

Welsh Government

**Great Western Main Line
Electrification - Cardiff to
Swansea**

Outline Business Case

117300-82

Final | June 2012

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It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Executive Summary

This Outline Business Case (OBC) confirms that electrification of the Great Western Main Line (GWML) from Cardiff to Swansea will result in significant operating cost savings. These efficiencies, combined with environmental benefits and benefits to rail users, are such that there is a positive economic case for electrifying the main line between Cardiff and Swansea.

The economic case for electrifying the GWML from London to Cardiff has been established by the Department for Transport. This OBC considers the case for extending the electrification project from Cardiff to Swansea. Therefore, the OBC takes as its starting point the electrification from London to Cardiff with bi-mode trains operating between London and Swansea.

Operating and maintenance cost savings resulting from the use of electric rather than bi-mode (for Intercity Express Programme) or diesel trains (for local services) have been assessed. Over the appraisal period of 60 years are not expected to out-weigh the capital investment needed to deliver electrification of the Great Western Main Line between Cardiff and Swansea. For the electrification option tested, when user benefits and rail revenue are taken into account, the net present value of the scheme is estimated to be £15.2 million with a Benefit to Cost Ratio (BCR) of 1.4.

This evaluation includes the cost of electrification of GWML between Cardiff and Bridgend. The present value cost (2002) of electrification of GWML between Cardiff and Bridgend is estimated to be £50.4 million. However, this section of track would also form part of Valley Lines Electrification (VLE). If VLE were to go ahead, then the electrification of GWML between Bridgend and Swansea would be likely to be delivered at no net cost to government with a net present value of £68.6 million.

The apportionment of part or all of the cost of electrification of GWML between Cardiff and Bridgend to VLE, or other funding source, would justify the electrification of GWML to Swansea.

The cost savings identified in this OBC could be further enhanced if the financial impact on the Intercity Express Programme (IEP) were to be taken into account. By removing the need for long bi-mode trains to serve Swansea, electrification could provide the Department for Transport with the potential to reduce the cost of the IEP by simplifying the train mix required. The timing of the proposed electrification is thus linked to maximising the benefits from other rail investment projects along the route and from the procurement of new rolling stock under the Intercity Express Programme (IEP).

As a result of electrification, there would be potential for train maintenance to be undertaken at existing facilities in the Swansea area for electric trains. This may have a positive impact on future franchise arrangements and will need to be evaluated in the development of the full business case.

The case for change demonstrates that Great Western Main Line Electrification from Cardiff to Swansea (GWMLE) aligns strategically with Welsh Government priorities for economic growth in South Wales. GWMLE is also a good fit with the timing and structure of franchise renewal. It accords with the principles of the Sir Roy McNulty led Rail Value for Money Study. It is also consistent with the

Department for Transport's (DfT) electrification priorities and business plans, including the efficient delivery of the IEP rolling stock procurement.

The commercial case demonstrates that the electrification of the Great Western Main Line to Swansea is feasible when treated as an increment to the committed London to Cardiff electrification. No additional programme risks have been identified that are not already considered in the GRIP 2 work carried out by Network Rail, which establishes the feasibility of the Project. The timetable for completion of electrification to Swansea is dependent upon further work by Network Rail in GRIP 3, which needs to be commissioned by Spring/Summer 2012.

Market interest in operating an electrified railway to Swansea has been established through discussions with the existing franchise operator and will be tested during the new franchise process.

The overall affordability of the scheme is set within the context of the current proposal to electrify to Cardiff and in the procurement of new rolling stock as part of the IEP.

Details of the Economic Case for GWMLE¹

	Electrification London to Cardiff and Bi-Mode IEP trains to Swansea ² £m	Electrification Cardiff to Swansea and IEP Electric Trains to Swansea ³ £m	Electrification Bridgend to Swansea, building on VLE ⁴ £m
(a) Time Benefits	470	37.0	37.0
(b) Crowding Benefits	550	-	-
(c) Highway User Benefits	605	3.5	3.5
(d) Environment Benefits	110	20.2	20.2
(e) Other Benefits	160	-	-
(f) Indirect Tax	-200	-7.3	-7.3
(1) Present Value Benefits (a+b+c+d+e+f)	1695	53.5	53.5
(g) Rail Revenue	1075	11.3	11.3
(h) Operating Costs	1270	-55.1	-58.0
(i) Infrastructure Costs	555	104.7	54.3
(2) Present Value Costs (-g+h+i)	750	38.3	-15.1
NPV (1) - (2)	945	15.2	68.6
BCR (1) / (2)	2.3	1.4	No net cost to government

¹ Economic appraisal based on 'Constrained Growth' scenario for passenger demand and revenue growth in line with WebTAG guidance. Demand and revenue are capped at 2032.

