Welsh Government

Valley Lines Electrification

Outline Business Case

117300-81

Final | June 2012

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Ove Arup & Partners Ltd
4 Pierhead Street
Capital Waterside
Cardiff CF10 4QP
United Kingdom
www.arup.com

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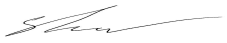
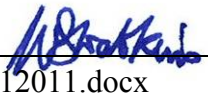
		Signature			
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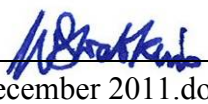
		Signature			
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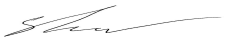
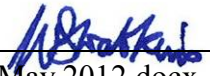
		Signature			
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Contents

Technical Appendices (under separate cover)

Appendix 1 – Appraisal Summary Tables
Appendix 2 – Technical Note on Timetables and Diagramming
Appendix 3 – Technical Note on Demand Forecasting and Economic Appraisal
Appendix 4 – Technical Note on Operational Cost Modelling
Appendix 5 – Wider Economic Benefits and Social Impacts Technical Note
Appendix 6 – Technical Note of Depot and Stabling Assessment
Appendix 7 – Planning Risk Review Paper

Other Reference Documents (under separate cover)

Market Analysis, October 2011
Options Assessment Report, September 2011
Strategic Outline Case, September 2011

Executive Summary

This Outline Business Case (OBC) for Valley Lines Electrification (VLE) has been prepared by Welsh Government. In preparing this OBC, Welsh Government has worked closely with the Department for Transport (DfT) and Network Rail.

The development of the OBC has been based on a five case model approach. In line with DfT guidance, a Strategic Outline Case was firstly prepared in September 2011. This clearly articulated that Valley Lines Electrification (VLE) is a good strategic fit with the plans and policies of Welsh Government, DfT and Network Rail.

The case for change with respect to the up-grading of the Valley Lines rail network is a compelling one and this is demonstrated in this OBC. The existing diesel rolling stock currently used on the Valley Lines will need to be replaced during the next franchise, providing the opportunity for a more efficient way of providing services. The set of circumstances has come together that presents a once in a generation opportunity to deliver VLE.

The appraisal compared the 'do minimum' with three 'do something' options. These were as follows:

- Option 1: Electrification and new electric multiple units (EMUs) rolling stock;
- Option 2: Electrification and cascaded electric multiple units (EMUs) rolling stock; and
- Option 3: New diesel multiple units (DMUs) rolling stock.

Option 2 performed best in overall terms.

The economic case for VLE is predicated both on the potential to achieve large operating cost savings and on the prospect of capturing very significant user and environmental benefits. Wider impacts would also result in social and economic benefits. The cascaded EMUs option is shown to provide the best value for money of the three options.

In order to ensure compliance with DfT guidance and to retain comparability with other projects being considered for funding, the main economic appraisal has been undertaken on the basis of the 'constrained growth' scenario for passenger demand. However, based on strong recent growth in demand, it is considered that the 'continued growth' scenario provides the best estimate of future demand.

Based on 'constrained growth', the economic analysis demonstrates that there is a strong economic case for VLE. The Net Present Value of the cascaded EMUs option is estimated to be £165.2 million, giving a BCR of 3.9 to 1. VLE would thus fulfil the objective of providing a better deal for passengers and taxpayers. A sensitivity test has been undertaken based on the 'continued growth' scenario which shows a higher NPV of £202.9m and a BCR of 4.8 to 1.

In the financial case, electrification is seen to greatly reduce the overall future costs of subsidising the franchise. Since rail operations will need to continue in the future, a franchise to ensure this is essential. As VLE is the option of least cost, it must be deemed to be affordable. The capital costs necessary to deliver VLE have been estimated by Network Rail to be £309 million (GRIP 2 proposal estimate Q1 2012). This OBC presumes that the necessary investment for VLE

will be met by Government as part of the CP5 investment programme (2014 – 2019).

As part of the commercial case, a market analysis has been undertaken. This has shown that there is an on-going strong travel demand, particularly on commuter routes into Cardiff and Newport. Rail services are well-placed to serve this demand, with potential to increase mode share. Various aspects of delivery of VLE are examined, including contracting and procurement, sourcing, payment mechanisms and the franchising process and risk and value management. This concludes that there is scope for the increased efficiency of electrified rail operations compared with diesel operations to be reflected in the terms of the next Franchise Agreement that is scheduled to commence in 2018.

The management case has focussed on achievability and thus delivery of the proposals. The proposed outcomes for VLE relate to a number of delivery points and/or events. These include:

- Preparation of a Full Business Case for delivery during CP5 (2012/13);
- Detailed design and construction of civil engineering and electrification infrastructure works (2012 – 2018);
- Preparation of an output specification for the new Wales and Borders Franchise (2013/14);
- Completion of Cardiff Area Signal Renewal (CASR) by Network Rail (2014); and
- Contractual commitment to operation of VLE under the new Wales and Borders Franchise (2018).

Realisation of VLE is dependent upon its inclusion in HLOS 2 and Government investment under CP5. It will also require Welsh Government to make available the necessary technical and managerial resources in order to successfully deliver VLE and manage the new franchise.

The recommendation of this Outline Business Case is that there is justification for the electrification of the Valley Lines rail network and for the provision of electric multiple units, in the first instance cascaded from elsewhere [redacted]. In the longer term, these EMUs will be replaced by new units.

1 Introduction

1.1 Background

The Valley Lines comprise a relatively dense rail network which plays a vital economic and social role, providing connectivity between settlements in South Wales and important links for commuters to key economic centres.

1.1.1 Ministerial Announcement

In March 2011, the then Secretary of State for Transport announced that, at an initial high level, *'a good case appears to exist for electrifying the key valley commuter routes 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 to the west.'*

It was further stated that Valley Lines Electrification *'promises to bring all the benefits of electric commuter trains - faster acceleration, greater comfort and cleaner, greener travel, as well as greater reliability - to rail users in South Wales. It would have a significant effect on the economy of Cardiff and the Valleys – deepening labour markets, improving connectivity and significantly enhancing the attractiveness of the area to investors.'*

Whilst the Secretary of State for Transport's recognition that there is a good case for electrification of Valley Lines is to be applauded, it must also be recognised that the Valley Lines extend from Ebbw Vale to Maesteg. The rail network serves this area as a whole.

The South Wales Valleys are seen as a single entity both in economic and transport terms. Investment in regeneration and economic development initiatives is on this basis. Therefore, the case for electrification of the Valley Lines rail network is, first and foremost, on the basis that all lines are included from Ebbw Vale to Maesteg and with the Vale of Glamorgan line also included.

The Welsh Government, working with the Department for Transport, has undertaken to examine the business case for electrifying the full extent of the Valley Lines network, comprising the routes listed above and including the Vale of Glamorgan, Maesteg and Ebbw Vale lines.

1.1.2 High Level Output Specification

Network Rail is currently developing a portfolio of candidate CP5 Enhancement Projects for inclusion in the Control Period 5 (CP5) Initial Industry Plan (IIP). Within Western Route, a range of candidate CP5 Projects is being developed to GRIP Stage 2 Output (Feasibility). In Wales, amongst others, the following Candidate CP5 Scheme is being developed:

Valley Lines Electrification (VLE) – comprising an assessment of the feasibility of potential electrification of the Valley Lines network centred on Cardiff.

VLE is strongly supported by the Welsh Government and by the consortium of local authorities in South East Wales (Sewta)[1]. The Welsh Government is developing a business case for investment in VLE. It is intended that this business case will be considered by the Department for Transport (DfT) for inclusion of the project in its High Level Output Specification (HLOS2) submission for CP5, which covers the period 2014-2019.

1.2 Outline Business Case (OBC)

This document represents the Outline Business Case (OBC) for VLE. A Strategic Outline Case (SOC)[2] was completed in September 2011. The SOC established that the project is consistent with government objectives and that there is a potentially strong case for intervention, which is both feasible and deliverable. The purpose of the OBC is to examine, in detail, the case for VLE and to establish a preferred option for the scheme.

The OBC for VLE was submitted to the Department for Transport in December 2011. The Welsh Government and Department for Transport have continued to examine and develop the case for VLE during 2012. This OBC has been refined and updated to reflect the best available information.

The development of the Outline Business Case has confirmed that Valley Lines Electrification (VLE) will fit with the strategies, plans and policies of the Welsh Government, the Department for Transport (DfT) and Network Rail. It also demonstrates that a case for change regarding transport provision in South East Wales can be justified and that the proposals are capable of generating sufficient benefits.

The remainder of this document is structured according to the five case model[3] structure, namely:

- The Strategic Case – that it fits with wider public policy objectives;
- The Economic Case – that it demonstrates value for money;
- The Financial Case – that it is affordable;
- The Commercial Case – that it is commercially viable;
- The Management Case – that it is achievable; and
- Conclusions.

[1] Sewta Rail Strategy Review and Roll Forward Study, Final Report, Jacobs Consultancy, April 2011
[2] Valley Lines Electrification: Strategic Outline Case, Arup (September 2011)
[3] 'The Transport Business Case' Department for Transport (April 2011)

2 Vision and Objectives

A range of objectives have been defined for the VLE. These objectives have been developed in consultation with core stakeholders through the Project Working Group and were confirmed during a Starting Gate Review.

The overall vision for the project is:

> ***'To develop rail operations in South Wales to achieve enhanced services with efficiency savings leading to a fairer deal for passengers and taxpayers.'***

The project objectives are:

- to deliver a more efficient and sustainable transport network supporting long-term prosperity by enabling South East Wales to function as a single coherent economic region;
- to provide for increasing rail travel demand in South East Wales;
- to provide a catalyst for mode shift in South East Wales from car to rail transport;
- to produce positive effects overall on people and the environment, contributing to the overarching Welsh Government goals to reduce greenhouse gas emissions;
- to support the creation of significantly improved employment links for parts of South East Wales Valleys in the convergence funding areas; and
- to strengthen the role of the key economic centres in South Wales as the drivers of economic growth in South Wales.

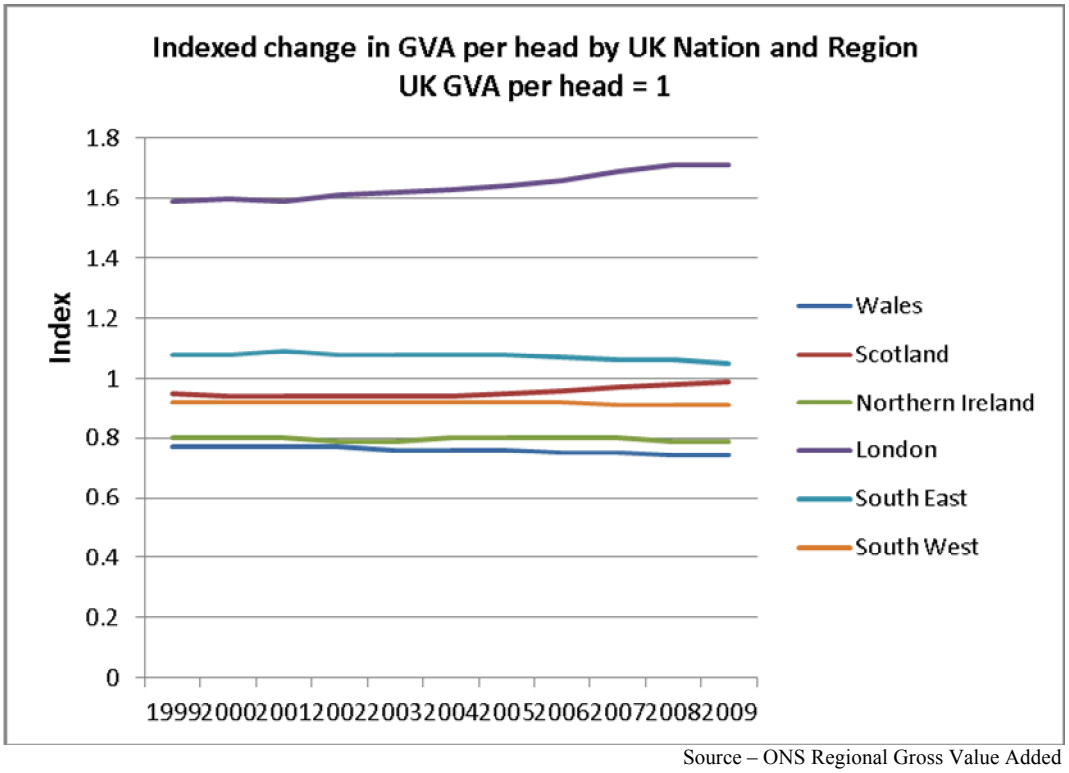
3 The Case for Change – The Strategic Case

3.1 Introduction

The economy and consideration of the environment, social inclusion and wider economic benefits must be the primary drivers of a major transport investment decision. In respect of Wales, and South East Wales in particular, there are serious economic reasons why transport investment and in particular rail investment is essential.

Wales' economic performance, over many years, has fallen behind other countries and regions of the UK (see Figure 3.1); so that today it has:

- Lowest Gross Value Added (GVA)/Capita – especially the Central Valleys of South Wales where, in 2008, GVA/Capita was 58.4% of the UK average[4]
- Lowest level of value generating business activities (R&D, exporting, corporate HQ) [5]
- Lowest levels of Mergers and Acquisitions (M&A) activity (Venture Capital investment, listed companies, start-ups)[6]



Source – ONS Regional Gross Value Added

Figure 3.1: Change in GVA by UK Nation and Region

[4] ONS 2009, "Regional, sub regional and local GVA", WG Regional Economic & Labour Market Profile – SE Wales June 2011
[5] UWIC 2010, "UK Competitiveness Index, UWIC 2010", Huggins & Piers Thompson
[6] British Private Equity and Venture Capital Association 2008, "Private Equity and Venture Capital Report on Investment Activity"

The position for the Cardiff journey to work catchment reflects a long-term decline in the region since the demise of the coal industry. This is in marked contrast to the City of Cardiff itself, which has GVA/Capita above the UK average (108% of UK average in 2008).

From a business perspective transport connectivity is crucial to economic performance – especially inter and intra-regional public transport. For example, Admiral Insurance's (one of Wales' leading private sector companies) recent statements as regards public transport provide a stark warning that *"as a valleys employer, the provision of an effective City Region public transit system is essential for the long-term success of its business"*.

It is clear, that part of the solution to Wales' economic problems will include a major investment in transport connectivity.

The 'Case for Change' considers the links between transport and the economy in South East Wales and examines whether the existing transport networks are 'fit for purpose'. In particular, it looks at the role that rail will have to play in the future and it sets down desired outcomes and targets that an electrified Valley Lines railway might aspire to. The Strategic Case is outlined in further detail in the SOC as referred to earlier.

3.2 The Valley Lines

The Valley Lines comprises a network of railway lines in South Wales as shown in Figure 3.2. The linear dispersal of valley settlements in South Wales is such that the economic and social wellbeing of the area is heavily dependent on efficient transport links between the Valleys and centres of economic activity along the M4 corridor. The Valley Lines is relatively unique as a self contained suburban rail network which is well placed to compete with road transport.

As referred to in 1.1, the Secretary of State for Transport has previously acknowledged that there is a good case for electrification of Valley Lines. However, this announcement identified individual lines. It is the view of Welsh Government that rail electrification should be extended to the entirety of the Valley Lines network, including the Ebbw Vale, Maesteg and Vale of Glamorgan lines.

3.3 Rationale for Intervention

A detailed analysis of the existing situation and the market for rail has revealed where the existing situation might be improved, creating a rationale for intervention.

3.3.1 Improving Value for Money

Existing Situation

The costs to the taxpayer of subsidising diesel rail services on the Valley Lines could increase significantly in the future. The cost of supporting the railway in the next franchise period could result in an increasing burden on the taxpayer.

The existing rolling stock on the Valley Lines comprises Pacer and Sprinter units which are over 25 years old and in need of significant modification to meet standards for disabled access[7]. Furthermore, the diesel engines are non-compliant with current European emissions directives. They have no facility for energy recovery from braking and emissions are discharged into the local environment. There is no reasonable prospect for improving the energy consumption or emissions performance on these fleets.

A standard rail industry assumption is that the useful life of diesel rolling stock is around 30 years. At the commencement of the next franchise period, the existing fleet of Pacer and Sprinter trains operating on the Valley Lines will be between 33 and 34 years old. It is considered that the useful life of the existing fleet of diesel units could be life extended through a comprehensive overhaul and refurbishment. However, even if investment was made to extend the life of these units, the fleet would need to be replaced during the next franchise period which begins in 2018.

Valley Lines Electrification

Electric train vehicles provide a more efficient option for the Valley Lines. Heavy maintenance is a significant cost component, including routine replacement of engine and transmission components as well as replacement of bogies and running gear.

