

EPSRC

Pioneering research
and skills



How did the Electrical Development Association attempt to mould domestic electricity demand in Britain, 1945-1964?

Anna Carlsson-Hyslop^a & Peter J G Pearson^b

a Department of Sociology, Lancaster University

b Low Carbon Research Institute, Cardiff University

WP 2013/1

March 2013

Realising Transition Pathways

Whole systems analysis for a UK more electric low carbon energy future



Realising Transition Pathways

'Realising Transition Pathways' (RTP) is a UK Consortium of engineers, social scientists and policy analysts. The consortium is managed by Professor Geoffrey Hammond of the University of Bath and Professor Peter Pearson of Cardiff University (Co-Leaders). It includes research teams from nine British university institutions: the Universities of Bath, Cardiff, East Anglia, Leeds, Loughborough, Strathclyde, and Surrey, as well as Imperial College London and University College London. The RTP Project [www.realisingtransitionpathways.org.uk] commenced in May 2012 and is sponsored by the 'Engineering and Physical Sciences Research Council' (EPSRC: Grant EP/K005316/1). It is a renewal and development of the earlier 'Transition Pathways' (TP) project, which was initially established in 2008 with the joint sponsorship of E.ON UK (the electricity generator) and the EPSRC. This project addressed the challenge of the so-called energy 'trilemma': the simultaneous delivery of low carbon, secure, and affordable energy services for the electricity sector. It developed and applied a variety of tools and approaches to analyse the technical feasibility, environmental impacts, economic consequences, and social acceptability of three 'transition pathways' towards a UK low carbon electricity system. These pathways explore the roles of market, government and civil society actors in the governance of a low carbon energy transition.

The research within the RTP Project seeks to explore further the constraints and opportunities in realising a low carbon UK energy sector, including those stemming from European developments. This project includes studies on the horizon scanning of innovative energy technologies over the period to 2050, the feasibility of demand responses, uncertainties in economic analysis, the estimation of investment costs of the different pathways, and the implications of markets for investment decisions about energy technologies. Further work is being undertaken on conceptualising, mapping and analysing 'actor dynamics' in the contemporary UK electricity sector, historical transitions and case studies, integrated energy networks modelling and evaluation, and 'whole systems' energy and environmental appraisal of low carbon technologies and pathways. The consortium is also developing their initial work on branching points on pathways, in order to identify and explore other potential branching points on the core transition pathways.

Follow us on Twitter @RealisingTP

This document has been prepared to enable results of on-going RTP work to be made rapidly available. It has not necessarily been subject to review and approval, and may not have the authority of a full Research Report or published paper.

How did the Electrical Development Association attempt to mould domestic electricity demand in Britain, 1945-1964?¹

Anna Carlsson-Hyslop*², Peter J. G. Pearson**

* Department of Sociology, Bowland North, Lancaster University, Lancaster LA1 4YT

**Low Carbon Research Institute, Welsh School of Architecture, Cardiff University, Bute Building, King Edward VII Avenue, Cardiff, CF10 3NB,UK

Abstract

Demand management in Britain is not new. We suggest that there is value in exploring earlier experiences, for the insights they offer into the culture and practices of the electricity supply industry and into the challenges demand management faces today. The paper focuses on the two decades after the Second World War, in which the UK electricity supply industry tried to mould and shift the time profile of electricity demand, especially for domestic heating. Between 1945 and 1964 the Electrical Development Association (EDA) was an industry actor that worked to impact domestic electricity demand. As the industry's central public relations arm, its main role was to promote electricity and its use, although in this period it also attempted to reduce domestic demand at peaks, especially for space heating. In the late 1940s, when electricity supply was very tight, it did this by advertising to discourage the use of electric fires. Later, the EDA encouraged the take-up of off-peak appliances, such as night-storage heaters, and considered these promotional activities successful attempts at load-shifting. The EDA is thus an interesting case of demand management by an organisation whose main interest was to increase, not decrease, the use of electricity, a position not unlike that of most large electricity utilities today.

The paper explores EDA's stated reasons for engaging with demand management and the context of their work in this area, including shifting government policies and social changes and competition from other fuels and technologies, in an attempt to understand the viewpoint and actions of one of the industry's influential but traditional actors. The EDA was constantly negotiating between critical views of its work, from both within and without the electricity industry, and their own organisation's desires both to promote electricity and shift demand off-peak. These negotiations are shown to have influenced their demand management work. The paper also investigates, partly as a reality-check against EDA's self-promotion, what types of heating appliances were actually used and preferred by domestic consumers.

Introduction

Demand management in the electricity sector, including reducing and time shifting of demand, is an important feature of future pathways towards the carbon reduction goals set by the UK's Climate

¹ Working paper written by Anna Carlsson-Hyslop in 2012, with inputs from Peter Pearson. We acknowledge the support of the *Transition Pathways to a Low Carbon Economy* project, financed by the UK Engineering and Physical Sciences Research Council (EPSRC) and E.ON UK (Grant EP/F022832/1) and its EPSRC-funded successor, *Realising Transition Pathways* (Grant EP/K005316/1). The authors are responsible for all views contained in the paper.

² Corresponding author: anna.carlsson-hyslop@gmx.co.uk

Act 2008 and related European legislation.³ More efficient delivery and use of electricity from low-carbon sources is expected to play a key role in achieving these goals. This is likely to involve increasing use of heat and transport services delivered via electricity. This expectation is reflected in the three pathways developed by the Transition Pathways project, especially in the community led but also in the market and state led pathways (Barton et al. 2013, Foxon 2013).

Demand management in Britain is not new. We suggest that there is value in exploring earlier experiences, for the insights they offer into the culture and practices of the electricity supply industry and into the challenges demand management faces today. The paper focuses on the two decades after the Second World War, in which the UK electricity supply industry tried to mould and shift the time profile of the demand for electricity, especially for domestic heating.

While we know that demand reduction and load shifting have often been attempted in the past (Chick 1990 & 1998, Hannah 1979 & 1982, Robertson 1987), apart from the earlier historical work of the Transition Pathways project, we do not know much about such attempts in practice, in particular for domestic electric heating. Historical work has tended to concentrate on the debates about the pricing and charging structure of domestic electricity and the debates about demand shifting within the upper levels of management of the electricity supply industry (ESI). However, how the day-to-day practices of using domestic heating appliances changed and the industry's involvement in these changes were important aspects of the post Second World War socio-technical transition towards higher use of electric heating. Such changes in the practices of domestic heating and electricity use, involving many different actors, will also be important in future transitions (Shove 2003, Hargreaves et al. 2013).

Between 1945 and 1964 the Electrical Development Association (EDA) was one of the industry actors that worked to impact domestic electricity demand. As the electricity supply industry's central public relations arm, its primary role was to promote electricity and its use, although in this period it also attempted to reduce domestic demand at peaks, especially for space heating. In the late 1940s, when electricity supply was very tight, it did this by advertising to discourage the use of electric fires. Later, from the mid-1950s and into the 1960s the EDA encouraged the take-up of off-peak appliances, such as night-storage heaters, and considered these promotional activities successful attempts at load-shifting. The EDA is therefore an interesting case of demand management by an organisation whose main interest was to increase, not decrease, the use of electricity, a position not unlike that of most large electricity utilities today. The study period has been chosen to include different types of demand management practices aimed at reducing and shifting demand, and ends with the arguably most successful of the practices: the introduction of domestic block storage heaters ('night storage heaters') that could be installed in both new and existing homes.

At least since the 1890s electrical engineers had argued that demand for electricity should be diversified away from lighting, to improve the load factor and thus the economics of production. If demand for electricity could be increased at non-peak time, i.e. in day time when the lighting-demand was less strong, more use could be made of existing generating plant, potentially reducing the cost of electricity generation and of future, avoided, investments. Some engineers encouraged the development of domestic appliances, arguing that domestic cooking and heating were promising

³ The Act commits the UK to reduce greenhouse gas emissions by 80 per cent on 1990 levels by 2050, through phased 'carbon budgets'.

avenues to improve the load factor, as they thought this demand would lie outside existing peaks (Forty 1986:183-7).

The EDA was set up and financed by the electricity supply industry under the Electricity Act of 1919 to develop common sales and advertising material. It was heavily involved in promoting domestic demand for electricity in the period between the two World Wars, when domestic electricity use rose sharply, from less than a tenth (8%) of the total electricity used in 1920 to just over a quarter (27%) in 1939 (Forty 1986:188). This increase came despite relatively high prices, lack of supply to houses and wiring within them, and fear of electricity. Electricity was widely seen as a “colourless, odourless, invisible, dangerous and expensive form of energy” (ibid:200), at a time when gas was cheaper and had more efficient appliances.

One of the EDA’s goals after its establishment was to overcome this fear of electricity. It used an image of modernity to promote domestic use of electricity, with slogans such as “To Electricity belongs the Present and the Future”, “Science’s Greatest Gift to the World – Electricity”, and “For Health’s Sake – Use Electricity”. This kind of emphasis on the supposed benefits and liberating capability of electricity has been dubbed *electrical millenarianism* (ibid:188-193). Electricity was also portrayed as a labour-saving servant: “Electricity provides the modern housewife with a perfect servant – clean, silent, economical” (quoted in Forty 1986:207, see also Jeremiah 2000:66-69, 102-6). Appliance manufacturers gradually also began adopting this modern imagery of electricity as “clean, silent, instantaneous, modern and revolutionary” (Forty 1986: 198) in their designs and advertising, for example in the design of electric fires by the appliance firms of Ferranti, HMV or Creda (ibid: 193-200). EDA’s inter-war work was thus a combination of electrical millenarianism with a general awareness within the industry that it was desirable to increase the load factor to reduce costs.

This paper focuses on domestic demand for electric heating, which was identified in the post-war period as a particularly important but difficult to control area of demand. It also focuses on demand management measures not involving increased prices, not least because the EDA was not directly involved in price setting. The electricity supply industry in this period tended to under-charge domestic consumers, who at peak demand (and sometimes more generally) were not paying the full cost of meeting their demand. Some have argued that the industry and government addressed this too slowly (e.g. Kelf-Cohen 1973). One reason to end the study period in the early 1960s is that from then on increased prices gradually became more commonly used to try to manage demand. This paper does not focus on the debates about the actual versus charged costs of supplying domestic demand for space heating, which Hannah (1979 & 1982) and Chick (1990 & 1998) have analysed in depth. Instead the paper concentrates on how the EDA approached the shaping and management of demand, in an attempt to understand the viewpoint and actions of one of the ESI’s influential but traditional actors, whose *raison d’être* was to stimulate demand.

The paper chronologically describes the EDA’s attempts at demand management between 1945 and 1964, through advertising and lobbying. First, in the immediate post-war period it promoted the ‘idea’ of electricity but simultaneously advertised against peak use of electric fires. Later, in the 1950s and 1960s, EDA promoted off-peak space-heating appliances, initially under-floor heating and then storage heaters. The paper explores EDA’s stated reasons for engaging with demand management and the context of their work in this area, including shifting government policies and

social changes and competition from other fuels and technologies. The EDA was constantly negotiating between critical views of their work, from both within and without the electricity industry, and their own organisation's desires both to promote electricity and shift demand off-peak. These negotiations influenced their work on demand management.⁴ The paper also investigates, partly as a reality-check against EDA's self-promotion, what types of heating appliances were actually used and preferred by domestic consumers.

