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Having revealed the demise of the Traction Decarbonisation Network Strategy last month, I thought it was time to produce a lay-person's guide to the proliferating types of traction technology available and their potential contributions to decarbonisation. However, there is no escape from the reforms proposed by Williams-Shapps, and this month I compare today's situation with the previous, now forgotten, attempt to make the railway affordable and its lessons for today. Back to traction, I conclude this month's column with a review of how the fleets which have been promoted from the new train reliability table have fared since their 'promotion'.

Traction à la mode

McNulty Review failure highlights today's GBR challenge

Rail reform - industry in limbo

TIN Watch promotions - what happened next?

Batteries are fast becoming the new hydrogen and I explore the various permutations for both electric and diesel battery hybrids. Back in in 2014, a Class 379 EMU was fitted with battery packs and ran in passenger service as an electric/battery hybrid, recharging the batteries while operating in electric mode. Tests showed a range of 60 miles under battery power.

Battery development since then will have reduced the cost and increased the range. And eight years on, adding a traction battery to an electric multiple unit (BEMU) both future-proofs the investment and enhances its immediate utility.

BEMUs are being specified in various situations. Stadler has converted seven of the Merseyrail Class 717 fleet to BEMU to run the short distance from Kirby to Headbolt Lane where extending the third rail network had been banned. Stadler is also supplying the Class 756 'tri-mode' (25kV overhead line/diesel/battery) multiple units for Transport for Wales.

Transport Scotland is also an enthusiastic proponent of the BEMU which will allow electric services to run between sections of electrified track pending closure of the gap. BEMUs will also complement its rolling programme of electrification, maintaining end-to-end electric services as the wires extend.

Then there is the pure battery EMU or BMU. Here Vivarail has taken the lead with its complementary fast battery charger.

At the terminal station, the BMU stops with its shoe-gear over conductor rails connected to a containerised battery bank. This provides the high current needed to recharge the train's batteries during a 10 minute stop. A full charge gives a claimed 60 mile range.

Optimists have pointed to the Wabtec FLXdrive heavy haul locomotive concept as demonstrating that battery traction can replace electrification. This is to misunderstand the application.

FLXdrive is a 21st Century version of what used to be called 'slugs', in effect a cab-less locomotive designed to run in a consist of several locomotives. Two have been ordered by BHP Western Australia Iron Ore.

Currently BHP uses four diesel-electric locomotives to haul its iron ore trains. The FLXdrives will join the diesel locomotives to form a hybrid consist. Each slug's 7 MegaWatt hour (MWh) battery will be used to boost tractive effort and recharge during the trip through regenerative braking, reducing fuel consumption.

You get similar benefit with a diesel-battery hybrid. MTU unveiled its diesel battery hybrid power pack at the Railtex exhibition in 2019. Chiltern and Porterbrook are currently trialling the latest version of the power pack - now branded Rolls-Royce - in a Class 168. Fuel savings of 25% have been predicted. Running under battery power at station stops also improves air quality.

Hydrogen fuel cell power has been the poster child for alternative traction, promoted heavily by Alstom and Siemens. Hydrogen trains are effectively fuel cell-battery hybrids. In the case of the Alstom i-Lint, the battery provides power for the traction equipment while the fuel cell charges the battery and powers the train when running at constant speed.

My critical approach to the rapidly inflating hydrogen traction bubble was not because there was no place for hydrogen traction in future. Rather, that this place was a very small niche and that, despite this, hydrogen was being promoted as an alternative to electrification, as opposed to decarbonising the lightly used fringes towards the end of a rolling programme. In any case, until green hydrogen from renewable sources was available in quantity, fuel cells show little or no advantage in terms of CO2 emissions over a diesel-battery hybrid.

All this before you consider the cost of the trains, the cost of the hydrogen and the cost of the infrastructure. This is reflected in a study commissioned for the German state of Baden-Württemberg into the economics of future traction for currently diesel hauled rural routes.

This study concluded that in terms of total cost of ownership over 30 years, hydrogen fuel cell traction came a poor third

after battery hybrids and electrification.

Freight leads

Meanwhile, in this country, freight is where traction technology is really being pushed, and, when it comes to versatile high power locomotives, Stadler is where it's at.

Freight operators are already looking for replacements for their de-facto standard locomotive - the diesel Class 66.

On our congested network, freight trains will need to have better acceleration to line speed to minimise their use of paths. Operators will need to run longer, heavier, faster trains if significant modal shift is to occur. All this adds up to needing more powerful traction.

Add in removing all those freight diesel locomotives currently running under the wires and electric traction is the answer. But since the wires don't run into the freight terminals the future will have to be electro-diesel.

Stadler has already supplied the Class 88, with a 4MW (5360hp) rating under the wires plus a 950hp Caterpillar diesel for the last miles. The company is now building the Class 93.

This is another 4MW electric Bo-Bo, but with a 110mile/h maximum speed and a 1200 hp Caterpillar diesel. And, if 4MW is not enough, a short-term rating of 4.9MW is available for 30 minutes. All this, plus a 120kWh traction battery.

And if even that is not enough, there is now the Stadler Class 99 Co-Co electro-diesel. With the six axles the 99 will give 6MW (8,000 hp) at the rail. Plus, at 113 tonnes the loco can accommodate the weight of a 2,400 hp Cummins diesel.

Forgotten McNulty illuminates today's issues

Jointly sponsored by the Department for Transport and the Office of the Rail Regulator, and launched in November 2009, Sir Roy McNulty's Rail value for money study dominated the pages of Modern Railways when its findings were published in March 2011. Unlike today's Williams-Shapps Plan, it supported its findings with enough data to keep even me happy. And unlike the Williams-Shapps Plan, it actually had a Plan - with timescales for actions and the associated expected savings, rather than fuzzy aspirations.