² For electrification of London to Cardiff, values are taken from the Department for Transport's business case (House of Commons Library, 'Railway investment on the Great Western Main Line and in Wales'). The format of the Appraisal Summary Table and calculation of the BCR have been amended to reflect current WebTAG guidance.

³ For electrification of Cardiff to Swansea, values are taken from Arup's analysis for this Outline Business Case

⁴ For electrification of Bridgend to Swansea, values are taken from Arup's analysis for this Outline Business Case.

1 Introduction

1.1 Background

This Outline Business Case (OBC) provides a rationale for electrification of the Great Western Main Line (GWML) to Swansea to build on the current proposal to electrify from London to Cardiff. The timing of the proposed electrification is linked to maximising the benefits from other rail investment projects along the route and from the procurement of new rolling stock under the Intercity Express Programme (IEP).

The UK Government is committed to a programme of modernisation and investment in the UK railway network, including the move to a higher proportion of services running on electrified railway. This was endorsed as one of a number of cost saving initiatives highlighted in the recent Rail Value for Money Study⁵ led by Sir Roy McNulty.

Electrification provides significant potential for benefits:

- for **passengers** in terms of capacity and reliability;
- for **Network Rail and operators** in respect of lower running costs; and
- for **Government policy** in achieving lower carbon emissions and improved environmental performance of the railway.

On 1 March 2011, the former Secretary of State for Transport made an announcement to MPs regarding the decision to electrify the GWML between London and Cardiff. This statement highlighted his desire to maximise the value of expenditure to cater for growth by authorising electrification and a new train fleet. The committed scheme maintains the current hourly service between Swansea and London with new bi-mode rolling stock (diesel and electric propulsion), procured under the Intercity Express Programme, which delivers quality improvements and extra capacity. The prioritised electrification programme, endorsed by Network Rail and the Department for Transport (DfT) includes a plan for electrification of the Great Western Main Line (GWML) between London and Cardiff by 2017, within the next investment delivery Control Period, CP5 (2014-2019).

Welsh Government is committed to maximising the impacts of electrification in South Wales and studying the case for gaining wider network and industry benefits. As well as the impacts for GWML this includes opportunities for wider cost savings for the rail network in South Wales and efficiency improvements for the rail industry.

Curtailing the railway enhancement at Cardiff, with the associated commitments to using diesel fuelled rolling stock will put back the possibility of further electrification into South Wales, possibly for many years, and would affect the efficiency of gaining benefits from a wider plan for electrification.

⁵ Realising the Potential of GB Rail, Report of the Rail Value for Money Study (DfT/ORR)

In relation to representations calling for electrification of the GWML to be extended as far as Swansea, the Secretary of State's statement pointed out that:

“The business case for electrification is heavily dependent on the frequency of service. Services between London and Swansea currently operate at a frequency of only one train an hour off-peak.”

The statement included a commitment to keep the future electrification to Swansea under review:

“the policy of the Government is to support a progressive electrification of the rail network in England and Wales, for environmental, among other reasons.....I will therefore keep under active review the business case for future electrification of the Great Western Main Line between Cardiff and Swansea in the light of developing future service patterns.”

This commitment is important in the context of ensuring value for money from existing proposals and making sure that the benefits from the incremental cost are explored to the greatest extent possible, and in a timely way for decision making. The Welsh Government has initiated the development of this business case for further investment in GWML electrification as a direct response to the challenge of achieving future economic growth in South Wales and meeting the needs of Swansea businesses and residents and the communities of South West Wales. It is intended that this business case will be considered by the DfT for inclusion in its High Level Output Specification (HLOS2) submission for CP5.

1.2 Importance of the GWML to South Wales

The Great Western Main Line (GWML) is an essential transport artery supporting the economy of South Wales over at least the area shown in Figure 1.1. It provides connectivity from the principal towns and cities in South Wales to London, Bristol and other major population centres adjacent to the M4 corridor. Rail speeds from South Wales to London are relatively modest compared with other long distance corridors. There are no direct links to Heathrow Airport. These are factors that currently restrict the scope for economic growth.

Rail travel is playing an increasingly important role in linking the key centres of economic activity in South Wales, both as a result of structural changes in the economy (the growing dominance of city centre based service economies) and because of capacity constraints on the M4 motorway and other main road links into the centres of economic activity along the M4 corridor.

Swansea is an important European city in its own right sitting on a designated Trans European Network (TEN) route. By grasping the opportunity to improve the efficiency of rail services in South Wales, there is potential to realise agglomeration effects through improved links between Swansea, Cardiff, Bridgend and Newport and through stimulating greater integration with Severnside and Greater Bristol.