Household heating practices ca 1945

What was the setting of EDA's activities in relation to domestic space heating? How were British people heating their homes at the end of the Second World War and what did they think of these arrangements? For a range of social, technical, and financial reasons, coal fires still dominated domestic space heating in 1945, though electric fires were increasingly being used for 'topping up', especially in bedrooms. Most households heated only their living room, usually through a coal fire in a grate; if they could afford to they used other heat sources for topping-up in other rooms or e.g. during cold evenings in spring or autumn. The *Heating of Dwellings Inquiry* by the Wartime Social Survey, conducted in 1942, found that three quarters (74%) of lower income working class households heated only one room during the period of the survey (February and March) and, as noted, almost all (96%) sitting rooms were heated by solid fuel. However, increasingly during the war gas and electric fires were used to heat bedrooms for short periods. In the Social Survey's sample, of the quarter (23%) who heated two rooms nearly three-fifths (57%) heated a bedroom, and of these a third (30%) used electricity for this (Chapman 1945:120-5). Other samples suggested that a much higher proportion used electric heating. For example, the Women's Advisory Housing Council found that 55% of their sample used electricity for some heating, though only 1% used it as their sole source of heating (PEP 1945:124-5). In 1946 the British Electrical and Allied Industries Research Association found that around three fifths (61%) of consumers had one or more electric space-heater, making a total of about 9.5 million appliances. While the remaining two fifths (39%) had no electric space heater, almost two fifths (37%) had one, 14% had two, 5% three and 3% more than three.⁵ From these figures it appears that those who could afford to were using electric, gas or oil heating appliances to 'top-up' solid fuel-based heating, which was still much cheaper. This pattern of combining background and topping-up heating was said to be a trend among higher income households (PEP 1945:114).

While most (90%) of households preferred solid-fuel open fires for living-room heating, there was also a "strong desire for satisfactory means of bedroom heating" (PEP 1945:xxiii), with many dissatisfied with what they had. People said they would prefer electric heaters in bedrooms, though a coal fire was sometimes also desired (especially during illness) (ibid:125-6). The preference for solid-fuel fires as the main heating source was strong despite recognition of their shortcomings. Coal stoves were a lot of work (Davidson 1986:90-100). They needed cleaning before being laid, lit and then feeding with coal that had to be stored and fetched (Mass-Observation 1943:137-8, 152-4). Also, chimneys needed regular cleaning, which caused much work for the housewife and problems

⁴ This work focuses on EDA's official views, such as published advertisements and Annual Reports. This is valuable, but not the whole story. Further work, using archives at MOSI, on the internal debates within EDA is necessary to deepen this aspect of the discussion.

⁵ Technical Report Reference K/T125, A large-scale sampling survey of domestic consumers, British Electrical and Allied Industries Research Association: London, 1948, Box 63 MOSI, p 10 & 16. The figures were based on a sample of 57,500 domestic consumers.

when sweeps were not available (ibid: 140-1). That the living room often was the only heated room in the house impacted on winter leisure, with families having to gather in one room in the evening for warmth (Chapman 1999:46, Ministry of Fuel and Power 1946). This concentration into one room affected school children's concentration during home work because of noise (Chapman 1955:78-81).

Why did British households prefer to heat their homes through an open coal fire in the living room? In 1955 the social researcher Dennis Chapman called fireplaces "one the most complex socio-technical artifacts of the home. Its primary purpose is space-heating, but appears to have deep mystical connotation and great aesthetic importance. It locates and focuses the family group in summer and winter ... Generally speaking, efficiency plays little part in the design and provision of heating appliances" (grammar and spelling as in original, 1955:96). Coal fires were thought to be cheerful, homely, cosy and warmer, as well as cheaper (Mass-Observation 1943:136). While respondents recognized that other types of fires were easier, cleaner and less work, there was also felt to be something missing: "the most technically perfect provision of other types of heating, cheaper, cleaner, easier to operate from the housewife's point of view and less polluting of the atmosphere, will fail to satisfy some deep-seated aesthetic demand that is satisfied by the old-fashioned, dirty, smoky coal-fire" (ibid:137).⁶ In addition, housewives, especially in the North of England, were said to have found it difficult to imagine how to cook and bake bread if they had central heating, as these activities were entwined with space-heating at that time. With a kitchen range it was possible to bake enough bread for a family in one session; something not thought possible using a smaller cooker (Chapman 1945:125). Taking a more technological and economical view, the research organisation PEP suggested that few existing heaters (using any fuel) produced either a "comfortable" balance between convected and radiant heat, or suitable ventilation and humidity (PEP 1945:xx-xxi). In particular, electric fires tended to be either radiant (not producing mixing of the air, thus leading to high temperatures at the ceiling and low at the floor) or convector heaters, and hence did not produce what PEP thought to be the desirable combination of these two properties (ibid:120-2).

During the Second World War, electricity increasingly became seen not as a luxury for the well-off but a necessity (Chick 1995:270 & 1998:81). Despite the preference for coal fires, between 1939 and 1945 domestic consumption of gas and electricity increased significantly (by 25% and 41% respectively). The government found that when it restricted domestic coal supplies, people shifted to gas and electricity, which then required similar amounts of coal for their production (Chick 1998:117, Hannah 1979, Robertson 1987:32).

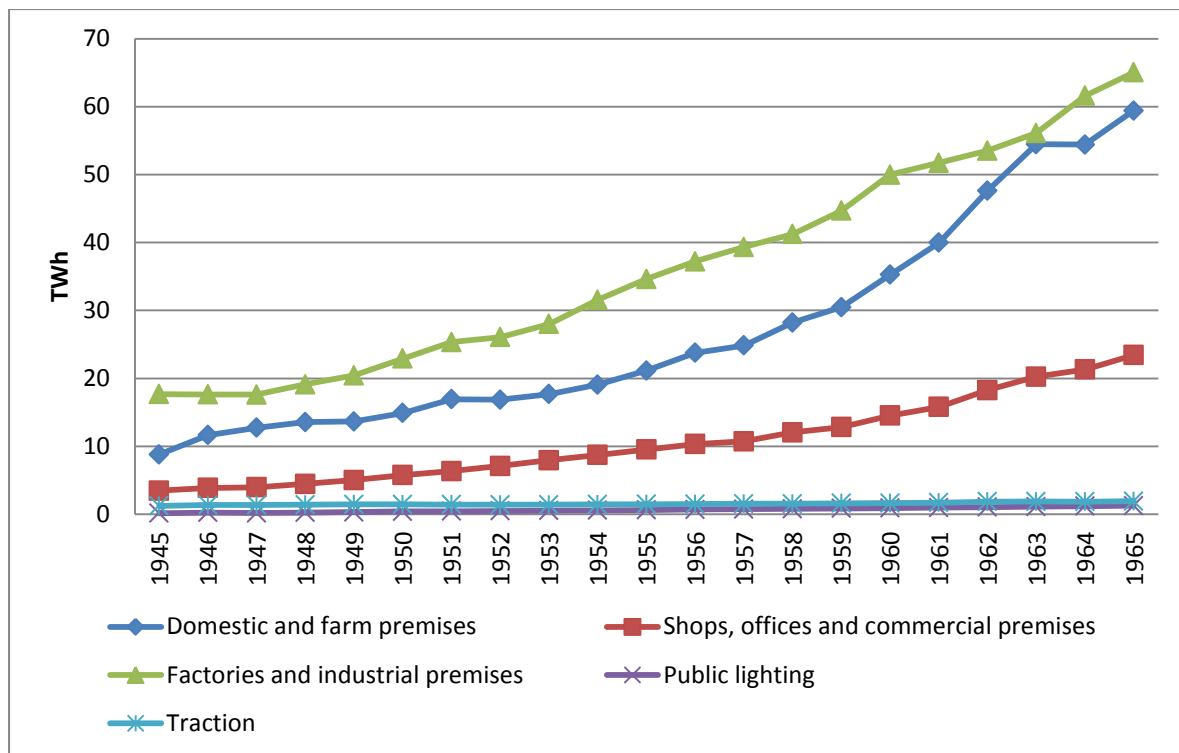
1940s: EDA reluctantly attempting to limit space heating demand

There was a sharp rise in demand for electricity in the immediate post-war period (see figure 1), especially from domestic consumers in peak hours (then between 7.45-9.00am and 4.30-6pm), when they consumed 25% of all electricity. One reason for this was that the price of electricity had fallen in real terms since before the war (Chick 1990:111 & 1998:116-7). Electricity was under-priced and especially at peak the domestic consumer paid less for electricity than it cost to produce – some researchers estimated that domestic consumers only paid one third of the cost of supplying

⁶ It is possible that the later advent of colour television may have helped substitute for some of the focus and 'togetherness' associate with the coal fire (Wright 1964:192 and Chapman 1999).

electricity for on-peak space heating (Hannah 1979 ch9 & 1982:83, Chick 1990 & 1998). Electric fires were seen as a particularly problematic load, especially when used during peak-hours as they often were in winter. Apart from the price issues, a second reason for the growth in use of electric heaters during and after the war was the continued rationing of coal. Domestic consumers could switch on an electric heater at will but could not always get as much coal as they wished (Hannah 1979 ch9). Local Authority Fuel Officers may even have suggested this alternative to their consumers (Chick 1990:113).

Figure 1 Electricity consumption in TWh by different users (DECC 2012)



Another influence on the rapid increase in domestic demand was that the light engineering industry which had been developed during the war then swiftly changed over to civilian manufacturing, e.g. of electrical appliances such as electric fires. Government found it difficult to limit the manufacture or retail of electric fires, which were not usually sold by the ESI but by other, harder to control, retailers (Hannah 1979 ch 9, Chick 1990:112). Around 200,000 fires were produced for the home market in the second quarter of 1946 (compared to 100,000 per month in 1937) (PEP 1947:247). By the late 1940s about two fifths of domestic electricity sales were estimated to be for space heating (Hannah 1982:83). Furthermore, wages were relatively high and many other goods were rationed, which may have further encouraged consumers to acquire any available electrical appliances (Chick 1990:112-3). In 1946 consumption increased on e.g. hardware and furniture, while it stayed the same on basic items like food, coal and clothing (Chick 1998:13). Also, the Government and Local

Authorities responded to the lack of houses at the end of the war by housing people in 'pre-fabs' (pre-fabricated bungalows), which were often highly-electric (Chick 1990:113 & 1998:121-22).⁷

Simultaneously, it was recognised by government and industry that the war effort had reduced investment in electricity supply (Hannah 1979 ch9 & 1982, Chick 1990 & 1998 ch6). Plans for extending supply by building new power plants were quickly put in place, but it would take at least three years, if not longer, before the new plants could be used. Also, the investment plans were not initially well co-ordinated and construction suffered from lack of crucial supplies such as steel, a common problem for industrial investment at the time (Hannah 1979 ch 9 & 1982 ch 3, Robertson 1987). Coal was in short supply at the end of the war, due to reduced output and increased demand (e.g. from existing electricity plants and to make steel needed for new power plants and other purposes). During the winter of 1945/46 the government narrowly avoided a coal supply crisis through restrictions in use. During the summer of 1946 much of the government, especially the Minister of Fuel and Power, were optimistic about the fuel supply for the 1946/47 winter, while others were concerned and suggested that measures were needed to avoid a fuel crisis (Robertson 1987:37-59).