Leasing costs are significantly lower for electric units than modern diesel trains. In the long term, it is expected that the availability of diesel units could be significantly constrained and, as such, options for employing cascaded diesel trains would be limited or expensive.

Both fuel and maintenance costs for the Pacer and Sprinter Diesel Multiple Units (DMUs) are high compared to more modern, electric vehicles. As a result, the existing trains offer poor value for money for the taxpayer. The Valley Lines diesel fleet requires a higher level of maintenance compared to modern DMU or Electric Multiple Unit (EMU) fleets with miles per casualty (mpc) figures generally half those of the modern DMUs and a quarter of those of EMUs[8].

VLE will reduce the costs of rolling stock and improve rolling stock reliability. Operating costs for the Valley Lines with and without electrification are further illustrated in Section 6 (the financial case) of this report.

[7] Rolling stock operating beyond 2020 in UK is required to comply with the Technical Specification for Interoperability for Persons with Reduced Mobility (PRM TSI).
[8] National Fleet Reliability Improvement Programme.

Figure 3.2: The Valley Lines Rail Network

3.3.2 Supporting Economic Growth

Existing Situation

A market analysis has been undertaken for the Valley Lines rail network and a Market Analysis Report[9] has been prepared and is included as a separate appendix to this OBC.

The Valley Lines is a well used rail network catering for over 13 million passenger journeys each year. Importantly, demand for rail travel on the Valley Lines has been rising rapidly for a sustained period of time. Patronage on the Valley Lines rail network has grown by 6.9% per annum since 1998 which exceeds growth on the UK network as a whole. Taking out the effects of new lines, average growth of 4.3% per annum was achieved between 2000 and 2010, well above the average for the UK as a whole.

The growing importance of the Valley Lines in the transport network is inextricably linked to the economic development of South East Wales. Growth in the Valley Lines reflects the changing nature of the economy and the increasing role of service sector employment located in urban centres. In particular, this has been a function of the increasingly important role of Cardiff as the 'regional' centre for business and administration functions. This has been reinforced by regeneration activity near the City Centre and in Cardiff Bay. Over the last decade, the level of commuting into Cardiff by all modes from surrounding areas has increased by 14%. This growth in commuting has played an important part in the increasing stress on the road network. Congestion on the road network in South Wales, combined with competitive rail fares, is encouraging mode shift from car to rail.

There is good reason to believe that these factors will continue to play an important role in stimulating demand for rail in South East Wales in the future. The Rail Utilisation Strategy for Wales predicts continued growth in commuting flows on lines into Cardiff of 3.4% per annum until 2018[10].

Many parts of South East Wales continue to suffer from the legacy of industrial decline. Issues of economic and social deprivation are especially acute in the northern areas of the Valleys where access to employment opportunities and to services is poor. The Heads of the Valleys regeneration strategy[11] reflects the Welsh Government's desire to deliver tangible economic improvements.

Valley Lines Electrification

It is often highlighted that Wales' 'productivity gap' is, in part, a consequence of the lack of a major conurbation. Increasingly, economic growth tends to be concentrated in large, densely populated urban areas which provide the conditions for productivity growth. This is termed the 'agglomeration effect'. Given its coverage, the Valley Lines has a key role to play in creating a coherent, integrated and successful urban area and in fostering agglomeration effects. The implications of electrification for the economy and labour market of south east Wales are discussed in Section 4.

[9] Valley Lines Electrification: Market Analysis Report, Arup (November 2011)
[10] Wales Rail Utilisation Strategy, Network Rail (2008)
[11] 'Turning Heads: A Strategy for the Heads of the Valleys 2020' Welsh Government (June 2006).

The spatial patterns of economic deprivation clearly highlight the importance of reinforcing links between Valleys communities and the M4 corridor. The transport network will be crucial to realising Welsh Government goals for regeneration of the area.

Electrification results in journey time savings of around 5% on average against the existing timetable. VLE will provide a fast and efficient rail service for commuters which is vital to enabling the future economic growth of South East Wales.

3.3.3 Delivering a Better Deal for Passengers

Existing Situation

The existing rolling stock principally comprises Pacer and Sprinter units built during the period 1985 to 1987. The trains operating on the Valley Lines have a number of weaknesses which reduce the quality of passenger ambience compared with other commuter rail operations in the UK. The standard of aesthetic finish on the interior and exterior of the vehicles, obvious riveted body panels and automotive bus doors, for example, make it difficult to avoid an impression of poor passenger comfort, train presentation and low value for money.

Valley Lines Electrification

Electric rolling stock is ideally suited to Valley Lines given the frequency of stops and the importance of fast acceleration and deceleration in response to the gradients on the network in South East Wales. This results in faster journey times for passengers.

Furthermore, electrification is expected to stimulate demand by offering a better quality experience for passengers. The 'sparks effect' on demand has been experienced elsewhere following electrification projects. Electrification and rolling stock upgrade has been proven to stimulate higher demand and mode shift, particularly in a context of capacity constraints on the highway network. In particular, electric trains offer reduced noise and vibration and their reduced environmental impact is valued by passengers.

VLE offers better value for money for passengers.

3.3.4 Building on Recent Investment

Existing Situation

Rail services have developed incrementally on the Valley Lines network services in recent years. Notably, the re-opening to passenger services of the Ebbw Vale and Vale of Glamorgan Lines has contributed to higher levels of rail travel in South East Wales by realising latent passenger demand through investment in rail. Platform lengthening on the Treherbert and Rhymney lines has been undertaken to allow 6-car trains to operate. Improvements to key stations such as at Newport have been made and further station improvement projects will be delivered through the National Station Improvement Programme.

The Cardiff Area Signalling Renewal Project, CASR (to be delivered during CP4 by 2014), will increase the capacity of the network and the potential of increasing the frequency of services by increasing the number of hourly train paths between Cardiff Central and Cardiff Queen Street. The infrastructure improvements delivered under CASR are of vital importance in enabling the Welsh Government to achieve its objectives of improving service quality and providing sufficient capacity to deal with expected future demand.

Valley Lines Electrification

Following on from committed investment under CASR and electrification of the main line, electrification offers the most efficient and cost effective way of providing the level of service required to satisfy future demand and to deliver the Welsh Government's aims for the Valley Lines.

3.3.5 Delivering Environmental Objectives

On the Valley Lines, the existing diesel engine designs date from the 1980s and fail to meet current European emissions directives. They have no facility for energy recovery from braking and emissions are discharged into the environment locally. There is no reasonable prospect of improving the energy consumption or emissions performance on the existing fleet on the Valley Lines.

Valley Lines Electrification

Rail electrification delivers environmental benefits by switching fuel use to less carbon intensive sources, whilst also reducing emissions from road transport by offering a more attractive travel mode. Comparison of diesel and electric rolling stock suggests that electrification will lead to a 20% to 30% reduction in carbon based on the current carbon intensity of electricity[12]. Further reductions in emissions would be expected to result from mode shift from car to rail.

There are ten Air Quality Management Areas designated within 200 metres of the Valley Lines railway. The switch from diesel to electric traction for passenger rail services is likely to have a positive impact on air quality within these areas.

3.3.6 Other Imperatives for Change

Upcoming franchise renewal, the need for rolling stock renewal and the decision to electrify the Great Western Main Line determines that there is a once in a generation opportunity to electrify the Valley Lines. Aside from the economic, environmental and social factors that provide a compelling case for VLE, there are a number of other influences and drivers that lend support for early action on the project, namely:

- ***Franchise renewal:*** the current franchise will be replaced in 2018 and the process of designing a new franchise will begin well in advance. There is an opportunity to re-let the franchise such that the future operation of the Valley Lines maximises the benefits that VLE provides.

[12] Electrification RUS, Network Rail (October 2009)

- ***Rolling stock renewal:*** in parallel with franchise renewal, it will also be necessary to replace much of the life expired Valley Lines diesel fleet by around 2025. There is, therefore, a major opportunity to put in place the ideal rolling stock solution for the Valley Lines. The VLE programme provides an opportunity to procure more efficient, higher capacity rolling stock.
- ***GWML Electrification:*** the decision to electrify the Great Western Main Line (GWML) to Cardiff also provides an opportunity to extend electrification to the Valley Lines given that a source of sufficient power will be provided to serve VLE in addition to the GWML project, at Imperial Park, Newport.

3.4 Strategic Fit

Electrification of the Valley Lines delivers against the objectives of the Welsh Government and the Department for Transport.

The McNulty Agenda – Improving Value for Money[13]

VLE will greatly reduce the operating costs and subsidy requirements for future franchise arrangements for the Valley Lines by reducing the costs of rolling stock, limiting maintenance costs and reducing the costs of energy. The McNulty Rail Value for Money Study suggests that the rail industry should be aiming to achieve a ***30% reduction in costs per passenger by 2018/19***. Electrification of the Valley Lines is the only option which offers the potential of reducing costs to this level whilst delivering improvements for passengers. Electrification delivers an improved service quality for passengers whilst reducing the burden on taxpayers.

Transport Investment to Deliver Growth

By improving journey times and delivering capacity for growth, VLE helps to ensure that South Wales has the public transport infrastructure to underpin economic growth. The Valley Lines play a hugely important role in the labour market of South Wales and VLE delivers the connectivity which will ensure that key economic centres can continue to grow. This is directly in line with the Welsh Government's Economic Renewal Programme as well as the Department for Transport's vision for ***'transport as an engine for economic growth'.***

Sustainable Transport

VLE will greatly reduce CO_2 emissions by switching to a lower carbon energy source and by reducing energy consumption through use of regenerative breaking. VLE is, therefore, directly in line with the objective set out in the Initial Industry Plan of ***reducing industry's CO_2 emissions per passenger kilometre by 25 per cent***. VLE is estimated to reduce CO_2 emissions by 20% in the short term and over 50% in the long term as the UK's grid connected energy mix moves towards renewable sources of energy.

Delivering Regeneration

The Valley Lines network connects some of South Wales most deprived communities to key centres, Cardiff and beyond. Improving the speed and quality of service in the South Wales Valleys will improve access to employment opportunities and support regeneration activity in the Heads of the Valleys Area.

[13] Realising the Potential of GB Rail: Final Independent Report of the Rail Value for Money Study, Department for Transport / Office of Rail Regulation (May 2011)

3.5 Summary of the Strategic Case

The vision of developing rail operations in South Wales to achieve enhanced services with efficiency savings leading to a fairer deal for passengers and taxpayers contributes directly to Government objectives.

VLE is likely to reduce operating costs and provide a significant improvement in service quality for passengers. The project supports economic growth and regeneration in South East Wales by supporting improved access to employment and closer economic integration of the South East Wales economic region. Furthermore, VLE reduces Greenhouse Gas and other emissions from both rail and road transport.

The following summarises the Strategic Fit of the project:

- A strong fit with Welsh Government priorities for economic growth and regeneration in South Wales;
- Correspondence with the principles of Sir Roy McNulty's Rail Value for Money Study recommendations; and
- A good fit with the timing and structure of franchise renewal and stimulating investment in the railway, with the potential for innovation and investment by the Department of Transport, Network Rail and the Welsh Government.

4 Value for Money – The Economic Case

4.1 Introduction

The economic case considers whether the proposal is good value for money and whether the benefits of intervention outweigh the costs.

4.2 Approach

The value for money case has been developed according to the DfT's Transport Business Case framework. An economic appraisal has been undertaken in line with Department for Transport (WebTAG)[14] and Welsh Government (WelTAG)[15] guidance for the assessment of transport investments. It is assumed that electrification infrastructure will be delivered within CP5 which will enable a change in the operation of the Valley Lines to be rolled out during 2018 and 2019 to coincide with the start of the next franchise period. The appraisal has been undertaken over a 60 year period from 2019. All costs and benefits have been discounted to 2002 values by applying HM Treasury's the Green Book social discount rate.

4.2.1 Appraisal Parameters

A summary of the key assumptions and appraisal parameters are given in Table 4.1 below. Full details of the assumptions used in the economic appraisal are provided in the Demand Forecasting and Economic Appraisal technical note provided as a separate appendix to this OBC.

Table 4.1 - Overall Appraisal Parameters

Parameter	Approach	Source Data / Guidance
Appraisal Period	60 years from 2019/20 to 2078/79	WebTAG 3.5
Price base	2002 Market Prices	WebTAG 3.5
Discounting	Discounted to 2002 based on the social discount rate of 3.5% first 30 years and 3.0% thereafter.	HMT The Green Book / WebTAG 3.5

Detailed results of the appraisal are set out in the standard WebTAG appraisal tables: Transport Economic Efficiency (TEE) and Public Accounts (PA).

A summary of the overall quantitative and qualitative appraisal of each option is provided in the Appraisal Summary Tables (AST) provided as a separate appendix to this OBC.

[14] Web-based Transport Analysis Guidance, in particular Unit 3.13 Guidance on Rail Appraisal.
[15] Welsh Transport Planning and Appraisal Guidance (June 2008)

4.3 Options

As part of the business case process an options selection process has been undertaken, employing the Early Assessment and Sifting Tool (EAST). This process has identified two electrification options for detailed analysis: the first employing new electric multiple units (EMUs) rolling stock and the second employing cascaded electric multiple units (EMUs) rolling stock. A third, diesel based option has also been taken forward as a means of comparison. Each of these options is compared against a ***do minimum*** scenario. An Options Assessment Report[16] has been prepared and is included as a separate appendix to this OBC.

The do minimum case assumes a rail network based on post CASR conditions. Under this option, there is a continuation of the current timetable across Valley Lines routes, plus inclusion of schemes committed under the National Transport Plan (NTP), namely peak time turnback services between Cardiff Central and Pontypridd and Caerphilly and increased frequency on the Vale of Glamorgan and Maesteg lines to two trains per hour. The do minimum case assumes continued use of the existing fleet of vehicles until the end of their useful life.

As noted, each of the following options has been tested against the whole Valley Lines network including the Maesteg, Ebbw Vale and Vale of Glamorgan lines and, as a sensitivity test, against the routes outlined in the Secretary of State for Transport's 1 March 2011 announcement.

- ***Option 1: Electrification and New EMUs*** – Deployment of new electric units across the network. Service patterns are consistent with those under the 'do minimum' case, other than where improved performance of the rolling stock permits a timetable enhancement without increasing overall fleet size.

  For this option, the Business Case is largely predicated on the cost savings as a result of the use of new electric vehicles as opposed to existing and then new diesel vehicles.

- ***Option 2: Electrification and Cascaded EMUs*** – Deployment of cascaded electric units across the network. Service patterns are consistent with those under the 'do minimum' case, other than where improved performance of the rolling stock permits a timetable enhancement without increasing overall fleet size.

  Under this option, VLE will be resourced by 'spare/displaced' EMUs, which otherwise would be off-lease. Therefore, the Business Case for this option is initially driven by the operational cost differences between 'new' diesel in the do-minimum and 'existing' electric vehicles. This will, of course, be dependent upon the availability of existing EMUs. Given the timing of VLE and other rail improvement projects, advice has been sought from industry experts on this matter. This has indicated that there is a good possibility that suitable cascaded EMUs would be available for VLE; and this is the premise upon which this option is based.

[16] Valley Lines Electrification: Options Assessment Report (September 2011)

- ***Option 3: New Diesel Rolling Stock*** – Deployment of modern diesel multiple units (DMUs) rolling stock on the existing network with journey times commensurate with vehicle operating capability and, subject to Network Rail rules, to be as similar as practicable to timetables for Options 1 and 2.

4.4 Operating Assumptions

4.4.1 Rolling Stock

Each option has been assessed based on 'proxy' rolling stock types for future diesel or electric operation of the Valley Lines. Performance parameters for the different rolling stock types have been informed through dialogue with rolling stock leasing companies, manufacturers and industry experts.

The specification and cost of individual rolling stock types have been applied in the assessment of operating costs. In the early stages of the project (ie from 2019 onwards), it is possible to develop rolling stock scenarios which reflect likely future availability. Further into the future, availability and cost of rolling stock is much less certain. Consequently, the appraisal makes reasonable assumptions based on the industry's long term view about rolling stock availability and costs.

By the end of the existing franchise period, the existing fleet will be in excess of 30 years old and nearing the end of its useful life. During the next franchise, the cost of renewing units and replacing parts for the existing fleet will become uneconomic and the units will need to be replaced. Under the do minimum scenario, therefore, it is assumed that the existing rolling stock will be refurbished and life extended to enable operation of the fleet until around 2027.

In the longer term, it is likely that the availability of suitable diesel rolling stock will be highly constrained, given that manufacturers are increasingly focussed on production of electric units.

From 2018 onwards, cascaded electric rolling stock is likely to become available as a result of projects such as Crossrail and Thameslink. This is the assumption that underpins the cascaded EMUs option. However, in the longer term, in order to reflect uncertainty, the costs of a new electric fleet have been assumed under this option.

