


Could a utility approach work for the UK's Railways?

In RAIL 768's Editorial, Richard Clinnick suggested, and points out that previously so too has Nigel Harris, that Network Rail (NR) needs to look beyond what is happening in front of it. Both rightly seize on what is a fundamental element in an asset management business which is what NR is. If NR looks they will find help could be at hand. There are some important and potentially useful lessons that the railways can learn from other asset management utilities when it comes to maintaining service with an asset base that ranges over several decades in terms of age, serviceability and condition grades.

Richard Clinnick also mentioned, in the past couple of years Network Rail, Train Operating Companies and the Government have found themselves reacting to events, that whilst not entirely surprising, were largely unforeseen in terms of scale and timing. Dawlish and Workington being two such examples and both are worthy of commendation of Network Rail for the way it worked so hard to restore the assets and thus the rail service that relied upon them.

Less focus seems to have fallen the relevance of single points of failure (SPOF) and ensuring an adequate level of redundancy exists to mitigate them. A SPOF is part of a system that, if it fails, will stop the entire system from working. SPOFs are undesirable in any system with a goal of high availability or reliability, be it an asset, business practice, software application, or other industrial system.

A level of understanding needs to be applied to the definition of SPOF's when applied to asset management environments such as railways or utilities. The element that refers to 'stopping the entire system' needs to be qualified. The loss of a section of railway line does not 'stop' the wider rail network from operating but it does stop elements of it working normally and that can have significant and wide ranging effects. It is the measure and scale of such effects that determine if a loss is a SPOF.



Significant works have been taking place along the Cotswold Line adjacent to Mickleton Tunnel stabilising the eastern side of Campden Bank. The scale of the works can be seen here with the new banking replacing a coppice of trees that previously stretched down to the trackside boundary.

With the Vale of Evesham in the background a Class 43 approaches the portal of Mickleton Tunnel as it heads for London Paddington with a FGW 125 from Hereford on 17 January 2014.

The British Geological Survey indicates a north-east/south-west band of mudstone and siltstone running through Harbury and Mickleton, (which are just 20 miles apart "as the crow flies"). Combined with the typically high incidence of clay in the South Midlands rainfall and/or drainage issues can lead to the kinetic motion necessary for mud, clay, and silt transport.

If we consider the current and ongoing landslip at Harbury, Warwickshire between Leamington Spa and Banbury, the requirement of Cross Country passenger services to be truncated at Banbury and Leamington Spa with replacement bus services between the two points is, in railway terms, a SPOF. Simply, a passenger cannot undertake a journey from Reading to Manchester wholly by rail. In terms of freight services, there has to be an alternative rail route, paths and route trained personnel to avoid the loss of a section of line being a SPOF.

Can the railways learn from Utilities?

The catastrophic floods of 2007 in Gloucestershire, Worcestershire and Warwickshire caused utilities to fundamentally reconsider their approach to risk assessment, resilience and associated investment. The loss of power to Gloucester and Cheltenham came to within one inch of rising water inundating key electric infrastructure and was narrowly averted.

The loss of the water supply to Gloucester, Cheltenham and Tewkesbury was not averted and occurred with the irony of its cause being severe and unprecedented flooding. It affected some 350,000 people for 7 to 10 days, led to questions in the House of Commons, several inquiries being instigated, a Prime Ministerial visit and unrelenting significant national media coverage.

Until then most investment almost always went to those areas with the highest density of population because the assessment process always weighted that element higher than all others within resilience matrixes and models.

What 2007 demonstrated was that this methodology led to an inadequate recognition of SPOF's and adequate redundancy to mitigate them. The weighting continually directed most of the funds the regulator would permit for resilience in their five yearly determinations (equivalent to the railway's CP periods) on Birmingham. This was simply because all the other cities and places in the company's operational area could not come close to the population density and number associated with Birmingham.

Consequently, utilities and the relevant regulators had to pause and "get outside the box" they had been in for some 18 years and fundamentally revise their approach so investment and resilience would focus on real risk arising from SPOF's rather than largely concentrating on one location because the highest number of people lived there. With a changed approach utilities were able to invest more efficiently in resilience and understand the criticality of individual assets and the wider dependencies that rested upon them for the general system and maintenance of a 24/7 service across their networks.