Until the early autumn of 1946, the EDA had been re-starting its activities with optimism, generally promoting the use of electricity (EDA 1945). The organisation claimed its work had made the public increasingly "electricity-minded" (EDA 1946:9). However, in October 1946 the ESI warned the government that they were short of coal and that power cuts were being introduced (Robertson 1987: 59). The industry was beginning to realise that supply was not keeping up with the increased demand and began changing its policies. The EDA took part in this, changing their advertising and educational policy away from that which "urged the unrestricted use of electricity" towards "appeals for economy, particularly during peak periods" (EDA 1946:9). This change in policy can be dated to September or October 1946, through the pulling of a promotional campaign which had been due to start in November. The new policy was discussed with the rest of the industry at the EDA's annual general meeting in spring 1947, which unanimously adopted the Annual Report and, implicitly, the new advertising policy.⁸

In practice, the change of policy meant a switch from advertisements that urged readers to visit their local Electricity Showroom to find out about electricity and put their name down for appliances such as cookers, under the slogan "Electricity? Wonderful thing!" (see e.g. Times 3 May 1946 p3 & Times Oct 18 1946 p3). From November, EDA instead ran a campaign with the slogan "Use electricity at off-peak periods and help to avoid cuts", explaining when peak times were and why supply was low, urging consumers to 'time-ration' their electricity. Another ran with the slogan "Four million electric fires can be wrong!", which would have resonated with those familiar with the 1927 hit song "Fifty

⁷ Though Barty-King (1984: 226) also suggests widespread installation of gas-powered refrigerators in some prefabs.

⁸ The council's new policy consisted of a) assisting "the industry and public to obtain the maximum advantage from the existing supplies", b) educating the public about peak loads and "the need for economical use of electricity in order to minimise the ill effects of the fuel crisis", c) attempts to maintain the public's goodwill towards the industry, and d) undertaking education and propaganda that would benefit "the industry and the country" in the longer term without immediately increasing the electric load. E.D.A. Annual General Meeting, EDA Bulletin number 135 Apr 1947, p 1-2, in MOSI 1989.338/506

million Frenchmen can't be wrong" (see e.g. Times 20 Nov 1946 p3, 5 Feb 1947 p3, 3 Jan 1947 p3).⁹ EDA ran advertisements in 84 national newspapers and magazines. These advertisements were also displayed on outdoor hoardings and 708,000 pieces of publicity material were purchased by local electricity supply companies (EDA 1947:9).

Lobbying was another part of EDA's work, which indicates its somewhat conflicted view of demand management. In 1946 its lobbying included strongly opposing those, in particular the government's Fuel and Power Advisory Council, who argued for solid fuel as the most economic and efficient way of providing most domestic heating. The Council published a March 1946 report on "Domestic Fuel Policy", known as the *Simon Report* (after the committee's chairman Sir Ernest Simon). It had been prompted by the "urgency of dealing with domestic heating matters" because of the Government's house-building programme (Ministry of Fuel and Power 1946: ii). On the basis of calculations of how much coal was needed to produce a unit of heat, it recommended that the main winter space and water heating load should be met by efficient solid fuel stoves burning smokeless fuel, with extra heating for 'topping-up' provided by gas or electric fires, e.g. in bedrooms in case of illness or use as a study. In late 1946 EDA and the Electricity Supply Joint Committee (representing all undertakings) responded to the Simon Report by producing a memorandum sent to government ministers (including the Prime Minister), MPs, Local Authorities, architects and builders. It was highly critical of the Simon Report's assumptions, e.g. its limited definition of cost as not including items like transport, domestic labour and pollution, and argued that technological development in the electricity industry meant that suggesting the main winter space heating load should be provided by solid fuel was to lock the nation's housing into a soon to be out-of date system. It also "deprecated" the recommendations that government support solid fuel appliances through various subsidies and grants, unless similar allowances were given to electric appliances.¹⁰ Thus while the EDA had changed its short-term advertising policy because of the supply shortages, the industry's long-term policy clearly still emphasised and defended increased electricity consumption.

Despite repeated Cabinet discussions about the potential for a fuel crisis in the autumn of 1946, following the previous winter's problems, it did not agree on fuel restrictions until early January 1947, when electricity cuts were already forcing manufacturers to stop production (Robertson 1987:65). When an unusually cold and snowy spell hit the country from the end of January until the middle of March, coal became hard to transport (ibid: 10-16).¹¹ Electricity demand remained high and load was shed on 82 days during this winter – in the most extreme case, 29 January, an estimated 16% of demand could not be met (Hannah 1979:314). In early February 1947 the government introduced further restrictions on the use of fuel, especially electricity as it was feared the whole supply system would collapse if demand for it was not reduced. For example, supplies to street lights and week day sporting events were cut, and severe cuts to 'non-essential' industries were introduced. Domestic consumers were told not to use electricity between 9 and 12 am and 2 and 4pm (Robertson 1987:17-18). Some of the restrictions to industrial and domestic use of

⁹ See <http://www.youtube.com/watch?v=u-IPODE2kTI>. The musical comedy *Fifty Million Frenchmen*, with lyrics by Cole Porter, opened on Broadway in 1929 and was made into a film.

¹⁰ Domestic Fuel Policy, EDA Bulletin number 132 Jan 1947, p 6-7, in MOSI 1989.338/506

¹¹ February had the lowest registered mean maximum temperature for any month in Greenwich for over a hundred years and snow fell somewhere every day between 22nd January and 17th March.

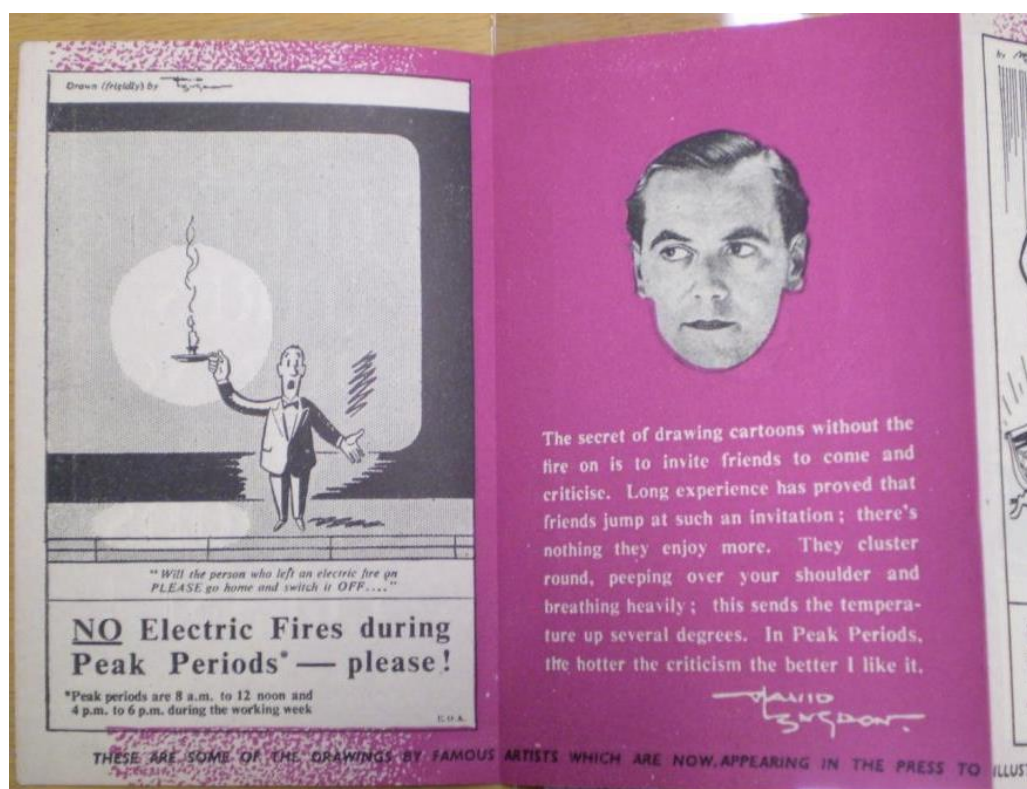
electricity were initially suggested by the Central Electricity Board chairman Harold Hobson to the Minister of Fuel and Power, Emanuel Shinwell (Hannah 1979:316). At first people complied with the restrictions and consumption fell by over a quarter (29% in the first week, 28% in the second), but later compliance faltered and by the fourth week the reduction was down to 15%. The government's measures to reduce demand only worked initially and were difficult to enforce. In the first half of March, the use of electric fires led to increased demand and by 3 March electricity undertakings were again shedding load (Robertson 1987:108-128).

The mandatory but hard to enforce restrictions on domestic consumers remained in place until the end of April 1947, when they were replaced by a ban on gas or electricity space heating between May and September and a request that domestic consumers reduce their gas and electricity consumption by 25% on 1946 levels. These restrictions were complemented by a government campaign, during which representatives from women's organisations such as the Women's Institute dropped leaflets and informed people of the need for restraint. The advertising campaign was begun in May 1947 but analysis of its impact by the Government Social Survey showed disappointing results: just over half the sample remembered receiving the leaflet and few of those who had read the material realised the measures suggested in it were meant to save 2.5 million tons of coal. Very few housewives thought they could reduce their consumption by 25%. The campaign was wound up on 31 Mar 1948 (Robertson 1987:169-71).

Perhaps as part of the 1947/48 public information campaigns (Robertson 1987: 169-71) or as a response to a further cold-snap in November and early December, which led to substantial power cuts (Hannah 1979: 323), the EDA ran what they called an "urgent campaign" in late 1947 and early 1948 against the use of electric fires. The material for the campaign, the main theme of which was "NO electric fires during peak periods, please!" , included posters, press and magazine advertisements, window bills and displays, school wall sheets, artists folders, invoice stickers and cinema slides (see figure 2). The EDA made clear to Boards that it aimed to put the message across in an amusing way, using "famous artists" to produce "humorous drawings to show the public what happens when electric fires are switched on during peak periods", as humour was thought to produce a better response in the public.¹² EDA believed in the power of advertising, claiming that their campaigns had much positive impact, leading to better understanding of the issues involved in the capacity and fuel crisis, but it is unclear how or if it measured the impact of its work. For example, it "anticipated that much of the confusion in the minds of the general public in regard to fuel economy would disappear" (EDA 1947:10) through its campaigns in 1946 and 1947, but does not appear to have measured their impact or accumulated evidence of their effectiveness.

