INFORMED SOURCES e=Preview April 2019

INFORMED SOURCES e=Preview April 2019

First of all, thanks for all the positive feedback on last month's exclusive coverage of the McNaughton Report on the way forward for main line electrification. Publication of the parallel Railway Industry Association's Electrification Cost Challenge had to be delayed – for very positive reasons – and came out last week.

It's an excellent pieceq of work, and forensic in its analysis of where the Great Western electrification went wrong. My lead article this month also supports the case for a rolling programme of electrification, even though the topic is diesel traction.

Freight diesel traction realities.
Northern - George report emphasises local expertise
New Train TIN-watch

Last month's news pages covered the initial report of the Rail Industry Decarbonisation Task Force and my colleague Ian Walmsley also gave it the treatment in his column. Now it's my turn and I focus on the implications for freight of former Transport Minister Jo Johnson's aspiration to take all diesel-only trains off the track by 2040.

When it comes to freight, the Task Force is unequivocal. 'The removal of diesel only freight and maintenance (Yellow Rail) trains from the national rail network presents unique challenges. There is no alternative independent power source available, which delivers the power and range necessary to meet the specific demands of these uses'.

But since the Rail Safety & Standards Board is involved, this is a minor inconvenience. The report adds that, while a challenge, bi-mode and battery technology could deliver 'significant' improvements. Further industry-led research and development into solving this challenge 'is recommended'.

This combination of common sense and wishful thinking runs all through the Report's references to freight, highlighting the problem facing the railway industry in various of its current dealings with a government ruled by policy based evidence. I can't better the observation of a perceptive chum who explained that 'if you press too hard for reality of thinking, you lose the argument politically just now'.

That said, I would liked to have seen a more robust defence of the rail freight sector's environmental credentials. Emissions statistics make variable track access charges look simple. However, I calculate that while rail freight is responsible for roughly 10% of the UK's total freight tonne km (rail and heavy goods vehicles) it generates 3% of the total CO2 emissions.

To its credit, the report does remind Government that 'there is currently no low or zero carbon alternative to diesel for road haulage, other than for local delivery vans'. It adds, 'this presents rail with a unique opportunity to offer low carbon freight transportation if greater use can be made of existing and future electrification. It follows that priority ought to be given to future electrification schemes for those mixed traffic lines that carry a significant volume of freight'.

What about the claim that bi-mode and battery technology could deliver 'significant improvements'.

To put the energy density of current batteries in context I work out the weight of Lithium Ion (Li Ion) batteries needed to do the work of a Class 60 diesel locomotive taking a 3,000 tonne iron ore train up Stormy Bank between Port Talbot and the former Llanwern steelworks back in the day.

This also provides a baseline for the Report's suggestion that a hybrid diesel-battery freight locomotive could have a smaller engine with a large battery pack to provide extra grunt when accelerating or climbing. With regenerative braking some energy could be recovered on down grades.

It sounds seductively simple. But as I explain, energy densities quoted for the actual cells fall when you add the weight of the housing and any ancillary equipment. And then you can't use all the capacity.

However, costs of Li Ion batteries have been falling dramatically as mass production has built up. So if someone wanted to convert, say, a spare Class 47 to demonstrate a diesel/battery hybrid it wouldn't cost an arm and a leg. That's something BR Research would probably have done by now. Certainly more relevant in environmental terms than faffing around with hydrogen.

Contrary

While the biggest reduction in emissions will come from transferring freight from road to rail plus a rolling programme of electrification, if freight diesels are to run-on long term, we need to minimise the environmental impact.

However, there is a conflict between 'clean' (emissions) and 'green' (low CO2). CO2 is the product of combustion. The more fuel you burn the more CO2 you produce.

Now comes the conundrum. The more efficient an engine, the less fuel it burns and the less CO2 it generates per horsepower. However, to get NOx emissions down you have to mortgage combustion efficiency.

When Wisconsin Central bought the BR freight businesses and formed EWS, it brought in Jim Fisk from Wisconsin Central as Chief Engineer. When he was buying the General Motors Class 66 fleet for operation in the UK Jim waxed strongly to me about the perversity of the need to meet the Nitrous Oxide (NOx) emissions, which meant that the fuel consumption of his new locomotives went to pot.

While more efficiency can be squeezed out of the diesel engine, good housekeeping is likely to be the most fruitful option. Stop/start, where engines are shut down rather than left idling, is already being applied. Fuel efficient driving will benefit from Connected Driver Advisory Systems (C-DAS). Traffic Management should make it easier to keep heavy freight trains rolling, preserving hard won kinetic

energy.

