

ELECTRIFICATION: Back in favour, but how far can the wires go in the next few years?

2011: the year of the sparks effect?

Electrification is back on the agenda with a vengeance, with a momentum not seen for thirty years. The Government's recent announcement of substantial electrification of the Great Western Main Line – all the way to Cardiff and also via two routes to Bristol – has come after several other newly-authorised extensions of the wires – particularly in north-west England. But it is important not to overlook the significance of recent developments in Scotland, either, where 350km of route is to be electrified between now and 2016.

We have just seen the slightly belated completion of the link between Airdrie and Bathgate, although the frequency of train service is still building as this article is written, because problems with the new Siemens Class 380s intended for the Inverclyde and Ayrshire Coast lines mean that Class 334 Alstom units from these routes cannot be cascaded to Airdrie-Bathgate as quickly as had been planned.

Of course, this demonstrates that electrifying a railway is only half the story. The appropriate rolling stock is essential as well and, as **Sim Harris** discovered, this can sometimes be a stumbling block – and may yet be again.

IN MANY ways, 2011 is shaping up to be the year of electrification. Coincidentally, it is also the 30th anniversary of British Rail's last big push to extend the wires around its network. Electric traction became practicable in the late nineteenth century, and played a major part in shaping the progress of rail-based public transport from the 1880s onwards. Electricity provided a tremendous boost to urban tramways in particular, which reached their peak between the later 1890s and the outbreak of the First World War. Trams began a steady decline in the 1920s: they were increasingly perceived to be a nuisance, running (and stopping) in the middle of the road and impudently obstructing the all-conquering motor car. Their rapid rise in a very short time also meant that the technology of many systems

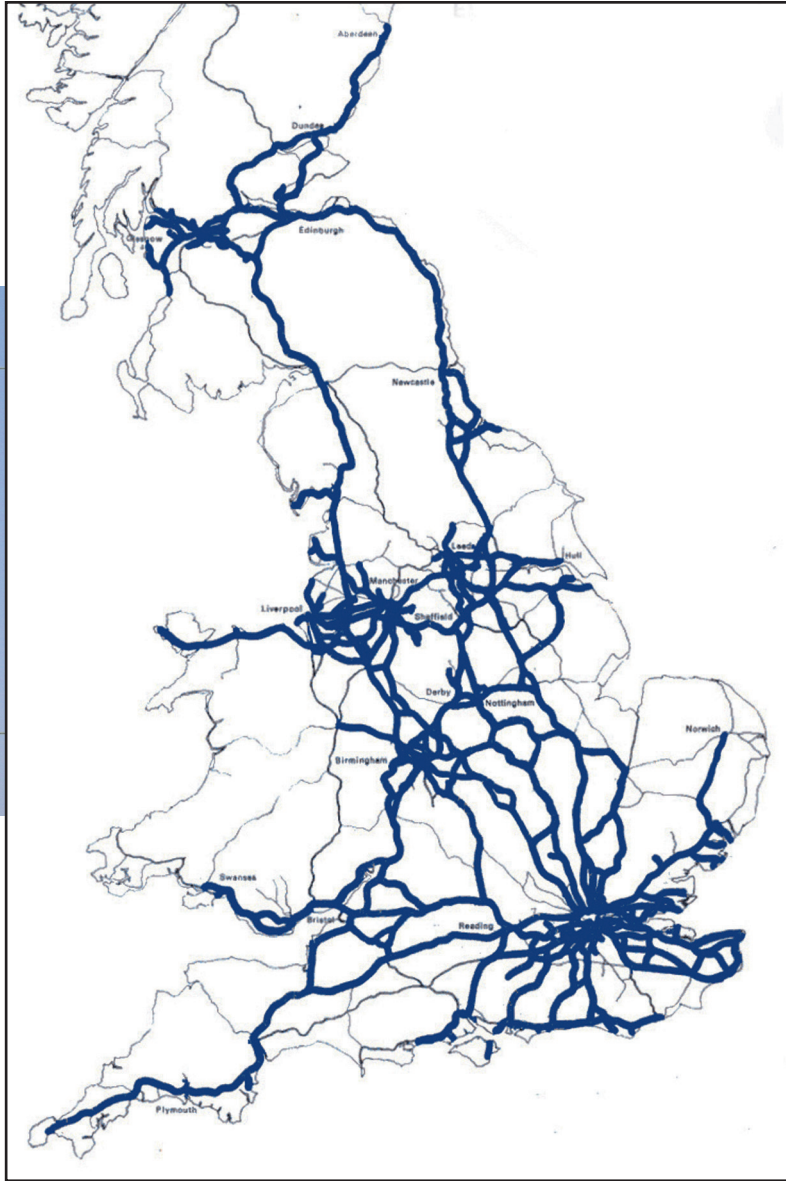
was stuck in a time bubble, c.1905, and the technology was perceived to be almost quaintly out of date by the time the 1930s arrived. Today, of course, our views of trams have changed, and once again the story is one of growth. Who would have thought, in 1949, that the citizens of Manchester would one day again be riding around their city centre – and far out into the suburbs – on street railways? A film made three years later about the withdrawal of London trams included the final 'run in' to a depot with, as the spectators made their way home on foot, the sad comment: 'It was too early for the buses, and the next tram had gone'. As we now know, it hadn't – although there would be a wait of almost half a century before the next 'car' came down the track. As a pleasing gesture to its heritage, Transport