Table 4.2 - Proxy Rolling Stock Types

<table>
<tr><th>Time periods</th><th>Do Minimum</th><th>Option 1 – Electrification (New EMUs)</th><th>Option 2 – Electrification (Cascaded EMUs)</th><th>Option 3 – New Diesel</th></tr>
<tr><td>2019/20 – 2026/27</td><td>Refurbished Existing Fleet (Class 14X, Class 15X)</td><td rowspan="4">New Electric Units – (Class 378 or equivalent)</td><td rowspan="2">Cascaded Electric Units - (Class 315 or equivalent)</td><td rowspan="4">New Diesel Units – (Class 172 or equivalent)</td></tr>
<tr><td>2027/28 – 2032/33</td><td rowspan="3">New Diesel Replacement</td></tr>
<tr><td>2033/34 – 2044/45</td><td>Further Cascaded Electric Units</td></tr>
<tr><td>2045/46 – 2078/79</td><td>New Electric Replacement</td></tr>
</table>

4.4.2 Timetables

Under electrification scenarios, it is assumed that all of Valley Lines are electrified:

- Lines through Pontypridd to Treherbert, Aberdare and Merthyr Tydfil;
- the Line through Caerphilly to Rhymney;
- the Maesteg line (including Cardiff to Bridgend on the Mainline);
- the Ebbw Vale line;
- lines to Penarth, Barry and the Vale of Glamorgan Line;
- the City Line, and;
- the Cardiff Bay shuttle[17].

An appraisal has also been undertaken including only those lines referred to in the Secretary of State for Transport's announcement on 1 March 2011[18]. This excludes the Maesteg and Ebbw Valley Lines and the Vale of Glamorgan line beyond Barry. In practice, services to the Vale of Glamorgan are integral to the overall timetable. In the event that the Valley Lines were electrified but the Vale of Glamorgan line was excluded, the efficiency of the timetable would be compromised. This is explored further below.

The current franchise arrangements end in 2018, approximately coinciding with the proposed programme for electrification. In any event, the service pattern will be recast under a new franchise arrangement. Diesel and electric timetables have been designed based on a post-CASR service pattern including the turnback services and frequency enhancements set out above.

The Valley Lines are well suited to electrification for a number of reasons. Firstly, the service pattern and the proposed service pattern following the completion of CASR result in frequent services. Therefore, reducing costs of fuel and track wear can have major benefits. Secondly, the network is characterised by frequent stops and steep gradients. Therefore, the faster acceleration and deceleration of a lighter electric unit has significant advantages over diesel units.

Running times on the Valley Lines have been calculated for a typical electric unit and a performance-based potential electrification timetable has been designed. The result of the switching to electric trains is a faster service for passengers but also an efficiency saving for the franchise given that the equivalent service pattern can be maintained with fewer train units or 'diagrams'.

4.4.3 Fleet Size

The current fleet comprises of two and four car Pacers and Sprinter DMUs. For electric options, vehicles are available in three or four car formations. An analysis has thus been undertaken on this basis to ensure that the proposed fleet for each option caters adequately for future demand. Currently, crowding on Valley Lines

[17] The costs of electrifying the Cardiff Bay line have been included although the appraisal assumes that shuttle services between Cardiff Queen Street and Cardiff Bay continue to operate as a diesel service under normal conditions.
[18] Intercity Express and Rail Electrification, The Rt Hon Philip Hammond MP, Department for Transport, Oral Statement, 1 March 2011

services is mainly limited to two car units although some crowding is experienced on four car trains. Since future growth is expected to result in greater crowding, the Welsh Government has set out plans, following the implementation of CASR, to increase service frequency on the most crowded lines, as well as to extend platforms to allow six car trains on some lines. These interventions will occur regardless of which option is taken forward.

Changes in rolling stock are not assumed to take place until 2019. Given the timescales involved and uncertainty over future patronage, only an indicative analysis of future fleet size requirements is possible at this stage. However, it is considered that a fleet of mainly three car electric vehicles could comfortably cater for future demand under the service pattern outlined in the National Transport Plan. The fleet proposed under the electrification scenario retains the flexibility to attached 'spare' units on event days to provide six car trains to maximise short term capacity to cater for major events in Cardiff City centre or in times of perturbation.

Although electrification would enable the Valley Lines to be operated with fewer units overall – either because of diagram savings or a reduced need for spares - the net result of switching to a three car fleet would be an increase This is illustrated in the analysis of demand, capacity and crowding given below.

Table 4.3 – Assumed Fleet Size for the Valley Lines (Post-CASR Timetable)

	Do Minimum	New Diesel	Electrification Options
All Lines Excluding Maesteg, Ebbw Vale and Cardiff Bay Services			
2 car units	28	28	-
3 car units	-	-	39
4 car units	13	13	-
Spares	8 (2-car)	7 (2-car)	3 (3-car)
Total Vehicles	**124**	**122**	**126**
Ebbw Vale – Maesteg[19]			
2 car units	4	4	-
3 car units	-	-	6
4 car units	2	2	-
Spares	1 (2-car)	1 (2-car)	0
Total Vehicles	**18**	**18**	**18**

[19] Currently, services to Maesteg are primarily operated as through trains to and from Cheltenham, but also Holyhead and Chester. In the event of the proposed electrification timetable being implemented an initial assessment suggests that the proposed electrification timetable would reduce the requirement for units for the franchise by up to two units.

4.4.4 Summary of Operating Assumptions

Key assumptions with respect to operational planning are provided in the Table below:

Table 4.4 - Appraisal Parameters - Operations

Parameter	Approach	Source Data / Guidance
Service pattern	Post CASR timetable – existing service pattern with addition of turnback services to Caerphilly/Pontypridd and frequency enhancements on the Maesteg and Vale of Glamorgan lines.	Welsh Government National Transport Plan / Network Rail Wales RUS
Timetables	Do minimum – as per existing allowances	Project team analysis employing RailSys software. Timetables tested in CMS software.
	Electrification (New EMUs) – electrification based on proxy rolling stock type	
	Electrification (Cascaded EMUs) – electrification based on proxy rolling stock type	
	New Diesel – assumed as electrification timetable pending resolution of potential gauging issues	

4.5 Project Costs

4.5.1 Capital Costs

The capital costs of electrification have been estimated by Network Rail as part of the GRIP 2 study into electrification[20]. An allowance for risk of 20% has been included as an addition to the basic cost estimate. Optimism bias of 50% has been applied to project costs (including risk) in line with WebTAG 3.5.9 and 3.13.1 guidance for schemes at Level2/GRIP 2.

The total costs of the project for the Valley Lines as a whole, including allowance for risk, is £309 million in 2012 prices. The addition of optimism bias increases the cost used for the appraisal to £463 million.

The appraisal has been undertaken assuming that costs are financed through the Regulatory Asset Base which allows Network Rail to borrow the necessary funds and for the Government to make regular payments to Network Rail to allow servicing of the debt. This is further explained in the financial case (Section 5). Inclusion of financing costs increases the *present value,* or discounted costs of the scheme by approximately 10%.

The costs are given in Table 4.5.

[20] The initial results of the GRIP 2 study currently being undertaken by Network Rail as set out in the letter from Mike Gallop (Principle Programme Sponsor West and Wales) to Jeff Collins (Director of Transport, Welsh Government) on the 16 December 2011 (without platform extensions). GRIP 2 cost estimates have subsequently been updated and passed to Welsh Government by Network Rail in April 2012.

Table 4.5 - Electrification Capital Infrastructure Costs Including Depot Conversion - GRIP 2 (£M, 2012Q1 Prices)

Item	All Valley Lines (Excluding Airport Link)	Valley Lines as Per Secretary of State's (Including Cardiff Bay)
Direct Costs		
Civil Engineering	[redacted]	[redacted]
OLE	[redacted]	[redacted]
Power Distribution	[redacted]	[redacted]
Power Feeder Supply	[redacted]	[redacted]
Signalling	[redacted]	[redacted]
Direct Cost Sub Total	**177.9**	**111.2**
Indirect Costs		
Contractors Indirect Costs	35.3	21.3
Construction Costs Sub Total	**213.2**	**132.5**
Professional Services		
Design and Survey Costs	[redacted]	[redacted]
Network Rail Services	[redacted]	[redacted]
Schedule 4 Costs	[redacted]	[redacted]
GRIP 2 Spot Cost Estimate	[redacted]	[redacted]
GRIP 2 Estimate Including 20% Risk Allowance	**308.8**	**190.3**
Optimism Bias (50%)	**154.4**	**95.1**
Adjusted Project Cost	**463.2**	**285.4**
Present Value Costs (2002 Prices, Discounted to 2002 Values) Including RAB Finance Costs	**306.0**	**188.5**

4.5.2 Operating Costs

Operating costs for the Valley Lines have been modelled for each of the options. Over the appraisal period, operating costs are significantly lower for electrification scenarios than for diesel options. Key aspects of the operating cost assessment are as follows:

- **Rolling stock lease/purchase costs** – Electric trains are less expensive to lease than diesel trains. Rolling stock costs used in the operating cost assessment are based on rates provided by rolling stock lease companies;
- **Maintenance costs** – electric vehicles are less expensive to maintain. The maintenance reserve costs for electric rolling stock is assumed to be 20% lower than for diesel rolling stock at £0.20 per vehicle mile compared with £0.25 per vehicle mile;
- **Fleet availability** – electric trains are more reliable and therefore have higher fleet availability. The fleet availability ratio for diesel units is around 86%

compared to around 91% for electric trains. Therefore, fewer electric units are required to be held as spares.

- **Variable track access charges** – track usage charges have been provided by Network Rail. The existing units are relatively light for diesel vehicles. In the short term, track wear charges under electrification will be similar to the existing rolling stock. In the longer term, it could be expected that the track usage charge may be up to 50% lower, per vehicle km, with electrification since heavier diesel units would otherwise be required.
- **Infrastructure maintenance** – an additional allowance has been made for the Network Rail charges for the maintenance of the electric infrastructure. These costs have been provided by Network Rail.
- **Energy costs** – based on the fuel consumption rates of the existing rolling stock (provided by Arriva Trains Wales) and electricity consumption rates provided by Network Rail.
- **Regenerative breaking** – traction energy costs are around 20 pence per vehicle mile less expensive for electric rolling stock where applicable.
- **Staff costs** – train staff requirements are linked with the number of train diagrams required to operate the Valley Lines as a proxy for the efficiency savings resulting from electric rolling stock. Further efficiencies could be made if Driver Only Operation (DOO), enabled by improvements in rolling stock, is considered. Rates are based on current Arriva Trains Wales staff costs.

Results

Details of the analysis of operating costs are contained under separate cover in Technical Appendix 4 to this OBC. The results of the operating cost assessment are displayed in Figures 4.1 and 4.2. Further details of the operating cost models that have been developed to undertake this analysis are contained in a technical note[21] which is included as a separate appendix to this OBC.

Electrification of the Valley Lines network leads to very significant operating cost savings. Over a 60 year appraisal period, this amounts to a saving of £222m PVC in 2002 prices and values for the cascaded EMU option compared with the do minimum. Cost reductions are driven primarily by lower rolling stock lease costs (for cascaded rolling stock and lower maintenance costs and lower fuel costs). Operating cost savings would also be expected if new EMUs are employed, although lease costs would be higher and therefore the overall saving is significantly reduced (a saving of £90m PVC). Switching to a new diesel fleet at the outset of the next franchise period would result in higher rolling stock costs and therefore an overall increase in operating costs of £84m PVC.

[21] Valley Lines Electrification: Technical Note on Operational Cost Model, Arup (December 2011)

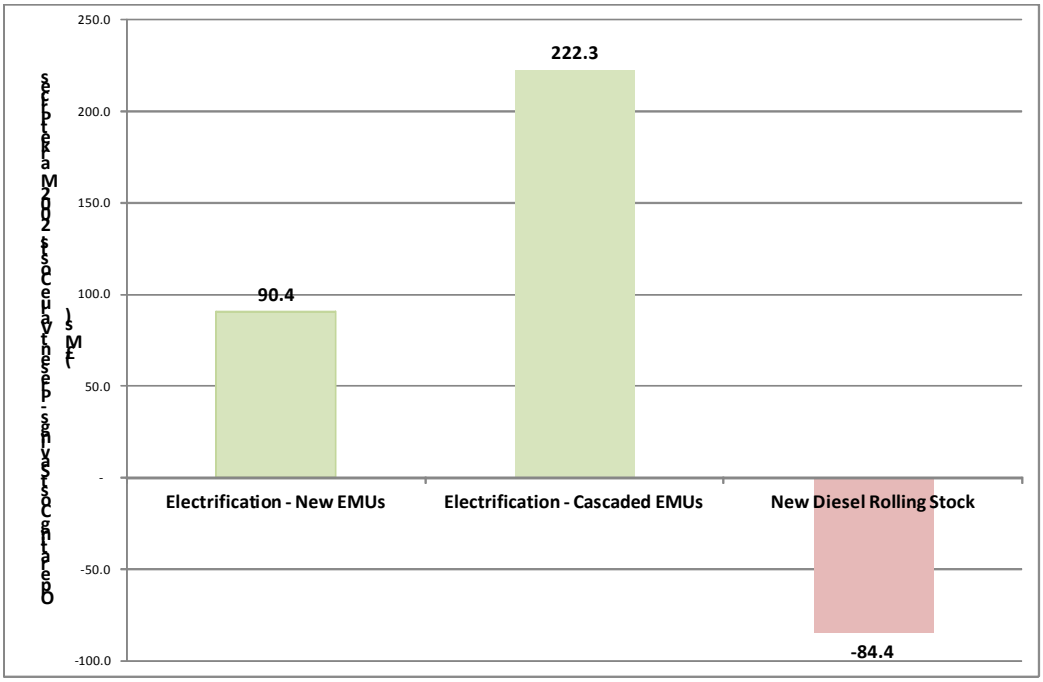


Figure 4.1- Operating Cost Savings (including Rolling Stock costs) by Option Against Do Minimum: All Valley Lines (PV £Ms 2002 Prices and Values)

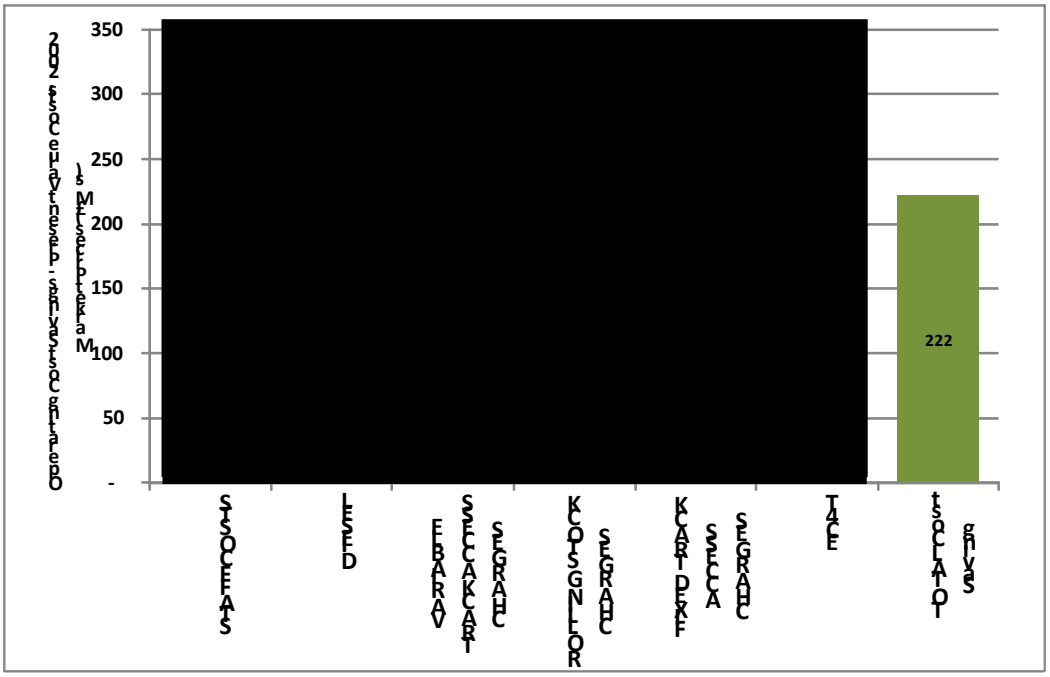


Figure 4.2 Operating Cost Savings (including Rolling Stock costs) – Electrification (Cascaded EMUs) vs Do Minimum: All Valley Lines (PV £Ms 2002 Prices and Values)

4.5.3 Project Costs Summary

Further details of operating cost inputs into the appraisal are included in Section 5 and a summary is given in the Table below:

Table 4.6 – Appraisal Parameters - Costs

Parameter	Approach	Source Data / Guidance
Capital Costs		
Construction period	2016 - 2019	Working assumption
Capital cost estimate	Network Rail GRIP 2 study initial estimate & depot upgrade cost estimate.	Network Rail
Risk	Risk to Pmean (20%)	Network Rail / WebTAG
Optimism Bias	50% uplift to total capital costs	WebTAG 3.13 / WebTAG 3.5.9
Finance costs (where shown)	Regulatory Asset Base (4.75% rate of return)	Department for Transport Advice
Operating Costs (including Rolling Stock Costs)		
Rolling stock costs	Standard leasing arrangements assumed. Includes allowance for refurbishment or upgrades for retractioning where applicable.	Lease and maintenance costs based on quoted rates provided by ROSCOs.
Energy costs	Diesel consumption and costs based on current price paid by Arriva for Class 14X and 150 units. EC4T charges based on observed consumption rates for rolling stock elsewhere in the UK. Regenerative breaking allowance included where applicable.	Arriva Trains Wales Network Rail
Future energy costs	DECC Central Growth Scenario for DERV and electricity – retail: industrial.	Department for Energy and Climate Change
Track access charges	Variable track access charge as per Control Period 4 price list for proxy rolling stock types. Fixed track access charge for electric infrastructure provided by Network Rail.	Network Rail
Staff costs	Existing staff rates assumed.	Arriva Trains Wales
Optimism bias	Optimism bias of 1.6% per annum has been applied to the difference in operating costs of each option against the do minimum.	WebTAG 3.13

4.6 Benefits for Passengers

4.6.1 Growth Assumptions

Baseline growth forecasts for passenger demand are summarised in Figure 4.3 and fully documented in a technical note[22] which is included as a separate appendix to this OBC. The baseline forecast reflects the growth of demand, not limited by train capacity, based on a range of exogenous growth drivers including change in employment, population, Gross Domestic Product (GDP) and the cost of travel by car.

