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THE VIEW FROM MY WINDOW

An historical perspective of the Electricity Supply Industry.

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Extracted from a Presidential Address given by Glyn England, then Chairman of the CEGB, on 2nd April 1982 to the Metals and Materials Association meeting at Bath University.

INTRODUCTION

I propose to interpret this title metaphorically as well as literally, using a few landmarks, past and present, as pegs for : -

- reflections on some aspects of the history of electricity supply in this country;
- considering some lessons that can be learnt from that past experience; and
- a few personal thoughts about the future, together with a mention of some of the CEGB's present preoccupations.

In other words, I intend to think aloud about how things seem to me, from where I sit in my office on the fifteenth floor of the CEGB's headquarters building, Sudbury House, in one of the most historic parts of the City of London.

Indeed, the industry as we know it today was really started by a big step forward in high-temperature materials technology which took place about 100 years ago. It was the development, by Swan and Edison, of a filament of carbon, which could be heated in a vacuum to incandescent temperatures that resulted in the production of the first practical incandescent lamp. We all know what a great impetus that gave to electrical technology.

SPATE OF CENTENARIES

I have mentioned one centenary. In fact, we in electricity supply are having quite a spate of centenaries about this time. Two others stand out. One is the lighting of the Surrey town of Godalming from a central hydro station in September 1881. The other is the Holborn Viaduct scheme of Thomas Edison, which began operation in January 1882 and was officially opened on 12 April of that year.

Fig. 1 "Edison Electric Light Station 57 Holborn Viaduct" (words written on the awning)

Although the Godalming scheme was selected to mark the official centenary of the electricity supply industry last year, in many ways the Holborn scheme was more significant. Certainly Godalming had the world's first public supply of electricity, and I would not wish to understate its importance. A water-driven generator there provided electricity both for street lamps and for lighting a number of private houses in the town. But the initial supply to Godalming was only 30 incandescent lamps and three arc lights, and didn't last long.

The Holborn Viaduct scheme, in the centre of the City of London, was much more ambitious. It was the world's first steam-driven central electricity station and its numerous customers were supplied with power for 1,000 incandescent lamps. This total had risen to 3,000 before the station closed in 1886. If the CEGB headquarters building had been in existence at the time, it would have been supplied from the Holborn station, for Sudbury House is only a few hundred yards from the Viaduct.

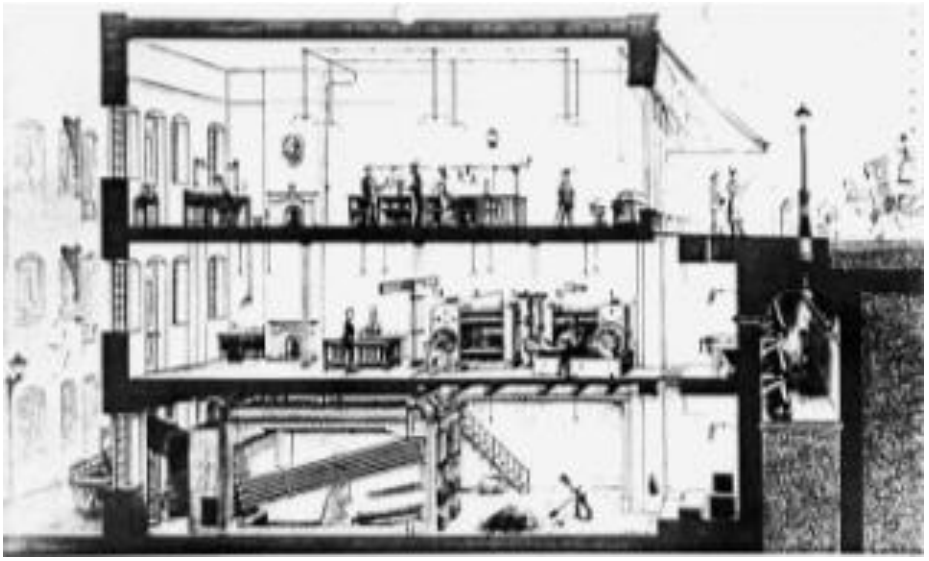

Fig. 2 Artist's Impression of the Cross-section through 57 Holborn Viaduct
Photos by Courtesy of the Mansell Collection and the Ford Museum Dearborn

