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From hydroelectricity to the National Grid: Harewood House and the history of electrification in Britain, 1900-1940

Michael Kay and Graeme Gooday¹

Abstract

This paper explores the changing experiences of electricity consumption in British country houses up to the early years of national electricity supply. We identify three stages of domestic electrification: the 'experimental' stage, when the technology was viable only for limited household purposes; the 'fashionable' stage when electrical lighting was rendered an aesthetic luxury; and finally the normalisation stage, when electricity was treated as a commodity, no longer a curiosity. We focus on this previously little-discussed final stage with evidence taken from a typical example: Harewood House, Leeds, at which electricity was installed in 1901. Like other pre-Grid country houses, Harewood had to be self-sufficient in electricity production for longer than households in urban areas where networked supply was available sooner. Since country houses could often employ hydroelectric generating systems, their electricity supply was both fully controlled by residents and free to use (discounting initial installation costs). However, in the 1930s the arrival of the National Grid in rural areas brought not only new opportunities of centralised supply, but also new challenges. Our paper draws on new archival evidence from Harewood House to examine the adjustments required to electrical energy consumption when switching from self-generated electricity to a metered external supply.

Key words

Electrification, hydroelectricity, history, rural, Britain, self-sufficiency

We understand that our District Engineer, Mr. Taylor, has recently called on you and explained the points raised in your letter of the 7th instant relating to the consumption of electricity at Harewood House. It is hoped that the suggestions he has offered will be of assistance in avoiding undue extravagance in the future...ⁱ

Hayes to Bliss, 29 March 1940

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Consumers have been disputing their electricity bills for as long as they have been receiving them.ⁱⁱ In March 1940 the electricity company Electrical Distribution of Yorkshire (EDY) was engaged in just such a disagreement with Harewood House, Leeds. This prompted the District Manager to write to Miss Bliss, the Secretary at Harewood, placing the onus firmly on the household to keep their bills down by monitoring their use of electricity. Such disputes are very revealing of the differing conceptions of and expectations regarding domestic electricity in the first few years of nationwide centralised supply. This nationwide supply was conceived in the Electricity (Supply) Act of 1926, which proposed the construction of a National Grid. The grid was built and connected gradually over the course of the 1930s, bringing centralised electrical supply to many rural areas for the first time. It was fully operational by 1938.ⁱⁱⁱ Centralised power plants had been built in large cities in small numbers since the 1880s,^{iv} and had become more common in urban areas by the 1920s. However, many rural areas were less well served, and large houses often supplied their own electricity – as Harewood House did when it was first electrified in 1901. This pattern of self-sufficient supply and consumption persisted due, at least in part, to remote locations and the logistical challenges involved in running a supply from a nearby town or city.

In this paper we examine the changing experiences of electricity consumption in British country houses during the period when electricity came slowly to be seen less as an expensive luxury, and more as a widespread, though by no means ubiquitous, commodity. We identify this as the period of ‘normalisation’ of electrical supply. We focus on Harewood House as being representative of this period; it epitomises the discussions which large home owners were entering into, and the changes they were debating. The importance of users in the development and spread of electrical technologies is a growing historiographical theme.^v It provides a more nuanced insight into questions of technological change – or the lack thereof – than is visible through the focus on engineering, politics or administration in, for example, the electrical histories of Thomas Hughes and Leslie Hannah. Users, through their choices to adopt or reject a technology, can determine its success or failure. The use or otherwise of technologies must therefore be considered within the context of

available alternatives, and within the complex landscape of economic, social and political incentives, benefits and disadvantages.

[Figure 1: Harewood House. Reproduced by kind permission of the Harewood House Trust.]

