuclear power, we can better appreciate how their construction affected local communities in post-war Britain. Recent coverage of the British nuclear industry has been predominantly national in focus, which was logical for a state-level project implemented by the UK Government.[2] Only research led by Christine Wall has covered a specific power station (Sizewell A) and its construction in significant depth.[3] For north Wales, the location of two early British nuclear power stations, limited published work exists to help explain the industry's impact in this predominantly rural region. Although oral history has helped to fill in some gaps, such as the comprehensive Sellafield story's project run by Cumbria Archives, the passing of time ensures that fewer key actors are available for interview, meaning potential for such effective studies is rapidly disappearing.[4] The Women's Archive of Wales' project "Voices from the Factory Floor" has collected the experiences of women working in the manufacturing industries in Wales from 1945 to 1975, but without references to nuclear plants – while a similar project dedicated to nuclear energy in Wales might prove transformative, there is no sign of such a project as of yet.[5]

2 This article considers how nuclear power generation more broadly, and the construction of Trawsfynydd and Wylfa (and the non-construction of Edern and Connah's Quay) stations in particular, have had limited impact on the historiography of post-war Wales, despite the presence of significant archival material.[6] In major modern Welsh history texts, north Wales' power stations receive only fleeting mentions.[7] Not all of these are even accurate. For instance, Kenneth O. Morgan suggested that Wylfa was constructed before Trawsfynydd, when the opposite was the case.[8] While recent scholarship has moved beyond a traditional focus on extractive industries prior to the Second World War, there has been little exploration of public utilities beyond the coal and steel industries.[9] More fundamentally, we lack a clear timeline of when governments planned and built these two stations. Construction at Trawfynydd began in 1959, with the station commissioned in 1965.

1 "Nuclear Communities" was a feasibility study funded by the Boiling Water Reactor (BWR) research network at Bangor University between January and April 2018.

2 Jonathon Hogg and Kate Brown, "Introduction: social and cultural histories of British nuclear mobilisation since 1945", *Contemporary British History*, vol. 33, n° 2, 2019, 161-169; Simon Taylor, *The Fall and Rise of Nuclear Power in Britain* (Cambridge: UIT, 2016); For wider literature: Tom Kelsey, "Review of The Fall and Rise of Nuclear Power in Britain. By Simon Taylor", *Twentieth Century British History*, vol. 28, n° 1, 2017, 152-154.

3 Christine Wall, "'Nuclear prospects': the siting and construction of Sizewell A power station 1957-1966", *Contemporary British History*, vol. 33, n° 2, 2019, 246-273; Christine Wall, Linda Clarke, Charles McGuire, and Olivia Munoz-Rojas, *Building Sizewell A nuclear power station: it was a new world* (London: University of Westminster, 2014).

4 Hunter Davies (ed.), *Sellafield Stories: Life in Britain's First Nuclear Plant* (London: Constable, 2012).

5 Women's Archive of Wales, "Voices from the Factory Floor", 2014, URL: **http://www.factorywomensvoices.wales/en/index.php?** (accessed 23/02/2021). Many thanks to the anonymous reviewer for this observation.

6 Marc Collinson, "Nuclear power and historical Change: Wylfa", *Transactions of the Anglesey Antiquarian Society and Field Club*, 2018, 97-104.

7 John Davies, *A History of Wales* (Harmondsworth: Penguin, 2007), 607; Geraint H. Jenkins, *A Concise History of Wales* (Cambridge: Cambridge University Press, 2007), 259-260; Philip Jenkins, *A History of Modern Wales, 1536-1990* (Harlow: Routledge, 1992), 20, 374, 387; Gareth Elwyn Jones, *Modern Wales: A concise history* (Cambridge: Cambridge University Press, 1994), 191; Martin Johnes, *Wales since 1939* (Manchester: Manchester University Press, 2012), 155-156, 214, 261, 306, 403; Kenneth O. Morgan, *Rebirth of a Nation: A history of modern Wales* (Oxford: Oxford University Press, 1982), 319, 327-328, 338; David Ross, *Wales: History of a Nation* (New Lanark: Waverley Books, 2005), 246.