Strategic Policy Driver – Welsh Government (*Economic Renewal Programme*)

“The absence of a major conurbation (by European standards) is associated with wages and productivity levels that are lower than would otherwise be the case (the “agglomeration effect”); however, there is a key opportunity in the medium term to build on the projected rapid population growth of Cardiff, our capital city.”

The Welsh economy has lagged behind other regions of the UK in recent years. The linear dispersal of centres of economic activity along the coast of South Wales is such that the economic and social wellbeing of South Wales is heavily dependent on efficient transport links between local and regional centres. The implementation of electrification to Swansea is an enabler for growth and economic prosperity in South Wales.

The proposal for electrification between London Paddington and Cardiff delivers important benefits to South Wales. The case for investment includes financial efficiencies of electric operation and integration with other important projects. These include Crossrail, Network Rail’s signalling renewal programme and the Reading Station Area Redevelopment Project, each of which will provide additional capacity and are complemented by the GWML Electrification.

The Welsh Government’s National Transport Plan (NTP) reiterates the strategic importance of the east-west transport corridor in South Wales:

Welsh Government (*National Transport Plan*)

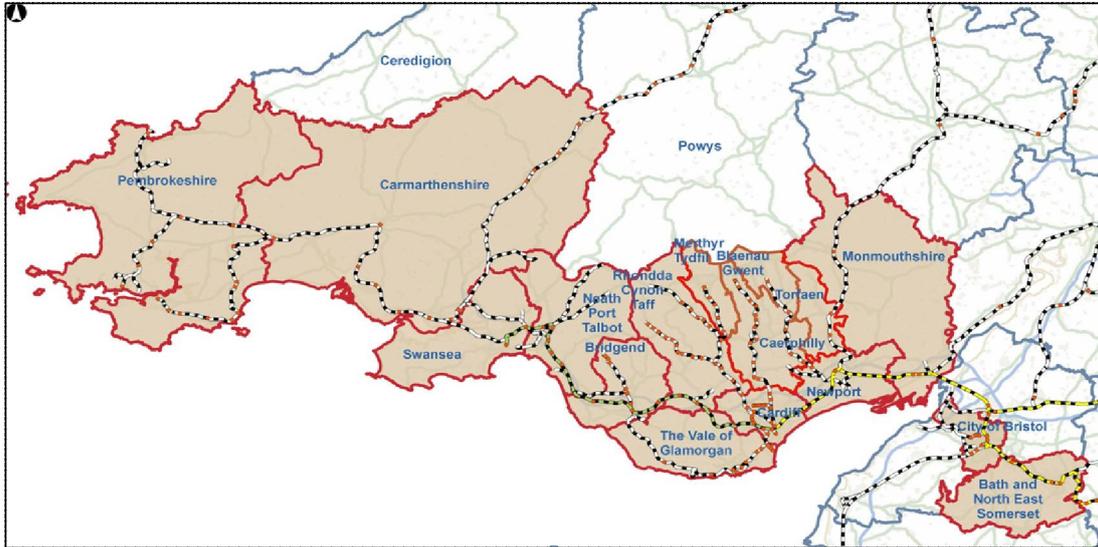
“East-west travel in south Wales by rail, road and public transport is dominated by movements in and between the key settlements of Cardiff, Swansea and Newport and their surrounding areas.”

“Continued passenger growth on the rail network in south Wales and on the Valley Lines is predicted, and pinch-points on the network need to be addressed to provide sustainable travel options and create opportunities for economic and social inclusion.”

“Working closely with the UK Government and the rail industry we will continue to develop plans to improve rail services, particularly the Great Western Main Line between Swansea and London. To do this, we will follow a three stepped approach. Firstly, we will make improvements to existing services. Secondly, we will continue to pursue electrification of the Main Line between Swansea and London, which will not only be better for the environment, but provide quieter, more reliable trains and reduce journey times. Thirdly, we will work with the UK Government to link Wales to the high speed rail network. Along with electrification of the Main Line, the timing of links to the high speed network will be co-ordinated with the UK Government timescales for investment.”

The above extracts demonstrate that electrification of the Great Western Main Line between Swansea and London is a clear aim of the Welsh Government. This project, to develop a business case for electrification of the Main Line between Cardiff and Swansea, has been initiated in response to this aim.

