

ON TRACK FOR VALUE

A white paper on improving the value
of our rail network

February 2015



WSP

**PARSONS
BRINCKERHOFF**

#FUTURERAIL

Foreword

Interest in UK railways is at an all-time high. The headlines regularly buzz with news of unprecedented investment plans, mammoth projects such as Crossrail, or hot debate about whether we need a high speed railway. But whatever the news, getting value from our railways is increasingly important to everyone, from rail industry professionals to those who climb aboard each day.

One of our biggest challenges is to accommodate increased passenger demand and a growing pipeline of improvement work while at the same time delivering value. With public funding for rail in steady decline and costs increasingly passed to the fare payer, there's a risk that rising fares could deter travellers at a time when environmental concerns mean we should encourage people out of their cars.

We love a challenge. While business-as-usual improvements to supply chain, procurement and individual projects can and do add value, we have been looking at the bigger picture. Read our views on how the railway system itself – our national treasure – and its assets could be used in a different way to add widespread, longer-term value.



Julie Carrier
Head of Rail

Contents

- 03** Introduction
- 04** Key issues
- 10** Improving the value of the UK rail system – our ideas
- 14** Next steps
- 16** Summary

Introduction

The railway system of Great Britain is a national asset, part of our identity and heritage. However, the last 20 years have seen unprecedented passenger growth coincide with the tail end of years of underinvestment. This has placed enormous strain on a network predominantly built during the Victorian era.

The way we operate, maintain and manage our railway is hugely complex, with an array of interested parties holding differing views on how to improve the service. Key voices include infrastructure owners, train operators, funding organisations and contractors. Outside of their professional interest, most stakeholders naturally also have personal experience of using the railway network, which will inform the improvements they would like to see implemented. According to research by independent passenger watchdog Passenger Focus⁽¹⁾ while the 'wish list' of the rail traveller varies from region to region, there are two frequently recurring grumbles: cost and overcrowding.

Our team of experts has examined these two key issues in more detail. You can read our findings on pages four and five – and our recommendations for adding value to the network in these key areas on page ten.

Typical allocation of income for every £1 train operating companies receive⁽³⁾



Goes to Network Rail and covers other infrastructure costs



Goes on staff costs



Goes on miscellaneous costs including train maintenance, administration and contractors



Goes on leasing trains



Goes on fuel / energy



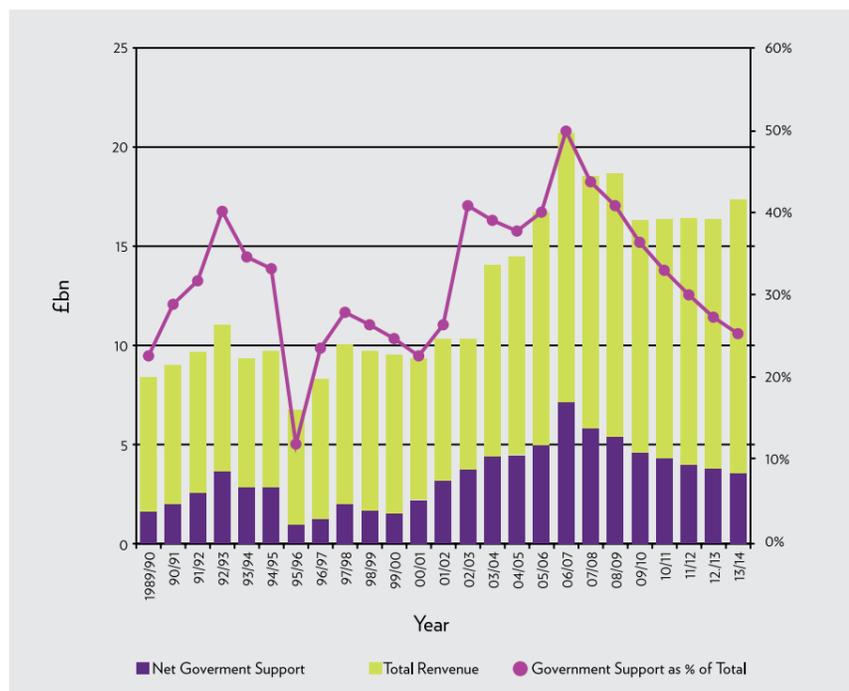
Goes to train company profit

Problem one - cost

The railway costs a lot to run and the industry is increasingly expected to deliver a better service with less subsidy.