The problem in 2007 was no water main existed between the the failed works and another works only 3.6 miles away that would have allowed output to be switched and thus maintain supplies despite the failed works suffering a prolonged loss of output. It also became apparent that handing out bottled water and distributing roadside bowsers which require regular refilling is a logistical nightmare, labour intensive and a very poor alternative to a live piped water supply. Many customers view such things as a "Dads Army" approach in handling service failure. Umm... sounds a lot like prolonged use of 'Rail Replacement Bus Services'.

Today, some 8 years on a main has been installed and commissioned between the two works and represents a significant element of redundancy to mitigate any loss of output at either works in the future. Of course it does not rule out events but it does provide the utility with a much greater ability to avoid them graduating to an incident or crisis both of which are defined as significantly affecting customers.

Harbury as a comparison

If you take the elements that arise from the events in Gloucestershire in 2007 and apply them to the railway and the Harbury Landslip there are some profound similarities. This indicates the railway industry could learn and use these in a revised approach to network resilience, SPOF's and redundancy.

On a weekday in total (north or south) there are over 200 train movements between Leamington Spa and Banbury.

The daily 82 Chiltern Railways services between London and Birmingham are mitigated by the redundancy provided by the WCML and London Midland and Virgin Trains services between the same two main locations. Passengers in South Warwickshire have some mitigation by redundancy provided by lower frequency FGW services along the Cotswold Line at Evesham, Honeybourne and Moreton in Marsh.

Cross Country passengers have no mitigation as they do not have any redundancy from alternative rail services and require to alight and re-embark between Leamington Spa/Banbury prolonging journey times, increasing journey disruption and no first and standard class distinction.

Redundancy could be provided for some of the 72 weekday Cross Country services the if Network Rail reinstated the 6 miles of railway line between Stratford upon Avon station and Long Marston (Honeybourne).

If a re-instated Stratford - Long Marston (Honeybourne) line was constructed up to W12 gauge and the Cotswold line modified up to W12 then redundancy would be provided for at least some of the 68 freight trains that normally use the Leamington Spa - Banbury line too.

It is understood that limited paths and extremely limited route knowledge of drivers of the southern section of the WCML has been a significant constraint on the level of redundancy the WCML can provide. Further, similar problems exist together with significant additional route mileage by using the already overcrowded mixed traffic Birmingham - Cheltenham line and onto the GWML.

Reinstating Stratford upon Avon to Long Marston (Honeybourne)



With the level of redundancy it provides, highlighted by The Harbury Landslip, the reinstatement of the Stratford-Honeybourne line has taken on more strategic importance, as this would provide an alternative route between Birmingham and Oxford/Reading/London. Of course re-instatement would also provide Stratford with the rail services an international tourist destination needs and deserves.

Stratford on Avon District Council are currently examining their Core Planning Strategy and in January 2015 a prospective developer of Long Marston Airfield announced they are prepared to contribute £17m towards the railway reinstatement costs as well as £400,000 towards a GRIP stage 4 work on the study.

In 2012, a high level rail industry business case study was commissioned to GRIP 3 level, on reinstatement of the southbound rail link from Stratford to Honeybourne where it would join the Worcester- Oxford section of the Cotswold Line

The ten funding partners that came together included Stratford-on-Avon District Council, Network Rail; First Great Western; London Midland; Oxfordshire County Council; Worcestershire County Council; Gloucestershire County Council; Centro; St. Modwen and local rail promotion groups.

Hourly service options of Stratford-Oxford and Stratford-Worcester were proposed and the report, undertaken and produced by Arup, showed revenue would exceed operating costs giving a Benefit Cost Ratio of 2.03. i.e. that the service can make a profit from day one, generating income on a capital investment of approximately £60m and it exceeds the DfT's minimum criteria for funding, of a BCR of 2.0.

The report also highlighted that rail accounts for just 6% of day trip visits to Stratford, compared to an average for tourist locations in the UK of 13%, i.e. there is scope to increase this by 100% if Stratford were on a through route. This is particularly attractive as the town has become gridlocked throughout the summer and at most weekends because of too much road traffic.