Under the central case, the appraisal is based on a demand forecast which applies, directly, the factors and parameters set out in the Passenger Demand Forecasting Handbook (PDFH). However, as noted, demand on the Valley Lines has grown rapidly in recent years driven by structural changes in the economy of South East Wales and encouraged by congestion on the road network. As a result, standard PDFH parameters provide a poor fit with current trends. Therefore, an alternative demand forecast has been produced which better reflects expectations for continued growth on the Valley Lines.

Under the 'continued growth' scenario, growth rates are broadly consistent with recent trends with an annual average growth rate of 4.1% to 2021. Over the same period, the growth rate under the 'constrained growth' scenario is 2.8% per annum. Under both the continued and constrained growth forecasts, demand growth has been capped at 2032. The demand growth is shown in Figure 4.3, with historical growth and Wales RUS assumptions for comparison.

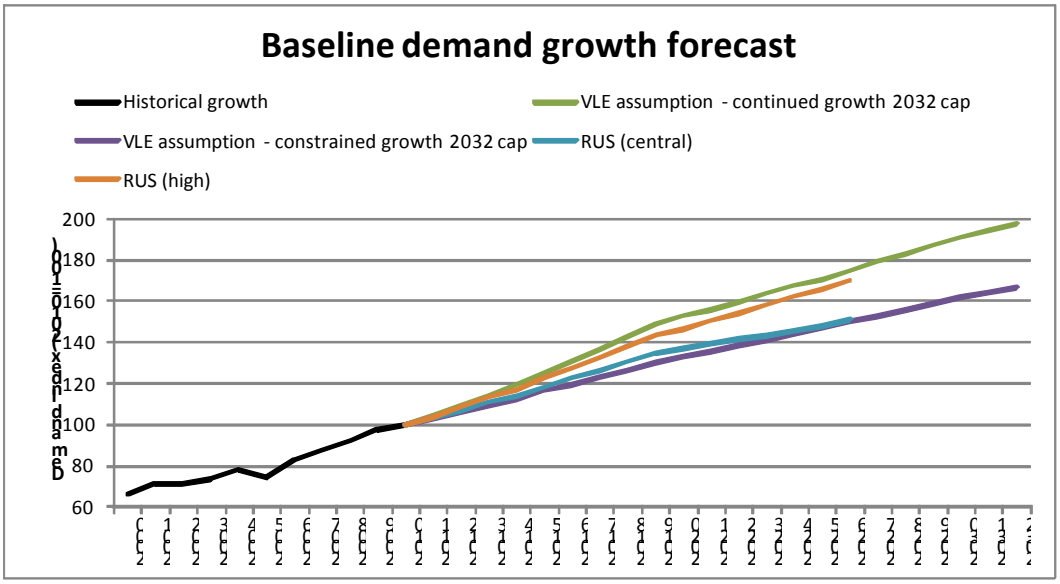


Figure 4.3 – Valley Lines Future Baseline Passenger Growth Forecasts

[22] Valley Lines Electrification: Demand Forecasting and Economic Appraisal Approach (November 2011)

Over the whole period from 2011 to 2031 the average growth rates per annum for the scenarios are as follows:

- Continued growth: 3.1%
- Constrained growth: 1.9%

It is considered that the 'continued growth' scenario provides the best estimate of future demand based on recent trends and current available evidence. However, in order to ensure compliance with DfT guidance and to retain comparability with other projects being considered for funding, the main economic appraisal has been undertaken on the basis of the 'constrained' growth scenario.

The results of the 'continued growth' scenario have been included as a sensitivity test. Furthermore, a sensitivity test has been included in which demand growth, under 'constrained growth' assumptions, is capped at 2026.

4.6.2 Journey Time Savings

Improved train performance reduces travel time for passengers because of faster trains and reduction in train pathing time that this enables. An improved timetable employing electric rolling stock leads to journey time savings under an electric timetable of up to 20% compared to the existing timetable due to a combination of faster trains and reduced pathing time. More generally, time savings of, on average, around 5% are expected due to electrification. More details relating to the proposed electrification timetable can be found in a separate technical note, which is included as a separate appendix to this OBC[23].

Modern diesel rolling stock typically performs better than older units and, for the purposes of the OBC, it is assumed that the New Diesel option offers the same journey time savings as the Electrification option. In practice, however, in the case of the Valley Lines, it is anticipated that the operation of new 23 metre vehicles (compared with existing 20 metre vehicles) would result in significant gauging issues. Therefore, in order to realise such time savings, significant realignment and other infrastructure works would be required. Further feasibility work is required to establish that trains comprising 23 metre long vehicles can be physically accommodated on the Valley Lines network. There are likely to be significant costs associated with provision of adequate space and platforms. However, these costs are currently unknown.

[23] Valley Lines Electrification: Technical Note on Timetables and Diagramming, Arup (October 2011)

Table 4.7 Travel Time to Cardiff Central

Origin Station	Diesel Timetable Journey Time	Electrification Timetable Journey Time	Journey Time Saving due to Electrification	% Difference
Bridgend	00:57:00	00:55:00	**00:02:00**	**4%**
Barry Island	00:30:00	00:30:00	**00:00:00**	**0%**
Penarth	00:11:00	00:11:00	**00:00:00**	**0%**
Aberdare	01:05:30	00:52:30	**00:13:00**	**20%**
Merthyr Tydfil	01:04:30	00:53:30	**00:11:00**	**17%**
Treherbert	01:03:30	00:58:30	**00:05:00**	**8%**
Pontypridd	00:28:30	00:26:30	**00:02:00**	**7%**
Rhymney	01:00:30	00:55:30	**00:05:00**	**8%**
Bargoed	00:41:00	00:37:30	**00:03:30**	**9%**
Caerphilly	00:18:00	00:17:00	**00:01:00**	**6%**
Radyr	00:16:30	00:16:30	**00:00:00**	**0%**
Coryton	00:18:30	00:18:30	**00:00:00**	**0%**
Maesteg	00:53:00	00:47:00	**00:06:00**	**11%**
Ebbw Vale	00:57:00	00:54:00	**00:03:00**	**5%**

4.6.3 Passenger Experience and Crowding

Journey Ambience

This effect is likely to embody a range of factors which make the perception of electric trains more attractive to passengers. These include reduced noise and vibration as well as environmental considerations. Such factors have a real impact, which is difficult to quantify. Nevertheless, for the purposes of the economic appraisal, factors have been applied to reflect journey ambiance under each scenario. These rolling stock quality factors have been based on the Passenger Demand Forecasting Handbook guidance.

In the do minimum, it is assumed that trains are refurbished to a high standard such that the quality of the train environment improves. Slightly higher benefits are assumed where new rolling stock is employed. Electric trains also offer reduced noise and vibration and therefore a further improvement in journey ambiance is assumed for electrification relative to diesel operations.

The impact of improvements in the train environment are assumed to deliver benefits to passengers and deliver higher demand only during the initial years of the appraisal during which time, in the absence of intervention, the existing Pacer and Sprinter units would operate on the network. The benefits of improved ride quality due to electrification are assumed to deliver benefits throughout the appraisal period.

Crowding

In general, electric vehicles provide improved capacity compared with diesel vehicles. This is particularly the case in comparison to the existing fleet of Pacers on the Valley Lines. The existing fleet consists of a mix of 2- and 4-car trains

although the majority of services are operated using 2-car trains. At present crowding occurs on Valley Lines services during peak periods, mainly on 2-car trains. Following electrification, the fleet will consist primarily of 3-car units. Approximate capacities of each unit type are shown in the Table below. This assumes that all units are refurbished or specified to a similar standard with the inclusion of a disabled toilet on each unit. Standing capacity is based on two passengers per square metre.

Table 4.8 Rolling Stock Types and Capacity

	Class 14X DMU (2 Car)	Class 15X DMU (2 Car)	New Diesel Rolling Stock (2 Car)	EMU (3 car, 2+3 seating formation)	EMU (3 car, 2+2 seating formation)
Seating Capacity	92	104	121	210	164
Standing Space	18	30	41	46	63
Total Capacity	128	181	222	302	288

Overall, following electrification, there will be a significant increase in the provision of capacity in terms of seated and standing space. The net effect, therefore, is a significant reduction in crowding and a benefit to passengers.

Table 4.9 Train Capacity, Demand and Load Factors during Peak Periods

	Do Minimum (assuming 23 metre diesel units are employed by 2027)				Electrification			
	Total Train Capacity		Seated Capacity		Total Train Capacity		Seated Capacity	
	2019	2027	2019	2027	2019	2027	2019	2027
Total Peak Demand (daily)	10,330	12,400	10,330	12,400	11,030	13,250	11,030	13,250
Total Peak Capacity	19,560	28,420	12,500	15,490	30,500	30,500	21,210	21,210
Average Load Factor (demand versus capacity)	55%	47%	87%	86%	36%	44%	52%	63%
Busiest Hour Load Factor	78%	68%	125%	124%	52%	62%	75%	90%

Note: excludes demand uplifts due to rolling stock quality improvements

4.6.4 Electrification Effects on Passenger Demand

Journey time reductions and improved journey ambience are forecast to lead to an increase in demand across the Valley Lines of around 4% per annum compared with the do minimum forecast. This means that rail revenue (accruing to the Wales and Borders and other franchises) would be expected to increase by around [redacted] per year as a result of electrification in opening year.

4.7 Environmental Benefits

Energy consumption levels have been calculated based on the known performance of diesel trains and typical electricity consumption experienced in other parts of the UK. Emissions can be further reduced by the use of regenerative breaking and this has been assumed where applicable to proxy rolling stock types[24]. Emissions have been based on rates of carbon intensity of electricity provided by the Department of Energy and Climate Change (DECC). In the first year of operation, electrification is estimated to deliver a reduction in carbon emissions of 21%, equivalent to 5,400 tonnes of CO_2. Government forecasts that the carbon intensity of electricity generation will fall dramatically, such that emissions by electric trains of the Valley Lines will be 95% less, per vehicle mile, than emissions from diesel operations by 2050.

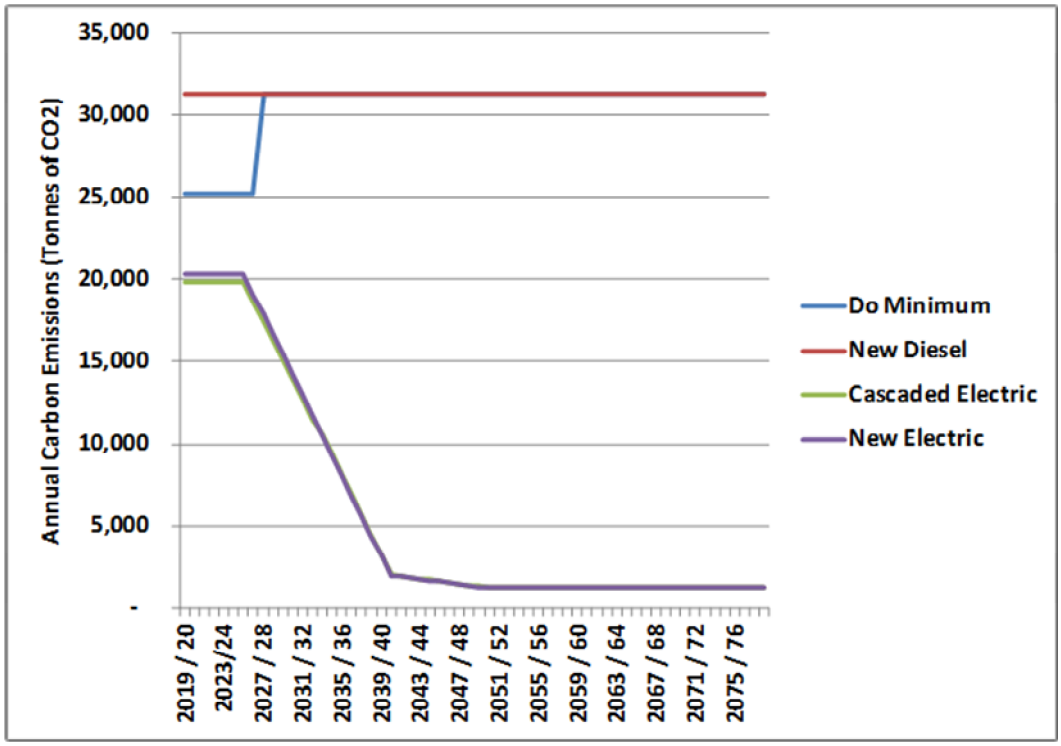


Figure 4.4 - Carbon Emissions

There are other significant environmental benefits of electrification which are less easily quantified. Firstly, electric rolling stock is much quieter than diesel and this will be a benefit for both passengers and residents living close to a railway line. Given the population density around the railway network in South Wales, this is likely to be a significant benefit. Secondly, electric trains eliminate local emissions, leading to an improvement in air quality. In this context, there are currently 10 Air Quality Management Areas (AQMAs) adjacent to the Valley Lines network (i.e. within 200 metres[25]). An Air Quality Management Area is created where air pollution levels are high enough to be a potential health risk. It is recognised that much air pollution comes from transport emissions.

[24] Electrification infrastructure assumed as part of the Network Rail GRIP 2 study allows for regenerative breaking and the costs of fitting rolling stock with regenerative breaking have been included in the operating costs.
[25] See WelTAG 7.5.7 & WebTAG 3.3.3

4.7.1 Summary of Benefits Calculation

A summary of the approach taken to quantifying benefits is given in Table 4.10.

Table 4.10 - Appraisal Parameters - Benefits

Parameter	Approach	Source Data / Guidance
User Benefits		
Demand forecast	Growth scenario – 2.8% per annum, growth capped at 2032	Passenger Demand Forecasting Handbook Welsh Government Population and Employment projections MVA/ATOC: Regional Rail Demand Study
	Growth scenario – 1.6% per annum, growth capped at 2026	Passenger Demand Forecasting Handbook TEMPRO
Time savings (existing passengers)	Application of MOIRA software employing WebTAG Values of Time	WebTAG 3.5.6
Time savings (new passengers)	As above employing the 'rule of half'	WebTAG 3.5.6
Crowding benefits	Load factors based on MOIRA demand forecast adjusted to reflect recent count data. Adjustments to generalised journey times based on PDFH values.	Arriva Trains Wales Passenger Demand Forecasting Handbook
Journey Ambiance	Journey time adjustment factors based on empirical data for: • Refurbishment • New Rolling Stock • Electric Rolling Stock (noise / ride quality)	Passenger Demand Forecasting Handbook
Non-User Benefits		
Mode shift	National Diversion Factor for Rail Demand (-0.26%)	WebTAG 3.13
Reduced car use	Pence per kilometre values due to reduction in car use for decongestion, accidents and carbon emissions.	WebTAG 3.13
Rail Sector Carbon emissions	Emissions per litre of diesel fuel based on ATOC estimate. Emissions per KWH of electricity based on DECC carbon intensity factors.	ATOC Department for Energy and Climate Change (DECC) DECC Spreadsheet Tool
Indirect taxation	VAT and excise duty on rebated oils.	HM Revenue and Customs

4.8 Value for Money Assessment

Table 4.11 summarises the results of the economic appraisal of each of the options for all Valley Lines for the constrained growth scenario. Option 2 – electrification with cascaded EMUs – provides the best value for money of the three options. In addition to the benefits shown in Table 4.11, there will be wider economic benefits which are described and quantified separately in 4.10. Operating cost savings and higher revenue are such that, over the whole 60 year appraisal period, including finance costs, the net costs to Government of Valley Lines Electrification falls to £57.5m in present value costs (PVC). Factoring in the benefits to passengers of faster journeys, improved journey ambiance and reduced crowding, as well as environmental benefits, the **Net Present Value** of this option is **£165.2**. The **benefit cost ratio (BCR)** of this option is **3.9 to 1.**

Under a new electric vehicle option, operating cost savings are slightly lower than the capital costs of investment. However, passenger benefits are such that this option still achieves a benefit cost ratio of 1.2 to 1.