We all like to feel that we are getting value. Our railways receive funding from two principal sources; government and fare payers. The graph below⁽²⁾ shows government support to the railway since the 1980s.

Since 2007, support provided by government to train operating companies (TOCs) as a percentage of the total – which includes revenue from fare payers, leasing of assets and property and so on – has steadily declined. This is as a result of government policy to reduce support by shifting the costs of the railway to the fare payer.



As a result, franchises have had to find ways to become more commercially competitive, without sacrificing quality for passengers. Clearly, finding ways to generate revenue from existing assets is one way to maintain the required overall level of investment, while recognising the trend for reduced reliance on government support to TOCs.

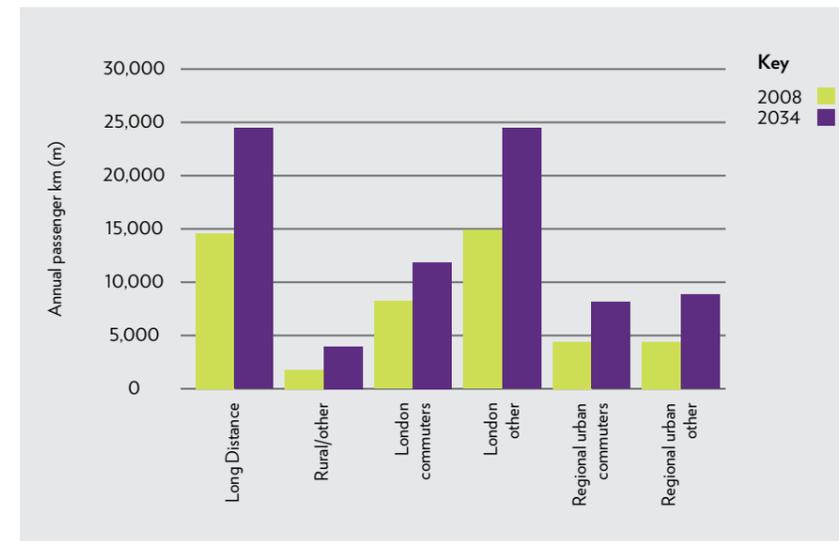
The government also 'lends' money to Network Rail to fund maintenance, operation and enhancement of railway infrastructure. Network Rail is keen to find innovative ways to deliver more for less, reducing this debt - which is now clearly visible on the country's balance sheet.

The railway costs a lot to run and the industry is increasingly expected to deliver a better service with less subsidy.

Problem two - overcrowding

The network is struggling to cope as more and more people choose to travel by rail and forecasters predict that this is going to increase.

Anyone who travels regularly by train will know that our railways are already crowded. Over the last decade passenger journeys have grown 50 per cent to 1.46 billion a year – and by 2020 a further 400 million journeys will be made. Network Rail forecasts that the West Coast Main Line, the Midland Main Line and the East Coast Main Line will all reach full capacity in the 2020s, preventing commuters from being able to board in peak times. It's a serious problem.



Rail passenger km forecast growth 2008 to 2034⁽⁴⁾

The answer is not straightforward. A lot can be done to create more capacity on the existing network by providing more frequent services and longer trains. However in reality, to tackle the problem effectively we will need to build new railways – and these come with a hefty price tag.

