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BRIGHTON – "ELECTRIC CITY"

by Roger Hennessey

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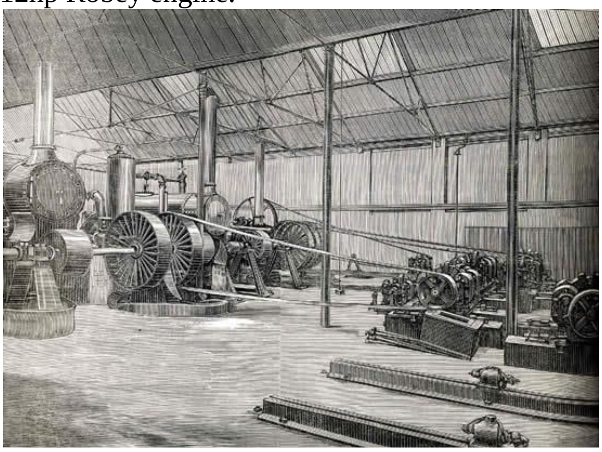
Back in the 1880s the American electricity supply tycoon, Samuel Insull took a holiday in the UK. He visited Brighton and was amazed to see not only the extent of electric lighting in shop premises, but the long hours for which it was used. He interviewed the engineer behind this, Arthur Wright, and discovered the secret: a two-part tariff. This logical economic device was but one of the range of firsts and innovations that have characterised Brighton's electrical history. Insull took the idea back to Chicago which followed where Brighton had led. The split tariff system has since become widespread and, in various forms, virtually world-wide.

Brighton was the originator or early emulator of much else: automatic voltage control; precise metering; long-distance telephony; electric cars and more besides. To this day it is the home of the oldest electric railway in the world, Volk's Electric Railway . Depending on criteria Brighton has a strong claim to have the longest-running public supply of electricity in the world (other contenders include Rochester, NY; San Francisco and Grand Rapids).

Context explains much: early electricity usage was an expensive proposition. Incandescent bulbs might cost £1.25 at a time when working men's wages might amount to £1 per week; current (in Brighton) started at 5p per Unit. But Brighton was also the centre of considerable wealth, home to large numbers of relatively well-off families, also large hotels and fashionable shops.

It was well placed to encourage electrical enterprise and was quick to do so. Robert Hammond (1850-1915), an electrical enthusiast with strong entrepreneurial inclinations, used an exhibition at a 'Brighton Health Congress' (1881) to publicise arc lighting as initiated by the Brush system. Some local shopkeepers persuaded Hammond to string up a 1.75 mile circuit of sixty street lamps which they agreed to back at 60p per lamp per week.

The experiment was a success, encouraging Hammond to set up the 'Hammond Electric Light and Power Co' in early 1882. From February of that year interested customers could purchase electricity 'from dusk to 11pm daily', i.e. chiefly, even exclusively at that time, for lighting. Brighton's first power generators were basic, portable boiler and engine sets put up in the yard of a foundry in Gloucester Road. Here a 10.5 amp Brush dynamo produced 800V (dc) driven by a 12hp Robey engine.



1. Brighton's second power station, Gloucester Road, 1887

This modest enterprise grew from 16 to 60 lamps in a year; with eight miles of circuit (overhead copper wires) and 1,000 incandescent lamps by 1886. The station engineer, Arthur Wright applied one lateral thought after another to meet a series

of challenges that were new to the human mind. For example, he arranged for incandescent lamps to be energised off arc lamp circuits, by placing them in parallel, in groups of ten. In case of one such lamp failing, threatening to damage its fellows, he placed electro-magnets in series with each lamp, able to switch a spare lamp into operation at once. Another source of voltage surges, the slumbering of the 'voltage boy' in the generating station, was cured by Wright's automatic voltage control, using electrodes in a water tank, actuated by solenoids sensitive to current in the circuit.

Wright also invented a practical meter to record the amount of current supplied to a customer, a system that deposited copper on electrodes dipped in copper sulphate, a marked advance on existing systems. His most famous innovation, however, was the two-part tariff. Wright realised that each customer cost the company in two ways: laying on power to a premises in the first place, and then supplying amounts of electricity. Accordingly, each service was charged separately, the reason why Insull found lights burning later than he counter-intuitively expected.

Wright was not the only original mind devoted to the development of electricity in Brighton. Possibly better known was Magnus Volk (1851-1937), a precision engineer with a taste for the new form of energy. His work preceded Hammond's, for example in 1880 he rigged up his private residence with incandescent lights, actuated by a gas engine and Siemens dynamo. Like Hammond, he first used the 1881 exhibition to effect, demonstrating an electric fire alarm, and some early telephony.