Having run through the politics and theory, I provide a table of the current freight locomotive fleet and its withdrawal dates. This highlights the dependence of the freight hauliers on the Class 66, which represents 70% of the total freight diesel fleet and could still be in service beyond 2040.
Even if only half the Class 66 fleet has to be replaced by new diesels, that represents a worthwhile investment in research and development by a locomotive builder and diesel engine supplier. The priority would be to produce a low CO2 locomotive with the performance of a 4,000hp diesel.

Assuming a modest rolling programme along the lines of the McNaughton report, another 2,000 route miles could be added to the electrified network by 2040. And as the Decarbonisation Task Force notes, new electrification should be focused on mixed traffic routes carrying high volumes of freight.

Extension of electrification should also reduce the length of the 'last miles' beyond the end of the wires, which should, in turn, simplify the design of an 'electro-diesel' hybrid.

Even so, the transition period will initially require electric locomotives with substantial diesel traction power and range. Stadler's Class 93 'tri-mode' locomotive ordered by ROGs (Pan Up February 2019) provides an interesting preview.

It builds on the Class 88 which added a 700kW (940hp) Caterpillar diesel engine to a 4MW 25kV AC Bo-Bo electric locomotive. With the Class 93, some clever packaging has squeezed a more powerful 900kW (120hp) diesel engine plus a Lithium Titanate Oxide (LTO) battery rated at 400kW into the Eurolight platform. The battery gives a short term (6-7 minutes has been quoted) power boost to 1740 hp.

Stadler were unable to provide information on the type of engine or the battery capacity pending contract signature. What we do know is that LTO sacrifices maximum energy density in return for the type of rugged battery needed for rough, tough freight locomotive use.

So not a lot of boost from the battery and I look forward to the full technical description. But at £4 million a throw it is not a cheap option.

Long-term freight traction policy is full of known unknowns. The extent of any rolling programme of electrification that emerges from the current revival and routes covered is top of the list. Traffic to be hauled is another – although it is reasonable assumption that trains will be longer and faster.

Certainly diesel traction will continue to be required. A diesel/battery hybrid locomotive may have potential. However, to validate the concept, more work needs to be done on freight duty cycles on the key routes in terms of power demand to determine how much battery boost would be needed and for how long.

Researching and writing this piece I was conscious that readers might see my argument that electrification is the only credible replacement for freight diesel locomotives as a counsel of despair in the face of global warming. But UK rail freight's CO2 emissions are infinitesimal on a national transport, let alone global transport scale. And if we are to keep freight moving with the lowest environmental harm, the steel wheel on steel rail – even with diesel traction – is, if not the best, the least worst option.

Improving Northern performance

Having a sort-out in the post-new year lull I came across a copy of the 1998 Sir Robert Reid lecture given by civil servant turned railwayman John Welsby. John had been BR's Director Provincial services before moving to the Board. Sir Bob appointed him as BR Chief Executive in 1989, John then succeeded Bob Reid II as the last BR Chairman.

In his paper Mr Welsby took the opportunity to take the first look at privatisation 'as it is, not as it might be or might become'. One topic he raised was performance, which at that time was falling following the short recovery when the distraction of privatisation had come to an end.

John was also concerned by issues raised in the latest Railway Inspectorate annual report. His experience suggested that both performance and safety were showing the classic signs of 'under-management of the nuts and bolts of running a safe and customer-friendly railway'.

As you will have read in last month's Guest Editorial, Network Rail Chief Executive Andrew Haines is also concerned about John Welsby's 'nuts and bolts'. Andrew takes the view that Network Rail had 'possibly' neglected the skills and processes of operating the railway in the interests of asset management, major infrastructure projects and workforce safety.

With rail operations as a profession 'not cultivated and valued as it should have been', according to Andrew, 'that dwindling expertise has contributed to our collective failure to make sure the railway works seamlessly as a system (and) we are paying the price for that in the level of performance that we are delivering'.

Meanwhile, DfT has been quietly bringing in old-railway operating skills. Before Andrew Haines appointment, it had commissioned Chris Gibb's report and recommendations on Southern performance, Sir Michael Holden's report on South Western and, most recently, Richard George's recommendations on restoring Northern Performance.