for London's modern, growing fleet is numbered in sequence, following on from the highest numbered tramcar in the old days. It was the very success of the trams, though, that presented a serious challenge to railways in the Edwardian era. The electric motor did do one type of railway a favour early on: thanks to parallel advances in tunnelling techniques, particularly the Greathead shield, deep 'tube' lines became possible. In an amazingly short two decades, the deep London Underground system grew from a pioneering line linking the City with Stockwell, on the other side of the Thames, to a respectable urban network which by 1910 covered much of central London and was also beginning to thrust outwards into the nearer suburbs. It was the wonder of the age, and

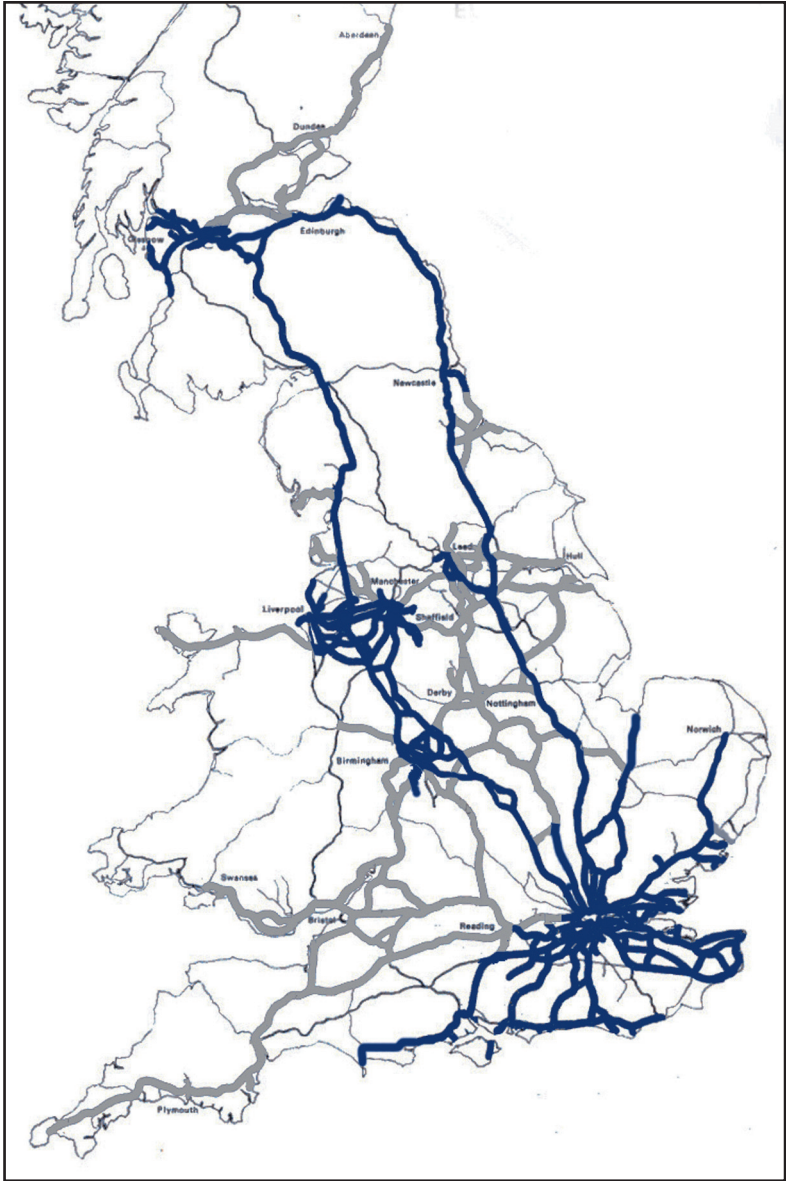
London's subterranean railways, both shallow and deep, inspired many foreign cities to follow suit. The main line railways, which had been firmly wedded to coal and boiling water, were less entranced. First the trams and then Underground railways began eroding their suburban business. They began introducing electric traction in response, mainly where the competition pressed hardest. So early electrification was carried out by companies like the London, Brighton & South Coast, although the Brighton main line itself was to wait until the succeeding Southern Railway was in full swing, in the early 1930s. Between the wars, it was the Southern which took electrification to its heart, transforming the railways of Kent, Sussex, Surrey and Hampshire by adding the 'third rail'