8 Morgan, *Rebirth of a Nation*, 327-328 (cf. note 6).

9 Louise Miskell (Ed.), *New Perspectives on Welsh Industrial History* (Cardiff: University of Wales Press, 2020).

Work at Wylfa started in 1963, with the plant commissioned in 1971. Furthermore, even fewer scholars discuss the localised impact of nuclear power on north Wales, or consider what happened after Trawsfynydd and Wylfa were built.[10] A notable recent intervention by Sean Martin and Mari Wiliam analysed the influence of the Chernobyl accident in the Soviet Union on north Wales perceptions of nuclear power in the 1980s.[11] Publication of such pathbreaking work is encouraging, but further and deeper research is clearly necessary to truly comprehend the enormous impact of nuclear power generation on this part of Wales.

3 Primarily what exist are political history studies of the area which focus on nuclear power as one of several projects designed to reinvigorate a local economy impacted by the decline of traditional industries such as slate and agriculture.[12] This ambition was predominantly seen as a failure.[13] Most published and unpublished research on north Wales nuclear power station construction has placed it in either a national political framework or a localised high political context in which atomic power generation is a periodic concern.[14] Regional politicians focused on securing nuclear power stations to alleviate pressures created by economic, social, and cultural change, and to maintain their elected position. Such research places these changes in a narrow, representative political context.[15]

4 What is missing is the broader picture of how and why the power stations were constructed in their locations, their design and commissioning, and their perceived impact on the local environment. To do this, the article outlines a number of potential research areas that maybe pursued, based on initial, scoping research. First, it shares the findings of a review of relevant regional newspapers to reconstruct key events and issues contemporary to the construction of north Wales' nuclear power stations. Second, it examines different aspects of how these national infrastructure projects affected localities, the ambitions that underpinned them, and the sources available to facilitate the study of this. Finally, it explores the political debates around the development of nuclear power, including the initial importance of landscape and environment rather than health. Throughout, it evaluates the archival source base, outlining what is available to scholars re-evaluating this understudied aspect of post-war history in north-west Wales.

RECONSTRUCTING NARRATIVES THROUGH LOCAL NEWSPAPERS

5 Existing historical interpretation is limited in scope, with the study of nuclear power's impact on Wales in its infancy. Furthermore, the lack of any accurate and detailed narrative hindered understanding of the development of north Wales' nuclear industry and its wider impact. Therefore, this article is partially based on a survey of newspaper coverage which examined historical newspapers to understand how the development of nuclear power was represented in varied Welsh media outlets. This provided a chronology of

10 Kenneth Roberts, "The Development of Industry in Anglesey from the late Eighteenth Century", *Transactions of the Anglesey Antiquarian Society and Field Club*, 1969-1970, 219-220; Geraint Jones and Gwenllian Jones Rowlinson, *Anglesey Towns and Villages* (Stroud: Amberley Publishing, 2015); Steve Plant, *A Wander Around the Coast of Wales* (Peterborough: Fast Print Publishing, 2014), 65-66.

11 Sean Aeron Martin and Mari Elin Wiliam, "Politicising Chernobyl: Wales and Nuclear Power during the 1980s", *Transactions of the Royal Historical Society*, vol. 29, 2019, 273-292.

12 Andrew Edwards, *Labour's Crisis: Plaid Cymru, the Conservatives and the challenge to Labour dominance in north Wales, 1960-79* (Cardiff: University of Wales Press, 2011).

13 D. Ben Rees, *Cofiant Cledwyn Hughes* (Talybont: Y Lolfa, 2017).

14 David S. Moon, "Devolution", in Andrew S. Crines and Kevin Hickson (Eds.), *Harold Wilson, the unprincipled Prime Minister? Reappraising Harold Wilson* (London: Biteback, 2016), 228-230; Andrew Edwards, "Answering the challenge of Welsh nationalism: Goronwy Roberts and the appeal of the Labour party in north-west Wales during the 1950s",*Welsh History Review*, vol. 22, n° 1, 2004, 139-143; Keith Gildart, "Jones, Thomas William (Lord Maelor)", in Keith Gildart and David Howell (Eds.), *Dictionary of Labour Biography, Volume 13* (Houndmills: Routledge, 2010), 188-198.