Overall, the economic appraisal within the report indicated that "the line is a promising candidate for reinstatement". There would be important economic benefits to Stratford arising from additional tourist spend but crucially additional redundancy thus improving rail network resilience in the South Midlands rail corridor.

Stratford-upon-Avon is on an international tourist corridor from London Paddington (Heathrow Express), via Reading(Gatwick/Heathrow links)-Oxford-The Cotswolds-Stratford-Birmingham. This is the very rail route that is operational other than the 6 mile strategic missing link between Stratford and Long Marston. The existing Chiltern service does not serve this corridor and direct Stratford – London Marylebone services will be reduced to 3 services a day in September 2015.

Utility and railway similarities

One clear comparison between the crisis in Gloucestershire in 2007 and the current incident at Harbury is likely to have already occurred to you. The 3.6 miles of new trunk water main linking the two works now provides a much greater level of redundancy mitigating the Mythe works as a SPOF. The 6 miles between

Stratford upon Avon and Long Marston (as track is still in place between Honeybourne and Long Marston) would, if reinstated, provide significant redundancy for the railway between Tyseley, Birmingham and Wolvercote Junction, just north of Oxford and mitigate many of the services using that corridor.

Another comparison is that part of the response to the floods at Mythe was to construct a permanent bund to a height of 1.5 metres around the works to guard against repeat inundation by floodwater. This does provide some redundancy but is not robust if another even worse, and thus unprecedented flooding, took place. Simply, however high the bund it cannot offer the redundancy to maintain service to customers that an alternative supply can.

In the case of Harbury, even when the cutting is stabilised there are other areas along the same corridor that have been problematic for years. Only two or three miles away the embankment north of Fenny Compton has seen hundreds of thousands of pounds spent on it by Network Rail's and Railtrack's predecessor British Rail. The embankment is notorious for subsidence and soil transport despite major sheet piling works.

The line at this location continues to be subject to a permanent speed restriction. Imagine the reaction if that section failed following completion of works and re-opening at Harbury.

Finally, and not least, the customer. Gloucester taught us that bowsers (insecure small tanks in the street enabling customers to fill buckets) and bottled water in no way is a prolonged substitute for piped safe drinking water. Yes, bottled water will ensure people can keep hydrated but how many bottles of it do you need to flush the toilet manually? Replacement bus services are the standpipes in the street, bowsers, bottled water and "Dads Army" approach of the railway industry, they are not ideal, and the longer that customers are forced to use them the more intolerant they become.

The long term use of rail replacement bus services cannot qualify as a strategy in planning for network failures only in extreme circumstances that customers themselves can and will appreciate. We live in a world that increasingly expects robustness with the services it uses and relies upon. For most of us the benchmark is the high level of reliability we enjoy with our gas, electricity, water and telecommunications infrastructure. That has been achieved and is being maintained by investment and regulatory support for it to ensure a modicum of redundancy that mitigates SPOF's.

It's a direction the railway would be well advised to consider and "get outside the box" in its thinking and approach. With the demise of the Strategic Rail Authority it became Network Rail's role to consider line reinstatements, resilience and growth. To date precious little has been promoted by NR themselves. Even less has been actioned in terms of increasing network mileage to add in redundancy to a network of which the services it provides, and for which people rely upon, are all the more vulnerable due to the unprecedented record levels of passengers and rail freight growth.

Fraser Pithie

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Fraser Pithie now writes on railway matters. Retired from a career of over 30 years in the utility industry, he was Severn Trent's Senior Operations Manager at the time of the 2007 floods that affected Gloucestershire and caused some 350,000 people to lose their piped water supply for over 7 days. He represented the company on National Media throughout the incident and on a visit to the affected water treatment works by the Prime Minister.

In 2009, at a Reception in the House of Commons, he was recognised by the National Joint Utilities Group and presented with their "Most significant Personal Contribution to the Utility Industry". The award was largely in recognition of his work at Severn Trent, subsequent to 2007, to better understand the impact of essential and/or emergency utility works on customers and how to effectively manage the associated disruption of essential services.