¹² Advertising material MOSI 1989.338/491/53 to 56: EDA 1649, 1654, 1655

Figure 2 Extract from artist's folder (MOSI 1989.338/491/54: EDA 1654)



As well as the advertising campaign, the government tried to restrict domestic demand in other ways. For example, purchase tax on most appliances operated from electric mains was increased in the April 1947 budget from 33 1/3% to 66 2/3 % (Robertson 1987:136-8). This decision reversed an earlier intention to abolish the tax and was taken because of the high levels of consumption and the fuel crisis.¹³ Purchase tax became a bugbear for the EDA, which was particularly annoyed that the tax on gas and solid fuel appliances had not been similarly increased.¹⁴ For years to come, the EDA lobbied government to have purchase tax reduced, particularly for appliances regarded as off-peak (e.g. EDA 1947), but to little avail. The tax sometimes went up (e.g. to 100% on space heaters in 1948) and sometimes down, and varied between different appliances (cookers, seen as off peak, very quickly had their purchased tax reduced) (Corley 1966: 45-6). Overall, however, the government appears to have listened to those (e.g. the Simon Report) who argued that higher fuel economy

¹³ Purchase tax was introduced in 1940 as a wartime impost on a wide range of "luxury goods", to restrict spending and act as "a source of substantial additional revenue in time to come", according to Sir John Simon (HC Deb 23 April 1940 vol 360 cc74-86: <http://hansard.millbanksystems.com/commons/1940/apr/23/purchase-tax>). It remained a revenue raiser until superseded by Value Added Tax in 1973. At the end of the war in 1945, purchase tax was set at the rate of 33 1/3 % of the wholesale value of the taxed goods (HC Deb 23 October 1945 vol 414 c1901: http://hansard.millbanksystems.com/commons/1945/oct/23/purchase-tax-2#S5CV0414P0_19451023_HOC_321). For an explanation of the 1947 rises, explaining it as a reaction to the fuel crisis and high consumption of electricity especially for heating, see Dalton's speech in June 1947 (HC Deb 17 June 1947 vol 438 cc1843-69: http://hansard.millbanksystems.com/commons/1947/jun/17/third-schedule-purchase-tax-intermediate#S5CV0438P0_19470617_HOC_341).

¹⁴ The purchase tax restored, EDA Bulletin number 135 April 1947, p 13 & 20, in MOSI 1989.338/506

could be gained from using fuels other than electricity for domestic heating, considered a key reason for the increased demand, and kept the purchase tax as one of the few things it could do to restrict sales of electric appliances.

The government also, for example, attempted with limited success to restrict the supplies of material to manufacturers of electric fires. Some civil servants and politicians suggested that the price mechanism should be used, but the electricity industry, other civil servants and politicians fought this. The industry claimed peak electric heating had low price elasticity of demand and so would be unresponsive to price changes. When the government pushed through an experiment to test this, by introducing a winter surcharge, the industry did not tell many of its consumers in advance (so they could not adjust their behaviour) and the experiment was deemed to have failed. Throughout the 1940s and the 1950s the ESI did not increase prices to reduce demand, despite researchers within the industry as well as some within the Civil Service repeatedly arguing for it (Chick 1990 & 1998, Hannah 1979 & 1982).

In spite of its changed advertising policy and the advertisements against electric fire usage, the EDA's long-term aims clearly remained those of promoting electricity use. Its response to the Simon Report, discussed above, is an example of this. Just after the 1947 fuel crisis, Mr V.W. Dale, EDA's General Manager and Secretary, also showed his underlying electrical millenarianism. At EDA's Sales Management Conference in the spring of 1947, where he was talking to industry insiders, he stated that he felt that the fuel crisis was temporary and restrictions on electricity usage not needed in the long term: "When the present fuel crisis was past and the present shortage of plant and mains made good, the industry would not be in the least perturbed at the prospect of a substantial increase in domestic demand owing to the complementary characteristics of industrial and domestic loads."¹⁵ In other words, once supply had been increased EDA thought domestic demand would be a desirable and primarily off-peak load – not something in need of reduction.

Nationalisation and the Promotion of Off-Peak Demand

The industry began operating as a nationalised entity on 1 April 1948 (Hannah 1982: ch 2), one of several nationalisation decisions taken by the Labour government after its 1945 General Election victory. Debates in the inter-war period about how to organise the electricity industry had increasingly during the war switched in favour of nationalisation (Hannah 1979 ch 10 & Chick 1995). The EDA's headquarters was kept more or less as before, with a staff of 67 funded by the industry, although its local work was taken over by the new Area Electricity Boards that were responsible for distribution and sales to local consumers (Hannah 1982:77).

After nationalisation, EDA continued its work promoting electricity, though it claimed to do so in a way that would not raise demand at the time. Taking 1949 as a typical example, it wrote that while supply difficulties remained, so that "electrical economy" and discouraging demand were necessary, overall the Association sustained and increased its core mission: "the *electrical idea* has been maintained and sedulously propagated" (EDA 1949:6, italics in original). This was for example done by circulating more films (5,458), increasing displays and demonstrations and producing reports, e.g. "Electricity turns old houses into new flats" (ibid:6). It continued to run conferences, such as the annual Sales Management Conference in May, attended by 434 delegates who, as part of the

¹⁵ Sales Management Conference, EDA Bulletin number 136 May 1947, p 2, in MOSI 1989.338/506

programme, heard a paper on “The development of off-peak load” by J.I. Bernard, EDA’s chairman, and E.R. Wilkinson, the Commercial Manager of the British Electricity Authority (ibid:18). EDA also continued lobbying non-domestic actors, including government. As was to be expected, EDA argued against restrictions on the use of electrical appliances, for example convincing the Ministry of Health to relax the terms of an earlier notice against the use of electric cookers in new Local Authority built houses in areas where the local electricity generating capacity was deemed sufficient (EDA 1949:13).

Advertisements for the ‘electrical idea’ compared the feats of the electricity industry in overcoming the capacity crisis with historical examples of British men achieving the seemingly impossible (e.g. Charles Bright laying the first transatlantic cable) through determination and hard work, urging readers to contact their local Electricity Service Centres or the EDA for advice on using electricity (e.g. Times 27 Jun p2, 8 Aug 1949 p7). These advertisements appeared monthly in 44 national newspapers and magazines. While EDA’s own campaigns concentrated on keeping consumers “electrically minded” (EDA 1949:6), it also assisted the British Electricity Authority in a national press campaign called “Use electricity off peak” (ibid:10), for which advertisements ranged from humorous explanations of peak hours and why there could be a power cut in the morning and blazing shop lights in the evening (Times 2 Dec 1949 p3), to the more moralistic “Why should I care?”, with an explanation of why small consumers should also switch off during peak hours (Times 7 Oct 1949 p3).

In summary, while in the early post-war period the EDA remained fundamentally in favour of increased usage of electricity, including for domestic heating, it reluctantly accepted the reality of the capacity crisis. It adapted to it by changing its policy to promote the ‘idea’ of electricity while attempting to reduce domestic peak demand by advertising against the use of electric heaters during peak hours and encouraging off-peak use. It appears to have believed in the ability of advertising to change behaviour and demand, without necessarily checking the impact of its campaigns in a systematic way. Much of its work was aimed at influencing government policy in favour of electricity use, especially in the area of housing, and it frequently contested government and official committee views on fuel policy (such as the Simon Report). Nevertheless it was also keen to show itself as supportive of government, e.g. assisting its efforts through the ‘No electric heater’ campaign and by giving advice to domestic consumers during the 1947 fuel crisis.

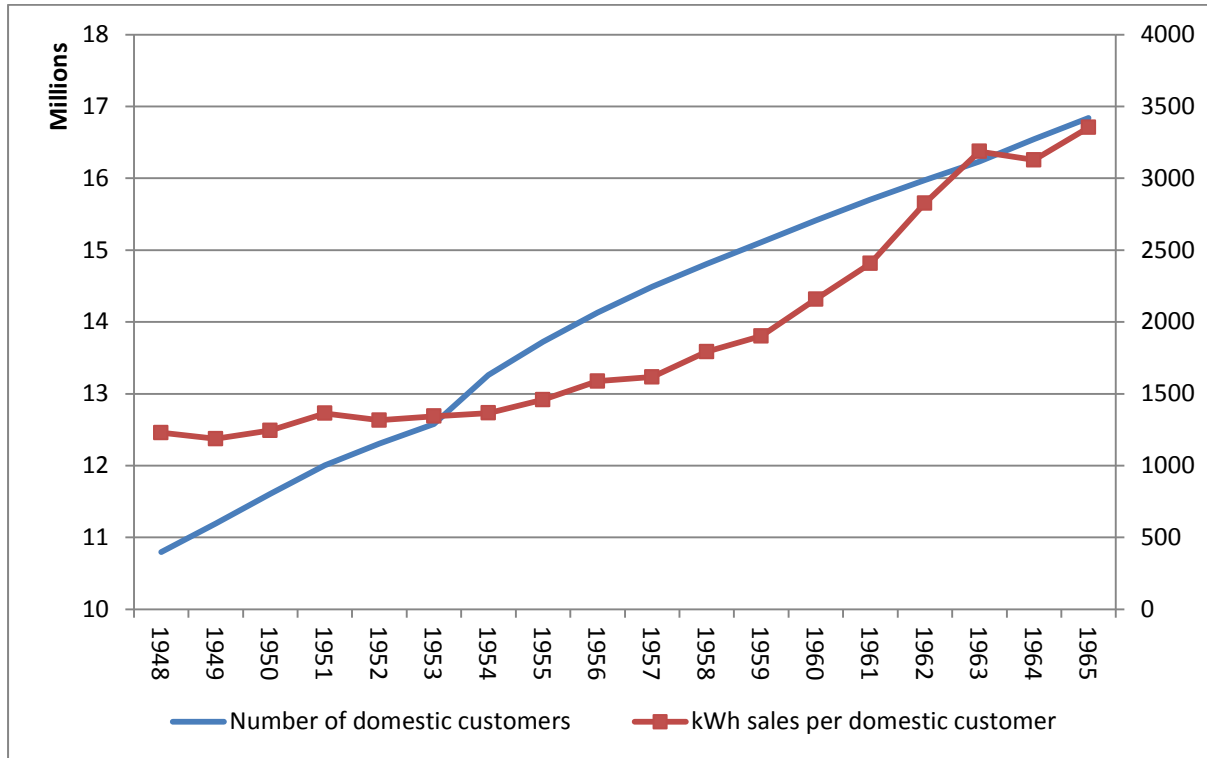
1950s: The rise of off-peak under-floor electric heating

After the concerns about the 1947 fuel crisis, government anxiety about fuel had lulled somewhat. However, in November 1950 the issue again reached crisis point. Because of lower coal production and increased demand, another fuel crisis hit and measures were again introduced, for example to increase the recruitment of miners and to reduce demand (Robertson 1987:176-9). Throughout the 1950s the supply situation gradually became more sustainable, though there were continued material shortages and intermittent restrictions on investment in the electricity industry, e.g. during the Korean War (1950-53). The Conservative government (in power from 1951) gradually changed how it controlled the industry, away from physical controls towards setting of financial constraints, especially imposed through interest rates (Hannah 1982, Chick 1998).