Our work contributes to this historiography by demonstrating how these consumers encountered electricity, how they used it, and how their houses were supplied. This can help to explain why people chose to use electricity, bearing in mind that a decision to opt in to one technology is also a decision to opt out of another. In the case of the adoption of electricity for lighting, the flipside was the rejection of alternatives such as candles, oil lamps or gas – whether or not they were already in use.^{vi} Choosing electric lighting in a rural setting often meant the requirement to be self-sufficient. Self-sufficiency in electrical supply had also been commonplace in urban areas in the first few years of domestic electricity. However, whether this situation persisted in rural areas through logistical necessity, financial considerations or some other form of conscious decision is not always clear. As we demonstrate, around the turn of the twentieth century hydroelectricity was a very popular choice for owners of country houses looking to modernise and electrify their homes. The low cost of running such systems once installed may have encouraged consumers to retain them. However, doubts about the reliability of hydroelectricity may sometimes have negated this consideration. Our discussion of the transition to centralised supply at Harewood House addresses these issues. We also examine how having a centralised electricity supply or being self-sufficient affected users' conceptions of energy consumption in this period.

The three stages of electrification

We have identified three stages of early electrification in Britain up until the turn of the twentieth century: the experimental phase, the fashionable phase, and the normalised phase. The factors we have used to determine these stages include changing technologies, changing user expectations, and changing degrees of consumer 'take-up'. Each of the three stages can be represented by electrical installations at different country houses.

The experimental phase ran roughly from the late 1870s until the late 1880s, when electrical installations were predominantly individual, isolated dynamos or hydroelectric systems. Necessarily these were in the homes of the wealthiest, and indeed in houses where the grandeur of electric lighting could be used to both social and political benefit. The very first such electrical lighting installations included those at houses such as Hatfield House, Hertfordshire and Craggside, Northumberland.^{vii} At this time there was considerable inexperience in the safe usage of electricity, and accordingly there were accidents and in some cases deaths by electrocution. Although not common, these incidents were so remarkable that they were widely reported and caught the public imagination. One notable example was the death of a labourer in the garden of Hatfield House. Electricity generated by stand-alone installations was also unreliable in this period. We therefore argue that at this time electricity supply appeared to be a scientific curiosity, with which some intrepid men of science, such as Robert Gascoyne-Cecil, the 3rd Marquess of Salisbury, and Sir (later Lord) William Armstrong, dabbled and experimented – with assistance from sympathetic family members and or technicians. However, it was not a utility for mass public consumption.

The second stage, in the 1890s, saw a focus on the aesthetics of electricity in the home, in particular on the design of fixtures and fittings. This was epitomised for example by a book published in 1891 by Alice Gordon: *Decorative Electricity*.^{viii} While James Gordon, her husband, was busy as a consulting electrical engineer installing the first of London's central generating stations,^{ix} Alice explained to (mostly) female home owners how they might best make use of electrical lighting – thereby creating a demand for her husband's business. In particular her writing illustrated how electrical light fittings could – and should – be chosen in such a way as to fit into and complement existing décor. Standen, a house in West Sussex, is a good example of this phase; built between 1892 and 1894 for the nouveau riche family of James and Margaret Beale, it had electricity designed in from the beginning. As an Arts and Crafts house built by Phillip Webb, it is notable for having light fittings which blend seamlessly with the rest of the interiors.^x We argue that during this stage, electricity was perceived as more of a fashion in interior design than a technology which had the potential to become widely affordable and available.

As a stage in the uptake of a technology, we believe this fashionable stage was quite particular to electric lighting, if not unique. Gas lighting did not have such a fashionable phase, perhaps because gas suppliers never pursued aristocratic patronage. Indeed, as Maureen Dillon notes gas lighting had associations of the middle classes. Gas fumes could also damage expensive furniture, fabrics, painting and gilt-work in such fashionable residences.^{xi} In this way the story of the uptake of electricity is not only one of economics, but also of aesthetics and class.

The fashionable stage acted in many ways as a bridge to what we have called the normalised stage, from about 1900 up until the 1930s. At this point it was no longer surprising to find electricity in upper class homes – in fact it may have been expected – and also in many upper-middle class houses as well. This represents a period when for the first time electric lighting looked as if it could eventually become a widespread commodity, and thus have a broader impact on the everyday lives of the majority of the population. It is in order to understand this period better that we focus on Harewood House as a good example of a large home which was electrified at the turn of the century. By then it was more normal to see electrical installations, and the technology could no longer be so easily dismissed by detractors as experimental, untested, or impractical, or as a passing fad or fashion for those who wanted to show off their wealth. Harewood is also important as it is a good example of a house which was lit initially by hydroelectric power.