IMPRESSIVE PANORAMA
From where I sit, the panorama is impressive, and I find it a great stimulus to thought. Close by, on the left, rises the majestic dome of St. Paul's. On the other side is that massive reminder of things temporal, the Old Bailey. St. Paul's has few connections with electricity supply, although it is worth mentioning that it was fitted with a lightning conductor in 1769, Benjamin Franklin acting as consultant. During a storm in 1772 the conductor glowed red as lightning was discharged through it. Chance observations such as this provided the background knowledge, which led to such developments as electrical heating of lamp filaments and other elements.

Looking beyond St. Paul's to the other side of the River Thames I can see Bankside power station, now (partly because it burns expensive oil) nearing the end of a very useful life. The architect was Sir Giles Gilbert Scott, who much earlier in his long professional career in 1903, when he was only 22 years of age, had designed the Liverpool Anglican Cathedral. Bankside was completed in 1960, and it was the last of the great London urban power stations, which became known as "Brick Cathedrals of Power". Its construction was vigorously opposed, partly because it was feared wrongly, as it turned out, that it would spoil the view from St. Paul's.

Another and even more famous London power station, designed by Sir Giles is Battersea, which I can also see from my window. The proposal to build this station, too, was a cause of protest, when it was built half a century ago. The fact that the possibility of its demolition recently met equal opposition is an interesting example of the changing face of public protest. In electricity supply, as in other fields - the railways are a case in point - controversial innovations of yesterday are now widely accepted and even highly prized. Battersea has now, in fact, been placed by the Secretary of State for the Environment on the list of buildings of historic or architectural interest.

ANOTHER CHAPTER
I want to return to St. Paul's for a moment or two because it provides an unusual starting-point for another chapter in the history of electricity supply.

In a rather obscure corner of the cathedral hangs Holman Hunt's painting, "The Light of the World"- a copy by Hunt himself of his original in Keble College, Oxford. It is in a poorly-lit position and this is interesting. Hunt was obsessively interested in illumination; he had in fact painted the work by moonlight and artificial light.

It is worth recalling that the earliest paintings we know - the cave paintings of the Dordogne and Pyrenees - were both painted and viewed by artificial light. Some authorities believe that this added to the religious significance of the cave-man's work. You may be wondering what all this has to do with electricity supply. It has, in fact, a direct bearing, because a minor project to illuminate a few paintings eventually led to the construction of Deptford power station.

During the 1880s the owner of the Grosvenor Art Gallery in Bond Street decided to install a portable generator to provide lighting for his pictures. His neighbours were impressed and asked, if they too could be supplied with electricity. This unexpected business grew and a supplier of meters, Sebastian de Ferranti, was taken on to solve some technical difficulties. The business continued to expand, and Ferranti had the idea of transferring the Bond Street activities to a purpose-built station at Deptford. The planned capacity was 90 megawatts, capable of supplying two million lamps, more than the projected demand for the whole of London.

ENGLAND'S EDISON
This was the start of a plan to build the largest central electrical station the world had then known - a station which would be capable of lighting up the whole of London. The plan was not completely realised, but because of it Ferranti justly became known as "England's Edison".

Deptford was a considerable distance (about eight miles) from what was to be its substation at the Grosvenor Gallery and its principal customers. To avoid undue power losses it was essential to transmit at very high voltages, implying the adoption of AC supply. Ferranti, unlike the majority of the British electrical establishment, was an enthusiastic supporter of the use of AC and his system was designed to transmit at the then unprecedented pressure of 10,000 volts.

The subsequent commercial failure of the Deptford scheme had many causes, including disastrous fires both at the Grosvenor Gallery substation and Deptford itself. Unfortunately the failure confirmed British prejudices against AC and set our technological development back many years.

Ferranti had incorporated into his station many developments, which were years ahead of his time. The only way in which his station differed from one constructed, say, 50 years later was that it used reciprocating engines. Britain had led the field in steam engine technology throughout the preceding hundred years, so it is not surprising that in this one area of electricity generation, that of prime movers, Britain more than held its own against foreign competition. When Deptford was under construction, however, reciprocating steam engines were becoming obsolete for large-scale generation plant. In fact Parsons had taken out a patent on the steam turbine six years earlier, in 1884, although these only began to come into use during the 1890s.