15 Arglwydd Maelor (T.W Jones), *Fel Hyn Y Bu* (Denbigh: Gwasg Gee, 1970), 149-151; Edwards, "Answering the challenge", 139, 143 (cf. note 12).

events and commentary, and elaborated on the names of relevant groupings, individuals, and occurrences to inform further research. Post-war news media remains a useful historical source, as local newspapers acted as filters between local communities and the events that affected them: how nuclear power was discussed, and by whom, from the initial debates considering the siting of stations in 1955, to the confirmation of the final station at Wylfa in 1963. To achieve this, full runs of two relevant local newspapers and a collection of press cuttings from Bangor University archives can be conducted. This wide sample reflected different political traditions and a cross-section of communities affected by power station construction across north Wales.

6 First, the *Welsh Nation,* the English medium monthly newspaper of the nationalist party, Plaid Cymru, which provided interesting coverage of the centrality to its thinking of leader Gwynfor Evans' electoral prospects within the Merioneth constituency. This area was the site of significant events in Welsh nationalist interpretations of the country's recent past, like the controversial construction of the Tryweryn reservoir, and provides an alternative perspective on the construction of the power station at Trawsfynydd. Taken together with the established, Bangor-based, Conservative-leaning *North Wales Chronicle*, whose coverage focused across historic Caernarfonshire, Conway, and Anglesey, a more comprehensive picture emerges.[16] These full runs of newspapers were complemented by the Dafydd Glyn Jones press cutting archive, compiled by a Bangor University academic over a sixty-year period. This collection gives a broader picture of Welsh life as recorded in newspapers throughout the second half of the twentieth century.[17] This collection has provided a variety of insights into the wider press discussion of the sighting of north Wales as three proposed nuclear power stations alongside commentary on the activities of the London-based, Conservative governments of the late 1950s and early 1960s.

7 This survey of local press reports corrected several assumptions linked to the construction of the stations and their significant impact upon communities in north Wales. For example, to better appreciate the impact of the Trawsfynydd station, local government papers can help us understand how the operation of the first station impacted the local landscape and resident communities. Meanwhile, with the Edern station, there is an opportunity to consider why nuclear power stations were not constructed as opposed to simply why they were.[18] Further examination of the purpose of local authorities in historic Merionethshire, Caernarfonshire, and Anglesey highlight how smaller infrastructural changes, such as moving roads, were often linked to the development of larger, state-funded projects.[19] Much significant work took place from the 1950s and these power stations were major public utilities that required new infrastructure to supply their markets. Similarly, the significant presence of the Central Electrical Generating Board (CEGB) in the area likely increased their activity in ensuring rural communities received power.

8 Local council and government papers trace the reasoning for political decisions and emphasise the importance of the power stations as catalysts of socio-economic change.[20] The newspaper survey emphasised the importance of the early 1960s as a turning point in the redevelopment of north Wales. Government funding was utilised to rebuild roads, towns, and even the Britannia bridge to make the new power station

16 Before local government reforms in 1974, these were the used names for counties now known as Gywnedd (combining Caernarfonshire and Meirionethshire), Conwy, and Ynŷs Môn.

17 Toriadau papur newydd "Ynni niwclear - Yr Wylfa", Dafydd Glyn Jones Press Cutting archive (DJGPCA), DJG/22/26, Bangor University Archives (BUA), Bangor; "Toriadau papur newydd "Trawsfynydd ac Edern", DJGPCA, DJG/22/27, BUA, Bangor.

18 *North Wales Chronicle*, 14 October 1958; "Caernarvon and Denbigh Herald", 12 September 1969, DJGPCA, DJG/22/27, BUA, Bangor.