Whereas histories of technology have often tended in the past to focus on innovations, and pioneers of new technologies, this tells us only about the early days of these inventions; in the case of our topic it would tell us only about the first stage as noted above. Recently however a new focus has emerged of how technologies came to be domesticated into everyday routines. Historians of technology thus now highlight later stages of development and maintenance in order to better understand how technologies that we now consider to be ubiquitous – for example, such as electrical lighting, power and communications technologies – actually came to be so.^{xii} Our study contributes to this broader story, which is in many ways more interesting as it touches more human lives and has a greater, certainly a wider historical scope.

Such issues are best addressed through examining the third stage of ‘normalisation’. This was the period when electricity supply had become sufficiently accessible and

affordable in urban settings and civic environs that there was no longer a need to promote domestic electricity as an innovation. It was approaching instead the status of a mass consumer utility – albeit with electric lighting still more expensive than gas lighting until the National Grid was completed.

In what follows, we focus in on Harewood House in two stages: firstly the initial electrification of the house in 1901, and secondly the modernisation of the house and accompanying upgrades carried out to the electrical supply, including the switch over to centralised supply, in the early 1930s.

A first rate installation: hydroelectricity at Harewood

Harewood House is the ancestral home of the Lascelles family, the Earls and Countesses of Harewood, and is located just north of Leeds. It was originally built between 1759 and 1771 by Edwin Lascelles who wanted ‘a fine, new country seat to enhance his standing in politics and society’.^{xiii} By 1900 it was the home of the 5th Earl, Henry Lascelles, who had inherited the house and title following his father’s death in 1892. Although the preceding decades had seen the beginning of the agricultural depression which was to reduce the value of land, and with it gradually the power of the landed aristocracy,^{xiv} historian of the house Mary Mauchline notes that in 1900 the Lascelles family fortunes were looking quite healthy, and the 5th Earl took the decision to install electric light in the house.^{xv}

At this time the house was lit primarily by oil lamps and candles. As noted above, gas lighting was very rarely installed in family areas of large houses, furnished as they were with fabrics, paintings and furniture which were liable to be damaged by longer term exposure to the fumes from the burning gas. However, gas lighting was installed in the servants’ areas at Harewood; one or two gas fittings remain in the historic collections in the house. The 1901 electric lighting specification, detailing the work to be done to install electricity, notes that: ‘In any room or passages in which Electric light is being fitted, and where there are existing gas brackets they are to be taken down and the pipes stopped by the Contractor.’^{xvi}

[Figure 2: Gas fittings and the 1901 electric lighting specification on display in the house. Reproduced by kind permission of the Harewood House Trust.]

The story of the electrification of the house, a process which stretched from 1900 to 1902, offers a window onto the state of the industry at the time, and an insight into the way in which it was perceived by consumers. The process began with the 5th Earl attempting to get an idea of how much the project would cost. Claude Pilkington, put in charge of this endeavour, wrote to a number of electrical firms in July and August 1900. Perhaps a little overwhelmed by the number and variety of responses, Pilkington then also wrote to several consulting engineers who might organise, supervise and oversee the work. Letters were sent to potential candidates at the end of August, enquiring as to their fees. However, this was not always well received. F. Hastings Medhurst, of F. H. Medhurst and Lloyd, Consulting Electrical Engineers, replied that he was not happy to see that multiple engineers were being approached, noting that: 'Consulting engineers are as much professional men as architects or solicitors, and you would never think of asking 4 or 5 solicitors to quote each against the others for any legal work that you required to have done.'^{xvii} The electrical firms who would be called upon to tender for the work itself would be expected to quote against one another. However, such professional men believed that the distinction which existed in their eyes between themselves and the electrical firms was not one which was recognised by consumers.