Yet, less than a decade later McNulty is never mentioned. I have wondered why for some time. Revisiting the 2010s for the last in my retrospectives of Modern Railways' six decades, I discovered the reason: it was a total failure.

McNulty promised much, but in 2018, when the Review was supposed to have delivered its promised savings, the cost of the railway was as 'unsustainable' as it was claimed to have been in 2011. And in 2018 the Williams Review was launched - reviving the search for the affordable railway.

Why write about this failure today? Because there are already signs that the Williams-Shapps Plan, and its central plank, the creation of Great British Railways, is going the same way as the McNulty review.

McNulty estimated that, based on what the railway 'should cost' when bench-marked against unspecified European railways, there was an 'efficiency gap' of 20-30%. At 2008-09 prices this represented a potential cost reduction - to be reflected in the annual subsidy requirement - of £2.5 to £3.5 billion. The expectation was to close this gap by the end of CP5 in 2018-19.

In the column I explain how politics and events ensured that Sir Roy's reforms were never going to happen. The net result was that in 2018-19 the subsidy for the railways was much the same as it had been in 2010-11.

In the column I put some number on what happened. While Sir Roy's cost savings didn't appear and costs continued to rise, they were offset by rising passenger revenue. Today, as the Williams-Shapps reforms struggle, we don't have that cushion.

Rail reform stalled

Who said this? 'How do we make rail travel more affordable? What can be done to get more out of our existing rail network? How do we improve and expand our rail network when money is tight? I believe that Government and the rail industry can and must do more for the passenger and the taxpayer. So we will'.

Obviously a trick question. It was Coalition Transport Secretary Justine Greening in 2012. But it could have been any of the ministers who have passed through the whizzing revolving doors at the Department for Transport in the last couple of months.

Unfortunately, they have not been able to be as positive as Ms Greening. Instead they have had to report a lack of progress with the current reforms.

First there was official confirmation that the Transport Bill, containing the legislation giving GBR its powers, had been shelved. Independently, at the end of October, the Office of Rail & Road (ORR) also noted that GBR was 'unlikely' to be established, before the start of Control Period 7 (CP7) on 1 April 2024.

Having GBR up and running on the same date would have simplified the transition to the reformed railway. In particular, with GBR responsible for what used to be franchised passenger services, track access charges would have been redundant since GBR would have been charging itself.

Thus ORR will now take its decisions on the CP7 charging framework based on the existing legal requirements governing access charging, while also 'ensuring the framework can be applied by GBR'. ORR 'recognises there remains some uncertainty around how any transitional arrangements may work as GBR is established'.

Meanwhile, this uncertainty is compounded by the news that DfT has been granted a four week extension to the deadline for delivering the HLOS and SoFA, as required by the Railways Act 2005. Due at the end of October, these are the High Level Output Specification, which lists what the Government wants the Railway to deliver during the up-coming Control Period, and the Statement of Funds Available which says how much the Government is prepared to pay for this output.

That extension took DfT past the key date of 17 November when the new Chancellor published his 'medium-term fiscal plan'. Much heralded cuts are aimed at putting public spending 'on a sustainable footing, get debt falling & restore stability', according to the Treasury.

Obviously, in the present situation, determining the size of the SoFA is, at best, a wet finger in the breeze exercise. Not least among the unknowns is how ridership and revenue will recover over the next two or three years.

Equally unknown are the service levels, plus any associated enhancements, required to meet the evolving ridership patterns. Like the rest of us, DfT has little idea what the railway's income is likely to be when the new Control Period dawns on 1 April 2024. And the Regulator's determination locks in Network Rail's subsidy for the next five years.

DfT does, however have a detailed idea of costs. As I write, TOCs, under their contracts with DfT, are preparing their annual business plans. And have been instructed that these will include cost reductions of 10%, or more.

Now, the obvious thing to do in this evolving situation, well obvious to me, is to postpone the Periodic Review, or perhaps revert to a steady-as-she-goes Interim Review until railway income has stabilised. A check with the Railways Act 2005, suggested that ORR could do this, but just to be sure I asked ORR. Their ever-helpful spokesman told me: 'We have implemented the statutory Periodic Review process and have control over relevant timescales, and we have the ability to react and adapt to external factors'.

TIN-Watch promotions – what happened next?

When the TIN-Watch table first appeared in Informed Sources, the intention was that 'promotion' would be secured by achieving a Miles per Technical Incident Moving Annual Average (MTIN MAA) of 25,000. After two fleets had achieved this – South West Trains' Siemens Class 707 and ScotRail's Hitachi Class 395, it gradually became clear that these were the exceptions which proved the rule.

To thin out what was becoming the 'Table of shame', promotion now depends on passing an MTIN MAA of 15,000, combined with at least two years in revenue earning service.

Under this relaxed regime 14 fleets have now left TIN-Watch and, in advance of next month's annual rolling stock reliability spectacular, this month I investigate whether their reliability growth continued. And it is good news.

Roger's blog

As I type this, all the calculations have been made, the winners of the various categories listed, the 11mm combination spanners have been sprayed and it's all systems go for the Golden spanners Awards next Friday 25 November.

Three things for me make the Spanners unique. First, you don't have to enter. Second, the winners are decided on the cold numbers in the Fleet Challenge data; no judging panel opinions, no 'it's their turn this year.

And, best of all, it's the day the unsung depot teams come to town to have their efforts rewarded and this audience gives the Spanners their special ambiance. My first contact with the working railway was in depots and watching how they have embraced new technology over the years has been fascinating.

But no time to relax, as I have to finish my contributions to our annual publication The Modern Railway and then write my annual rolling stock reliability review, including the tables showing the performance of every fleet on the network, for our January issue – at Informed Sources Central 2023 arrives early.

Roger