19 *North Wales Chronicle*, 15 December 1961; *North Wales Chronicle*, 27 September 1963.

20 *North Wales Chronicle*, 14 September 1962.

sites more accessible for contractors.[21] Similarly, the constructors of both power stations were focused on how the projects fitted into the landscape. Appointing influential architects such as Basil Spence and landscapers such as Sylvia Crowe demonstrated the appreciation of blending these power stations into the countryside.[22] How industry impacted the scenic rural nature of north Wales, especially as the electricity produced had to be transported large distances to customers, led to the construction of pylons becoming a major concern.[23] By examining official government documents linked to the project, and exploring maps and plans submitted to local authorities, it is possible to understand the approach taken by these landscape engineers to alter the nature of the environments in which the stations were situated.[24] Yet this willingness to modernise and transform rural areas at a time when ideas of preserving landscapes had been enacted as government policy in the shape of "National Parks" and "Areas of Outstanding Natural Beauty" inflamed much local and national resistance to power station construction.

9 During the 1950s and 1960s landscape was central to early anti-nuclear protests. For example, the influential Campaign for the Protection of Rural Wales' (CPRW) major concern was how the stations fitted into their wider landscape. Local CPRW branches often had contrary views to its central, executive council, which reflected local national splits that were also existent in local political parties. Plaid Cymru had similar problems with its national concerns and the local need for employment, particularly in Merionethshire, where the party was attempting to secure parliamentary representation.[25] In many ways, the Labour and Conservative parties were more consistent. Labour favoured a "jobs first" approach to its politics in north Wales, while local Conservatives attached themselves to the investment overseen by the new Minister of Welsh Affairs, a post they had created in 1951.[26] Fundamentally any study needs to understand the place of local people in the construction of these power stations.[27] Local need for jobs must be understood in the context of rural depopulation and unemployment caused by the collapse of historic industries.[28] Such concerns then informed the lobbying and campaigning of local politicians.

Afterall, the jobs did not only create employ- 10
ment in the power station, but also through their construction and businesses created in association with them. In Anglesey, the development of the "Anglesey Aluminium", an enormous aluminium-smelting concern near Holyhead operated by Kaiser Aluminium and Rio Tinto Zinc, but heavily subsidised by the UK government, relied on the presence of the Wylfa power station to provide reduced price electricity for its smelting operations.[29] Used as base load for the Wylfa station, "Anglesey Aluminium", was a major user of the station's power, and it was Britain's largest user of electricity.[30] Such projects represented significant government intervention in north Wales, and clearly showed the extent to which unemployment and depopulation linked to deindustrialisation underpinned significant political problems that government, local authorities, and politicians sought to address. Further work is needed to understand the impact of this

21 *North Wales Chronicle*, 2 October 1964; *North Wales Chronicle*, 27 November 1964; *North Wales Chronicle*, 14 May 1965.

22 Anon., "Trawsfynydd nuclear power station, Lake Trawsfynydd, Merionethshire; Architects: Sir Basil Spence, Bonnington & Collins, Sylvia Crowe & Associates (Landscape architects)", *Official Architecture & Planning,* 1969, 542-548.

23 *North Wales Chronicle*, 17 January 1964. Further discussion of this issue may be found in: Katrina Navickas, "Conflicts of power, landscape and amenity in debates over the British Super Grid in the 1950s", *Rural History*. vol. 30, n° 1, 2019, 87-103.

24 *North Wales Chronicle*, 16 August 1957.

25 *Welsh Nation*, September 1957; *North Wales Chronicle*, 26 September 1958.

26 *North Wales Chronicle*, 1 December 1961; *North Wales Chronicle*, 24 April 1964; *North Wales Chronicle*, 12 June 1964.

27 *Welsh Nation,* November 1964.

28 *North Wales Chronicle*, 29 August 1958; *North Wales Chronicle*, 12 September 1958; *North Wales Chronicle,* 3 October 1958.