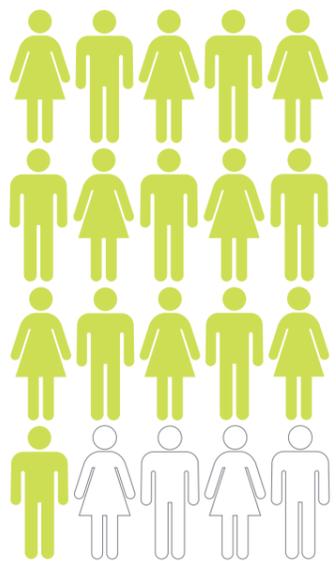
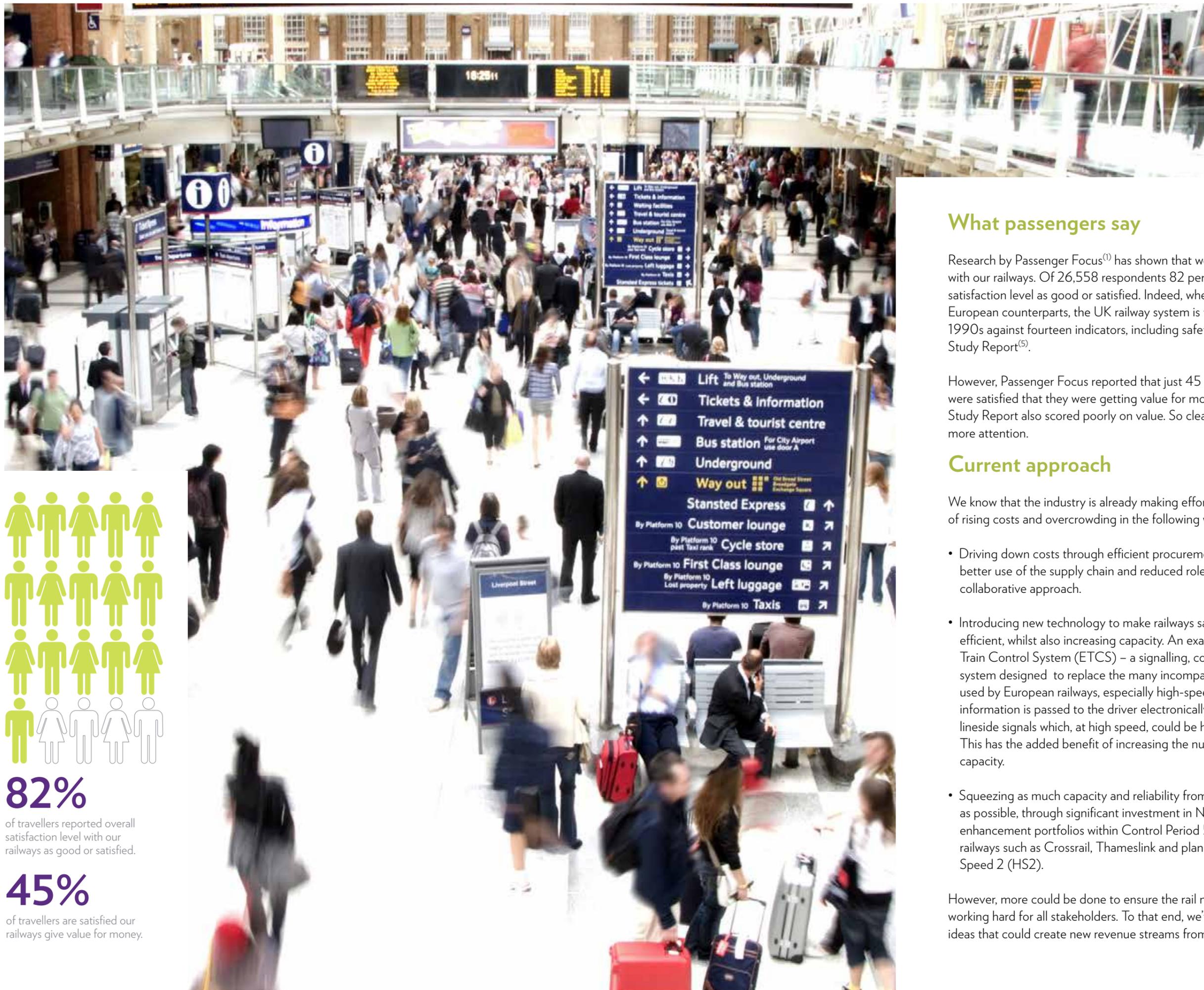
For example, High Speed 2 is estimated to cost £42.6 billion. To justify the cost, the industry must be seen to be demonstrating value.