and encouraging a flow of commuter traffic to and from London which was to reach unprecedented heights. The old, rather dirty steam-hauled trains which had chuffed into a string of termini mostly south of the Thames were replaced in less than a generation by hundreds of businesslike green electric multiple units, which smoothly conveyed the Southern's thousands of season ticket holders to their day's toil via London Bridge, Cannon Street, Victoria and – of course – Waterloo. Here the business traffic was so great that the London & South Western Railway had found it worth its while to build its own Underground line, just 2.4km long, providing a direct link with the Bank. Opened in 1898 and still going strong today it was, naturally, electric. The growth of the electric railway in Britain until after the Second World War was concentrated, very largely, in and around London. There were isolated schemes elsewhere – the LMS wired up the Bury and Altrincham lines in Manchester, for example, and the Great Western investigated the possibility of electrifying its lines between Taunton and Penzance in 1938 – but steam remained virtually supreme. When the railways were nationalised in 1948 there was a tremendous need for repair and renewal following the ravages of a six-year war. One electrification scheme was completed early on – services between Liverpool Street and Shenfield were converted in 1949, completing a project which had been started by the LNER before the war – but the new Railway Executive decided to stay with tradition, indeed designing several new standard steam locomotives for British Railways. A major BR modernisation plan was, however, published in December 1954. This did envisage the replacement of steam, but more by diesel traction than electric. There was some progress with electrification in these years – the Southern Region widened and electrified its Kent Coast lines, with the first phase opening in June 1959 – but by now the real winds of change were begin-

ning to blow not in London, but north west England. The focus for this was, appropriately, the West Coast Main Line, and the pioneering stage of what would eventually become a fully-electric route from London to Glasgow – the busiest of its type in Europe – was energised in the late summer of 1959. This was the modest section between Wilmslow and Sandbach, which was then used for trial running and training. At the same time the Crewe area was being wired up, a job which involved installing the overhead on almost 130 track kilometres of what was described at the time as 'one of the most complicated areas on British Railways'. The work continued well into the next decade, and the new intercity electric services from London Euston to Manchester and Liverpool were launched in 1966. There had been some disquiet about the prospects of continuing to Scotland, when the BRB chairman Dr Richard (later Lord) Beeching made it plain that he was unimpressed by the business case. As things turned out, by 1966 Beeching had departed, and the West Coast electric service was extended to Glasgow Central in 1974. The success of West Coast electrification could not be ignored, and the prospects of wider conversion from diesel were reviewed in the later 1970s, the final version of this review being published in 1981. It was hardly the first of its kind – the British Transport Commission had published its own analysis of the situation thirty years earlier – but now the horizons had broadened, along with the technical specification. 25kV AC was now the standard outside third rail areas, whereas in 1951 the preferred voltage had been 1500V DC, although even then continental trials had been taking place using 20kV AC. The 1981 report set out five options. Option I, the 'base case', included London to Bedford, Royston/Bishop's Stortford to Cambridge and Colchester to Norwich and Harwich. Interestingly, Manchester-Bolton-Euxton Junction



This was the ambitious Option V in BR's 1981 report. It would have taken the wires to Aberdeen and Penzance, among many other places.