29 Edwards, *Labour's Crisis*, 243, 262 (cf. note 12).

30 *The Times*, 7 February 2009.

national infrastructure project on various local communities, including communities of workers employed and those who protested against nuclear power. After all, these varied groups often possessed contradictory ideas and interests, but all resided within the hinterland of north Wales' atomic power stations and were affected by them.

HOW NATIONAL PROJECTS AFFECTED LOCALITIES – PLANNING AND PERMISSION DOCUMENTS

11 The rationale behind the sighting of new nuclear power stations and concerns about the natural landscape can be discerned from a plethora of government documents available. Government papers linked with the Treasury Solicitors and the National Parks Commission demonstrated that building at Trawsfynydd was not a straightforward decision due to its location within the recently designated Snowdonia National Park.[31] Concerns about the preservation of the natural landscape was the basis of protest long before the health effects of nuclear power became apparent. Archival material created by the designers themselves allows for greater appreciation of what was intended. The papers of Dame Sylvia Crowe, the landscape architect hired by the government to landscape the area surrounding Trawsfynydd power station, show significant attempts were made to situate the stations within the countryside.[32] Collections like this aid understanding of how the areas surrounding power stations were landscaped to better inhabit their dramatic settings. Planning was central to this government intervention in north Wales and all levels of government were involved.

12 Significantly, power stations could only be built with the consent of the local authorities within whose boundaries they existed. Due to this the purpose of local community councils will be important in any study relating to their construction. In particular, the views of Lleyn Rural District Council were decisive in the decision not to construct a station at Edern on the Llŷn Peninsula.[33] The enthusiasm of Merionethshire County Council is a notable counterpoint to this, and collections relating to this authority show how county policymakers addressed issues and concerns raised by local communities.[34] Further evidence is available from local newspapers (both in English and Welsh), local authority archival collections, and papers belonging to the local branch of the CPRW.[35] For the Wylfa station, material also exists in the archives of Anglesey County and Twrcelyn Rural District Council, and these also focus on pylons housing and roads policy together with the station itself.

13 Records of formal political activities are limited, but a great deal of evidence exists in collections accumulated by local representatives. For example, north Wales MEP Beata Brookes retained various assessments of the closing (without replacement) of Trawsfynydd in the early 1990s

31 Public Inquiry in Snowdonia National Park: application by the Central Electricity Board for the siting of a nuclear power station near Lake Trawsfynydd in Merioneth Snowdonia National Park', 1957-1958, Treasury Solicitor collection, TS 58/388, TNA, London; "Consultation with the Central Electricity Authority on the general siting, etc., of atomic power stations including Trawsfynydd in Snowdonia", 1956-1959, National parks Commission, COU 1/103, TNA, London; "Trawsfynydd Nuclear PowerStation: reports and correspondence", National parks Commission 1958-1968, COU 1/935, TNA, London.

32 Sylvia Crowe Collection, AR CRO, University of Reading Museums and Special Collections, Reading.

33 Before local government reforms instituted in 1974, the Llŷn Peninsula was governed through the Lleyn Rural District Council. Lleyn is the anglicised name for the area.

34 Available as: "Merioneth County Council Minutes", 1877-1965, Merioneth County Council collection, GB 0220 Z/CM, Gwynedd Archives (Merionydd Record Office), Dolgellau. [In particular, Minutes of Merioneth County Council, 1877-1965, comprising County Council minute books, 1889-1965, and statutory minute books, 1954-1959; minutes of committees, 1877-1963, highways, 1911-1959, housing and public health, 1911-1961, 1937-1963. Committees for exploration include: Hydro-Electric Committee; Public Health and Housing Committee; Clerk's draft minute book].