BRITAIN'S POSITION
By the end of the 1880s, British scientists and engineers had contributed a great deal to the emerging electrical industry. I have mentioned Swan, Ferranti and Parsons, but of course there were many others. Britain should have been poised to take as dominant a position in the new world of electricity as up to then we had enjoyed in the age of steam. But we were not.

We had much less generating capacity than the USA, Germany and other major powers, and our electrical manufacturing industry was in equally poor shape: three of the four major electrical manufacturing companies which had become established in this country - Siemens, BTH and British Westinghouse - were subsidiaries of German or American corporations. The fourth, GEC, had been formed by a German immigrant (Hugo Hirth) and owed its prosperity to an agreement with a German company to manufacture for the British market Welsbach's 'Osram' metal filament lamps.

Between 1880 and 1914, nearly all major developments in electrical engineering were made abroad. We took no part in the development of polyphase AC for example. We relied on American and German technology for our electrical transport system - the London Underground was almost entirely financed with American money and used American equipment. GE of America was the major supplier of electric tram motors and supplied virtually all the generators for the traction power-houses.

Strenuous efforts were made to improve our international standing in the electric world in the immediate post-war years, but these met with little success. In 1923 the total output of electricity in the United Kingdom, with a population of 45 million, was less than that of Metropolitan New York with a population of 7 million.

COMMITTEE'S REPORT
The Weir Committee, set up by the Government to look into the health of electricity supply in 1925, stated in their report: "We use less electricity per head than Shanghai or Sydney, less than a twelfth as much as California, less than an eighth as much as Canada, and less than a quarter as much as Tasmania, the USA, Norway, Sweden or Switzerland". It was the Weir Report that led to the creation of the Central Electricity Board. The CEB's task was to construct a transmission grid to cover the whole of the country. The grid was largely completed by 1936 and it had an immediate impact. Average coal consumption per unit generated was almost halved, and total national production of electricity more than doubled, between 1929 and 1937.

While the grid itself was a success, there was little reduction in the number of supply authorities. Even at the end of the Second World War, there were still 560 separate supply undertakings operating with 300 stations, half of which had outputs of less than 10 megawatts.

The difficulties arising from this multiplicity of supply undertakings, were resolved by the 1947 Electricity Act, under which the generation, transmission and distribution of electricity for public supply was transferred to public ownership.

THE REASONS WHY

How can we explain our disappointing performance in the field of electrical technology, particularly during the first quarter of this century? There are many reasons. I should like to examine some of them.

(1) *Lamp Research*

In spite of the splendid example provided by the work of Joseph Swan, British industry did hardly any research and development work on the incandescent lamp during the 40 years 1880 to 1920. (We had to import all the technology of metal filament bulbs). Largely as a result of this, our manufacturing industry became dominated by foreign companies.

(2) *Competition from Gas*

The second important factor inhibiting the growth of the electrical industry was the fact that the United Kingdom had one of the most efficient and comprehensive gas industries in the world. For the whole of the period 1870 to 1910 electric illumination was at least twice as expensive as gas lighting. It was the development of the incandescent gas mantle during the 1890s that helped gas to maintain its economic advantage. It was only after about 1915, as a result of the advent of the metal filament bulb, that the price of electric lighting fell below that of gas.

(3) *The Role of the Scientific Establishment* The third factor was that the British scientific establishment, in what became known as the "Battle of the Systems", came down firmly on the side of DC supply. It was because of this that the industry developed piecemeal with small stations supplying restricted areas.

A Select Committee was set up in 1879 "to consider whether it is desirable to authorise Municipal Corporations or other local authorities to adopt any scheme for lighting by electricity; and to consider how far and under what conditions, if at all, gas or other Public Companies should be authorised to supply light by electricity". The chairman of the committee was Sir Lyon Playfair, a distinguished scientist and politician. The committee did a workmanlike job and were generally sympathetic to scientific innovation.