And this is what we got. This is the Option V map amended to show the extent of electrification up to 2010.



and Preston-Blackpool were also in the plans, along with the lines to Ayr and Largs. Most of this was achieved, with the obvious exception of Manchester-Blackpool, which has had to wait until now. Option II added the East Coast Main Line northwards from Hitchin to Leeds and Newcastle, and also the Midland Main Line from Bedford to Sheffield. The next option included Great Western electrification to Bristol, Swansea and Paignton/Plymouth (via Westbury as well as Bristol), Newcastle-Edinburgh and Manchester-Leeds. Option IV had been left out of the final version, because it was felt to be too similar to Option III to need further consideration, but Option V survived and was the most ambitious, taking the wires onwards to Penzance, Holyhead, Aberdeen and Hull. As we now know, most of this stayed on the table at the British Railways Board. The 1980s did see one major project completed – the East Coast Main Line from London to Leeds and Edinburgh – as well as Great Northern/West Anglia, London-Bedford and some additional routes in the Strathclyde area. But as privatisation approached, the impetus was lost. Since the end of British Rail, new electrification has been mostly confined to the link between Crewe and Stoke via Alsager and, in Scotland, the Larkhall line. The recently restored Airdrie-Bathgate route is electrified too, and



of course we must also include High Speed 1, a high-quality 300km/h route triumphantly completed from the Channel Tunnel in 2007, which incidentally introduced 25kV in Kent for the first time. One other modest addition, opened in 1998, brought electrification into Paddington, for BAA's Heathrow Express. But so far Great Western electrification extends just 19km from Paddington to Airport Junction, where the Heathrow trains leave the main line. But elsewhere there was no progress, although there has been plenty of discussion. One project which has long promised to extend Great Western electrification at least to some extent has been Crossrail, with its proposed western terminus at Maidenhead. Although that is still the official boundary of the service, the line onwards from Maidenhead to Reading was 'safeguarded', which prevents any work taking place which would hinder subsequent electrification, in April 2009. Network Rail has also revealed that its modernisation plans for Reading station allow for the presence of overhead line equipment. There was much more to follow, and electrification plans have since moved onwards remarkably, especially since the general election in May last year. But even before then, the former Labour government had already apparently been warming towards the sparks effect, after some years of

apparent official apathy at the Department for Transport. This became so marked that in October 2007 ATOC and Network Rail jointly asked the Department to become more enthusiastic about electrification, although the reply they received at the time is not recorded. It was on 23 July 2009, just after Parliament had risen for the summer recess, that the then transport secretary Andrew Adonis unveiled investment in electrification worth £1.1 billion. The lines included were the Great Western from London to Bristol, Cardiff and Swansea, and also the GW sections from Didcot to Oxford and Reading to Newbury, at a cost of roundly £1 billion. In the North West, the 51km line from Liverpool to Manchester via Earlestown was also on the list, to cost another £100 million. This did not meet the full aspirations of those who had been calling for electrification of the 'north west triangle', but it was a start. However, some doubts were voiced by critics who wondered whether such a commitment meant a great deal, considering that a general election was less than a year away. Whether or not these doubts were justified, Lord Adonis continued his theme in December of the same year, adding Huyton-Wigan, Manchester-Euxton Junction and Preston-Blackpool North to his electrification list. The total cost would be another £200 million. At this point, we may pause to wonder what kind of trains would

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run on all these newly-electrified routes. For London-Bristol-South Wales, the answer was Intercity Express, expected to be built in bi-modal and electric-only versions.

A train from Paddington to Plymouth, for example, would run to Reading (or Newbury) under the wires, and then switch to diesel for its journey onwards to Devon, whereas a train to Swansea could use an electric-only set. The alternative (which is, in fact what appears to be current thinking), is that a limited number of HSTs would stay in service for services to Devon and Cornwall, with IEP sets not expected to work west of Exeter.

For Great Western suburban to Oxford and Newbury, the rolling stock would be ex-Thameslink Class 319 units, freed by the arrival of the 1200-vehicle new Thameslink fleet. The 319s – about 80 four-car sets – would be refurbished and given air conditioning. Not all the 319s would go west to the Thames Valley: some would go north west instead, for service between Manchester-Preston-Blackpool/Earlestown-Liverpool.

This is not the whole picture. Electrifying Manchester-Euxton Junction completes a route under the wires from Manchester Piccadilly to Glasgow Central, for which the 319s are not really suited, and what will happen on this route is yet to be decided.