Employing new diesel rolling stock would significantly increase operating costs. Whilst journey time savings of the same magnitude as the electrification case have been assumed for the new diesel options, it should be noted that it is likely that significant investment would be required in order that gauging issues associated with 23 metre vehicles can be overcome. As these costs are as yet unknown, further feasibility work will result in capital cost estimates which will reduce the BCR for this option.

Table 4.11 - Economic Appraisal Summary: Constrained Growth Scenario, All Valley Lines (2002 Values and Market Prices, £Ms)

	Option 1 Electrification: New EMUs	Option 2 Electrification: Cascaded EMUs	Option 3 New Diesel Rolling Stock
a. User Time Savings	117.3	117.3	117.3
b. Crowding Benefits	25.2	26.7	17.0
c. Rolling Stock Quality Factors	21.7	17.3	8.3
d. Benefits of Reduced Car Use	7.3	7.1	6.7
e. Rail Sector Carbon Emissions and Air Quality Benefits**	73.5	73.5	- 1.9
f. Indirect Tax	- 19.3	- 19.3	1.1
g. Present Value Benefits (a+b+c+d+e+f)	**225.7**	**222.7**	**148.4**
h. Revenue	27.1	26.1	24.8
i. Operating Costs	- 90.4	- 222.3	84.4
j. Capital Costs	306.0	306.0	-*
k. Present Value Costs (j+i-h)	**188.4**	**57.5**	**59.6***
Net Present Value (g-k)	**37.2**	**165.2**	**88.8***
Benefit Cost Ratio (g/k)	**1.2**	**3.9**	**2.5***

** Costs have been assumed to be zero for this option for the purposes of the OBC although infrastructure improvements would be required to cater for 23m vehicles as noted above. These would result in an increased PVC and lower NPV and BCR than stated*

*** Based on DECC 14 October 2011 publication using the 'Toolkit for guidance on valuation of energy use"*

4.8.1 The Preferred Option

The economic appraisal supports the preferred option, which is the electrification of all Valley Lines under Option 2 – electrification employing cascaded rolling stock. This option provides ongoing cost savings and improvements in revenue which are nearly equivalent to the capital costs of the project. New electric rolling stock, whilst reducing costs when compared with diesel options, fails to deliver the same level of value for money. However, if purchase rather than lease options are explored, it is possible that, for new electric rolling stock, operating cost savings could be expected to improve greatly.

4.9 Sensitivity Analysis

A range of sensitivity tests have been undertaken on the preferred option to test whether electrification offers value for money under alternative scenarios. The sensitivity tests are as follows:

- ***Demand Growth*** – in order to assess the sensitivity of the business case to lower passenger demand growth a version of the appraisal has been undertaken employing the higher growth 'continued growth' scenario, as well as a 'constrained growth' case with demand growth capped at 2026 (in line with current WebTAG requirements);
- ***Network Coverage*** – Value for Money has been considered based on electrification of the more Valley Lines network as per the Secretary of State for Transport's announcement on 1 March 2011;
- ***Capacity Increases Post CASR*** – CASR will enable additional trains to operate and consideration is given to the situation with and without these additional trains, and;
- ***'In Draft' Rail Appraisal Guidance*** – The main economic appraisal has been undertaken in line with up to date DfT appraisal guidance (WebTAG). However, it is noted that 'in draft' updates to guidance are due to come into force later in 2012. In view of this, a version of the appraisal has also been undertaken on the basis of this 'in draft' guidance.

4.9.1 Demand Growth

It is acknowledged that there are both upside and downside risks to demand for an appraisal being undertaken over a long period of time. Table 4.12 below presents the results of a sensitivity test employing the 'Continued Growth' demand forecasts. Under this scenario, user benefits and revenue resulting from electrification are higher such that the BCR rises to 4.8.

If demand and revenue growth are capped at 2026 rather than at 2032, whilst user benefits are reduced, VLE continues to demonstrate strong value for money with a benefit cost ratio of 3.5 to 1.

Table 4.12 - Economic Appraisal Summary: Alternative Growth Scenarios, All Valley Lines (2002 Values and Market Prices, £Ms)

Preferred Option Electrification: Cascaded EMUs	Continued Growth	Constrained Growth – Demand and Revenue Capped at 2026
a. User Time Savings	135.1	107.4
b. Crowding Benefits	38.9	25.8
c. Rolling Stock Quality Factors	20.1	16.3
d. Benefits of Reduced Car Use	8.2	6.5
e. Rail Sector Carbon Emissions and Air Quality Benefits	73.5	73.5
f. Indirect Tax	- 19.3	- 19.3
g. Present Value Benefits (a+b+c+d+e+f)	**256.5**	**210.2**
h. Revenue	30.1	24.1
i. Operating Costs	- 222.3	- 222.3
j. Capital Costs	306.0	306.0
k. Present Value Costs (j+i-h)	**53.5**	**59.5**
Net Present Value (g-k)	**202.9**	**150.7**
Benefit Cost Ratio (g/k)	**4.8**	**3.5**

4.9.2 Network Coverage

A version of the economic appraisal has been undertaken on the basis of the electrification of a more limited Valley Lines network which excludes the Maesteg and Ebbw Valley Lines and the Vale of Glamorgan Line between Barry and Bridgend.

There are efficiency savings for operating the network with a single fleet type. Excluding the Vale of Glamorgan (VoG) line from the electrified network is likely to result in significant dis-benefits for the operational efficiency of the Valley Lines. Compared to a fully electrified network, operating services between Bridgend and Cardiff Central on the Vale of Glamorgan line with diesel trains is expected to require an additional three diagrams for the Valley Lines as a whole. Alternatively, the Vale of Glamorgan line might be served by a shuttle service between Bridgend and Barry, requiring passengers travelling to and from Cardiff to change trains. This would be an impractical and undesirable outcome for passengers on the Vale of Glamorgan line.

The results of this exercise are provided in Table 4.13. By comparing the results of the economic appraisals of 'all Valley Lines' and the more limited network, it is possible to infer the economic case for electrifying the Maesteg, Ebbw Valley and Vale of Glamorgan lines as an 'incremental' project.

The Net Present Value for the electrification of the entire Valley Lines network is higher than for the more narrowly defined network. If treated as an 'incremental'

scheme, electrification of the Maesteg, Ebbw Valley and Vale of Glamorgan lines show a positive NPV of £21.5 and a BCR of 1.5. Therefore, the economic case for VLE is strengthened by the inclusion of these lines.

It should be noted that this result is, in part, influenced by the assumption of higher frequencies on the Maesteg and Vale of Glamorgan lines in line with the National Transport Plan and CASR. The full implications of this service pattern for the economic case for electrifying the entire Valley Lines network would not have been apparent at the time of the Secretary of State's announcement in March 2011.

If the narrow definition of the network were to be considered, Valley Lines Electrification could be delivered at a lower cost to Government. As a result, the BCR for the more limited network is higher than for the electrification of all Valley Lines. However, it should be considered that whilst the BCR provides a measure of the *economic efficiency* of a project, the Net Present Value measures the *total net benefit* of the project.

Table 4.13 - Economic Appraisal Summary: All Valley Lines and Narrow Network Definition – Constrained Growth capped at 2032 (2002 Values and Market Prices, £Ms)

Preferred Option Electrification: Cascaded EMUs	All Valley Lines Electrification	Electrification Excluding Lines to Maesteg, Ebbw Vale and Vale of Glamorgan	Maesteg, Ebbw Valley and Vale of Glamorgan Lines as an 'Incremental' Scheme
a. User Time Savings	117.3	81.1	*36.2*
b. Crowding Benefits	26.7	17.7	*9.0*
c. Rolling Stock Quality Factors	17.3	13.5	*3.8*
d. Benefits of Reduced Car Use	7.1	4.9	*2.2*
e. Rail Sector Carbon Emissions and Air Quality Benefits	73.5	53.1	*20.4*
f. Indirect Tax	- 19.3	- 13.9	*-5.4*
g. Present Value Benefits (a+b+c+d+e+f)	**222.7**	**156.3**	***66.3***
h. Revenue	26.1	19.2	6.9
i. Operating Costs	- 222.3	- 156.7	- 65.6
j. Capital Costs	306.0	188.5	117.5
k. Present Value Costs (j+i-h)	**57.5**	**12.6**	***44.9***
Net Present Value (g-k)	**165.2**	**143.7**	***21.5***
Benefit Cost Ratio (g/k)	**3.9**	**12.4**	***1.5***

4.9.3 Capacity Increases Post CASR

As noted, the main economic appraisal given in this Outline Business Case is on the basis of the introduction of frequency enhancements on the Valley Lines in

line with the National Transport Plan. Table 4.14 summarises the results of a sensitivity test that is based on the current pre-CASR timetable of 12 trains per hour (tph) through Cardiff Queen Street station. The standard assumption for the business case is 15 tph.

The sensitivity test assuming that there are no changes to the current service pattern following the CASR project is provided in Table 4.14 below. The results of this sensitivity test are provided for both the 'Continued' and 'Constrained' demand growth scenarios. Under the Constrained growth scenario there is a reduction in the present value of benefits of £16.9m and an increase in the present value of costs to £39.8m. The benefit to cost ratio is reduced from 3.9 to 2.1. Under the constrained growth scenario, the benefit cost ratio remains above 2. The conclusion is that the project remains a robust proposition with the current timetable assumptions. The purpose of the CASR is specifically to allow a train frequency of 15 or 16 trains per hour, so it is unlikely that a 12 train per hour timetable will continue to operate beyond 2015.

Table 4.14 - Economic Appraisal Summary: Current Service Pattern, All Valley Lines (2002 Values and Market Prices, £Ms)

Preferred Option Electrification: Cascaded EMUs	Constrained Growth Scenario (Capped at 2032)	Continued Growth Scenario
a. User Time Savings	105.6	121.7
b. Crowding Benefits	31.0	42.3
c. Rolling Stock Quality Factors	16.5	19.2
d. Benefits of Reduced Car Use	6.1	7.0
e. Rail Sector Carbon Emissions and Air Quality Benefits	63.6	63.6
f. Indirect Tax	- 17.0	- 17.0
g. Present Value Benefits (a+b+c+d+e+f)	**205.8**	**236.8**
h. Revenue	22.7	26.1
i. Operating Costs	- 186.0	- 186.0
j. Capital Costs	306.0	306.0
k. Present Value Costs (j+i-h)	**97.4**	**93.9**
Net Present Value (g-k)	**108.5**	**142.9**
Benefit Cost Ratio (g/k)	**2.1**	**2.5**

The following sensitivity test shows the results of the economic appraisal for the electrification of the more narrowly defined network referred to in the Secretary of State's announcement under the assumption of a continuation of the existing service pattern. This test, under both the Continued and Constrained demand growth scenarios, continues to demonstrate the strong economic case for electrification.

Table 4.15 - Economic Appraisal Summary: Current Service Pattern, Narrow Network Definition (2002 Values and Market Prices, £Ms)

Preferred Option Electrification: Cascaded EMUs	Constrained Growth Scenario (Capped at 2032)	Continued Growth Scenario
a. User Time Savings	82.4	94.9
b. Crowding Benefits	22.8	32.1
c. Rolling Stock Quality Factors	13.2	15.3
d. Benefits of Reduced Car Use	4.9	5.6
e. Rail Sector Carbon Emissions and Air Quality Benefits	48.4	48.4
f. Indirect Tax	- 12.7	- 12.7
g. Present Value Benefits (a+b+c+d+e+f)	**159.0**	**183.7**
h. Revenue	19.0	21.9
i. Operating Costs	- 134.8	- 134.8
j. Capital Costs	188.5	188.5
k. Present Value Costs (j+i-h)	**34.7**	**31.8**
Net Present Value (g-k)	**124.3**	**151.8**
Benefit Cost Ratio (g/k)	**4.6**	**5.8**

4.9.4 'In Draft' Rail Appraisal Guidance

Table 4.16 shows the results of the economic appraisal if undertaken on the basis of 'in draft' appraisal guidance which is due to come into force later in 2012. The main differences in the approaches to the economic appraisal under the 'in draft' guidance are as follows:

- values are presented in 2010 prices and values rather than 2002;
- parameters used to forecast passenger demand are based on version 5 of the Passenger Demand Forecasting Handbook, and;
- updated values of time and corresponding growth rates.

The results provided in Table 4.16 are based on an equivalent 'constrained growth' forecast with a cap on demand growth at 2032.

The main difference between the appraisals undertaken using existing and 'in draft' WebTAG guidance relates to the change in the units used to express present value costs and benefits. In 2010 prices and values, the Net Present Value is £439m. The BCR using the 'in draft' guidance is 3.8 and is therefore similar to the result of main test outlined above (3.9). In conclusion, expected changes in appraisal guidance have a negligible impact on the economic appraisal of VLE.

Table 4.16 - Economic Appraisal Summary Applying 'In Draft' Guidance: All Valley Lines – Constrained Growth capped at 2032 (2010 Values and Market Prices, £Ms)

Preferred Option Electrification: Cascaded EMUs	Constrained Growth Scenario (Capped at 2032)
a. User Time Savings	190.4
b. Crowding Benefits	34.0
c. Rolling Stock Quality Factors	27.9
d. Benefits of Reduced Car Use	9.7
e. Rail Sector Carbon Emissions and Air Quality Benefits	116.5
f. Indirect Tax	- 30.6
g. Present Value Benefits (a+b+c+d+e+f)	**347.8**
h. Revenue	43.5
i. Operating Costs	- 353.3
j. Capital Costs	306.0
k. Present Value Costs (j+i-h)	**- 90.8**
Net Present Value (g-k)	**438.6**
Benefit Cost Ratio (g/k)	**3.8**

4.10 Wider Economic Benefits and Social Impacts

A range of other socio-economic benefits need to be considered alongside the quantitative value for money assessment. These are summarised below. Wider economic benefits (or WEBs) are the indirect, or second order, benefits to the local economy arising from reduced travel times and consequent improvements in accessibility. A framework for calculations of WEBs has been established by DfT, as set out in guidance note TAG unit 3.5.14 'The Wider Impacts Sub-Objective'. This guidance has been followed in the consideration WEBs that might arise due to VLE.

The three main aspects of WEBs are:

- **Agglomeration** – the concentration of economic activity. Additional benefits are expected as an indirect result of journey time savings resulting from electrification. Faster train services will widen labour markets resulting in higher productivity. Investment in rail allows businesses to better link with each other and with their employees. Higher levels of agglomeration are empirically linked with higher levels of productivity and GDP.
- **Output change in imperfectly competitive markets** – lower production costs (following from reduced travel costs) can result in an increase in output. The welfare gain will be higher than the initial value of the user benefits shown in Table 4.11.
- **Labour market impacts** – reduced commuting time means access to more and better employment opportunities, allowing people to switch to more productive and/or better paid jobs; and increasing total employment in the region. The Valley Lines play an important role in linking people to jobs in South East Wales, particularly for those without access to a car. This role will be strengthened following electrification. The impact of the scheme on access to employment is illustrated in Figure 4.5.

With regard to social inclusion and distribution of benefits, it has been established that the electrification of the Valley Lines will bring considerable net benefits to the UK economy. This does not give the full picture of the value of the project. The benefits must also be considered in the context of the communities served, which in the case of the Valley Lines includes some of the most deprived communities in the UK.