A more favourable response was received from Nigel Harrington Balfour, who was subsequently appointed. Balfour, whose office was a few doors down from Medhurst's, on Victoria Street in central London, gave details of his credentials in a letter dated 13 September 1900: he had served 'the usual apprenticeship', studied under William Ayrton and William Unwin at the Central Technical College in London, was for 18 months the manager of the electrical department of Messrs. Taylor Smith and Co., and by 1900 had been in business on his own as a consultant for three years, 'having severed my connection entirely with the above mentioned firm.'^{xviii} Correspondence from Balfour reveals more of the struggle which electrical engineers faced in order to identify themselves as a respectable profession to consumers. He noted, for example:

...without wishing to be brusque I want to point out that I see you have already obtained some tenders and wish for my opinion on them [-] now I have had such trouble and worry with work done on contractors [sic] own specifications which I have been called in to supervise that I have quite

determined to refuse to have to do with it in future except when I am allowed to draw up my own specification on what should be done and put that before contractors to estimate on.^{xix}

He cited his fees as being 5% on the total cost of the work done, as well as travel expenses, and was happy to undertake the work, listing examples of other country house installations which he had supervised. By the end of October, Balfour had visited Harewood and drawn up a plan for the electrification of the house, comprising estimates for three different schemes for generating the electricity. One scheme used a steam engine, and the other two used hydroelectric power generated by a turbine, in conjunction with a steam engine as a back-up for when there was less water in the summer.^{xx} The estimates assumed 700 lights would be required in the house and stables – a fairly large and comprehensive installation. Balfour noted that the initial costs of the combined steam and hydroelectric scheme would be £500 higher than a steam generator alone – £3715 compared with £3215 – but the former would be cheaper to run. He did not however include detailed costings for the light fittings to be used in the house: ‘...it is very hard to estimate the cost of these as it entirely depends on the taste of the person choosing them’.^{xxi} For the guest bedrooms in particular he pointed out that it would be best to install wall plugs near all the dressing tables and buy lamps, rather than go to the trouble of arranging wiring to hang pendant fittings near them. The cost, he said, could vary between 10s and £2 or £3 each, but neat plain lamps could be bought for 15s – over £40 in today’s money.

Balfour’s covering letter for the report listed four firms which he said he was comfortable approaching for tender, but while he said that he would be happy to approach any others which the 5th Earl specifically wanted to ask, he emphasised again: ‘...I am very careful never to advise a firm I have any doubt about for one careless workman not properly supervised can do an enormous amount of damage to the decorations such as are found at Harewood.’^{xxii} The scheme chosen to supply the electricity was the one Balfour recommended as being the best: a turbine installed near the lake along with a steam engine. This scheme used two dynamos to generate the electricity, one powered by the turbine and the other by the engine. Balfour noted however that installing a steam engine would necessitate a tall chimney about 35 feet high – but if this was not a popular suggestion for aesthetic

reasons an oil engine could be installed.^{xxiii} It seems that the 5th Earl did indeed object to the chimney, as later insurance documents confirm that an oil engine was used instead. The electricity was thus generated by a 33 HP Turnbull Turbine and a 35 HP oil engine, each of which was attached to a 27 KW dynamo.^{xxiv}

Pilkington had previously been seeking estimates directly from electrical firms, but Balfour recommended that he reject these tenders, and tell the firms that a consulting engineer had been put in charge of the matter. Balfour was against having them tender again, because 'the firms I do know out of the lot that tendered would not make a good job of the wiring, and those I don't know about personally I am naturally loth to trust on such an important installation.'^{xxv} However, the 5th Earl was not entirely satisfied with Balfour's costings, and not long after this the consulting engineer was surprised, and clearly more than a little annoyed, to find that the Earl was again looking into tenders from contractors:

I am much surprised at Lord Harewood's attitude in this matter and the more I think over it the more extraordinary it appears – he makes enquiries as to consulting engineers and selects me for the purpose of advising him on the installation of electric light at Harewood and then when it comes to deciding on a scheme after I have fully gone into matters he says I have made the work too expensive and is either going to or has entered into correspondence with a firm of contractors as to the cost etc etc.^{xxvi}

Like Medhurst earlier, Balfour now also noted that the Earl seemed to confuse his role and that of the contractors, and their respective standings and status:

...I should like to point out there is a great difference between profession and trade and that to deal with a firm of contractors behind your consulting engineer's back is not a proper course for anyone to adopt besides being extremely misleading as a contractor will naturally try and make out that the cost will be as little as possible so as to get the work but when it comes to paying for the work there will be large extras.^{xxvii}

[Figure 3: Balfour's letter to Pilkington, 15 November 1900. Reproduced by kind permission of the West Yorkshire Archive Service.]