Much depended, therefore, on at least two major rolling stock orders – one for Intercity Express (providing electric trains for the Great Western to Bristol and South Wales, as well as other intercity routes) and the other for the replacement Thameslink fleet (providing 319s or 365s for almost everywhere else).

The general election in May 2010 produced a decisive rejection of Labour, but lacked a decisive acceptance of an alternative.

The result, of course, was the present coalition between the Conservatives and the Liberal Democrats.

After the new government came to power, railway observers speculated that all the Adonis plans could now be thrown to the four winds, amid cries of despair about the international economic situation and talk of major reductions in spending by government departments at home.

Happily, the railways did not seem to bear the brunt of the economic crisis.

In November 2010 electrification of the Great Western Main Line from London to Oxford and Newbury was confirmed, while on 28 February this year Mr Hammond said this would be extended to Bristol Temple Meads (via Bristol Parkway and also via Bath) and Cardiff Central.

However, the electrification of the GWML would not now continue to Swansea. Mr Hammond said: "I have received representations calling for the electrification to be extended as far west as Swansea and we have looked carefully at the arguments. The business case is heavily dependent on the frequency of service. Services between London and Swansea operate at a frequency of only one train an hour off-peak.



Above: The line to Larkhall, south of Glasgow, was reopened in 2005 and electrified from the outset.

Right: Renaissance of the tram: a Bombardier-built vehicle travels through central Croydon.

Below: The latest plans for Lancashire and Merseyside will see electric trains on several more routes (shown in red).



There is no evidence of demand that would be likely to lead imminently to an increase. Consequently, I regret to have to say that there is not, at present, a viable business case."

Interestingly, however, Mr Hammond had some brighter news for the Greater Cardiff area, when he continued: "We have established, at an initial high level, that there appears to be a good case for electrifying the lines north of Cardiff via Pontypridd and Caerphilly to Treherbert, Aberdare, Merthyr Tydfil, Coryton and Rhymney, as well as the lines to Penarth and Barry Island. My Department will therefore work with the Welsh Assembly Government to develop a full business case..."

There, for the moment, matters

rest, although work is well under way on the first stage of an electrification project in the Scottish central belt that will eventually cover eight routes, measuring a total of 350km. These include the core main line between Edinburgh and Glasgow Queen Street.

Further south, there seems little doubt that there will continue to be pressure for an extension of electrification to Swansea, and for that matter further west of Bristol, possibly as far as Exeter in the next phase.

The Midland Main Line is still at the forefront of many minds, too, with East Midlands cities such as Derby and Nottingham particularly rueful that the business case for the MML was better than that for the Great Western, and no doubt they, along with Sheffield, will continue to lobby for early inclusion in electrification, particularly as the first 80km of their route, to Bedford, is

already electrified.

Another keen discussion continues – the possible insertion of an additional pantograph car in the Class 222 Meridian sets, thus creating bi-modal trains for perhaps £2 million or £3 million apiece (the figure is our estimate, not that of Bombardier).

This then leads onwards to the natural conclusion that something similar could be done with the CrossCountry and Virgin Class 220/221 Voyagers.

If the MML were to be electrified, then some selective infill, particularly Derby-Birmingham and Birmingham-Bristol, would place a substantial proportion of the core CrossCountry routes under the wires.

This, then, is a story which is only half told. We await, among other things, a decision on the Thameslink fleet, to say nothing of signatures on the IEP contract.

Meanwhile, work has started on the ground, particularly between Manchester and Liverpool. Network Rail announced on 29 March that it was issuing tenders for electrifica-

tion machinery and plant 'to install overhead power lines quickly and efficiently'.

The timescales are also becoming clearer. The Liverpool-Manchester schemes should be ready by 2014, and Blackpool North two years later. The wires should also reach Bristol, Oxford and Newbury by 2016, and Cardiff a year after that. The Scottish central belt schemes should also be completed by 2016.

"What we want," a Network Rail spokesman told Railnews, "is a rolling programme. Whether we still deploy 'factory trains' is not clear at the moment. We will be seeking cost-effective solutions."

One particularly cost-effective solution would be to keep going with further electrification, in incremental stages, until the proportion of electrified railway in Britain comes closer to that of the Netherlands, Belgium or Switzerland. Perhaps Option V of that British Rail report of 30 years ago is not beyond reach, after all.