Over the last decade passenger journeys have grown 50 per cent to 1.46 billion a year, and by 2020 a further 400 million journeys will be made.

The network is struggling to cope as more and more people choose to travel by rail and forecasters predict that this is going to increase





82%

of travellers reported overall satisfaction level with our railways as good or satisfied.

45%

of travellers are satisfied our railways give value for money.

What passengers say

Research by Passenger Focus⁽¹⁾ has shown that we are reasonably satisfied with our railways. Of 26,558 respondents 82 per cent rated the overall satisfaction level as good or satisfied. Indeed, when benchmarked against our European counterparts, the UK railway system is the most improved since the 1990s against fourteen indicators, including safety, based on the European Rail Study Report⁽⁵⁾.

However, Passenger Focus reported that just 45 per cent of rail passengers were satisfied that they were getting value for money, and the European Rail Study Report also scored poorly on value. So clearly this is an area that requires more attention.

Current approach

We know that the industry is already making efforts to tackle both the problem of rising costs and overcrowding in the following ways:

- Driving down costs through efficient procurement of projects and services, better use of the supply chain and reduced role duplication through a collaborative approach.
- Introducing new technology to make railways safer, reliable and more efficient, whilst also increasing capacity. An example of this is the European Train Control System (ETCS) – a signalling, control and train protection system designed to replace the many incompatible safety systems currently used by European railways, especially high-speed lines. ETCS lineside information is passed to the driver electronically, removing the need for lineside signals which, at high speed, could be hard to see or assimilate. This has the added benefit of increasing the number of train paths and hence capacity.
- Squeezing as much capacity and reliability from the existing network as possible, through significant investment in Network Rail's renewal and enhancement portfolios within Control Period 5 (CP5) and the build of new railways such as Crossrail, Thameslink and planned schemes such as High Speed 2 (HS2).

However, more could be done to ensure the rail network's existing assets are working hard for all stakeholders. To that end, we've come up with a couple of ideas that could create new revenue streams from existing assets.

IMPROVING THE VALUE OF OUR UK RAIL SYSTEM - OUR IDEAS

Focusing on these key issues for industry, our experts have come up with some ideas based on estimates and models we have developed.

Idea one:

Self-generated, renewable power for electric trains

By deploying solar panels widely across Network Rail's surplus trackside land, we have calculated that £235 million worth of energy can be generated in the first year by a third party investor, a proportion of which can be used to power electric trains.

Our calculations below show this would mean an annual saving of around £30 million for Network Rail as they are purchasing their traction electricity at a reduced rate.

Electrification of our railways is a key part of government plans. Electricity is quieter, better for the environment and more cost effective. Currently 50 per cent of passenger miles are travelled by electric train, with a target to increase this to 75 per cent by 2020. The cost⁽⁴⁾ of electricity to run these trains is significant; the Office of the Rail Regulator (ORR) has assumed that Network Rail will spend £1,794 million over five years in the current control period⁽⁶⁾ on traction electricity costs.

The UK rail network consists of 17,732km of track, with land on either side. We suggest that this space could be used to generate solar power to supply the electricity needs of the rail network, with any surplus exported for use on other, local networks.

In practical terms, solar panel arrays could be deployed in batches of a few hundred kilowatts (KWs) and connected to the rail network at the appropriate voltage. Consideration could also be given to connecting to other energy consuming assets, such as buildings, depots, stations and so on. This would not be without its challenges, but if successful the solution could deliver savings worth tens of millions of pounds a year.

Powering up

Solar power may not be possible on all rail side space for logistical reasons – some may be too tight or over-shaded for example. However, our team estimates that 50 per cent of the land could reasonably be used. On this basis, a series of solar arrays covering 50 per cent of the trackside would equate to a significant overall deployment of 2.44 gigawatt (GW) – to put this in perspective the UK has around 5GW of installed photovoltaics (PV) solar today.