The 5th Earl's response to this is, unfortunately, unknown, but as the installation continued under Balfour we can only assume that he capitulated to the engineer.

However, the Earl was not initially keen on using hydroelectricity, as there were concerns regarding the quantity of water available. Nevertheless Balfour, in agreement with the firms which had previously looked into the matter, decided that there was sufficient water,^{xxviii} and as one of the contractors noted: ‘...we would beg to point out that if the water scheme is adopted the power will cost nothing.’^{xxix} When electrical firms contacted Pilkington about the installation in August 1900, most mentioned that they had been involved with hydroelectric lighting installations. These were quite common at large houses where a source of water existed nearby on the estate, although alternatively electrical supply was generated by oil or steam engines.

The job went out to tender in spring 1901. The specification document, drawn up by Balfour, demonstrates that the installation was very comprehensive, including all the servants’ rooms such as the bedrooms and toilets. It also lists many existing fittings which were to be converted over to electricity.^{xxx} This suggests a desire to modernise and update candelabras and chandeliers, but also the recognition that these pieces should not simply be replaced by new electrical fittings. Many chandeliers on the State Floor of the house were very fine works of craftsmanship dating back to the late eighteenth century, and their electrification involved a careful fusion of the old and the new in terms of style and technology. Likewise though, the decision to attempt to electrify them would not have been taken lightly for fear of damage. This then was a highly discretionary modernisation.

[Figure 4: A chandelier in the Music Room at Harewood House. Reproduced by kind permission of the Harewood House Trust.]

The electricity would most likely have been a DC supply, with a series of batteries installed alongside the dynamos which could be kept charged to supply more electricity when it was needed. The electricity would then have been conveyed to the house through underground cables. This was a very common set-up at the time. Some (unfortunately undated) notes on how to use the system stated: ‘Rules to be observed for working the electric installation. ... In event of a House Party, or the load to the House exceeding 40 amps, the Lights must be run direct from the Engine or Turbine using the cells as regulators only.’^{xxxi} Thus when the demand was high it could not be supplied by the batteries, which were only to be used to even out the power supplied by the turbine or oil engine, in case it dipped.

However, the 5th Earl was not happy with how much the undertaking had cost: nearly £5000 over two years – over £280,000 in today's money.^{xxxii} A letter from Balfour to Claude Pilkington reveals that the Earl had hoped to keep this cost below £3000. However, Balfour asserted: 'Of course if Lord Harewood likes to do with a less number of lights than I proposed the cost can be reduced but certainly at the risk of having an unsatisfactory installation and probably adding them at a future time which is far more costly in the end than starting with the proper number.'^{xxxiii} Leopold Paget, who worked in the Estate Office at Harewood, was later blamed for not keeping a closer eye on this overspend, and had to write to the Earl in July 1902 to reassure him: 'Believe me you have not been "done". You have a first rate installation, and full value for money.'^{xxxiv}

The story of the initial electrification of Harewood reveals the struggles of electrical professionals to convince consumers to trust them, and to treat them as other respected professions were. It demonstrates as well an uncertainty on the part of consumers as to the possibilities of hydroelectricity. Although electricity in general was becoming more reliable, it was not clear how reliable hydroelectricity, dependent on weather conditions and water levels, would be. When convinced of its suitability, consumers thus developed a conception of electricity as a plentiful resource, but only for normal usage: for more intensive use, they would have needed to pay extra to run the generator. Nevertheless, for most everyday purposes for much of the year, electricity at Harewood was free.