Noting Hammond's work, the Pavilion Committee of the local Council consulted Volk about installing electric lighting in the world-famous Brighton Pavilion, so as to dispense with hazardous gas burners. Volk obliged with 473 of the then state-of-art Swan incandescent bulbs, a 40hp steam engine and another Siemens generator, 90V, ac. First lights were switched on in April, 1883.

This interest of the local authority into electricity supply was to burgeon into a massive enterprise over the years. For the time being Hammond's modest system held sway, but its originator had wider ambitions. He went on to develop supply in Hastings, Eastbourne and far beyond. Later, he founded Faraday House for the training of electrical engineers; it lasted 1890-1967.

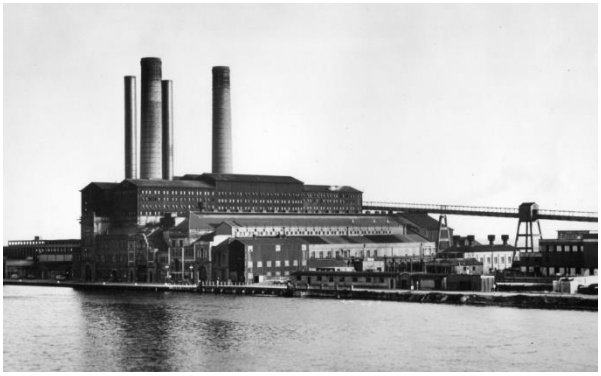
Hammond's Brighton undertaking was sold to the Brighton Electric Light Co (later Brighton & Hove Electric Light Co) in 1885. Arthur Wright continued as Managing Director with larger, purpose-built premises next to the original site in Gloucester Road. At which point the town Council emerged as a strong rival. This was the golden age of local government in the UK, running waterworks, hospitals, schools and many other necessary foundations of modern life. Although Brighton had obtained a Provisional Order for an electricity undertaking (1883), it had been dilatory in doing much about it. The Board of Trade threatened to rescind the PO unless it was acted upon. The Council got to work and built its own power station in North Road, opening it in September 1891, supplying some 1,500 lamps.

A short combat broke out with the original company; the Council becoming obstructive over the laying of underground mains, the company trying to hold its customers with restrictive contracts. The Council won this unequal struggle, first by attracting Arthur Wright as its electrical engineer (he lasted in post until 1905) and then by buying out the Company with its 192 customers, 1894. The two systems were by then not compatible; Wright had changed the Company supply to 1.8kV ac, with transformers situated on or near consumers' premises reducing it to 100V. The Council preferred a two-wire 110 V dc system.

For many years Brighton was to be on a three-wire dc system, with four separate voltages (115, 230, 460 and 550V) as well as ac which could be found next-door to dc supplies and which predominated in some areas, e.g. Rottingdean; an electrical mixed economy. The situation had some hairy outcomes over the years: anything from laboratory apparatus to model railways, operating on dc ran their apparatus in series with lamps by way of reducing voltage. Neighbours might run extension leads to access ac from a nearby street, and some households used primitive inverters to change dc to ac.

With local government resources available, the stage was ready for a huge expansion of electricity supply. From 1,300 customers at the time of the merger, demand grew to 4,500 in 1905, the year before the new and massive Southwick generating station was opened by the President of the Board of Trade, the Rt Hon R Burns, MP. It was extended in 1924, about the same time that substations were opened at

Roedean Road, Hollingdean Road, and Preston Road, all of which are extant.



2. Southwick power station (later Brighton A) 1906-76. *Photo, erstwhile CEGB*

The original station at North Road (nearly 6MW capacity), was shut in 1908 and used as a rotary converter station. Southwick (sometimes referred to as Shoreham power station or as Brighton 'A' in later years) was quite a phenomenon by the standards of Edwardian Britain. It had been sited to receive coal from the North directly by sea, London style. It cost £350K and supplied not only the County Borough of Brighton, but also Hove (bulk supply)and later the Central Electricity Board's National grid; also Shoreham. Its 190MW capacity served nearly thirty thousand consumers prior to nationalisation in 1948.

The swansong of Brighton's undertaking was the splendid Brighton B station, not far from the original Brighton A.; a steel frame structure, clad with 15 million bricks from High Brooms, Tunbridge Wells. Work started in 1947, but was not completed until 1952, well after nationalisation in 1948. Within a decade its four turbo-alternators had a capacity of 342MW. It closed in 1987.

3. Southwick power station (later Brighton A) 1906-76. *Photo, erstwhile CEGB*

A gas turbine generating station now occupies the Southwick site, started in 2002 and now owned by Scottish Power.

Waste heat from the gas turbine is used to raise steam in another set, the combined output is 400MW. In keeping with Brighton's cutting-edge tradition of electricity generation there now lies eight miles offshore the Rampion Wind Farm, 116 wind turbines completed in 2018 with sufficient capacity (400MW) to supply nearly half of the homes in Sussex.