35 "Lleyn Rural District Council, records", 1895-1985, Lleyn Rural District Council Records, GB 0219 XB/13, Gwynedd Archives (Caernarfon Record Office), Caernarfon.

and how this concerned several local stakeholders. Merionydd District Council, the Mid-Wales Development Board, Gwynedd County Council (which then included Anglesey), and the CEGB collectively commissioned a report from the Institute of Economic Research at the University College of North Wales (UCNW - now Bangor University). It provides interesting statistical evidence of how the Trawsfynydd plant's staffing reflected its local environment, based on a survey with a reasonable 44 per cent response rate, and considered how a proposed station closure would affect the wider community. For example, 70 per cent of staff were local, compared to only 24 per cent at Oldbury in Gloucestershire.[36] Further to this, 48.5 per cent of staff spoke Welsh at home while another 22.6 per cent spoke both Welsh and English at home. Therefore language, a major regional concern during the construction period, and local staffing of infrastructure projects in north Wales more generally, was less affected than presumed as a significant proportion of staff were Welsh speakers.

14 Other statistics emphasised the economic investment that the power station both directly and indirectly facilitated. Around 82% of employees were homeowners, which would have a significant impact on an area where the housing market was traditionally slow, and much housing stock was composed of holiday and second homes. Projections suggested a station closure would force at least 300 workers to move and 240 houses be sold, adding pressure to the housing market. When we consider 86.6% of staff lived within a reasonable travel to work area such a decision would have a major impact not only on the housing market but on the wider area's income also. Not only did the power station spend directly in the local economy, but it also paid over 8,000,000 pounds in salaries over 7 million of which was within the local travel to work area.[37] After concerns were raised following the Chernobyl accident in 1986, the chief executive of Gwynedd County council noted that "closing the two north Wales nuclear power stations without a job replacement scheme would be a tragedy for the local economy".[38] Material from Magnox, the station's operating company, is made available through the International Atomic Energy Agency (IAEA).

15 A copy of the Trawsfynydd decommissioning manager's report to an IAEA conference demonstrated that the UCNW report was broadly correct, and calculations of the closures actual impact emphasised its significant. It described how, of 487 employees before closure, only 87 or 17.9% (all aged 25-45) moved on to other stations, 270 or 55.4 % remained to defuel the power station, itself a time-limited activity, while the remaining 26.7% took voluntary redundancy.[39] While the station maintained a staff at 60% of its operating level, clearly the stations closure did have some effect.[40] However, once constructed, the impact of removing these power stations would require equally significant investments. Due to the elongated decommissioning process of a nuclear power station, this was slower than for more immediate and comparable factory or slate industry closures, which had been comparatively instantaneous. Despite this, such national energy projects are always locally interpreted in terms of jobs and livelihoods, which were undoubtedly affected. Vast amounts of archival material, together with opportunities for oral history, clearly exists with reference to the decommissioning process, which happened comparatively recently. However, any project must also consider the other communities that existed, which either favoured or opposed the arrival of nuclear power. They shaped local and national perceptions, and in one case, managed to halt the planned construction of another station in north Wales.

36 "Pamela M. Lewis (Institute of Economic Research, UCNW, Bangor), The Economic Impact of the Closure, without replacement, of Trawsfynydd Power Station", May 1985, Beata Brookes papers, 107, National Library of Wales (NLW), Aberystwyth.

37 Id.

38 "Daily Post cutting", 17 June 1986, Beata Brookes papers, 72, NLW, Aberystwyth.

39 H.M. Jones, "Social Effects of Decommissioning Trawsfynydd Power Station", 2001. URL: **https://inis.iaea.org/collection/NCLCollectionStore/_Public/32/057/32057819.pdf** (accessed 24/02/2021).

40 Id,

POLITICAL TENSIONS AND NUCLEAR POWER - ARCHIVES OF INTEREST GROUPS

16 Although archives of local authorities exist in some detail, those of constituency-level political parties do not. As the limited political party collections for north Wales at the National Library of Wales' "Welsh Political Archive" clearly demonstrated, in the post-war era local political organisations in this region were less well organised than in the industrial heartlands in other parts of Wales or at the Wales-wide level. As Andrew Edwards has argued, this was because their paper trails were less consistent in detail and preservation.[41] Prior to the 1970s, political structures in north Wales were very informal, with clear party affiliation unclear at best. Notably, one Labour MP's agent was the independent councillor, as a formal party-political structure was non-existent.[42] Formal and informal political activity must, therefore, be reconstructed from newspapers, local parliamentarian's private papers, and campaign group collections. Local media, Wales-level political party papers and municipal archives therefore form the backbone of policy-oriented documentation. In this part of Britain, party labels mattered only as much as those who held them.[43] However most local MP's and authorities supported the development of the power stations to combat rural unemployment and depopulation and they championed the need for the employment of local staff.[44]