“What sufficed in the past is not adequate for present-day requirements”: the 6th Earl and Princess Mary at Harewood

Carol Kennedy, in her history of Harewood, notes that by 1930 little change had taken place in the house since 1890, apart from the initial installation of electric lighting.^{xxxv} It was at this time that the house changed hands; the 5th Earl died in 1929, and his oldest son, Henry, inherited the house and the title, becoming the 6th Earl of Harewood. Mary Mauchline relates how the 6th Earl came to have far fewer financial worries than his father by the time he inherited: he was an avid collector of paintings even whilst young, and during World War One as a soldier he briefly met his great-uncle, the 2nd Marquess of Clanricarde, who was also a notable collector.

When the Marquess died shortly thereafter, he left a considerable amount of his fortune, estimated at £2.5 million, and his collection of paintings to the then Viscount Lascelles. In 1922 the Viscount married Her Royal Highness Princess Mary, the daughter of King George V and Queen Mary.^{xxxvi} Thus by the time they planned to move into Harewood House they were a very wealthy and distinguished couple, and they made plans to renovate and upgrade the house.

[Figure 5: The 6th Earl and Princess Mary. Reproduced by kind permission of the Harewood House Trust.]

In terms of electricity, it is almost certain that the house was not switched over to a central supply before this time. The first record of a payment to the supply company Electrical Distribution of Yorkshire (EDY) appears in the Household Cash Books in June 1931, and subsequently every quarter.^{xxxvii} We can therefore argue that this was part of the programme of modernisation undertaken by the 6th Earl. Indeed, an undated document in the Harewood archives, probably from 1931, reveals concerns about the cost of running Harewood in comparison to nearby Goldsborough Hall, where the 6th Earl and Princess Mary had lived previously. It notes that whilst some increases in running costs were inevitable due to the size of the house and the increased numbers of staff required, economies could be made in electricity use, heating, and some other areas.^{xxxviii} Perhaps this was part of the incentive for switching to a centralised supply. It is a reflection also on the lack of standardised electrical supply in this period that Princess Mary could note in October 1930 that the voltage used at Harewood House was different to that at Goldsborough Hall, although the two properties are only about 10 miles apart.^{xxxix}

[Figure 6: Harewood House Household Cash Book, June 1931, showing a payment to EDY. Reproduced by kind permission of the Harewood House Trust.]

Another motivation may have been that the existing plant would not be able to supply enough power to meet the new demands which would be placed on it by the increased use of electricity in the newly modernised house. One such case of increased consumption was the electrification in 1931 of more of the house's call bells, used for summoning servants. Although it is not clear when the bells were first electrified at Harewood, at this time the system was extended following complaints from the servants and the family. It was claimed that given the locations of the call

boards the bells often rang in places where there was no-one to hear them.^{xi} In March that year Stuart Syme, electrical engineer for Brierley and Rutherford, a firm of architects based in York, wrote to the Comptroller at Harewood House, H. F. E. Lewin, noting that although there was an electrical bell system in use, many of the old mechanical bells were still in use as well, and were no longer fit for purpose:

The defects in the present arrangement of the bells is in a great measure due to changes in the use to which some of the rooms have been put, and the manner in which the house has to be run these days. [...] ...it is now clear that what sufficed in the past is not adequate for present-day requirements.^{xii}

Rather than replace these older mechanical crank bells with new electrical push buttons, such as those which were designed into Princess Mary's new Drawing Room at around the same time, and which can still be seen in the house today, they kept the old bell pulls. These were electrified by arranging for the original wires to activate electrical switches when pulled: 'The extensions will almost necessarily have to be of the electro-mechanical type, that is to say the present crank equipment would remain, and electrically worked extensions connected to it.'^{xiii} Thus, while the bell pulls still looked and felt to the user like the old mechanical handles, which one pulled clockwise, turning them in order to operate the bells, they were now operated by electricity.

[Figure 7: A mechanical bell pull at Harewood House. Reproduced by kind permission of the Harewood House Trust.]

[Figure 8: An electrical call board at Harewood House. Reproduced by kind permission of the Harewood House Trust.]