However, they attached little importance to the exciting developments, which were then taking place in the field of incandescent lighting. Edison was dismissed as an American upstart and Joseph Swan was not even called to give evidence. Thus the committee assessed the immediate need for legislation on the basis of using electricity for no other purpose than to supply light from arc lamps.

(4) *The Role of Parliament*

These were some of the factors, which hampered the electricity industry in its early days. Parliament didn't help much either.

Admittedly the politicians were operating under a severe handicap - they weren't quite sure what electricity was all about. Faced with the problem of legislating for an entirely new industry centred on what was to them (and many others) a mysterious source of energy, they naturally sought guidance from their previous actions in trying to control other basic industries, notably transport, gas and water.

This was unfortunate. Parliament's treatment of the road transport industry, for example, had been conspicuously unimaginative. In delving into some of the records in preparation for this talk, I was surprised to learn that in 1831, the year Clark Maxwell was born and Faraday discovered electro magnetic induction, there was a regular steam autobus service between Gloucester and Cheltenham. During 1831 this service ran a total of 4,000 miles and carried 3,000 passengers at an average speed of 12mph.

Such daring had alarmed Parliament. In 1865 they passed the Locomotives on Highways Act which reduced permissible speeds on public roads to 2 mph in towns, rising to a breathtaking 4mph in rural areas. This Act became known as the Red Flag Act, because of its requirement, that every steam carriage should be preceded by a man carrying a red flag. This legislation completely stifled the development of road transport in the United Kingdom.

Although the Act was amended in 1878 it was not repealed until 1896. In other words it was in existence during the whole of the time our electricity industry was trying to emerge. So perhaps the pioneers of our industry could not have expected more sensitive treatment from the parliamentarians. They certainly didn't get it. The legislation eventually passed for the new electricity industry, the Electric Lighting Act of 1882, encouraged the formation of a multiplicity of small and uneconomic stations, and its influence continued well into the present century.

CHOICE FOR CUSTOMERS

Another setback to national development was the influential report of a senior official of the Board of Trade, Major Marindin, which recommended that individual customers should be given a choice of AC or DC supply. In effect this advocated a duplication of supply in any particular area. In another part of his report Marindin recommended the severe restriction of the area in which Deptford station could supply in central London, allocating parts to other suppliers. When implemented, this finally put paid to Ferranti's splendid concept.

Even as late as 1926, Parliament's grasp of electricity matters was still very shaky. An indication of this is that the excellent report of the Weir Committee, which was published in that year, was considered by the responsible Minister to be too technical for them, so it was not presented to Parliament.

PRESENT PREOCCUPATIONS

No one can deny that successive Governments have taken a close interest in our affairs - an interest, which, it could be argued, has not been uniformly helpful.

A recent indication came from the Commons Select Committee on Energy. In March the Committee reported on the Department of Energy's estimates for 1981-82 and quoted the specific example of the Government's decision in February 1981 to provide price support to the coal industry so as to enable its main clients, the CEGB and the British Steel Corporation, to cut their imports to an "irreducible minimum". The Committee commented: "It is clear from subsequent public exchanges that neither of these two principal interested parties was happy about this action and that they had not even been consulted about it. In the light of this, it would seem safe to assume that the interests of the consumer and taxpayer were not uppermost in the minds of Ministers when they reached their decision." That is a classical British understatement.

GOOD RECORD

These interventions by Ministers handicap our efficiency. However, I regard the CEGB's record, on the whole, as a good one. Like other organisations (in the public and private sectors alike) we have our weaknesses, and we know these better than any outsider. There are areas where I am disappointed that we have not made quicker progress.

However, having said that, I believe that the balanced picture is one of continued achievement, and I draw support from the exhaustive, nine-month investigation, which the Monopolies and Mergers Commission completed last year into the efficiency and costs of the CEGB. This independent audit of the Board's business confirmed that the CEGB was well organised, operated the electricity system efficiently and kept its costs under effective control.

FUNDAMENTAL PROBLEMS

We at the CEGB are preoccupied with two fundamental problems which did not confront our predecessors. One, which began with the oil crisis of 1973-74, is the high cost of the fuel we burn in our power stations.