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Brighton's own and long tradition of supply endured to the end. Just before nationalisation Southwick installed the UK's largest Brush-Ljungström generating set, 50MW capacity; a symbolic and ingenious exit for this redoubtable pioneer; two 25MW generators spun, contra-rotatively by a single turbine.

Brighton's public sector was itself a considerable consumer of electricity, for example with passenger transport. These days when electric cars are all the rage it is sobering to note that Brighton, and next door Hove, were quick off the mark over more than a century ago. Amongst the first dozen or so electric road vehicles in the world was a battery-powered electric taxi designed by a Brighton resident, Radcliffe Ward 1886. This was followed next year by a light electric dog-cart, a three-wheeler from the fertile mind of Magnus Volk. A battery below the driving seat drove a small, 0.5hp electric motor with chain drive to the offside rear wheel. The motor came from Immisch & Co, London, later more famous for their fleet of electric boats on the Thames.

News of this vehicle somehow penetrated to Constantinople, resulting in an order from the Sultan of Turkey, Abdul Hamid II, for a fully-fledged electric car. Volk duly delivered this himself and gave a demonstration drive around the Sultan's palace to the full approval of his client; yet another Brighton first!

Brighton adopted electric tramways and later, trolleybuses. The 9.4 mile tramway system had eight main routes of 3ft 6in gauge; it ran 1901-39. Hove was the location for an early trolleybus experiment (1914) on the Cedes-Stoll system, whereby a genuine light trolley ran along suspended conductor wires from which a lead ran to the vehicle. A more orthodox trolleybus system ran in Brighton 1939-61, a suitable location for this form of transport given the city's

hilly topography. Ownership of the system was unusual, mainly municipal but shared with a private operator. Power came from Southwick, via a two motor generators at North Road substation, feeding 550V dc into the overhead conductors.

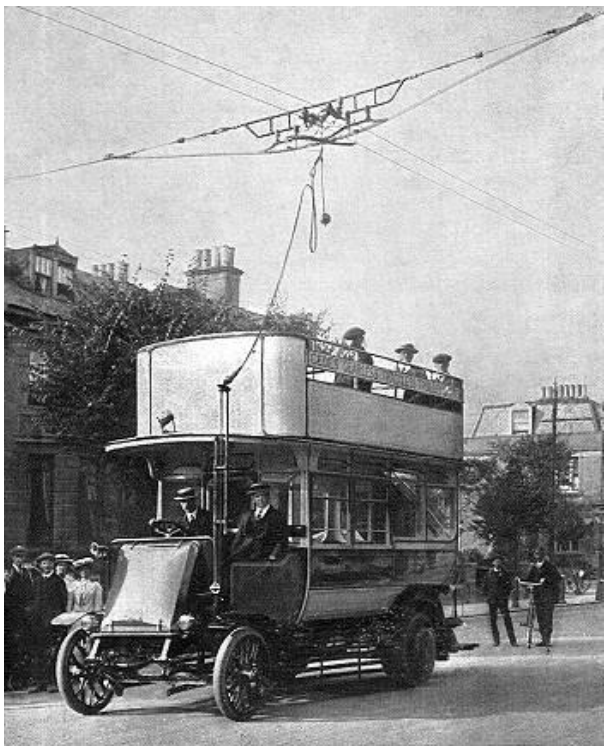
Possibly more famous, but part of a larger scheme was the Southern Railway's main line electrification from London to Brighton, 1931. One of the SR's predecessors, the London, Brighton & South Coast Railway had serious plans to electrify the same route on 6.6kV ac, but the Great War intervened. One unique aspect of the SR third-rail dc electrification was the world's only electric multiple unit luxury train, the all–Pullman car *Brighton Belle* that ran 1933-72. Power for this electrification was taken direct from the Central Electricity Board's grid, some of it delivered at Southwick.

Perhaps as famous is the oldest electric railway in existence, another brainchild of Magnus Volk, 'Volk's Electric Railway' (VER) has been operating since 1883, war and natural disasters apart. Only two electric lines preceded it, both long gone. It started as a 2ft gauge system running for about 0.25 miles, later converted to the unusual gauge of 2ft 8.5ins (825mm) and now running for just over one mile. At first it generated its own electricity supply (a Crossley gas engine and a small, Siemens dynamo) later purchasing it from Brighton's municipal supply (1902).

Its electrical characteristics have altered over the years; first running on 50V dc, using the running rails as conductors, it now runs with a third rail conductor and on 110V dc. Magnus Volk designed the original line, leased the necessary land from Brighton Corporation, built and ran it with family assistance. Brighton Corporation purchased it in 1940, and a recent grant from the Heritage Lottery Fund is refurbishing its infrastructure and rolling stock, some items of which date from 1892.