When Transport for the North (TfN) asked DfT for help in recovering from the May 2018 timetable crisis, DfT in turn asked Richard to 'assist' with railway industry performance improvement in the Region. Taking up the task in September last year, by November Mr George had come up with his preliminary conclusions which mirror those of the other railway 'lifers' DfT has eventually turned to.

According to Richard, 'There are no quick fixes. Many of the issues which have emerged will take long-term effort to resolve'. 'Significant capacity issues will become worse'. 'Some industry structural and governance issues are not helping'.

But what caught my eye was this: 'There are also indications that Signallers, Planners, Station Managers have been centralised for good reasons over several years – but this has reduced the level of local knowledge - this is key to responsive local operations'.

Just like Andrew Haines, Richard George's report is all about the operator-centric railway. Yes, I know the Williams Rail Review is pressing for a passenger centric railway, whatever that may mean. But unless you get your operating and engineering right you are never going to get the boringly-reliable, commercially-competitive railway that passengers value.

Operational matters feature throughout the recommendations. For example, local teams involving planning, signalling and station operations need to be created. Dispatch training is required across 'many stations'. Signallers training should emphasise 'local' rather than 'generic' routes and practices. Station and depot local planning should feature early in the timetabling process.

Note, in particular, the reference to local knowledge for signallers. Observing controllers and signallers in control centres it is clear that those with extensive experience can mentally convert the symbols on the screen into the situation out on the ground. This local knowledge may have been gained from working at smaller boxes before they were consolidated into larger signalling centres, or by more-senior signallers passing on their knowledge.

Today, the combination of new-entry signallers going straight from training into Rail Operating Centres (ROC), plus experienced staff leaving, means that new entrants may not have this local experience.

Fostering local knowledge is not an easy task in an age of ROCs and Signalling Centres. As one retired signaller put it, when experienced staff leave they do not just take 30-odd years of experience with them, they can take 100+ years of experience with them, as they had absorbed local knowledge from previous generations which had been passed to them.

This is of a piece with the 'dwindling expertise' of the operating profession highlighted by Andrew Haines. How do you find the time and provide the facilities for people to go out and experience the physical railway being worked in real life, rather than experienced remotely on the displays of a quasi-video game?

New fleet joins TIN-watch

ScotRail has finally started reporting the reliability of its fleet of Hitachi Class 385 EMUs. With 35 units in service and a starting Miles Per Technical Incident (MTIN) of 8,460 they have come into the Table of Truth in third place. We now have a sense check, and competition, for the Siemens Class 700 fleet on GTR.

Last month I suggested that the upward steps in the chart of Class 700 Period MTIN figures reflected improved performance following successful software drops. Well, yes and no.

This was indeed the case with the first 'step' covering Periods 6-8. However, GTR tell me that the subsequent improvement to a consistent 14,000 plus MTIN was the result of sorting out problems with the CCTV cameras.

Also in this section I have an update on the Variable Track Access charges price list. Latest additions are the ScotRail Class 385s, the Northern Class 769 bi-modes and even the Vivarail Class 230s. I have listed the EMUs in approximately ascending order of cost per mile for the motored vehicles.
Obviously, the price is based on a range of factors, from suspension parameters to axle load. It is interesting to note the variation between the three Desiro City classes.

For completeness I give the data for the Class 230. Surprisingly the new train is more expensive per mile than a Class 142 Pacer or a Class 150.

Roger's Blog

Well, following last month's blog my expected outings were frustrated by a series of postponements. On the other hand March began with a briefing session for the railway press with NR Chief Executive Andrew Haines. Among other topics, this provided more details of responsibilities the fast-developing devolution structure, plus a chance to discuss its implementation.

Then last week I finally managed to fit in the promised hail and farewell meeting with Network Rail's digital railway supremo David Waboso. It was a close run thing as we met on his last day at work and were joined by his interim successor Stuart Calvert.

On 27/28 March it is the Waterfront Partnership's invaluable annual ETCS conference. Also at the end of the month Angel Trains is celebrating its 25th anniversary with a reception.

How time flies. Hopefully there will be the chance to meet old friends from the early days when Angel's offices were round the corner from the Angel Islington. And isn't it odd that the original names for the three ROSCOs have stuck through so many changes of ownership?

Meetings being rescheduled for April include the new computerised system for managing 'stock and crew'. And who knows what else may come up in these turbulent times?

Meanwhile I haven't forgotten my self-imposed task of creating a master schedule of rolling stock cascades. However, it may have to be put to one side while I update my February analysis of new train non-deliveries and add the various refurbished/re-engineered ex-BR fleets to the list of laggards.

Roger