We are tackling this problem in a variety of ways. We have drastically reduced our oil-burn. We are influencing the price of coal (which provides over 80 per cent of our generation), notably through our joint understanding with the National Coal Board, which provides a ceiling on the price of home-produced coal. We are conserving fuel by improving the thermal efficiency and availability of our large fossil-fired stations, while making the fullest possible use of our nuclear stations. And we are streamlining and modernising the generating system by "cannibalising" less efficient plant to keep more efficient plant running, and by closing down older stations.

These measures, coupled with a sustained and effective drive to reduce costs and increase efficiency in all other areas of the Board's operations, have enabled us to hold down the cost of our product to the consumer.

FUEL UNCERTAINTY

The other fundamental problem, which is preoccupying the CEGB, is that we do not know how far we shall be able to rely on fossil fuels towards the end of the century and beyond. We have therefore developed broadly-based strategies to enable us to meet a range of possible future circumstances. An important part of this programme is the continued development of nuclear power, which in nearly 20 years operation on the CEG B's system has proved to be safe and economical. We are also looking at ways of making better use of coal - studying, with the National Coal Board, the possibility of applying coal gasification to electricity generation.

In addition we are helping with Government work on combined heat and power. When a lead city (or cities) for district heating has been identified, we shall play our part in the development of co-generation, for we recognise that CHP is a valuable way of conserving energy. In the field of renewable sources of energy we are conducting a range of investigations by ourselves and with others, including the Government. The' sources that interest us most are wind power, wave power, geothermal energy and tidal energy.

We have, in fact, just bought our first wind machine. It is of medium size (200 kilowatts), and it is due to become operational at Carmarthen Bay power station by the end of this year. At the same time we are collecting wind data from three potential sites for our first large machine, and we have alerted British manufacturers to the possibility that we shall be in the market for our first such machines in 1983, for operation in 1985.

SEVERN BARRAGE

I began this talk by describing an historic hydro scheme - the Godalming venture. I should like to end by discussing a future (and much larger) one: the Severn Barrage.

The most promising site for harnessing tidal energy in Britain-indeed, one of the most promising in the world, is the Severn Estuary. The CEGB assisted the work of the Government's Severn Barrage Committee, which produced a very comprehensive report last year. This recommended a further period of study to examine more closely the environmental aspects of the scheme and prepare more detailed engineering designs.

I personally believe that this country will, at some time, wish to build the Severn Barrage.

But a special combination of circumstances will be necessary to prompt that positive decision. This is because of three major factors: the cost of the project which must be committed all at one time and which will be high by any standard; the inevitably long construction period, and the possibility that it might be a one-off project from which relatively little could be learnt that would be useful elsewhere. I do not think that that special combination of circumstances is likely to arise for several years.

It is doubtful whether the project can be justified on electricity production grounds alone, but I can imagine circumstances in which the decision might be taken as part of a profitable investment that will bring to the South West and to South Wales social benefits that can be quantified and, perhaps, some that are difficult to quantify. In my view, there is no reason why this need be wholly a Government-sponsored enterprise, though I believe Government will need to make a contribution. It would be a discrete and distinctive development in which there would be scope for entrepreneurial activity and for private investment.

'ENABLING' WORK

Given all the uncertainties, which we know so well, in the energy future of this country, much of our work within the CEGB at present is in the "enabling" category. We are doing essential work to make possible decisions at a later date, which would not be possible, if preparatory work were not done now. In my view, that applies accurately to the need for action in relation to the Severn Barrage.

I believe that over the next two or three years we should make certain that we are conducting sufficient investigation work to enable us to know how to build the Barrage in the best way (and "best" includes considerations of cost) and how to maximise the environmental gains and minimise the environmental damage. When the proposal to go ahead is considered by our successors, I would not like them to say "What a pity that the people responsible for these affairs in the early 1980s did not have the forethought to do the necessary investigative work".

This period, too, would provide a good opportunity for the public to learn of the project's implications, favourable and unfavourable, and for them to express their views. Like every other means of generating electricity, the Barrage would have its problems and its hazards. These need to be considered carefully and suitable action taken to minimise the risks associated with this bold and imaginative venture.

That, then, is a positive proposition, which indicates that the view from my window is not restricted to the past or bounded by the very real concerns of the present, but also looks out on to a future that is full of excitement and full of promise.