In addition, this was a period when electrical appliances, in addition to electric lights, were becoming more common – for example two vacuum cleaners were purchased for the house, the first in 1929 and the second in 1935.^{xiii} An electrical passenger lift was also installed in 1930.^{xiv} This all served to increase the load on the generating plant, which would probably have gone beyond what was economical to run with the old generating system. As we have seen above, when the demand was expected to be higher this required the use of the oil engine, which was an expensive option. Along with an anticipation of there being more electrical appliances in use over the

next several years, this may have prompted the move away from self-supply and hydroelectricity.

Nevertheless, the use of electricity was still discretionary rather than absolute; in December 1929 an extensive quote was supplied for electrical cooking equipment for the kitchen – suitable for 150 guests on special occasions, and for 50-60 people on a daily basis.^{xlv} But this was not eventually accepted. Instead a more traditional Benham and Son’s coal range was installed. This demonstrates how electricity was not just adopted for its own sake in all cases, but other factors also played a role: a coal range would have warmed the kitchen more than electrical equipment, which may have been important for the staff. It may also have been more trusted as a cooking method rather than untested electricity. Gooday in his 2008 book *Domesticating Electricity* has emphasised the significance of servants’ views and opinions in the electrification of houses in this period: it was important that they accepted the new technology, as they were the ones who would need to use it.^{xlvi}

With this shift from a mainly free, sustainable supply to centralised, metered consumption came something new: electricity bills. This in turn brought a different perspective on the everyday usage of electricity in two main ways. Firstly it provided a fixed and consistent way in which to represent costs of consumption, and to compare them over time. Secondly it gave consumers in country houses, accustomed to organising their own supply, an external authority on whom they became reliant, but also to whom they could complain, and pass on the responsibility for expenses incurred.^{xlvii}

Table of costs quarterly from July 1931 – September 1933^{xlviii}

Date of bill	Amount
June 1931	£32 4s 10d
September 1931	£16 2s 5d
December 1931	£34 12s 11d
March 1932	£45 19s 1d
June 1932	£31 10s 5d

September 1932	£12 7s -
December 1932	£20 8s 2d
April 1933	£42 12s 10d
June 1933	£49 4s 1d
September 1933	£13 11s 8d

The table above demonstrates the cost of electricity bills for the first couple of years of external supply at Harewood House, indicating fairly steady patterns of consumption. In 1938, however, there was a query on the accounts: the Secretary, C. Bliss, thought EDY had overcharged for the March bill, although a delay on the part of the company seems to have prevented this from being addressed until February 1940.^{xlix} At the same time, she also queried the most recent bill of £42 14s 8d, taken from a meter reading on 18 December 1939. This payment was requested on 6 February. She wrote to the company, pointing out that:

For the same quarter last year, when the house was in full use, the amount of your account was £35 6s. 8d. Since last September practically only one wing of the house has been occupied, the remainder (about three-fourths of the house) being dismantled. I think therefore that the matter requires your serious attention.^l

The company agreed, and sent a representative, the District Engineer Mr Taylor, who looked at the daily consumption of electricity in the house over a seven day period from Thursday 14 March until Wednesday 20 March. This survey indicates that bulbs with a variety of wattages were in use depending on the rooms. These ranged from 15 watts to 25 and 40 – the two most common wattages – and up to 60, 75 and 100 watts. Passages had 15 or 25 watt bulbs, and most servants' rooms had 40 watt bulbs. It is a sign of Bliss's own status in the household that her sitting room enjoyed a 75 watt bulb, the same brightness as Princess Mary's Dressing Room. Most family rooms used multiple 25 or 40 watt bulbs, indicating a desire to avoid bright individual lights, and a preference for instead achieving an appropriate degree of illumination more softly. This supports Gooday and Harrison Moore's research into early attitudes towards electric lighting; often consumers expressed concerns

about the harsh intensity of the light and desired to maintain where possible the aesthetic of the softer light of candles or oil lamps.^{li} The brightest 100 watt bulbs were only used in servants' work areas: the Pantry, the Still Room, and the Work Room. This indicates that these bulbs were probably considered too bright to be comfortable for the family's everyday use, but would be tolerated by servants undertaking close work.^{lii} In addition to lights, the house also had several electric heaters, including a 3 kW heater in Lord Harewood's room, as well as other electrical appliances: irons, at least one wireless set, kettles and vacuum cleaners.^{liii} The estimated daily cost for running all of these lights, heaters and appliances, as well as the electric lift, was given as 9s. 4d., about £13 in today's money.^{liv}

[Figure 9: A list of the lights in use at Harewood House, 14 March 1940.