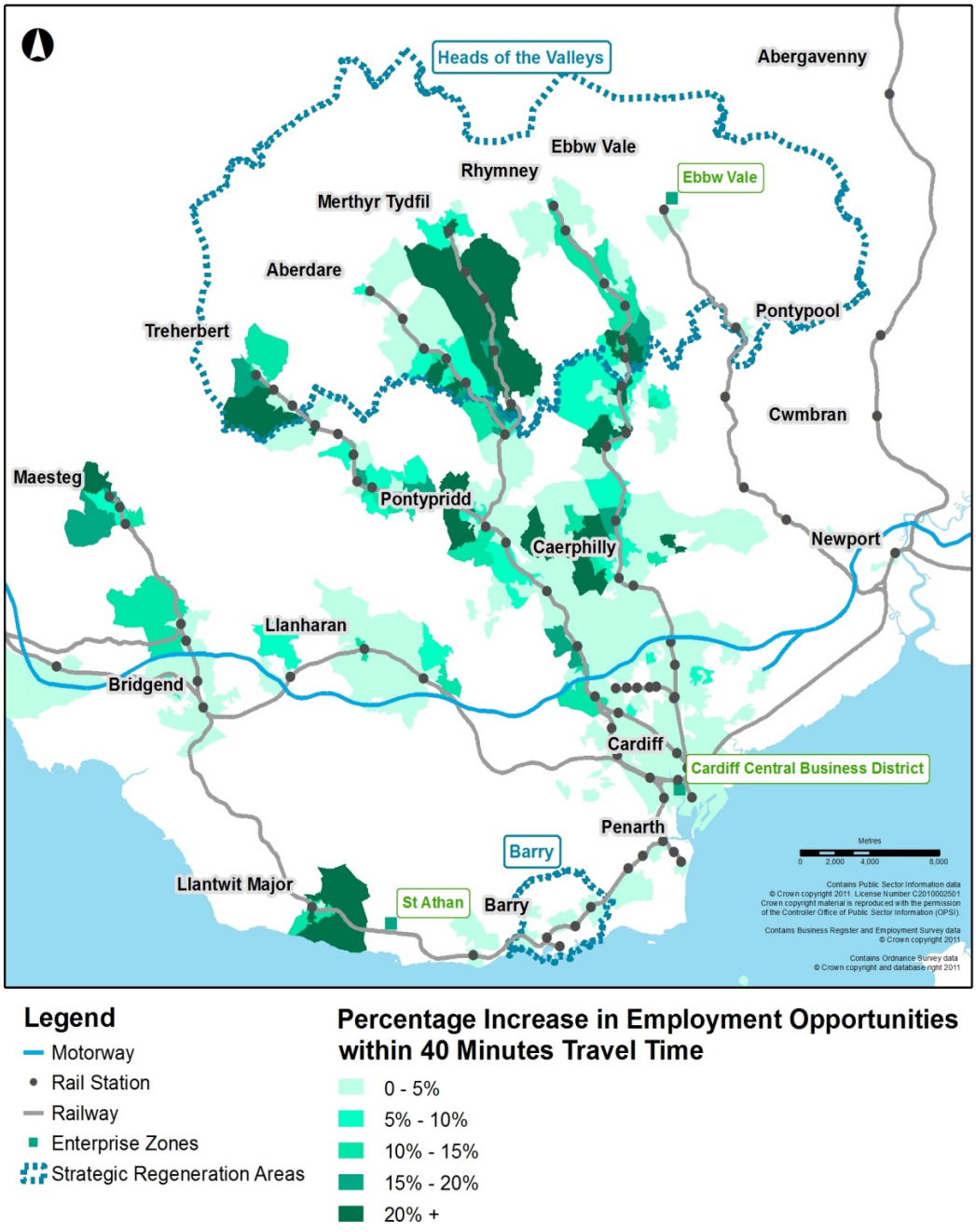


Figure 4.5: Electrification and Access to Employment

To illustrate this point, the benefits have been disaggregated by IMD[26] band, in accordance with DfT advice in TAG unit 3.5.3.

In order to determine WEBs and social inclusion and distribution of benefits, extensive use has been made of the South East Wales accessibility model in the analysis presented in this business case. This is a multi-modal accessibility model of the core study area. The output of the analysis of wider impacts is summarised

[26] Index of Multiple Deprivation

below with more detail provided in a technical note[27] which is included as a separate appendix to this Outline Business Case.

4.10.1 Agglomeration

Agglomeration effects (or economies of agglomeration) describe the productivity benefits that accrue to businesses from locating close together. These economies are derived from better skills matching, technology and knowledge spill-over between businesses, and better access to well matched suppliers. It explains why businesses concentrate in urban areas.

Agglomeration effects in each modelled year have been profiled over the 60 year period and discounted back to 2002. The value of agglomeration effects is £10.5m PVB.

4.10.2 Increased Output

Due to the presence of imperfect competition, reductions in travel costs can lead to higher economic output by businesses, which is a net benefit to consumers. Estimates vary of the degree to which reduced transport costs lead to higher output and the resultant benefit that this confers. However, DfT guidance[28] recommends that this value is set at 10% of business user benefits. Therefore, the value of benefits due to increased output is £0.5m PVB.

4.10.3 Labour Supply Impacts

The electrification of the Valley Lines will impact on the employment decisions of individuals across South Wales[29]. A factor when making employment decisions is the commuting costs (including travel time) which should be weighed against the wage for the job. Time savings associated with the electrification of the Valley Lines could make positions in a wider catchment area economically viable for individuals.

The labour supply impacts in each modelled year have been profiled over the 60 year period and discounted back to 2002. The value of the labour supply impacts is £1.6m PVB.

4.10.4 Overall Wider Economic Benefits

The results of the assessment of the wider economic benefits associated with VLE are summarised in Table 4.17. This shows that the scheme would produce predicted benefits of £12.6m over the 60-year assessment period associated with agglomeration effects and increased output. Wider economic benefits represent around 7.5% of total scheme benefits which is in line with estimates produced for transport schemes in other parts of the UK.

[27] Valley Lines Electrification: Wider Economic Benefits and Social Impacts Technical Note, Arup (December 2011)
[28] Transport Analysis Guidance, The Wider Impacts Sub-Objective, TAG Unit 3.5.14C, Department for Transport, September 2009
[29] See Technical Appendix 5 sections 2.4 and 2.5

Table 4.17: Wider Economic Benefits

	Benefits (£000, 2002 prices)
Agglomeration Effects	10,538
Imperfectly Competitive Markets	450
Labour Supply Impacts	1,588
Total Wider Economic Benefits	**12.576**

4.10.5 Social Inclusion and Distribution of Benefit

The categorisation against the Welsh Index of Multiple Deprivation (WIMD) of areas is shown in Figure 4.6 for South East Wales. It is immediately apparent that Valley Lines serve areas high in deprivation (marked in red and orange). The upper valleys, north of Pontypridd, and parts of Caerphilly, are among the most deprived areas in Wales and the UK as a whole. Bottom decile (most deprived 10%) IMDs are numerous along the rail corridors to Treherbert, Aberdare, Merthyr Tydfil, Rhymney, Ebbw Vale and Maesteg.

A key advantage of investment in the Valley Line Electrification project is that the project benefits largely accrue to communities with high levels of deprivation, communities that have most to gain from any public investment. Analysis has shown that:

- one-third of benefits accrue to residents of areas among the most deprived 20%
- two-thirds of benefits accrue to the most deprived 50%.

Three-quarters of all benefits accrue to residents of Caerphilly, Merthyr Tydfil and Rhondda Cynon Taff local authorities; and over one-third of all benefit is to the communities within the Heads of the Valleys Strategic Regeneration Area (SRA). The distribution of benefits is plotted in Figure 4.7.

This evidence strongly supports towards VLE as a socially inclusive project, with benefits targeted at the communities in greatest need.

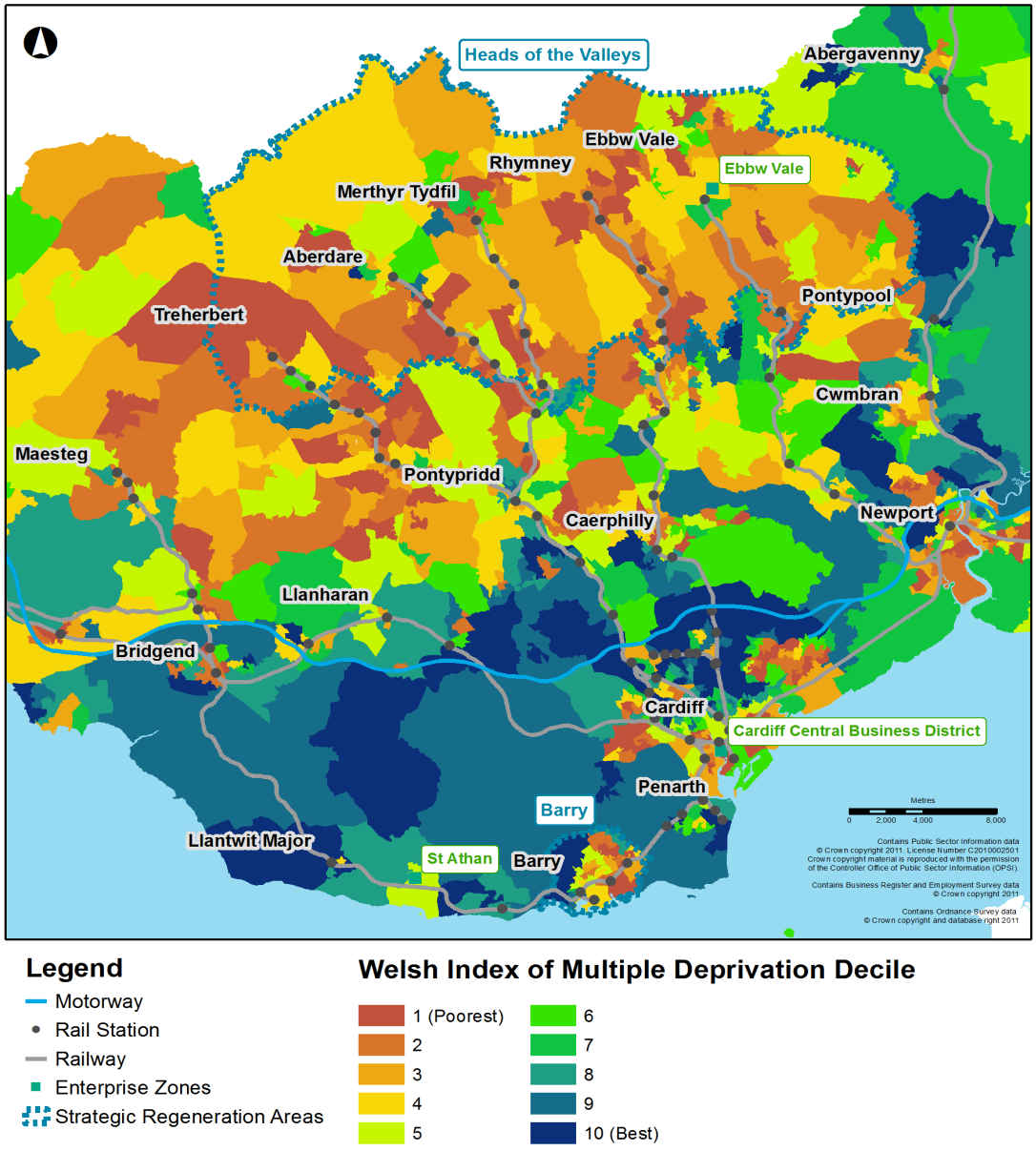


Figure 4.6: Welsh Index of Multiple Deprivation (WIMD) Indices in South East Wales

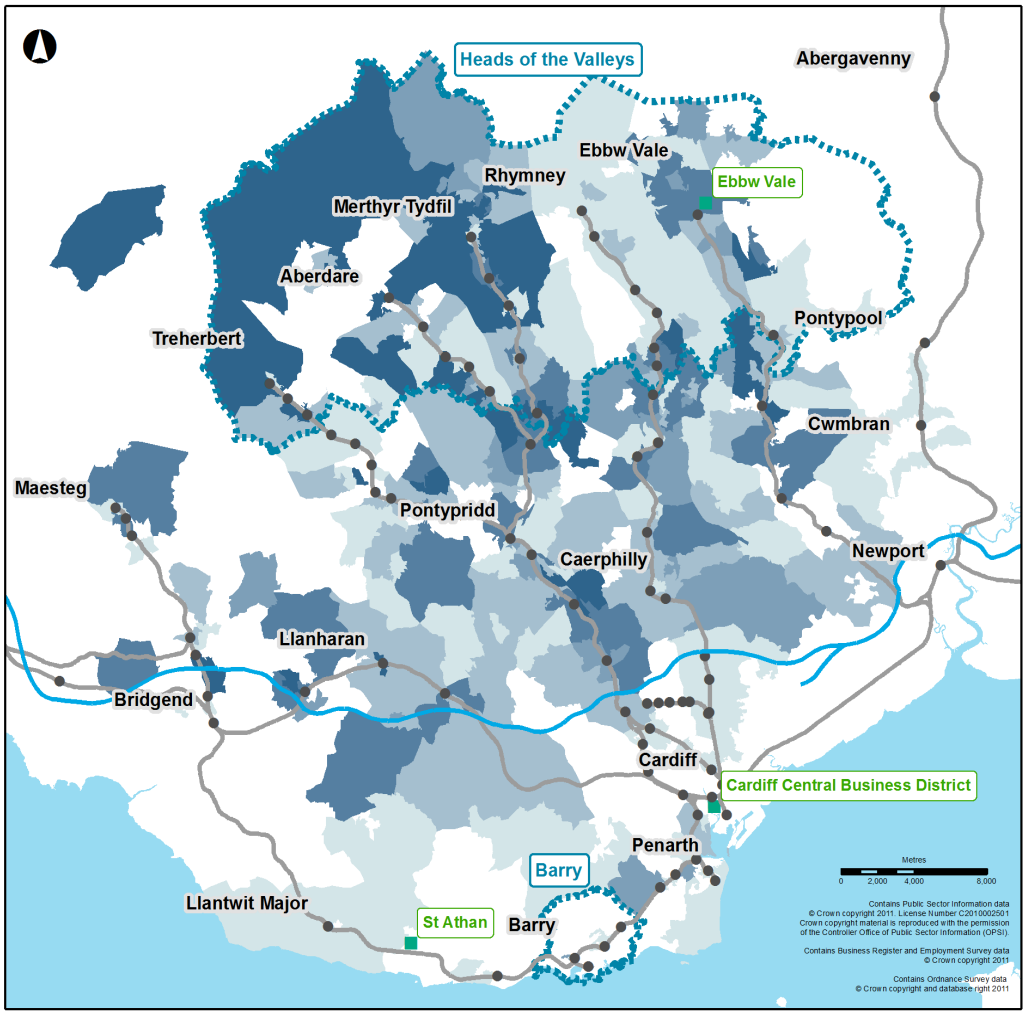


Figure 4.7: Distribution of Project Benefits

4.10.6 Generating Training, Skills and Employment

VLE will be a major infrastructure development project which will be a source of employment. It has the potential to develop skills locally with wider application.

4.11 Summary of the Economic Case

In summary, the economic case for electrifying the Valley Lines is strong, particularly if cascaded electric rolling stock is employed.

Whilst, by comparison, leasing new electric rolling stock delivers lower operating cost savings; nevertheless alternative procurement approaches involving purchase of new rolling stock may reduce costs significantly and thus improve the value for money of this option.

Future costs of diesel rolling stock and energy are such that future diesel operations will result in significantly higher subsidy costs.

For the preferred option, which is electrification of all Valley Lines employing cascaded EMU rolling stock, the present value benefits at £222.7 million far outweigh the present value costs at £57.5 million. The net present value of this option is thus £165.2 million with a BCR of 3.9 to 1.

Furthermore, a range of sensitivity tests have confirmed that the economic case for electrification remains strong under alternative future scenarios for demand growth and provision of service capacity.

A version of the appraisal has also been carried out on the basis of the electrification of a more narrowly defined network which excludes the Maesteg, Ebbw Valley and Vale of Glamorgan lines. Whilst the economic case for this option is strong, there are inefficiencies associated with the operation of two fleet types on the Valley Lines such that there is a net economic benefit of extending electrification to the entire Valley Lines network[30].

In addition, consideration of the wider economic impacts of electrification has shown how reductions in journey time associated with electrification may be expected to stimulate growth in rail demand, mode switch from car and will pave the way for reductions in unemployment and job creation – notably in the Heads of the Valleys Strategic Regeneration Area (SRA). Benefits will be delivered to businesses through greater agglomeration and access to more employees and customers. The expansion of Valley Lines capacity to meet peak demands is a key requirement to allow these potential benefits to be realised in practice.

A summary of the wider impacts of electrification are given below:

- Quantified WEBs of £12.6m in 2002 prices, or £17m in current (2011) prices
- Increases in GDP/capita of £2-5 (highest in Merthyr Tydfil local authority)
- One-third of benefits accruing to residents of in the 20% most deprived lower paper output areas (LSOAs)
- Two-thirds of benefits accruing to residents of in the 50% most deprived LSOAs

[30] As noted this result is, in part, influenced by the assumption of higher frequencies on the Maesteg and Vale of Glamorgan lines in line with the National Transport Plan and CASR. The full implications of this service pattern for the economic case for electrifying the entire Valley Lines network would not have been apparent at the time of the Secretary of State's announcement in March 2011 which made no reference to the Maesteg, Ebbw Valley and Vale of Glamorgan lines.