275

Watts per panel



2.44GW deployed. Total UK PV solar power 5GW

Rail network length (km)	Deployment %	Panel Output (W)	Width of panel (m)	Total Deployed (GW)	Annual Generation (GWh)
17,732	50%	275	1	2.44	1,950



Let's talk money

We see investment potential

We estimate the cost of installing the solar panels would be £1.2 million per MW installed – or around £2.9 billion overall. Network Rail might attract external funding from a third-party investor for the scheme, as it would be unable to invest this amount of money in full.

Our team is confident that the idea would be attractive to investors who fund projects of this sort in return for sharing the financial benefit with the infrastructure owner.

An investor could benefit from two revenue streams; firstly the installation could benefit from the Feed In Tariff – a government run payment scheme for the production of renewable electricity which pays 6.38p per kWh of electricity generated. Secondly, the investor could sell the electricity produced to Network Rail at a reduced rate of 6p per kWh – Network Rail currently pays 8p per kilowatt hour (kWh)⁽⁷⁾ on average – or export it to the local electrical network at a standard tariff of 4.77p per kWh.

A series of arrays totalling 2.44GW (covering 50 per cent of the trackside) would generate around 40 per cent of the electricity Network Rail currently uses to power trains, although we have assumed that they would only be able to take 75 per cent of the electricity generated. The main reason for this is that solar power, which peaks at about 1pm, will not match the profile of Network Rail demand which is around commuter rush times of 8am and 6pm.

Capital Expenditure (£)	£2,926M
1 st year revenue (£)	£235M
Return on Investment (%)	8.04%



Return on Investment (%)



In excess of

895Thousand tonnes of CO₂ emission reductions per annum

Electricity costs predicted to grow in real terms by 2020

Under this model, with Network Rail buying three quarters of the solar electricity produced from the investor at 6p per kWh and the rest being sold to the local network at a minimum of 4.77p per kWh, the return on investment in the first year would be over 8 per cent.

This could be sufficient to attract funding partners, particularly as Network Rail, as a counterparty, would be viewed as a low risk and the Feed In Tariff guarantees payment by the UK government per kWh.

Network Rail's annual saving of around £30 million would be enough to fund significant improvements, for example the operating/ signalling control center in Basingstoke, replacing 800 mechanical signal boxes with traffic management technology or a new roof and better, brighter and more open concourse and improved station facilities for passengers at Manchester's Victoria Station.

But wait, there's more

This is just the tip of the iceberg. We have been conservative in our estimations for both the amount of trackside land that could be used and the figure currently paid by Network Rail for electricity.

The reality is that Network Rail is an enormous land owner, with around 122,000 hectares in England alone, according to government land use statistics (2006)⁽⁹⁾. Much of this land could potentially be used for solar panels – for example, on station roofs, above parking lots, in surplus land, at depots. This, combined with wind turbines on appropriate sites, could generate far more power and greater savings than we have already suggested.

The system could also deliver significant environmental benefits, including CO₂ emission reductions in excess of 895 thousand tonnes per annum against a grid average. And with electricity costs predicted to grow by 25 per cent in real terms by 2020, this use of solar power and other renewables at a guaranteed price would provide increased price stability.

Idea two: Maximise the potential of second tier stations

Create value by identifying stations where there is a clear desire locally to improve facilities and create revenue streams by using the space differently, whilst also making them more energy efficient.

The quality and connectivity of the local railway station is often at the heart of any regeneration project's success. With the average British person making over 140 trips per year by train it's not hard to explain the growing demand for our often iconic station buildings and the role they play beyond their practical function. Stations no longer simply provide access to the rail network. They are increasingly becoming focal community points, providing space for retail outlets, leisure facilities, and office and residential developments – especially in city centres.

Major – or first tier – UK stations such as St. Pancras International, Kings Cross and Reading are exemplars of this approach. The £800 million refurbishment of St Pancras – which re-opened in 2007 complete with upmarket shopping, regular music and drama events and the longest champagne bar in Europe – has attracted a whole new audience to the station with around 25 per cent of its visitors never going near a train.