If the supply situation gradually appeared to improve, overall domestic demand continued to accelerate throughout the 1950s (see figure 1 above), though the use per customer remained fairly static until the mid 1950s (see figure 3 below). A quarter of the growth in the sales of electricity in

the 1950s came from newly-connected homes, a quarter from increased use of existing appliances and half from newly-purchased appliances (Hannah 1982:80). In the ten years after nationalisation in 1948, the number of domestic consumers rose from 10.8 million to 14.5 million in 1957 (see figure 3).

Figure 3 The number of domestic consumers in millions (left axis) and the sales per domestic consumer in kWh (DUKES, right axis)



The ESI encouraged cookers and water heating, as their load was deemed off-peak (Hannah 1982:81-82). Space heating remained a problem for the ESI: even though appliances were not promoted by them, electric fires were still easy and cheap to buy. In addition, electricity remained priced at below cost, especially domestic heating at peak. However, while some strongly disagreed, the majority view in the ESI still held that tariff policy would be of little help in improving the load factor of the system. Consequently, increased prices were only marginally used in attempts to manage demand. When coal supplies improved in the mid-1950s the electric space heating load decreased and off-peak sales increased faster than on-peak, though industry researchers still identified uneconomically high peak loads from domestic space heating during cold weather (ibid:89-90).

In the early 1950s the EDA claimed to be continuing to concentrate on promoting the ‘idea’ of electricity, without (apparently) encouraging increased demand. For example, in 1951 its Annual Report claimed its advertisements were “designed to promote greater economy and efficiency in the use of electricity without creating additional demand”. It also responded to shifts in the economy of the country, for example temporarily suspending its activities at the beginning of 1952 “in the interests of national economy” (EDA 1951:7) (most likely a reference to the impact of the Korean war on the British economy). Despite this it continued its general promotional work. For example, it

Realising Transition Pathways

argued against the rate of purchase tax on many electrical appliances which had been doubled in the 1951 Budget (in part to do with the rearmament programme). Also, in its 1951 sales training material, EDA pushed off-peak use of electric fires, but did not mention any potential need for reducing on-peak use. The manual accepted that “(m)any householders wish to retain the coal fire in the living room” but argued that even with a modern, post-war solid fuel stove with a backboiler providing hot water and a couple of radiators “there is still plenty of scope for the use of electric fires to deal with between-season and summer heating, to supplement hot water radiator heating with cheerful radiant heat, and to deal with rooms, particularly bedrooms, not heated by the solid fuel system”.¹⁶ Despite the recent campaigns asking people not to use electric heaters at peak time, the sales manual seems to have been aimed solely at promoting the use of electric heating appliances; this again suggests that EDA’s commitment to restricting demand may have been somewhat superficial.

As soon as electricity supply began to be less restricted, from 1953, the EDA launched more directly promotional campaigns, with a return to millenarian slogans. For example, the Annual Report for 1953 affirmed that “the New Year [1954] opens in an atmosphere of intelligent optimism – Electricity for all, and for every purpose” (EDA 1953:6). Domestic electricity was promoted in the national press, using the logo “Electricity a power of good” (ibid:23). EDA reported growth in the demand for electric appliances and electricity with “(a)n increasingly favourable attitude towards electricity throughout the country” (ibid:6) and in the press, with a reduction in the “recent wave of anti-electrical propaganda” (ibid:8).¹⁷

Throughout the rest of the 1950s EDA continued to promote electricity and electrical appliances in different ways. In 1954, the EDA launched a major promotional campaign aimed at increasing the domestic load: “The Four Foundations of Modern Living”, i.e. electric cooker, water heater, refrigerator and washing machine. There were said to have been 268 million impressions of these advertisements (EDA 1954). The increase in activity continued: EDA’s Annual Report for 1958 described it as a “record year” with “emancipation from financial and other restrictions” leading to the largest national advertising campaign aimed at domestic consumers for many years. The “Get up to Date – Go Electric” campaign promoted “two of the most desirable domestic loads – Water Heating and Cooking” (EDA 1958:9). The advertisements had a combined circulation of over 43 million and Area Boards had ordered record amounts of supporting material – apparently the campaign symbol, a boy in a bath towel, became very popular. This campaign was continued in 1959 and novelty items with the “Little Boy” symbol, such as button badges, iced biscuits and tea cloths, were added to EDA’s arsenal. In that year EDA achieved record sales of publicity material, with a 24% increase on the previous year (EDA 1959:9).

The EDA also used shows and exhibits to promote electricity and appliances to domestic consumers. For example, in 1957 it “staged electrical displays” at 32 exhibitions and shows and claimed to have doubled the enquiry numbers after a re-design of the electrical section of the London Building Centre (EDA 1957:6). In addition, throughout the 1950s EDA continued to lobby government regarding housing and issues such as purchase tax (EDA 1953: 9). Slowly it began to try to show more

¹⁶ Staff information and data booklets, “Space heating”, 1989-338/12/22 ESI 16/1/1, EDA 1951:12

¹⁷ Further work is needed to analyse the debates in the media to which EDA alludes, in order to understand how the ESI and others promoted or worked against increased used of electricity.

clearly the impact of its campaigns, for example providing details of the number of enquiries received in response to different campaigns towards the end of the decade. Thus in 1958 enquiries received from exhibitions, such as in the London Building Centre or the Ideal Home Exhibition, were said to have increased markedly (by 68% and 63% respectively) (EDA 1958:8).

While EDA's claims that it tried to restrict demand generally in the early 1950s ring somewhat hollow, given the content of the sales manual and lobbying activities, its long-term commitment to shifting load off-peak seems more solid. Not only did its campaigns primarily promote loads deemed off-peak, like cookers and washing machines, it also increasingly emphasised domestic off-peak storage heating, especially under-floor heating. Initially it concentrated on promoting it to architects, builders and planners. In 1954 EDA supplied advice to those involved in local authority housing schemes, and claimed there was "(i)ncreased interest" in electrical space heating, especially floor warming and storage block heaters, as operating results "showed that such storage methods are more economical than previously supposed" (EDA 1954:15). Also in 1954, J.W. Moule's paper on Electrical Floor Warming was said to have been "extensively used" in the architectural and building press (EDA 1954:6). The EDA also lobbied government to promote off-peak storage heating by reducing purchase tax (EDA 1954:8&15) and in 1958 EDA received a promise it would not be introduced on floor warming parts unless they were sold as prefabricated heaters or kits of parts (EDA 1958:13).

The EDA quickly also began promoting under floor storage heating direct to domestic consumers, for example through exhibitions. In 1955, it claimed that the largest group from the over 12,000 enquiries at EDA's exhibit at the Building Centre in London were about space heating of domestic and industrial premises (EDA 1955:10). More specifically, EDA claimed it was receiving more requests for technical advice about electric space heating "partly as a result of coal shortages, the increased cost of coke and the campaign for Cleaner Air" and also because of increased private house building (ibid:14). Boardman also argues that the Clean Air Act of 1956 spurred substitution away from coal in existing houses (1991:16). In 1957 EDA reported "a great increase of interest in off-peak heating" through telephone enquiries and stated it had sent information to 135 individuals building houses and 62 architectural and consulting engineering firms, although the ultimate impacts were not recorded.¹⁸ EDA had also produced a brochure titled "Cheaper Heat from Off-Peak Power" (EDA 1957:10-11). This indicates an important aspect of its promotion of off-peak heating: the introduction of off-peak tariffs by the Area Boards supported this development. Not only did Boards introduce off-peak tariffs, but in 1959 purchase tax was reduced and hire-purchase restrictions withdrawn. EDA argued that these measures led to strong growth in the demand for appliances, especially under floor heating, and directly linked that to improved load factors: "One of the newest applications of electricity, and one which showed the greatest rate of growth, was off-peak electric floor warming, the popularity of which was manifest in almost every type of building, with resultant benefits in the improvement of load factor" (EDA 1959:8).

EDA also paid more and more attention internally to off-peak heating. From 1957 a special section of the Annual Report was dedicated to off-peak domestic space heating (EDA 1957: 10-11). In 1958 it held a whole day of sessions on it during its Annual Sales Conference (EDA 1958:13). In the same

¹⁸ Further numerical data on the spread of off-peak heating, such as numbers of homes who used it, would be of interest to assess EDA's self-promotional claims, but this kind of data has not yet been found.

year its Space Heating Sub-Committee dealt with issues such as “recommendations on the construction of electrically heated floors, a brochure on floor warming in blocks of flats and another on its use in private houses, and the attitude of Building Societies towards mortgage loans on houses built without flues” (ibid.). And in 1959 its work continued on “the consumption of electricity for floor-warmed flats, off-peak heating by oil-filled electrical radiators, controllable-out storage block heaters [and] heated carpet underlays” (EDA 1959:13).

By the end of the 1950s the attention to electric off-peak heating was increasing in organisations outside the ESI too. In 1959 EDA’s Press Service reported that electric heating and floor warming were especially noticed by the press (EDA 1959:29), while the Ministry of Works included electric floor warming in its programmes of lectures. The Heating and Ventilating Research Association showed their increased interest by establishing a sub-committee to research off-peak heating, and architects continued to be interested, as were government committees on housing standards (ibid:8&11). By 1959 under floor heating appeared to be taking off, while a range of other off-peak heating methods were being investigated.

The uptake of electric under-floor heating was part of a wider increase in electric appliances and electricity. Between 1957 and 1962 domestic sales almost doubled (Hannah 1982:210), which the Boards had not expected. The increased demand was due to the decreased real price of electricity (by 11%) and, especially, reduced real prices for electric appliances, on which consumers were spending more than on electricity, while the Area Boards and EDA were increasingly promoting sales through advertising. At the same time incomes were rising, more married women were working (leading to demand for labour-saving appliances and the purchasing power to acquire them), and there was a boom in hire-purchase. There were rapid increases in the proportion of consumers owning different appliances (e.g. refrigerator ownership increased from 11% in 1957 to 28% in 1962) and ownership was reaching wider socio-economic groups, while consumers were becoming less frugal in their use of energy (ibid:210-11).

Although during the mid-1950s electric sales for space heating had levelled off, they grew rapidly between 1957 and 1962 – estimates range from doubling to quadrupling (ibid:211-212, n.1). It is unclear how this was split between on and off peak. Hannah argues the increase was due to several factors: a reduction in all-day heating needs (using solid fuel) as more married women went out to work, an increase in the number of rooms heated, increased living standards, outlawed coal fires in smoke control zones after the 1956 Clean Air Act and increasing prices of gas and smoke-less coal (Hannah 1982:211-2).¹⁹ According to industry research, ownership of domestic unrestricted electric heating appliances, i.e. potentially on-peak electric fires of different types, had risen from 60.5% in 1955 to 66% in 1961 and rose further to 69% in 1963.²⁰ However, these relatively low figures were and are contested by others; see e.g. Hannah (1979 & 1982). Hannah states that in the early 1960s more than three million electric fires were being sold annually (1982:211-2). In addition, the rate of

¹⁹ For further discussion on the links between rising living standards and rising consumerism, see e.g. Madigan and Munro (1991), Forty (1986) and Whilhite and Lutzenheiser (1999).