- Journey time benefits of £25m (in 2002 prices) accruing to the Heads of the Valleys SRA
- Up to an 8% boost in annual rail line loadings, driven by journey time reductions
- 120-150 vehicles per day removed from the southern end of the A470
- Potential for 650 unemployed residents of the Heads of Valleys SRA to get work
- Potential for around 100 new jobs created in the Heads of Valleys SRA
- Up to 20% more jobs in catchment for upper valleys communities
- Up to 15% more employees and customers in catch

This economic appraisal has shown that electrification of all Valley Lines meets the objective of providing a better deal for passengers and taxpayers.

5 Feasibility – The Commercial Case

5.1 Introduction

A market analysis has been undertaken for the Valley Lines rail network, which has considered current service patterns, existing passenger numbers and historic growth trends. This has indicated that crowding currently occurs on several routes during peak travel times. The existing road network in South East Wales is operating near to capacity during peak periods and the potential to increase highway capacity is severely constrained. These circumstances indicate that there is an on-going strong travel demand, particularly on commuter routes into Cardiff and Newport. Rail services are well-placed to serve this demand, with potential to increase mode share.

During the past decade, the Valley Lines rail services have experienced strong growth of passenger demand and the indications are that this growth will continue into the future.

The Valley Lines rail services form part of the existing Wales and Borders Franchise, which is operated by Arriva Trains Wales and managed by Welsh Government in co-operation with the Department of Transport. This franchise will end in 2018. The presumption is that Valley Lines Electrification will be delivered under a new franchise, which will be managed by Welsh Government in co-operation with the Department of Transport.

The existing Wales and Borders Franchise receives subsidy from Welsh Government. The aim of the new franchise will be to minimise the need for future public subsidy by initial investment to achieve longer term operational efficiency gains and service improvements. These will include operating cost savings by utilising more efficient rolling stock and more environmentally friendly and cheaper energy sources through electrification of the rail network.

5.2 Output Based Specification

A post CASR Do Minimum timetable and service pattern have been drawn up as has been described earlier and these have been modified to take advantage of the improved performance that would be available as a result of electrification. The output service levels required under the new franchise for VLE will be fully specified at the outset of the franchising process.

5.3 Contracting and Procurement Strategy

Commercial considerations associated with each of the procurement areas are discussed briefly below.

Infrastructure Capital Works

As there are different issues associated with electrification and the necessary supporting works to structures, track and signalling, for example, these works could be packaged. However, there would be a requirement for a Systems Integrator to bring these works together.

There may be scope for innovative procurement approaches for provision of electrification equipment as the risks of this work can be relatively self contained. Approaches include leasing, DBOT[31] and DBFT[32].

Changes to the structures and track inevitably carry more risks associated with asset condition and age; and more traditional work package based contracting approaches may be appropriate.

Rolling Stock

The approach to be adopted depends upon the flexibility given to the franchisee (see below), whether or not new or cascaded existing rolling stock is required and the appetite for a different funding and procurement model (e.g. a 'not for dividend' special purpose vehicle) should there be new rolling stock. For existing rolling stock, it is normally up to the franchisee to arrange the lease (normally as part of the bidding process).

Given the complexities and dependencies associated with cascading stock around the country, increasingly DfT, where necessary, provides guidance to bidders in relation to assumed rolling stock deployment. For electrification schemes, inheriting rolling stock cascaded from other parts of the country, this is essential. Franchisees can procure the rolling stock under a dry lease (franchisee conducts all maintenance activities), a soggy lease (ROSCO undertakes heavy maintenance such as refurbishment or major component renewal and franchisee does the rest) or a wet lease (ROSCO undertakes all maintenance often under contract). Depots for existing rolling stock are normally leased separately from Network Rail by the franchisee.

New rolling stock can also be procured this way although other approaches have been used. For example, Transport for London (TfL) directly acquired new rolling stock for London Overground via a leasing deal with a non-ROSCO leasing company (rather than via the London Overground concessionaire) and the Thameslink Programme is concluding its procurement acquiring rolling stock through a Train Service Provision contract, effectively an output contract requiring trains for timetabled services (which includes provision of depots).

Train Operations

Any changes to a franchisee's specification or commitment can be negotiated via the Franchise Change mechanism in the Franchise Agreement, but this risks reopening the contract enabling the franchisee to maximise the opportunity to exploit the impacts of changes on its farebox revenue and operating costs. It is much better to include any changes in the franchise replacement process so the competition places commercial pressure to minimise the impact of change and maximise the revenue payments (with resulting impacts on Franchise Payments).

The end of the existing Wales and Borders Franchise in 2018 creates an opportunity to do this and include the outputs required from VLE in the next franchise specification. Other issues surrounding this include allowing innovation and ensuring performance and efficiency targets create the incentive mechanism for Government to capture the financial benefits of electrification.

[31] Design, Build, Operate and Transfer
[32] Design Build, Finance and Transfer

5.4 Sourcing Options

Relationship to Intercity Express Programme (IEP)

Government is committed to electrification of the Great Western Main Line from London to Cardiff with the full electrification timetable to be introduced in December 2017. As part of this project, a high voltage power source will be provided at Imperial Park, which is situated just to the west of Newport. Department of Transport has stated that sufficient power will be made available at Imperial Park to supply both VLE and extension of the main line electrification to Swansea.

Capacity to Deliver Electrification Infrastructure

The timing of the new franchise for Wales, together with the CP5 investment opportunity, forms the driver of the delivery programme for VLE. Whilst the Valley Lines rail network is largely self contained and thus possession and access, in theory, can be controlled with minimal interference with other rail operations, VLE will need to compete with other projects for the necessary design and construction skills. There will, however, be scope for Network Rail and Welsh Government to co-operate to deliver the infrastructure works.

As a CP5 candidate, it is important that the promoters of VLE seize an early opportunity to take market soundings with the construction industry. Since there is likely to be a skills shortage with regard to rail electrification, there will be an opportunity to pre-empt the situation by developing skills training and certification programmes. Such an initiative could be led by Welsh Government and could involve partnership with the construction sector in Wales, resulting in much-needed employment and the creation of a local skills base to facilitate on-going maintenance programmes.

5.5 Payment Mechanisms and the Franchising Process

Passenger rail franchising was established to ensure value for money for taxpayers through a competitive process. The process of market testing provides assurance to Government that franchises are being delivered efficiently.

For the new Wales and Borders franchise, it may be possible to develop ways of evaluating bids relative to proposals for innovation and franchise development over and above the basic franchise specification. Evaluation criteria might also take into account less tangible costs and benefits such as wider environmental and socio-economic factors. This would serve to reward innovation and development whilst retaining cost as a criterion.

The new franchise could include the possibility to make a proportion of the premium payments from a franchise available for re-investment directly into the franchise or into infrastructure used by the train operating company involved. Such reinvestment could be dependent on clear, specific and innovative investment proposals from the operator with a demonstrable benefit to passengers and the environment.

The proposed payment mechanism for the new Wales and Borders franchise will be established during the preparation for letting the franchise by Welsh Government in co-operation with DfT. This will need to take full account of VLE and any other changes to rail operations, including geographic coverage. The franchise payments will subsequently provide some insulation to the Welsh Government budget from the ups and downs of franchise revenues and costs.

5.6 Risk and Value Management

Management of risk is an on-going process throughout the life of the project, as risks will be constantly changing. On the assumption that VLE is included in the CP5 investment programme, the full business case will identify those areas of risk to be addressed in order to deliver the fixed infrastructure to enable electrification of the rail network in a timely manner that will dovetail with the new franchise.

Risk management plans will need to be in place to deal with risks as they arise throughout the supply chain. Risk management arrangements will need to include risk allocation that:

- Is clear and unambiguous;
- Achieves best value for money; and
- Represents a fair balance between risk and control.

For Government, the franchising of rail services provides a means of managing the financial risks of the passenger business compared with running services directly.

Value management will provide a structured approach to obtaining the optimum balance of benefit in relation to cost and risk. The focus of value management is on function and value for money.

5.7 Efficiency and Innovation

The McNulty Rail Value for Money Study suggests that the rail industry should be aiming to achieve 30% reductions in costs per passenger by 2018/19. Welsh Government is aiming to drive innovation and manage costs for more efficient delivery of rail operations in Wales. In seeking to achieve the cost reductions called for by McNulty, Welsh Government is promoting VLE and other rail improvement proposals. However, success with these initiatives in Wales relies, not only on Welsh Government, but also on the close working and support of all bodies involved in the rail industry. In particular, in developing this Outline Business Case, Welsh Government has established good working relationships with DfT, Network Rail and Arriva Trains Wales.

Every effort has been made to utilise expertise to advise on matters relating to technical and financial aspects of options that have been considered. Welsh Government will continue to strive for efficiency and innovation in the delivery of VLE and the future rail franchise for Wales.

5.8 Summary of Commercial Case

Valley Lines rail services currently form part of the Wales and Borders Franchise, which is operated by Arriva Trains Wales as the Train Operating Company. Welsh Government is responsible for the management of the Franchise under the terms of a Joint Parties' Agreement with the Department for Transport. Welsh Government is also responsible for payment of any sums payable by the 'Authority' under the Franchise Agreement.

The economic case for VLE has demonstrated high value for money in relation to Network Rail's Initial Budget estimate with significant year on year operating cost savings compared with the Do Minimum diesel operation. In addition, VLE would be expected to result in increased farebox revenue compared with diesel operation.

The increased efficiency of electrified rail operations compared with diesel operations will thus be reflected in the terms of the new Franchise Agreement, which should result in a better deal for the taxpayer.

6 Affordability – The Financial Case

6.1 Introduction

Affordability has been assessed in the context of the ongoing costs of franchise subsidy as well as the affordability of the upfront capital investment. In this respect, it is to be noted that VLE will result in significantly reduced operating costs, especially from 2025 onwards, compared with the do minimum. In practice, the do minimum operating costs would determine the level of subsidy if the upfront capital investment was not made.

The affordability of the project needs to be considered within the context of the overall budget for CP5. The scale of the project and the costs are clearly in line with the scale of projects being proposed and identified in the Initial Industry Plan. Provided that VLE is included in the CP5 investment programme, the upfront capital expenditure will be funded by Government. Government will then see a return on its investment, year on year, in terms of operating cost savings and increased revenue, which will be reflected in the franchise subsidy.

6.2 Capital Costs

The total capital cost estimate for the project is £308.8 million at 2012 Q1 prices (including 20% risk allowance). A definitive construction programme has yet to be determined although Network Rail has indicated that the project could be delivered between 2016 and 2019. If optimism bias were to be included at a rate of 50%, the adjusted project cost would be £463.2 million.

Project costs have been calculated on the basis that the infrastructure investments were to be financed through the Regulatory Asset Base (RAB). Financing the project through RAB would increase the economic costs of the project, in present value terms, by a factor of approximately 10%.

6.3 Operating Costs

For electrification, operating cost savings will be achieved throughout the next franchise period. Nevertheless, operating cost savings will be expected to increase over time, primarily because the costs of leasing and operating diesel units is expected to increase markedly once the existing fleet is life expired.

In considering operating costs, the sums presented in this business case represent only a proportion of actual total operating costs for the Valley Lines as part of the overall Wales and Borders Franchise. For example, staff costs exclude all but drivers and conductors. In this financial analysis, other exclusions include all Arriva Trains Wales' overheads, all station related costs and much of the fixed track access charges as summarised below:

- *Staff costs* – include only on train staff;
- *Diesel costs* – representative of total Valley Lines costs;
- *EC4T* – representative of total Valley Lines costs;

- *Track Access Charges* – representative of total variable track access cost. Fixed track access changes (FTAC) only relate to electric infrastructure and exclude the vast majority of the FTAC; and
- *Rolling Stock Charges* – representative of total Valley Lines costs.

The average annual operating cost savings are presented in Table 6.1 and, graphically, a breakdown of the components of the average annual operating cost savings during 2019/20 to 2033/34 are shown in Figure 6.1. Details of the analysis of operating costs are provided under separate cover in Technical Appendix 4 to this OBC. It should be noted that the operating costs savings increase dramatically when the existing diesel rolling stock fleet is replaced in the do minimum in 2027/28, as shown in Figure 6.2

Table 6.1 - Average Saving in Operating Costs Per Annum (£000s) at 2011 prices

	Franchise Period 1 2019/20 – 2033/34	Franchise Period 2 2034/35 – 2048/49
Staff Costs	[redacted]	[redacted]
Fixed Track Access Charges	[redacted]	[redacted]
Variable Track Access Charge (track wear)	[redacted]	[redacted]
Traction Energy	[redacted]	[redacted]
Rolling Stock Capital Lease and Maintenance Costs	[redacted]	[redacted]
TOTAL	**16,565**	**16,866**

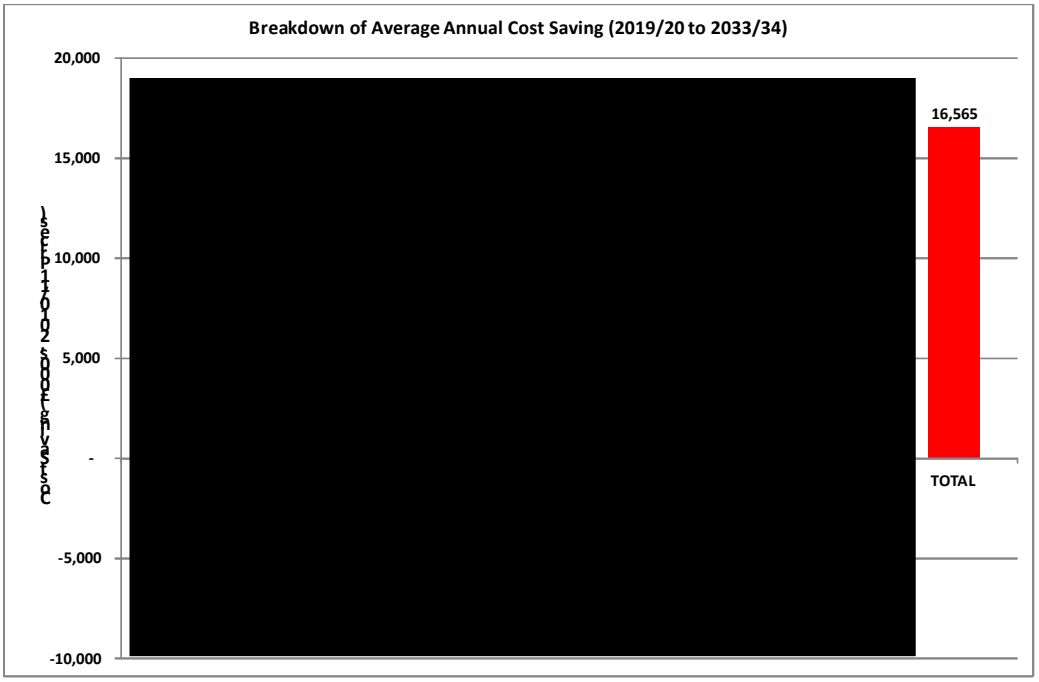


Figure 6.1 – Profile of Cost Savings in Franchise Period 1

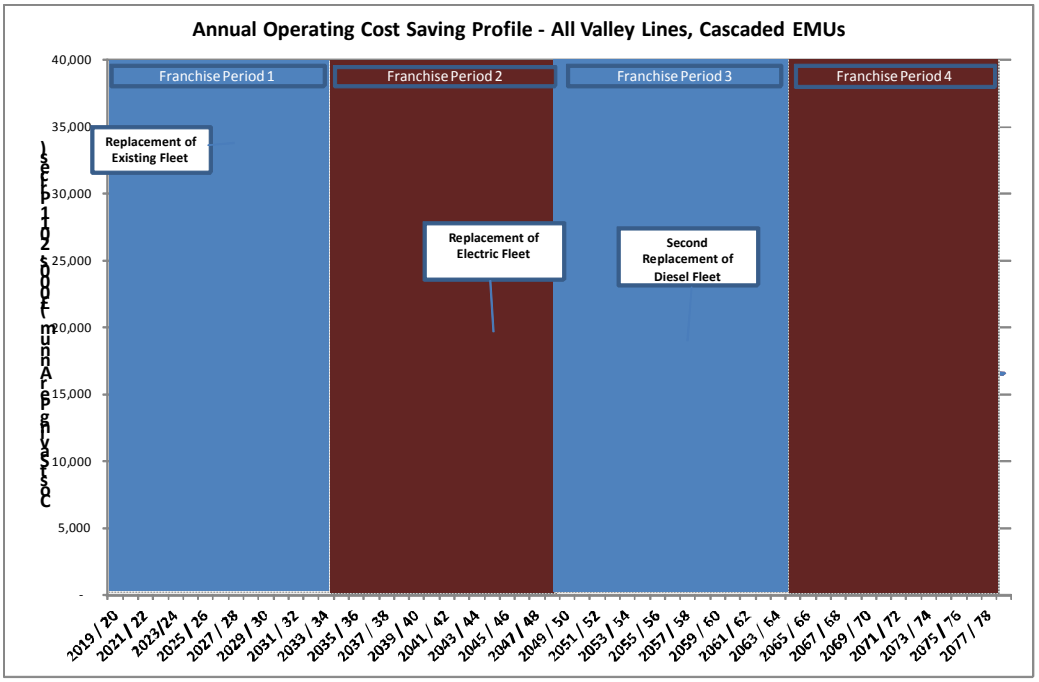


Figure 6.2 – Cost Savings by year (Electrification vs Do Minimum)

In Figure 6.2, there are step changes in operating cost savings for the preferred option compared with the do minimum. These will occur in 2027/28 (when the existing diesel fleet will be replaced), in 2033/34 (when there will be a further cascade of EMUs which will increase the operating costs of the option) and in 2045/46 (when new electric trains will be introduced). Throughout, however, the operating costs of the electrification option will be lower than those for the do minimum.