Elsewhere, on completion, the London Bridge station redevelopment will house a whole new centre in the London Bridge Quarter with enhanced transport services, complementing the popular Shard and London Bridge House destinations. Almost 8000 m² of retail space will be provided within the station, which in itself will become a destination with similar success to the Waterloo Station Balcony scheme. The balcony is already a hive of activity where visitors can use the various coffee bars and restaurants for business meetings, accessing the internet whilst waiting for trains, or even just for a social catch up on the way home.

However, there is a missed opportunity to create the same value in our second tier or 'tier two' stations, those not currently earmarked for investment but which perhaps should be.

We have identified three key opportunities to create value:

1. Make better use of existing space such as ticket offices.

Fewer and fewer people buy tickets at the station; even ticket machines may one day be outdated. The space inhabited by ticket offices and machines could be used differently in the future. Possibilities include:

- Providing wifi-enabled, serviced meeting hubs and office pods which could be booked online to meet flexible working needs. This would provide a revenue source for the railway and a convenient resource for commuters and businesses.

Reading station:
redevelopment has created enhanced retail opportunity and a world class station



Value can be unlocked in locations where there's a clear desire among local people to improve station facilities. Better parking, retail opportunities and other revenue streams can be realised by creative use of space. We can also make stations more energy efficient. How? By combining expertise and influence within a station enterprise partnership to maximise the regeneration benefits of investing in tier two stations.

- Providing facilities to collect online shopping or to take parcels for delivery through services such as Duddle or commuter friendly post offices.
- Acting as virtual shopping centres with online shopping 'walls.' This concept is in use at Gatwick Airport and could be easily transferred to railway stations, generating further revenue for the rail network.
- Providing a night and day destination for eating and socialising.

2. Consider the regeneration potential for tier two stations in partnership with private investors and local authorities.

For too long, station development has progressed in isolation from neighbouring town centres.

The land near a railway station is valuable. If urban development, shops and business, were concentrated in these areas, far more people would be likely to travel by train for meetings, to socialise, or to work at these destinations. Developing hubs at stations away from larger city centres will attract people to commute to them by train, using empty seats and travelling against the general flow.

The HS2 Growth Task Force led by Lord Deighton⁽⁸⁾, was established to examine how to maximise economic growth and job opportunities from the government's plans to build the high speed rail network. Their findings indicated the importance of unlocking the economic benefits of HS2 for communities. Attracting investment and transforming the role of stations needs new models of planning, operation and maybe even ownership. The current ownership structure for many of our stations, in which Network Rail has long-term responsibility and train operating companies have relatively short leases makes implementing long term change difficult.

We would like to see the Deighton approach taken beyond HS2, and propose that station enterprise partnerships should be created for appropriate stations across the network. The partnerships would join the rail industry with local land owners, businesses, communities and local government. The partnership could then draw up plans to transform their stations and surroundings into thriving districts, leading the regeneration of town centres, reducing the need to drive and adding passenger demand and bringing new value to the railway.



London Bridge: Clever use of space, as shown in the design of London Bridge station redevelopment, could add value by creating retail and revenue opportunities at second tier stations.



Kings Cross: Investment in Kings Cross station has led to economic rejuvenation of the surrounding area.

Image courtesy of John McAslan + Partners

3. Invest in making station buildings more energy efficient.

To add value, rail stations can also become more energy efficient, through modern techniques to reduce heat and light wastage. The initial investment required will bring long-term commercial and environmental benefits. The station enterprise partnerships described on page 12 could lead the charge, joining investors with operators and owners to evaluate the long-term returns and implement changes where the business case is sound.

Station buildings that have substantial thermal demand, biomass and combined heat and power systems (CHP) should especially be considered for investment, as they offer effective opportunities to reduce operating costs and, in the case of biomass, CO2 emissions. We have worked on numerous schemes adopting these principles, where third parties have been keen to fund such investments. These include a number of schools, distilleries and commercial farms, funded by a Green Investment Bank backed fund, where fuel costs were reduced by around 25 per cent against the existing Liquefied Petroleum Gas systems.