²⁰ Ownership of other electrical appliances had risen much faster, for example washing machine ownership grew three-fold, from 17.5% in 1955 to 50.2% in 1963, and refrigerators four-fold, from 8.1% in 1955 to 33% in 1963 (VI-5). Report on the space heating load in relation to the supply system in England and Wales, The Electricity Council, Research and Technical Planning Committee, Working party on the characteristics of the space heating load, February 1964, Box 377 MOSI

increase in consumption of electricity for domestic heating was much higher than the increase in ownership recorded by industry. Even a somewhat conservative industry report admitted that “over the period 1955 to 1961 space heating consumption doubled although space heating installed load only increased by half, thus pointing to a change in habits in use”²¹ – clearly existing appliances were being used more. This increase in non-storage space heating was increasingly a concern for the industry. At winter peaks, between 17 and 17.30, domestic demand was estimated at almost half (47-49%) of total demand and unrestricted domestic space-heating one-fifth (18%).²²

EDA’s campaigns to shift demand off-peak, especially for heating, were in part a response to concerns regarding the industry’s load factor, said to be still too low.²³ These concerns were raised by researchers within the industry, who were highly critical of the industry’s pricing structures, as well as by others, for example during Parliamentary debates on the Electricity (Borrowing Powers) Bill in 1959.²⁴ One of the industry’s researchers, Paul Schiller at the Electrical Research Association, argued that the EDA was promoting on-peak space heating through papers at its conference.²⁵ At the same time industry actors, such as EDA, valued campaigns that sought to increase the load factor, so part of the impetus came from the mainstream of the industry, at least as they themselves portrayed their view. Despite the increasing critiques against its practices, throughout the 1950s the traditionalists in the industry continued to win out: domestic charges remained low (Hannah 1982), with the industry instead concentrating on increasing off-peak demand, e.g. through promoting under floor storage heating. As in the 1940s the EDA supported the industry by promoting off-peak appliances. This now included under floor storage heating, which it saw as a success.

1960s: The rise of off-peak block storage heaters

Hannah argues that until 1961 the Area Boards continued much as they had before as regards pricing structures and load development, under-pricing domestic consumers, especially for on-peak space heating. However, the industry gradually realised that the increased demand was creating a problem, especially the space heating load, and in the early 1960s price rises and load-restrictions were increasingly seen as necessary by the senior men in the industry (Hannah 1982:211-3). Also the pressure from outside the ESI increased further in this area. In the late 1950s there were increasing calls for the ESI to earn a higher rate of return and in 1961 the Treasury forced the ESI to implement changes to ensure this (Hannah 1982: 202-7). The changed financial targets helped change ideas in the industry about pricing, making the choices regarding new pricing structures more clearly visible, although many in the industry still resisted change.

²¹ Report on the space heating load in relation to the supply system in England and Wales, The Electricity Council, Research and Technical Planning Committee, Working party on the characteristics of the space heating load, February 1964, Box 377 MOSI, p X-3

²² Report on the space heating load in relation to the supply system in England and Wales, The Electricity Council, Research and Technical Planning Committee, Working party on the characteristics of the space heating load, February 1964, Box 377 MOSI, p VIII-20

²³ In the period between 1955/56 and 1959/60, for example, the load factor varied between 46.7% and 47.8% (Electricity Council 1990, Table 17).

²⁴ See e.g. HC Deb 17 February 1959 vol 600 cc229-73, Clause 1.—(EXTENSION OF BORROWING POWERS.), http://hansard.millbanksystems.com/commons/1959/feb/17/clause-1-extension-of-borrowing-powers#S5CV0600P0_19590217_HOC_414

²⁵ Supplement to the Report on the Space-Heating Load, by P. Schiller, Commercial & Development Department, Electricity Council, 18.6.58, Box 397 on load development 58

In the early 1960s EDA continued promoting under floor heating, as well as supporting the development of block storage heaters suitable for domestic use, in the name of improved load factors as before. For example, in 1960, EDA reported that visitor numbers remained high at the London Building Centre exhibition, resulting in 21,000 enquiries, 28% of which were on space heating, with half of these on electric floor warming, and that space heating was the most popular topic (EDA 1960:11). The Space Heating Sub-Committee continued its work, related to e.g. “hot water storage heating, testing of block storage heaters with controllable output, ... domestic ceiling heating [and] off-peak domestic warm air heating” (ibid:13). More generally, EDA continued to promote floor warming through the publication of brochures and leaflets, advertisements, talks and exhibition stands. In 1961 EDA’s said that it continued to emphasise “off-peak load development, an aspect of the Association’s work which has assumed great importance in recent years” (EDA 1961:8) and stated that the introduction of domestic storage block heaters as well as the continued take-up of electric floor warming were key in this. While their main advertising campaign continued to promote electric cooking, water heating and refrigeration, adding a new slogan to the campaign: “Plug in to Electric Living (it’s all you ever have to do)”, it ran a campaign for domestic floor warming in the autumn. This campaign consisted of advertisements in three national Sunday newspapers and a selection of home magazines, as well as in specialist journals (e.g. architectural and town planning publications). It said it had received over 15,000 requests for information and publications in response to their advertising (ibid:8-9). In the autumn EDA also ran a pilot scheme advertising storage block heaters (ibid:13).

From September 1962 block storage heaters were more generally promoted through what was called the *Unit-plan*. Through this scheme block storage heaters of a type suitable for domestic use (often known as night-storage heaters) could be bought for £60 each and were combined with a lower off-peak tariff. The Plan was launched at a press conference attended by Margaret Thatcher, then Joint Parliamentary Secretary to the Ministry of Pensions and National Insurance, who “cordially commended” the new method of heating. The launch appears to have been a well co-ordinated promotional exercise, tying together press relationships with advertising, as many newspapers were said to have mentioned the launch. Apparently EDA’s whole-page advertisement received so much interest that insufficient heaters and manpower to install them were available, and the advertising was curtailed (EDA 1962:12). Also in 1962, domestic storage heating and floor warming were shown at many exhibitions, such as at the London Building Centre (where 37% of enquires had to do with space heating, with off-peak heating getting more interest than on-peak appliances), the Ideal Home Exhibition in Olympia and the National Housing and Town Planning Exhibition in Brighton (where many enquiries were said to concern Unit-Plan heating and off-peak tariffs) (ibid:10-11). In 1962 EDA also distributed 450,000 copies of their publications about domestic storage heating (ibid:13).

Off-peak storage heaters were given a push during the next winter, 1962-3, when a sustained period of unusually cold weather led to day time power cuts, but according to EDA off-peak heating continued to work relatively well and therefore received positive press (EDA 1963:8). In a Gallup survey, 12% of respondents had been affected by power cuts, 7% said they had not had fuel delivered this winter, 15% had had frozen pipes and more than 4 % burst pipes.²⁶ After the

²⁶ Questions from the Database of Selected British Gallup Opinion Polls, January 1963. For full reference see Archival material in the Reference list.

disruptions during the cold weather, the government reduced purchase tax on block storage heaters in 1963, a cut which the electricity supply industry had lobbied for since at least 1958: “no progress [reducing the use of on-peak heating] can be made until storage block heaters, free of purchase tax, are allowed to be used in domestic premises”.²⁷ EDA claimed that for the Unit-Plan, the “highlight of the year” in 1963 was when storage heaters were “freed” from purchase tax (EDA 1963:12).

The cold weather also affected the movements towards using the price mechanism to control demand. Hannah argues that the cold winters of 1961/2 and 1962/3 represented a crunch-point in this, as high demand had led to power cuts and reductions in frequency and voltage, especially during the Christmas holiday of 1961. Following this, the Ministry of Fuel and Power increased investment in the distribution system while the Electricity Council chairman, Ronald Edwards, increased the emphasis on load and utilisation research, leading to further work by Schiller, who again suggested that domestic price rises were necessary to ensure consumers helped pay for the increases in supply their demands required. From 1962 higher domestic price rises were gradually imposed by Edwards with Government support, despite resistance from others in the ESI. However, the price rises were slow and perhaps not sufficient to cover costs in some Boards. On the other hand, Hannah identifies the Unit-plan as a success, helping the industry to sell economic electricity for space heating, while retaining more desirable domestic loads (Hannah 1982: 213-6). The combination of promoting off-peak storage heating and gradually increasing domestic charges to something more closely related to costs led, Hannah argues, to the industry keeping the on-peak unrestricted space heating load at the 1964 level or below through the rest of the 1960s, with the growth in domestic heating supply coming from off-peak heating. The load factor of the system improved, from below 50% in the early 1960s to over 55% in the 1970s (ibid:281-2).

EDA claimed to support these attempts to improve the load factor. In 1962 EDA’s advertising to domestic consumers was said to have been “confined to those applications which improve the load factor and therefore the economy of the Electricity Supply Industry” (EDA 1962:8). In 1963, EDA claimed their domestic advertising continued to emphasise appliances with “desirable load characteristics”, with Unit-plan heaters included in this group (EDA 1963:9). However, their work and rhetoric was in part response to the debates about load issues and a defence against criticisms of the industry.

The *Morris Report* (after chair Sir Parker Morris), published in 1961, gave another push towards increased domestic heating. The Central Housing Advisory Committee had appointed its authors, to consider “the standards of design and equipment applicable” to residential accommodation (MHLG 1961:iv). It saw increased space and better heating as the two most important areas of change: “it seems to us entirely wrong to go on building homes in which so much of the available space cannot be used for day-to-day activities throughout the year” because of the room temperature (ibid:3). Like the Simon Report fifteen years earlier, the report recommended background heating (usually through solid fuel, though other central heating systems such as block storage heaters were considered) and topping up (usually through electric or gas fires). It proposed the same temperature standard as the Simon Report, i.e. 65^o F in living area and 55^o F elsewhere, but now included the kitchen and ‘circulation areas’ in the background heated areas (ibid:15-18). As part of its continued

²⁷ Load Factor Development, DMN, 11 Jun 1958, Commercial & Development Department, Electricity Council, Box 397 on load development 58,p 4

effort to lobby for the increased use of electricity in housing EDA submitted evidence to the Morris committee and was pleased with the report's emphasis on electric heating and the need for more wiring (EDA 1961:8&11). The report's recommendations were not made mandatory until later in the 1960s²⁸ and by 1965 only 20% of new council houses met what became known as the *Morris standards* (Burnett 1986:309). Nevertheless, it represented official pressure for increased domestic heating unrelated to the ESI and its load problems.