6.4 Costs and Financing

If the capital investment (£309 million) were to be financed through RAB, the repayment profile over thirty years (2016/17 – 2047/48) is illustrated in Figure 6.3. This shows the repayments that will need to be made year on year, assuming capital amounts are initially borrowed in 2016/17, 2017/18 and 2018/19 with the repayments increasing in each of these years to cover the amount financed. From 2019 onwards, the repayments amount around £30m per annum, although the *real* terms cost of the repayments (the cost in constant 2012 prices) falls over time due to inflation.

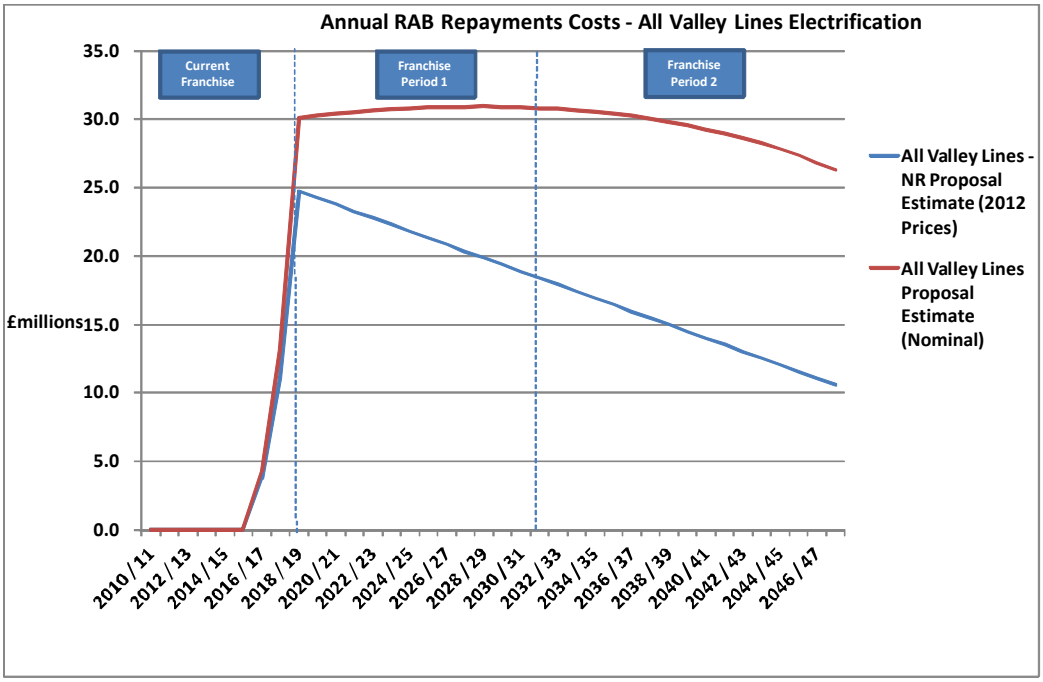


Figure 6.3 – RAB Repayment Profile (Excluding Optimism Bias)

6.5 Revenue

Electrification of Valley Lines will enable a more efficient timetable to be introduced. This is due, in part, to improved performance of electric units but largely due to the creation of available pathing time. A detailed timetabling exercise has been undertaken for Valley Lines to establish viable running patterns and this is documented in a technical note[33] which is included in a separate appendix to this business case. The impact of the timetable improvements across the Valley Lines network has been forecast in MOIRA to result in an increase in revenue of around £1.25m a year in the years following opening.

The impact of improvement in the train environment will also be expected to result in increased passenger demand. Electric vehicles will provide improved capacity compared with the existing diesel vehicles. Thus, following electrification, there will be a significant increase in provision of capacity in terms of seating and standing space leading to a reduction in crowding.

Overall, the impact of VLE is forecast to result in an increase in revenue of around [redacted] a year following opening[34].

[33] Valley Lines Electrification – Technical Note on Timetable and Diagramming, Arup (October 2011)
[34] Some of the increase will accrue to franchises other than Wales and Borders

6.6 Summary of Financial Case

Electrification of Valley Lines will require a capital investment, which has been estimated to be £309 million. Financing the project through RAB will result in annual repayments of around £30m per annum.

The operating cost savings and revenue gains are such that break even between investment and return (including RAB repayments) is forecast to occur in 2041/42. This situation is illustrated in Figure 6.4.

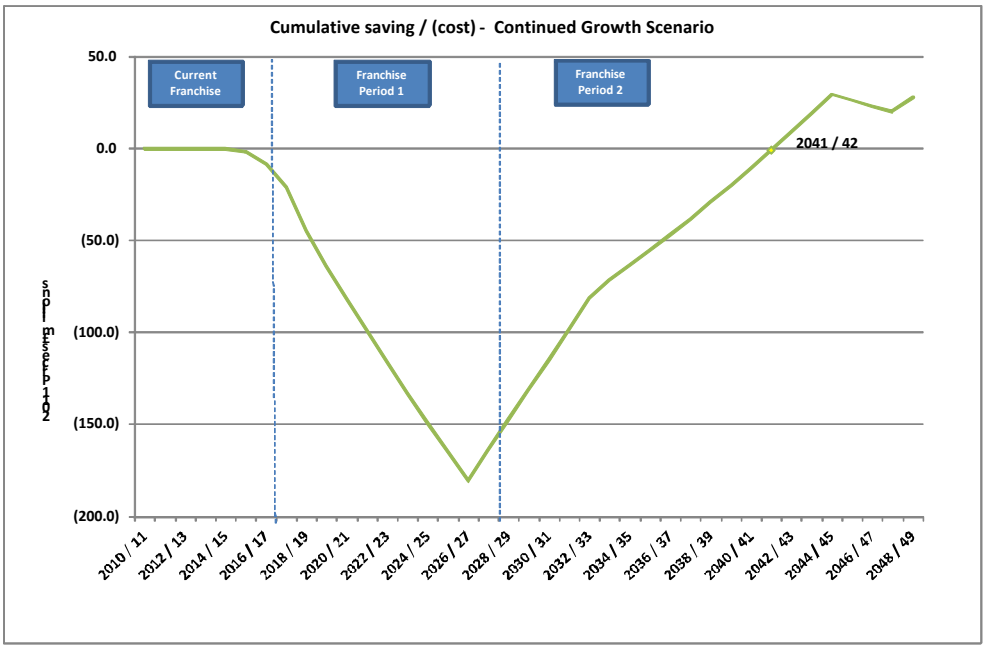


Figure 6.4 – VLE Financial Payback Period with RAB Finance

Figure 6.4 shows the cumulative effect of year on year operating cost savings and revenue gains against RAB repayments resulting in a year on year net return to government on the investment in VLE. In the early years this is negative and increasingly so up until 2027 during the period when the operating cost savings are fairly modest compared with the do minimum. From 2027, when there is a step change in operating cost savings, the negative returns get less and break-even is forecast to eventually occur in 2041/42. From 2042 onwards, government is expected to see a positive financial return on its investment in VLE.

This financial analysis has shown that electrification will greatly reduce the overall future costs of subsidising rail operations in South Wales with breakeven on the necessary investment forecast to occur within a period of 24 years following investment. The project is thus considered to be affordable with a realistic payback back period to Government.

7 Achievability – The Management Case

7.1 Introduction

During the preparation of this Outline Business Case for VLE, consideration has been given to delivery of the proposals. The proposed outcomes for VLE relate to a number of delivery points / events. These may be summarised as:

- Submission of Outline Business Case for consideration under HLOS 2;
- Preparation of Full Business Case for delivery during CP5;
- Detailed design and construction of civil engineering and electrification infrastructure works;
- Preparation of output specification for new Wales and Borders Franchise;
- Completion of Cardiff Area Signal Renewal (CASR) by Network Rail; and
- Contractual commitment to operation of VLE under new Wales and Borders Franchise.

7.2 Programme/Project Dependencies

Welsh Government is the sponsor for VLE. However, for the project to proceed, support is needed from the Department for Transport (DfT) and Network Rail. This OBC needs to be finalised and submitted for consideration by DfT by the end of 2011. The decision on whether VLE is to be included for delivery under CP5 (2014-2019) is expected to be announced mid 2012.

Following the CP5 announcement, a full business case will be prepared based on further development of the proposals (2012-2013) and the rolling stock specifications and new Franchise output specification (2013-2014). The process to procure the new Wales and Borders Franchise will commence in 2016 and the Franchise will commence operation in late 2018.

7.3 Governance and Organisation

Throughout the activities referred to in 7.1 and 7.2, Welsh Government will take the lead role; procuring services and providing funding as required. Throughout the process, Welsh Government will work closely with both DfT and Network Rail to ensure timely delivery and to resource the necessary skills and expertise.

Welsh Government will be proactive in liaising with the construction industry to establish a supply chain in a robust and commercially competitive environment. Where practicable, Welsh Government will also be proactive in supporting skills training to facilitate electrification works in Wales.

Welsh Government will build upon its existing internal resources to establish a Rail Division that will, amongst other things, manage VLE and the establishment of the new Wales and Borders Franchise.

For VLE, the key features of the proposed organisation will be: the **Project Board,** which will comprise of senior managers in Welsh Government with ultimate responsibility for delivering VLE; **Senior Management Team** within the Welsh Government, to whom the Project Board will report at key stages of the project's development; and who in turn will liaise with the appropriate Minister to achieve approval for expenditure and delivery.

7.4 Project Plan

The main activities to be undertaken to deliver VLE are referred to in 7.1 and 7.2. Following submission of this OBC, there will be a period of liaison between Welsh Government and DfT in order to continue to inform the decision making process. Provided that VLE is then included in the CP5 investment programme, a project plan will be finalised following the announcement. This will cover the period from the decision through to 2018 when the new Wales and Borders Franchise will be scheduled to commence.

The project delivery plan will include key assurance and approval milestones.

7.5 Communications and Stakeholder Management

To date, VLE has received general support from local authorities in South Wales. The project has received positive coverage in the local media and is generally viewed as a good initiative by the general public. The Core Stakeholders identified in the Strategic Outline Case have been represented on a Project Working Group and have all made important contributions to this OBC. In addition, Key Stakeholders and Wider Stakeholders have been identified and these will be invited to participate in stakeholder events as the project is taken forward.

7.6 Risk Management Strategy

A risk workshop was held during the development of the OBC. This involved wider technical expertise and identified areas of risk relating to, for instance, timescales to achieve infrastructure works, construction industry capacity to deliver rail electrification and skills shortages. Provided VLE is included in the CP5 investment programme, the risk management strategy will be rolled out to assist Welsh Government to, at an early stage, flag up, act upon and monitor the potential risks associated with the successful planning, procurement, delivery and maintenance of the proposed VLE operations.

7.7 The Planning Process

A review of planning risk with respect to electrification has been undertaken and is provided as a separate annex to the OBC. Network Rail is generally afforded development rights under the General Permitted Development Order 1995 (GPDO) where development is restricted to Network Rail land. Whilst the installation of overhead line equipment is likely to remain within the existing railway boundary, planning consent will be required where the project requires alterations to structures.

Where aspects of the project fall outside permitted development rights afforded by the GPDO a planning application will be required to the relevant Local Planning Authority,. Given that a significant number of structures will require alteration, the requirement for planning applications would demand additional financial and time costs to the project implementation process. Should a development impact on a listed building or conservation area, there may also be a necessity to apply for Listed Building Consent or Conservation Area Consent. At present, only one listed structure – a grade II listed footbridge at Cogan – has been identified. Should works require vegetation clearance, there could be a requirement to obtain consent should trees be protected by a Tree Preservation Order (TPO).

Whilst generally, it is acknowledged that the nature of electrification is unlikely to give rise to significant environmental effects, it should be noted that a development proposal may be considered as requiring Environmental Impact Assessment and the preparation of an Environmental Statement. Such an approach, although not a legal requirement, could strengthen the delivery process particularly in the case of a potential judicial review.

As per common practice for Network Rail, electrification projects would be largely delivered through permitted development rights afforded by Part 11, Schedule 2 of the GPDO.

7.7.1 Planning Risk

A desk study has been undertaken to identify the potential risks to the planning process. This has been reported in a review paper[35] which is included in a separate technical appendix to this OBC.

Environmental Designations – the nature of proposed works on the operational railway, it would be unlikely for an electrification scheme to be judged as likely to give rise to significant environmental effects. However, sections of the Valley Lines either pass directly through, or lie adjacent to, land designated as a Special Area of Conservation (SAC); Site of Special Scientific Interest (SSSI); Special Protection Area (SPA); Area of Outstanding Natural Beauty (AONB); National Park; or Country Park. Should works be deemed to significantly affect the setting of an environmentally sensitive site, there will be a greater risk to securing planning permission and a planning application would need to satisfy a screening process undertaken through the Environmental Impact Assessment Regulations 1999.

Flood Risk – Large sections of the Valley Lines are either considered to be at little or no risk of fluvial or tidal/coastal flooding, or served by significant flood defence infrastructure. However, there are also sections of the Valley Lines located either within or adjacent to land known to have flooded in the past and without significant flood defence infrastructure. Development within these "at risk" areas is likely to require a Flood Risk Assessment / Flood Consequences Assessment to identify flood risk, or support a planning application if one were to be required.

[35] Valley Lines Electrification – Planning Risk Review Paper, Arup (September 2011)

Heritage designations – The Valley Lines corridors contain a significant number of Listed Buildings, in addition to a smaller number of Scheduled Ancient Monuments and Registered Parks and Gardens – often set within land allocated as Historic Landscapes. A development proposal that could affect the setting of a heritage site will need to set out how it will protect or enhance local character, whilst Listed Building Consent may be required through the planning permission process, should a proposal materially affect a designated Listed Building.

Economic Issues – Identifying the economic benefits of Valley Lines electrification through the planning process would support the case for delivery. Whilst an economic appraisal would not be required legally should permitted development rights be utilised, communicating the benefits within a chapter of an Environmental Statement could strengthen the delivery process, particularly in the case of a potential judicial review. For the purposes of informing the business case supporting Valley Lines electrification, the primary planning risk in terms of economic deliverability of a major infrastructure scheme is the potential need for land acquisition or to gain the required access for construction.

Community Impacts - The delivery of necessary infrastructure works to electrify the rail network has the potential to impact on local communities, primarily through affecting visual amenity. A number of residential properties are located adjacent to sections of the rail network and there is a risk that their visual amenity could be adversely affected by the installation of overhead line equipment in particular. Whilst the impact of rail operations on local communities would be reduced following electrification due to anticipated reduced noise and air pollution levels; there may be some public opposition to proposed construction works by affected properties within the network corridor. Mitigation measures should be proposed within a planning application to address any potential concerns on community impact.

Community Safety – Any development proposal is required to set out how it will impact on/address community safety as part of the planning application process, through a mandatory Design and Access Statement. A proposed scheme should not threaten community safety both during and post construction works.

Whilst a range of planning issues are raised and discussed; it is considered that there are no significant planning risks that could jeopardise the delivery of Valley Lines electrification.

7.8 Summary of Management Case

Delivery of VLE is dependent upon its inclusion in HLOS 2 and Government investment under CP 5. The options for delivery are generally understood at this stage, but decisions will need to be taken down the line giving due cognisance of the risks and likely benefits. Welsh Government is aware of the need to up skill and will be taking steps to reinforce its technical and managerial capabilities in order to successfully deliver and manage VLE.

8 Conclusions

Valley Lines Electrification delivers against the stated objectives of the Welsh Government and the Department for Transport. In particular, VLE offers better value for money for passengers and tax payers and is therefore directly in line with the McNulty agenda for rail in the UK.

The OBC has demonstrated that electrification of the whole Valley Lines network offers good value for money. The recommendation of this Outline Business Case is that there is justification for the electrification of the Valley Lines rail network and for the provision of electric multiple units, in the first instance cascaded from elsewhere [redacted]. In the longer term, these EMUs will be replaced by new units.