Reproduced by kind permission of the Harewood House Trust.]

The conclusion was that for these two cases where the costs seemed unusually higher than those in the same quarter of the previous year, a large part of this extra cost was due to the length of the respective quarters. For example the quarter ending March 1938 had been ten days longer than that ending March 1937, and had also included Christmas week, whereas the previous one had not. This accounted for the higher charge. However, for the queried December 1939 bill, this was only part of the answer; the rest of the extra consumption, the company claimed, could be explained by the use of one particular electrical appliance:

There is a 4 kW. Hot Cupboard in the East Pantry, the use of which is equal to about 70 lights, so that a small increase in the use of this apparatus will quickly offset any savings made on lighting. This might arise from a variation in the operation of the apparatus by the servant, or for other reasons. An increased average use of 3 hours per day would account for the whole of the remaining increase...^{lv}

In other words, this was entirely the responsibility of the consumers to regulate and oversee, and the onus was placed on the servants to ensure they were not wasting energy and money. This was reflected in the letter written to Bliss by the EDY District Manager summarising these findings: 'It is hoped that the suggestions [Mr Taylor] has offered will be of assistance in avoiding undue extravagance in future, especially if the house electrician continues periodically to take readings of the

meters. The tabulated lists prepared by Mr. Taylor should be useful as a check in this direction.^{1vi} Consumers may have felt it the responsibility of the supplier to reduce their bills in response to specific circumstances such as those which Bliss had described. However, the suppliers were able to quantify consumption in great detail, and thus place the responsibility firmly back in the hands of the consumer. After many years of providing their own energy from sustainable hydroelectricity generated on the estate, which did not require such care in its everyday consumption, this may have taken some getting used to for families and servants at houses such as Harewood.

Conclusion

The story of electrification at Harewood House reveals much about the period in which electricity was becoming commonplace in larger homes, and, in the 1930s, in more middle class households as well. Taking electricity from a centralised supply was still a relatively unfamiliar way of consuming energy, the measurement of which was not fully understood by consumers. In the early days of electrical supply, represented in this paper by the initial electrification of Harewood, country house consumers with their own generating plant were at least able to measure electrical consumption in terms of other sources of energy or resources with which they were more familiar. For example when using a steam engine the cost or quantity of electricity used could be represented by the amount of coal consumed in running the engine. For an oil engine quantities of oil could serve the same purpose. At Harewood Balfour went into detail about these figures when preparing, and comparing, his estimates. When relying on hydroelectric power, this was less important in the first place, although a traditional measure of the flow of water and the horsepower of a turbine would have been familiar.

However, when houses switched to external supply, we argue that this frame of reference, based on previous modes of energy consumption, was lost. Companies installed and read meters, and charged accordingly. Consumers were thus forced to think in a new way about their use of energy: for example, how much more electricity was consumed by a hot cupboard rather than a lightbulb over certain periods of time. Consumers in rural areas were in some ways spared this transition for longer than

those in urban areas, where external supplies were provided sooner, and were more easily installed.

Our narrative also indicates how the electrical industry at this time was struggling to assert its professional identity: electricians wanted to prove that they knew best, but consumers were concerned to get the best price for a job. Electrical experts such as Balfour and Medhurst may have felt that consumers' lack of understanding of the complexity of electrical systems led them to underestimate the knowledge, training and skill involved in undertaking electrical work, and hence to underappreciate – and seek to underpay – those who carried it out. Supply companies such as EDY equally needed to enter a process of negotiation with consumers, in which they attempted to establish their authority not just as utility providers, but also as experts in electrical practice. For them, resolving disputes would thus not be a matter of compromising on profits, but rather of altering consumer behaviour and attitudes towards electricity. The companies were more successful than electrical engineers or firms in this respect, and they found that, in more ways than one, they had the power.

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