Energy efficiency specialists typically identify savings of 15-20 per cent at little or no cost when auditing premises. In addition, energy monitoring has come a long way and automated meter reading allows for real-time energy management and identification of problems. As well as making these low cost savings, many businesses now work with investors who pay for light emitting diodes (LEDs) and other energy saving measures, and share the benefit with end-users.

Bringing together these opportunities could attract external investment, with benefits leading to reduced costs for the industry as a whole.

How we can take these ideas forward

We are keen to challenge the industry to consider taking forward our two proposals to deliver value from existing UK rail assets. Here are our thoughts on what steps are required to do this.

Power

Encourage Network Rail to consider using solar power from PV panels to provide traction electricity. We have looked at trackside opportunities in this paper because data is more accessible for the available land, but there could be considerable opportunities to apply the idea to other assets such as station roofs and car parking canopies.

Recommended next steps:

- Step 1:** Hold introductory meetings with developers and potential investors to fully understand the technical issues, business case, potential return and logistical requirements of the proposal.
- Step 2:** Identify electrified sections of route where the topography is best suited to the use of solar power and shortlist final sites.
- Step 3:** Work with the investor/developer and solar company to install PV panels on a trial site to prove the business case over a distance of 20 to 30 route miles.

Stations

There is a significant opportunity to realise the potential of tier two stations to provide additional revenue streams. We suggest the following steps:

- Step 1:** Identify a shortlist of second tier stations where there is local appetite and potential funding to improve and or amend facilities within the existing buildings.
- Step 2:** Consider the development potential of the area around the shortlisted stations, engage with investors, developers and the local community to understand the potential.
- Step 3:** Find all locations that meet both criteria and establish a station enterprise partnership to create a long-term development plan for the station and surrounding area that meets the needs of all stakeholders and proves the business case.
- Step 4:** With the support of the station enterprise partnership, implement the recommendations of the long-term development plan, partnering with professional organisations where the business case is sound.

Summary

In producing this report, our team has concluded that stimulating ourselves to think about our railways differently will be key to solving the challenges faced by the industry. Across the world people are wrestling with the problems of rising population and diminishing resources and their effects. These issues are everyone's responsibility and are always on the table at WSP | Parsons Brinckerhoff. We are committed to helping our clients find solutions in their corner. To us, a way to add value to our rail system that answers these core concerns must be long-term and sustainable, and the ideas in this report aim to reduce costs, save energy, and strengthen communities; providing benefits over a number of years.

We would love to hear your views on our proposals, the blockers we will face in implementation, the things we haven't considered and associated risks and opportunities.

Please have your say on Twitter using - #futureail

References:

1. National Rail Passenger Survey, Spring 2014, Main Report
2. Realising the Potential of GB Rail, Report on the Rail Value for Money Study, Summary Report, May 2011 (updated to 2014 by WSP)
3. ATOC website <http://www.atoc.org/2013fares/fares-faqs.php>
4. Planning for CP5, Network Rail Route Utilisation Strategies
5. European Rail Study Report, Annex 3
6. ORR Final Determination of Network Rail's Outputs and Funding for 2014-19, October 2013: Summary
7. ORR: Implementing the EC4T Cost Reconciliation Consultation, October 2013
8. HS2 Growth Task Force: a report to government on maximising the benefits of HS2, March 2014
9. Generalised Land Use Database 2006, Department of Communities and Local Government

ABOUT WSP | PARSONS BRINCKERHOFF

We're one of the world's leading professional services firms in the built and natural environment. We work with governments, businesses, architects and planners to transform the built environment and restore the natural environment, and our expertise ranges from environmental remediation to urban planning, from engineering iconic buildings to designing sustainable transport networks.

Together, we're approximately 32,000 experts, including engineers, technicians, scientists, architects, planners, surveyors, environmental specialists, as well as other design, programme and construction management professionals. Globally, we're based in more than 500 offices, across 39 countries, on 5 continents, and we have a network of offices across the UK. Wherever you are, you're never far from one of our projects.

Follow us on Twitter @WSP_PB_UK

LinkedIn: <https://www.linkedin.com/company/wsp-in-the-uk>

YouTube: www.youtube.com/wspintheuk1

Email: contactus@wspgroup.com