Although advertising had been curtailed for the Unit-Plan early in 1963, it was re-launched in spring and summer, urging customers to order "before the autumn rush", and was then continued into autumn. EDA ran a pilot scheme of TV commercials, which were also turned into cinema advertisements. EDA claimed to have received 16,000 individual enquiries for further information and asserted that "almost every home in the country has now read about the system either in the press or in literature, or seen it on television" (EDA 1963:9). EDA claimed that "hundreds" of "generally favourable" articles on central heating in national, daily and weekly publications (including *The Times*, *Observer* and *Daily Mail*) "materially helped the Unit-plan campaign" (ibid:29). A Unit-plan Enquiry Centre at Trafalgar Square was opened, displaying approved Unit-plan and off-peak water heaters: "enquiries numbering several hundreds a week were passed to Boards" (ibid:11). Other advertising continued as before, though electric floor warming promotion now focused on specialist expert journals, e.g. building journals, and on providing advice on it to small builders (ibid:9 & 12).

In 1964 EDA had a "double aim of consolidating and then expanding public acceptance of Unit-plan electric central heating and demonstrating the positive advantages of electric cooking and water heating so that the public acceptance of these load building appliances was increased" (EDA 1964:8). It felt this had been achieved successfully. The success of this campaign was an important part of its rhetoric promoting the industry and increased use of electricity, as it could be used as evidence that the industry was trying to combat its load issues – note the mention of "load building" in the aims above. The Lingard Committee, a working party of the Research and Technical Planning Committee of the Electricity Council, reported in 1964. It had been established in 1962, to investigate concerns with increased use of 'unrestricted', non-storage space heating. The report saw electric space heating positively, even when temporally unrestricted, though it also encouraged home insulation.²⁹ It is in many ways an example of the industry resisting change, but it shows that there were continuing debates about the relationship between load issues, space heating and price structures, within the ESI, to which EDA responded in its claims and activities to promote load shifting.

EDA's promotion of block storage heaters continued in 1964. It continued to report it as a successful campaign, with record sales of over 255,000 Unit-plan heaters in the 1963-4 season and claimed a 96% satisfaction rate amongst customers (EDA 1964:11). In 1964 EDA also continued to promote all types of off-peak electric heating through exhibitions, publications and e.g. by offering "a complete Unit-plan central heating system" as the first prize in a competition at the 'Homefinder' New Home Show, Central Hall, Westminster (ibid:9-10). At the London Building Centre space heating was the

²⁸ For public sector housing in new towns in 1967 and for local authorities in 1969.

²⁹ Report on the space heating load in relation to the supply system in England and Wales, The Electricity Council, Research and Technical Planning Committee, Working party on the characteristics of the space heating load, February 1964, Box 377 MOSI

most popular subject for requests for information, at a third (31%) of almost 20,000 enquiries (ibid:10). While the EDA is likely to have been one of the last sections of the industry to admit there were issues with promoting the use of electricity for domestic space heating, as before it accepted that promoting use of electricity at off-peak times was the 'right thing' to do and continued to do so, for example by promoting off-peak heating.

Household heating practices ca 1964

In 1964, Lawrence Wright described household heating practices, emphasising the difference between such practices and those portrayed in advertisements, such as those by the EDA: "The advertisers' pictures of happy—nay, laughing families, basking idly in inexpensive warmth from invisible sources, while meals cook themselves, do not yet give a true overall image of British home life. In the average small house, a great part of the woman's work is still performed in cold rooms, with occasional spells in a hot kitchen that make her more sensitive to cold. Most of us still muddle along, shovelling coals, riddling and tipping out ashes, having flues swept, begging shillings for meters and carrying cans of paraffin ... We admit the need for cleaner, more efficient, labour-saving methods. But if we send for catalogues and estimate, we soon find that no good modern heating system is cheap to install [or run]" (Wright 1964:199).

In the early 1960s a solid fuel fire in the living room(s) was still the most common way of providing the main source of heating in domestic houses, but there was increasing variety (Boardman 1991:15). The 1961 Morris Report discussed present practice as still dominated by the open fire with a back boiler in the living room only. It also listed the use of other heating systems, especially in tall blocks of flats, but stated that only a small proportion of homes used them. These systems included a range of solid fuel heaters (e.g., openable stoves or high output back boilers with a couple of radiators attached), electric floor warming or gas warm air. The report also emphasised that there was much demand for additional heating, stating that three in five households had paraffin heaters and that domestic deliveries of electric heaters had doubled between 1954 and 1961 (MHLG 1961:15-17). In 1964, when the Government Social Survey undertook the Housing Survey in England and Wales, only about a tenth (11%) of households had central heating, of which merely 11% of systems used electricity, while nearly three fifths (58%) used solid fuel. Only a tiny proportion of households thus had electric central heating (Woolf 1967:89). However, a high proportion - perhaps around 70% - now owned electric fires. As before, the electric fire was usually used to provide 'topping-up' heating in bedrooms and in living rooms during spring and autumn evenings and cold spells. Electric fires were still "relatively more popular with well-to-do homes", e.g. the 8% of homes that were AB class owned 18% of electric heating capacity whereas the 33% DE households owned 20%. Londoners used more electric heating, which was thought to be due both to higher incomes and to a higher proportion of flats, which had little space for coal storage.³⁰ The installed load from unrestricted fires was concentrated: consumers with over 3kW of unrestricted space heating represented 55% of all installed load.³¹

³⁰ Report on the space heating load in relation to the supply system in England and Wales, The Electricity Council, Research and Technical Planning Committee, Working party on the characteristics of the space heating load, February 1964, Box 377 MOSI, p VI-9

³¹ Report on the space heating load in relation to the supply system in England and Wales, The Electricity Council, Research and Technical Planning Committee, Working party on the characteristics of the space heating load, February 1964, Box 377 MOSI, p X-2

Customers chose electric heating for convenience and cleanliness, not cost, which was a key reason for choosing other fuels.³² The Building Research Station found that under floor heating had long lag time, so was felt to require foresight regarding weather conditions. It was also said to be dusty and an additional source of heating was needed when sitting down for a long time. Local Authority tenants complained about not being able to control when heating came on or how much it cost (e.g. if they had landlord controlled heating paid for by fixed charge). A large minority of such tenants – one-quarter of those with electric floor warming and one-third of those with gas fires – did not use the installed system, but instead used another method of heating, e.g. electric fires or paraffin heaters, as they were unclear about what the system would do, thought it expensive or disliked the conditions it created (Hole and Attenburrow 1966:39-41). There were thus problems not only with the old heating systems but also with the new. Some problems were due to building practices: sometimes new public housing had the heating system changed at the last minute because of financial restraints, towards cheaper capital cost, often electrically based, heating systems, though this contradicted advice from the Electricity Council, which recommended that electric heating should only be installed where there was better-than-usual insulation (Boardman 1991:15).

Conclusion

In summary, the EDA continuously attempted to influence the demand for electricity. Usually it worked to increase demand. In relation to heating, though, it tended to promote off-peak developments. This first concentrated on new builds, for example in the form of under-floor heating in the 1950s. Later it promoted forms of heating that could be installed in existing housing, such as block storage heaters from the early 1960s with the Unit-plan beginning in the summer of 1962. However, it also campaigned against the use of electric fires at peak, especially in the 1940s, as part of wider demand management strategies (using modern terminology). EDA was thus in favour of off-peak heating and, at least officially, against on-peak direct electric heating. This was in a context in which, as Hannah (1979 & 1982) and Chick (1990) have shown, the industry as a whole under-priced electricity, especially at peak when costs of provision were often not recouped by the charges; this in turn is likely to have made demand grow faster than otherwise. Together with coal rationing in the early period and the later anti-smog campaigns and the Clean Air Act, this under-pricing may have especially stimulated demand for various forms of electric heating.

The EDA's heating campaigns gradually became more co-ordinated. The electric fire campaign consisted primarily of printed material in different formats (newspaper advertising, posters, window displays etc). Later, however, printed advertising for under floor heating was complemented by exhibitions and the use of the 'Little boy' logo on various materials. The Unit-plan appears to have been a well co-ordinated campaign, combining advertising with a carefully-planned launch/news conference that got the media interested. In addition the EDA gradually used more techniques to measure the impact of their campaigns, such as including coupons for respondents to ask for further information and counting their responses. This may also have reflected the growth of such techniques generally within advertising. Despite this increasing co-ordination and EDA's growing attempts to measure the impact of its work, it is unclear to what extent its campaigns affected demand or whether increased demand primarily stemmed from other factors, such as increased

³² Report on the space heating load in relation to the supply system in England and Wales, The Electricity Council, Research and Technical Planning Committee, Working party on the characteristics of the space heating load, February 1964, Box 377 MOSI

household incomes, under-priced electricity and changes in aspirations and regulations about home heating and thermal comfort.

While there are few figures, the use of off-peak electric heating was increasing, first with under-floor heating and then especially with the launch of the Unit-plan for block storage heaters. While the increase in off-peak heating reflected the appearance of new technologies, as well as consumers' desire for increased temperatures in their homes (MHLG 1961:15-17) and for 'modern' appliances, EDA's and others' promotional activities were also a contributory factor. However, without further work, requiring much quantitative data which may not have been collected at the time (by EDA or others),³³ it would be premature to try to assess the relative importance of the different factors involved in the increased usage of electric heating, both on and off-peak.

Whether EDA's campaigns to reduce the use of electric fires in the 1940s had much effect on everyday practice is even more difficult to judge, especially as the EDA does not appear to have measured this at the time. However, while something seems to have slowed down the rate of increase in domestic demand between ca 1947 and the mid-1950s (see figures 1 and 3), according to other research at the time this was only marginally due to the government's efficiency campaign in 1947-48 (Robertson 1987: 169-71). There is little reason to believe EDA's campaign had much more effect, but such campaigns may, together with e.g. purchase tax, have had some effect on the demand for electric heating.

How might this historical review relate to contemporary concerns about demand management, including load shifting? Firstly, it shows that concerns about managing demand are not new, though the terms used to discuss the (albeit somewhat different) issues were not the same. Secondly, it illustrates the challenges faced by an organisation whose mission was to promote electricity demand and revenue, when asked to discourage demand. Historically, the ESI, as represented by the EDA, its public relations arm, had been more concerned with shifting demand (with the incentive of reducing costs) than directly reducing it (with the disincentive of lower revenues). It did engage with demand reduction, particularly in response to energy security concerns manifested in actual or anticipated power cuts, albeit with some reluctance and a hankering to return to its millenarian outlook on electricity and to its 'normal' promotional role. Having a common narrative and agreement helped, as exemplified by the Unit-plan campaign, which appears to have produced better than expected results, with the campaign curtailed as demand for block storage heaters overwhelmed the supply chain. The EDA was probably more comfortable with load shifting via new heating methods, like block storage heaters and under floor heating, than with promoting direct demand reduction, since they could shift the load while also stimulating longer term demand by promoting off peak appliances.

³³ It is difficult to assess exactly how many used different heating systems. Official ESI figures are contested by others (Hannah 1979 & 1982) and official surveys, such as the 1967 House Condition Survey, did not explicitly ask about space heating (Central Statistics Office 1970:92). Boardman argues that heating was not emphasised in housing and environmental health standards in Britain, with these instead emphasising e.g. damp, structural instability, and ventilation (1991:11). It is also difficult to estimate how and to what extent different heating systems were used. For example, as discussed earlier the use of already-owned electric fires appears to have increased in the late 1950s and early 1960s. We generally rely on estimates from the time for the proportion of demand which came from non-storage space heating and such estimates vary from actor to actor.