17 With the limited nature of party records in north Wales, those seeking to understand how political activities and debates shaped power station construction, together with community reaction to this process, are reliant on local newspapers and the archives of interest groups such as the CPRW. When local opposition appeared, earlier government policy often underpinned the legitimacy of protester's demands.[45] For example, when the CPRW campaign to stop the construction of a nuclear power station at Edern, they pointed to the fact that the Llŷn peninsula, on which it would be located, had been designated as an "area of outstanding natural beauty" by the same government only a year before.[46] Such unintended consequences fitted into a narrative seen often in post war policy making, that the interaction between national and local government, resident communities, and pressure groups, often shaped policy making much more then ministers or planners might wish to admit. The actions of the CPRW had ensured that the sighting of any second station was to be on Anglesey, where the board hoped for less opposition.[47] However, the Edern proposal did not go away. Through the lobbing of Goronwy Roberts and Will Edwards, the location of the power station here was still being explored in 1969.[48] Lobbying occurred once again and this time the CPRW supported the CEGB's proposed site at Connah's Quay to avoid impacting rural Wales.[49]

18 Clearly, groups like the CPRW based their opposition on a deep commitment to conserving the rural beauty of Wales and were only willing to countenance projects that would "improve" the natural landscape. Its committee was primarily composed of local landowners, such as Clough Williams-Ellis (creator of the Portmeirion resort), his sister in law, Cecily Williams-Ellis (who chaired the Caernarfonshire group), and an assortment of military officers and local

41 Edwards, *Labour's Crisis* (cf. note 12).

42 Ibid., 205; "Diary", 1910-1971, Papers of William Thomas Bason, BMSS/39765-39, BUA, Bangor.

43 *Guardian*, 5 September 2007.

44 "Pamela M. Lewis (Institute of Economic Research, UCNW, Bangor), The Economic Impact of the Closure, without replacement, of Trawsfynydd PowerStation", May 1985, Beata Brookes papers, 107, NLW, Aberystwyth.

45 "Letter to Cecily Williams-Ellis from Peter Thomas MP", 24 March 1959, Cecily Williams-Ellis (CWE) papers, B16, NLW, Aberystwyth.

46 "Manchester Evening News cutting", 19 August 1969, CWE papers, B16, NLW, Aberystwyth.

47 "Letter to Cecily Williams-Ellis from Peter Thomas MP", 24 March 1959, CWE papers, B16, NLW, Aberystwyth.

48 "Newspaper clipping", 15 August 1966, CWE papers, B16, NLW, Aberystwyth.

49 "Letter to Cecily Williams-Ellis from CF Weedon (CEGB)", 21 August 1970, CWE papers, B16, NLW, Aberystwyth; "Letter to CEGB from CWE and Caernarvonshire branch", n.d., CWE papers, B16, NLW, Aberystwyth.

notaries.[50] Discussions were focused around how the local environment was impacted by the creation of the power stations. The groups effective lobbying, which undermined the construction of a station at Edern, angered local representatives who felt the CPRW reflected their own private concerns rather than the public interest.[51] That their membership was significantly drawn from the local landed elite, rather than working class voters who might benefit from jobs at the new power station was clearly noteworthy. Local politics and national decision making were, therefore, heavily influenced by ideas of landscape preservation and rural protection to a greater degree than is often appreciated.