Volk's other foray into railways resulted in an extraordinary one-off, the Brighton & Rottingdean Seashore Electric Tramroad. It is certainly no 'forgotten' railway, since it has been recorded, spoken about and described ever since its brief life (1896-1901). An abundance of descriptions and illustrations, including videos, can be found on the Internet.

The line ran along the seashore from Brighton to Rottingdean, about three miles. It consisted of a huge platform-based saloon and promenade deck, mounted on four 24ft hollow steel legs, the whole resembling a detached portion of a seaside pier. The legs stood on bogies, which ran on 'Volk's gauge' rails of 2ft 8.5ins, the two tracks separated by an overall gauge of 18ft. A conductor line ran beside this assembly, mounted on tall poles; the vehicle itself (suitably named *Pioneer*) had two GE800, 25hp electric motors aloft, driving two of the bogies through bevel gears.



5. Cedes-Stoll experimental 33-seat trolleybus, Hove, 1914.

There was a coincidental Gloucester connection with this railcar-cum-vessel; mostly constructed by the Gloucester Railway Carriage & Wagon Co. Its motor was driven along by a 500V dc current generated by plant placed underneath the Rottingdean jetty – a 100hp compound engine by Sisson, also from Gloucester, driving a dynamo. At low tide the entire vehicle was visible to spectators; but as the tide rose it waded along through the sea, a situation that required it to carry a qualified sea captain, as well as a lifeboat and lifebelts.

A severe storm damaged the line badly in 1896, but it was rebuilt to soldier on until 1901. Although a popular wonder it was financially anaemic and its backers may have been partly relieved when Brighton Corporation effectively closed it, requiring parts of the route for foreshore

strengthening operations. It was scrapped in 1909. Remains and traces, for example of some concrete blocks that bore the track, can still be observed at low tide, Rottingdean end.

Although the Seashore Tramroad might be perceived as the acme of Volk's ingenuity as an engineer, he also had a long record in more familiar fields, including telephony in which he and Brighton excelled as pioneers. The electric telegraph had arrived in Brighton in 1851; some thirty years on and Volk was installing telephones. He started in a modest way with Brighton's first connection between his own house in Preston Park, and that of a friend in nearby Springfield Road, 1879. Later, he demonstrated the new telephone at the crucial 1881 exhibition, from which local electric lighting also grew.

The press reported that the new United Telephone Company had won a licence from the Postmaster-General (PMG) to open an exchange in Brighton and, eventually, to link it to London; Volk was appointed its Brighton agent. The exchange, first on the south coast, opened in West Street, 1882. Two years later, the UK's first long distance trunk line opened, London-Brighton. The London telephone directory now included Brighton numbers which were allocated on a location basis: 700 onwards for the Preston exchange, 500 for Hove and so on.

Few local authorities in the UK set up their own telephone systems, but Brighton was one of them. Its exchange was opened in 1903 near the Pavilion. However, it sold out to the General Post Office in 1906; the privately operated rival (by then the National Telephone Co) was nationalised in 1912. At that time telephones, like electric light, were in effect a preserve of better-off people. Albert Morley, PMG in 1899 opined patronisingly that the telephone would never be enjoyed 'by large masses of the working classes'. Similar predictions about electric light, motor cars and air travel all proved equally wide of the mark.

Another early sign of social change in Edwardian times was the arrival of films and the cinema. Here also Brighton and Hove were in the vanguard and might, but for the Great War have become Britain's answer to Hollywood. The early flourishing of this electrically-based industry has come to be known among the cognoscenti as *l'école de Brighton*, the 'Brighton School'.

Brighton was first to exhibit films outside London; the show started in 1896 with two demonstrations. Its original purpose-built cinema, the Electric Bioscope, opened in 1907; by 1914 there were seven of them and in 1939 a maximum of 25 just before the outbreak of war.

6. Originally the Electric Bioscope; 1907-79; Brighton's first. Now a Waitrose.
Photo, brightonfilm.com

New films were also made in the area; although they were often very short, their number was great: 75 in 1898, 23 slightly longer ones in 1908. At one time or another there were half a dozen studios in the Brighton area one of which produced the first successful colour movies; by George Albert Smith in Shoreham, 1906.

Taking stock

Brighton's electrical history is one of remarkable early enterprise, setting the pace for the world beyond. It had its downside, the melange of ac/dc and different voltages, for example. But also opposition from doubters and vested interests: Volk's railways met with strong and organised objections. The Rampion wind farm ran into loud criticism, presumably from sources using and depending upon electricity. But thanks to the talents and enterprise of Brighton's electrical engineers there has probably been a reduction, not an increase in human unhappiness. And it has been doing it longer than anywhere else.