Thirdly, the experience of this period shows that domestic energy demand is a dynamic phenomenon continuously re-shaped by a complex of socio-technical and cultural influences and institutions. This means that attempts to manage demand face the challenge of identifying and then addressing a set of changing behaviours and moving targets. In light of this, fourthly, it is perhaps unsurprising that the experience of the EDA illustrates the difficulties of successfully pursuing demand reduction, even when committed action is taken. It proved difficult to decrease demand by discouraging the use of popular flexible appliances like electric fires, a challenge that remains today for attempts to mould energy use behaviour, not least in relation to new or enhanced devices, appliances and services. In addition, when this was attempted by the EDA it was difficult to judge the effectiveness and durability of their campaigns.

Thus, fifthly, not only does this suggest that decreased demand is difficult to achieve, it is also not easy to gauge the effectiveness of advertising campaigns in the longer-term, especially given the other on-going changes, mentioned earlier, that also impact demand. To understand and measure the effect of demand management campaigns requires the collection and analysis of significant amounts of both qualitative and quantitative data, as modern research illustrates (Hargreaves et al. 2013). Sixthly, despite the EDA's claims of high satisfaction rates, as we have seen, many consumers were unhappy with the performance and/or cost of under floor and block storage heating systems; future forms of electrical heating will need to exhibit a portfolio of performance and cost characteristics that satisfy consumers, if they are to be taken up and used in sustained ways.³⁴

Finally, we hope to have shown that although ours is a very different world from that of the households the EDA sought to influence, there is value in exploring these earlier demand management experiences, for the insights they offer into the past culture and practices of the electricity supply industry and into the challenges that demand management faces today.

³⁴ In December 2009, Ipsos MORI undertook a nationally representative survey of the views of the population of Great Britain aged 15 and over, about their propensity to undertake domestic energy saving measures if the cost of gas and electricity were cheaper at certain times of the day. The results suggested that greater use of electric storage heaters was generally unlikely: almost half (47%) of the respondents thought it 'very/fairly unlikely' while only a third (35%) saw it as 'likely', with the majority of people over 35 very/fairly unlikely. Interestingly, 60% of those aged 65 or over, i.e. people alive at the time of the 1960s promotions, were very/fairly unlikely to respond with greater use of storage heaters (Ipsos MORI 2009: 14; Ofgem 2010, Table A3.1).

References

Published sources:

- Barton, J., S. Huang, D. Infield, M. Leach, D. Ogunkunle and M. Thomson, 2013, 'The evolution of electricity demand and the role for demand side participation, in buildings and transport', *Energy Policy* 52, 85–102
- Barty-King, H. (1984), *New Flame*, Tavistock: Graphmitre Limited
- Boardman, Brenda, 1991, *Fuel poverty: From cold homes to affordable warmth*, London: Belhaven Press
- Burnett, John, 1986, *A social history of housing 1815-1985*, 2nd ed., London: Methuen
- Central Statistics Office, 1970, *House Condition Survey, England and Wales, 1967*, in *New contributions to economic statistics, fifth series*, reprinted from *Economic Trends* May 1967-August 1969, London: HMSO
- Chapman, Dennis assisted by Thomas, Geoffrey, 1945, *Heating of Dwellings Inquiry: An Inquiry by the Wartime Social Survey, Appendix 1 in Great Britain*. Dept. of Scientific and Industrial Research. Heating and Ventilation (Reconstruction) Committee, Heating and ventilation of dwellings, London : H.M.S.O., Series: Post-war building studies ; 19
- Chapman, Dennis, 1955, *The home and social status*, London: Routledge & Kegan Paul Ltd
- Chapman, Tony, 1999, "Stage sets for ideal lives: images of home in contemporary show homes", in eds Chapman, Tony and Hockey, Jenny, *Ideal homes? Social change and domestic life*, London: Routledge
- Chick, Martin, 1990, *Marginal cost pricing and the peak-hour demand for electricity, 1945-51*, in ed. Chick, Martin, *Governments, industries and markets: aspects of government-industry relations in Great Britain, Japan, West Germany and the United States of America since 1945*, Aldershot: Edward Elgar
- Chick, Martin, 1995, *The political economy of nationalisation: the electricity industry*, in eds. Millward, Robert and Singleton, John, *The political economy of nationalisation in Britain 1920-1950*, Cambridge: Cambridge University Press
- Chick, Martin, 1998, *Industrial policy in Britain 1945-1951: economic planning, nationalisation and the Labour governments*, Cambridge: Cambridge University Press
- Corley, T.A.B, 1966, *Domestic Electrical Appliances*, London: Jonathan Cape
- Davidson, Caroline, 1986, *A woman's work is never done: A history of housework in the British Isles 1650-1950*, London: Chatto & Windus
- DECC (Department of Energy and Climate Change), 2012, *Historical electricity data: 1920 to 2010*, http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/electricity/electricity.aspx last accessed 05 April 2012
- DUKES: 1954, Ministry of Fuel and Power. *Statistical digest*; 1961, Ministry of Power. *Statistical digest*; 1972, Department of Trade and Industry. *Digest of United Kingdom energy statistics*, all London: HMSO

- Electricity Council (1990), Handbook of Electricity Supply Statistics 1989, The Electricity Council, London.
- Forty, Adrian, 1986, Objects of desire: Design and society 1750-1980, London: Thames and Hudson
- Foxon, T.J. (2013), 'Transition Pathways for a UK Low Carbon Electricity Future', *Energy Policy* 52, 10–24
- Hannah, Leslie, 1979, Electricity before nationalisation: a study of the development of the electricity supply industry in Britain to 1948, London: MacMillan
- Hannah, Leslie, 1982, Engineers, managers and politician: The first fifteen years of nationalised electricity supply in Britain, London: The MacMillan Press Ltd
- Hargreaves, T., M. Nye and J. Burgess, 2013, 'Keeping Energy Visible: Exploring how householders interact with feedback from smart energy monitors in the longer-term', *Energy Policy* 52, 126–134
- Hole, W. V, Attenburrow, J. J., (Ministry of Technology, Building Research Station), 1966, Houses and people: A review of studies at the Building Research Station, London: HMSO
- Ipsos MORI (2009) Energy Issues 2009: Survey of British public opinion:
<http://www.ofgem.gov.uk/Sustainability/Cp/CF/Documents1/MORI%20energyissuesreport%20Final.pdf>
- Jeremiah, David, 2000, Architecture and design for the family: In Britain, 1900-70, Manchester: Manchester University Press
- Kelf-Cohen, Reuben, 1973, British nationalisation 1945-1973, London: Macmillan
- Madigan, Ruth and Munro, Moira, 1991, Gender, house and "home": social meanings and domestic architecture in Britain, *The journal of architectural and planning research*, 8:2, p. 116-132
- Mass-Observation 1943: An enquiry into people's homes: a report prepared by Mass-Observation for the Advertising Service Guild, the fourth of the "Change" wartime surveys. London: Published for the Advertising Service Guild by J. Murray, 1943.
- MHLG (Ministry of Housing and Local Government), 1961, Homes for today and tomorrow, London: HMSO
- Ministry of Fuel and Power, Domestic Fuel Policy: Report by the Fuel and Power Advisory Council, London: HMSO, Cmd. 6762, March 1946
- Ofgem (2010), Demand Side Response, Discussion Paper 82/10. Office of Gas and Electricity Markets: <http://www.ofgem.gov.uk/Sustainability/Documents1/DSR%20150710.pdf>
- PEP (Political & Economic Planning), 1945, The market for household appliances, London: Published by PEP, distributed by Oxford University Press
- PEP (Political & Economic Planning), 1947, The British fuel and power industries, London: PEP
- Robertson, Alex J, 1987, The bleak mid-winter: Britain and the fuel crisis of 1947, Manchester: Manchester University Press
- Shove, Elizabeth, 2003, Comfort, cleanliness and convenience: The social organization of normality, Oxford: Berg
- Realising Transition Pathways

Whilhite, Harold and Lutzenheiser, Loren, 1999, Social loading and sustainable consumption, in Advances in consumer research, vol 26, eds. Arnould, Eric J and Scott, Linda M, Provo, UT: Association for consumer research, p 281-7

Woolf, Myra, for Government Social Survey, 1967, The housing survey in England and Wales 1964, London: HMSO

Wright, Lawrence, 1964, Home fires burning: The history of domestic heating and cooking, London: Routledge & Kegan Paul

Archival material:

Various archival materials related to the EDA and the ESI was used for the paper, and is referenced in footnotes in the text. This material is part of the ESI collection (collection ref 1989.338), held at the MOSI (Museum of Science Industry) archive in Manchester.

The Gallup Database of Selected British Gallup Opinion Polls for January 1963 was also accessed, via the ESDS (Economic and Social Data Service) website: <http://www.esds.ac.uk>. The reference for this material is:

The Data Archive, *Database of Selected British Gallup Opinion Polls, 1958-1991* [computer file]. Social Surveys (Gallup Poll) Limited, [original data producer(s)]. Colchester, Essex: UK Data Archive [distributor], February 1998. SN: 3803, <http://dx.doi.org/10.5255/UKDA-SN-3803-1>

Copyright for this material:

Social Surveys (Gallup Poll) Limited and The Data Archive. Copyright of the extraction programmes resides with the Data Archive. Copyright of the data is retained by Social Surveys (Gallup Poll) Limited.

Printed material in the EDA archive:

E.D.A. Annual General Meeting, EDA Bulletin number 135 Apr 1947, p 1-2, in MOSI 1989.338/506

EDA Annual Reports up to 1956, apart from 1946, in Box 461: 1945, 1947-1956

EDA Annual Reports for 1946 and from 1957, in Box 477: 1946, 1957-1946

Domestic Fuel Policy, EDA Bulletin number 132 Jan 1947, p 6-7, in MOSI 1989.338/506

Report on the space heating load in relation to the supply system in England and Wales, The Electricity Council, Research and Technical Planning Committee, Working party on the characteristics of the space heating load, February 1964, Box 377 MOSI

Sales Management Conference, EDA Bulletin number 136 May 1947, p 2, in MOSI 1989.338/506

Staff information and data booklets: "Space heating" 1989-338/12/22 ESI 16/1/1, EDA 1951

Technical Report Reference K/T126, Load characteristics of the principal classes of consumers, interim report by P. Schiller and F.H. Dennis, British Electrical and Allied Industries Research Association: London, 1948, Box 63 MOSI

The purchase tax restored, EDA Bulletin number 135 April 1947, p 13 & 20, in MOSI 1989.338/506

Newspaper material:

Advertisements from

Times 3 May 1946 p3

Times Oct 18 1946 p3

Times 20 Nov 1946 p3

Times 5 Feb 1947 p3

Times 3 Jan 1947 p3

Times 27 Jun 1949 p2

Times 8 Aug 1949 p7

Times 2 Dec 1949 p3

Times 7 Oct 1949 p3