19 As the 1980s wore on, a series of localised campaign organisations became active in Wales in opposition to a second generation of nuclear power stations. Such groups included CND Cymru, the Green Party, parts of Plaid Cymru, and localised groups in areas at risk of development, such as People Against Wylfa B (PAWB) in Anglesey and the Preseli anti-nuclear group in south-west Wales. The role of the Chernobyl accident in this change of emphasis has recently been discussed by Martin and Wiliam, further demonstrating how a nuclear meltdown in the Ukraine had the potential to reshape political debates both in the USSR and abroad.[52] Yet anti-nuclear protestors were just one interest group within Wales, and many contemporaries viewed the building of Trawsfynydd and Wylfa nuclear power stations as having a significant and overwhelmingly positive impact on local communities. The arrival and housing of the many workers needed to build the stations required the planned (and unplanned) construction of various amenities. For instance, Irish workers at Wylfa constructed Wales' most northerly Catholic Church at Cemaes Bay to fulfil their spiritual needs.[53] This social and cultural aspect to utility construction needs to be explored in greater depth than is the case in the existing literature.

CONCLUSION

20 Any future research into nuclear power in north Wales should explore the impact on services provided by local authorities and similar bodies and examine how they affected local businesses and attracted new industry to their area. Notably, nuclear power was fundamental to the development of "Anglesey Aluminium", once the largest commercial employer in north Wales. The construction of the power stations in north Wales had a clear physical and human impact on various local communities. Existing literature does not provide any detailed chronology or analytical narrative of events that shaped the station's conception, construction, and operation. The development of atomic power generation is often discussed as an example of political action and within the broad context of post war economic change, but never on its own terms. Additional work is necessary to better understand the social, economic, cultural, and political impacts of these stations within the landscapes in which they were constructed. Furthermore, a deeper examination is needed of how the stations interact with the landscape within which they are situated.

21 As a survey of accessible evidence, this article demonstrates the significant quantities of archival material and newspaper evidence that exist, much of it focused on station construction and operation. Regional archives and repositories hold designs and planning information that suggest the power stations were catalytic influences on local communities and infrastructure. While primarily an examination of north Wales, much evidence is often created by UK-wide, government bodies, or is linked to party-political activity in the locality, where material evidence primarily reflects the views of an elite, politically

50 "Council minutes", 31 January 1964, Campaign for the Protection of Rural Wales (CPRW)papers, 2/2, NLW, Aberystwyth.

51 "Document in collection 'Proposed nuclear power stations, Deeside and Edern'", date unknown (file range 1958-1975), CWE papers, B16, NLW, Aberystwyth.

52 Martin and Wiliam, "Politicising Chernobyl", 273-292; Serhii Plokhy, *Chernobyl: History of a Tragedy* (London: Penguin, 2018), 301-316.

53 *North Wales Chronicle*, 3 January 1964.

active minority. Collections created by groups like the CPRW demonstrate how the link between preservation of the natural landscape and protest remained important. The limited research undertaken for this study has suggested that concerns about community health were a post construction discourse. Clearly there is a substantial source base for a significant project on the history of nuclear power generation in north Wales. That such evidence exists, yet so little work has been undertaken, suggests that while the wider history of power generation has been neglected, nuclear power is perhaps more so.

22 Clearly, post-war Britain was desperate to remain at the centre of technological advance. Both Trawsfynydd and Wylfa, constructed between 1959 and 1971, represented an embracing innovative technology in an area that was still undergoing early-stage electrification. Likewise, this process stimulated significant change in north Wales' built and rural environment. Nuclear power stations, which changed the very function of their environments, were modernist infiltrators into assumed rural landscapes. Using the power station as a prism, future projects might examine not only their history, but also how they required the destruction of the rural countryside and the construction of amenities including housing, transport links, and even reservoirs. Nuclear power stations transformed the natural landscape, which was reshaped to accommodate them. Intriguingly, before the 1980s it was often this, rather than any fear of radiation or concern for community health, that underpinned the most heated political debates. This is a complicated and multifaceted area of research, with a number of interactive and interdependent themes that could be examined. Future projects may choose to examine these issues as a comprehensive, overarching project, or focus on more specific themes for research. Clearly, there is opportunity for a great deal of scholarship to be undertaken.

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