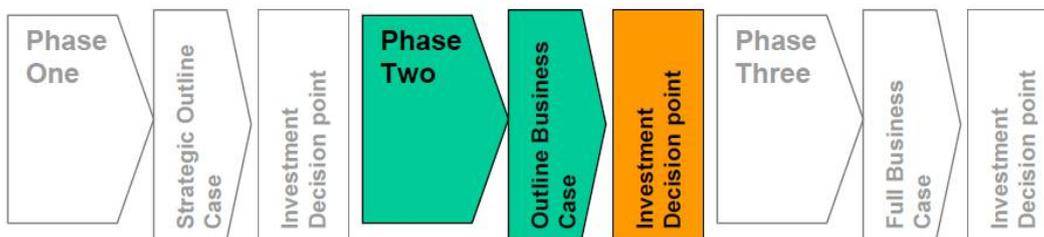
Figure 1.1: Impact Area for Great Western Main Line Electrification Cardiff to Swansea



1.3 Outline Business Case

The Outline Business Case (OBC) is the process of determining and appraising in detail the preferred option. The purpose of this OBC is to:

- Confirm the strategic fit and case for change of the proposals;
- Refine the investment proposal; and
- Provide details of the project’s overall balance of benefits and costs against objectives.



The development of the business case describes the process of developing and appraising investments. This Outline Business Case has aimed to:

- provide a clear and evidence based understanding of existing services, highlighting key issues on the Cardiff to Swansea GWML route both now and in the future;
- develop, examine and appraise feasible electrification options, for long term improvement of the route such that it is fit for purpose in the 21st Century;

engage with and be guided by industry experts, key local actors in the rail sector in Wales and a range of other public and private stakeholders;

complete a full appraisal of the preferred option using the five case model format considering the case for change, value for money, commercial viability, financial affordability and achievability; and

culminate in the production of an outline business case document and related technical reports which will assist ministerial decisions on the proposals.

The Outline Business Case report follows the five case model format which is accepted as best practice to develop the Transport Business Case. The remainder of this document takes each of the following sections in turn:

- Section 2: Strategic Case – the case for change;
- Section 3: Economic Case – the value for money case;
- Section 4: Commercial Case – commercial feasibility;
- Section 5: Financial Case – affordability;
- Section 6: Management Case – achievability; and
- Section 7: Recommendations.

2 The Case for Change (Strategic Case)

2.1 Introduction

The 'Case for Change' considers the links between transport and the economy in South Wales and examines whether existing transport networks provide sufficient capacity and capability to support future needs. It looks at the role for rail in supporting economic growth and exploring the benefits that could be achieved by more efficient operation of the rail network in South Wales. In particular, it considers the potential to reduce the cost of running rail services and it sets down desired outcomes and targets that an electrified Great Western Main Line to Swansea might aspire to.

Electrification of the Great Western Main Line to Swansea is considered in the context of other potential rail investment projects. For example, Valley Lines Electrification (VLE) could include electrification of GWML between Cardiff and Bridgend as part of the Maesteg to Cardiff route. A business case⁶ for VLE is under consideration as part of HLOS 2 for inclusion in CP5 investment programme.

2.2 Vision and Objectives

A range of objectives has been defined for the GWML Electrification to Swansea. These objectives have been developed in consultation with core stakeholders and were confirmed during the Starting Gate Review held with Welsh Government.

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 in South Wales supporting long-term prosperity and a dynamic economic region;
- to reduce lifecycle operating costs for provision of rail services;
- to provide a customer focused rail network in South Wales and a catalyst for mode shift from car to rail transport in this important but congested corridor;
- to produce positive effects overall on people and the environment, contributing to the overarching Welsh Government goals to reduce greenhouse gas emissions; and
- to strengthen the role of the key economic centres in South Wales as the drivers of economic growth in South Wales.

These objectives correspond to a need to resolve the following issues for transport connectivity in South Wales:

- To cater for an increased level of commuting between centres in a sustainable manner;

⁶ Welsh Government - Valley Lines Electrification - Outline Business Case, Arup, December 2011

To provide a reliable alternative to the already congested M4 motorway corridor;

To help meet environmental policy goals of the UK and Welsh Governments, including specific air quality improvements;

To stimulate economic activity and to foster connectivity between South Wales and Greater Bristol/Severnside; and

To enable cost effective rail services, offering significant lifecycle operational cost savings in the next Great Western Franchise period and facilitating onward investment.

Starting Gate Review

As GWML Electrification is a major initiative for Welsh Government that will have long-term consequences, a Starting Gate Review has been undertaken for extension of electrification to Swansea. The meeting was held on 12 September 2011. This demonstrated the importance of governance issues, good planning, timely delivery of the business case and channels of communication, particularly between the project team, Welsh Government and the Department for Transport.

2.3 Existing Situation

The demand for strategic east/west transport connections in South Wales has been the focus of Welsh Government transport investment for many decades. This includes delivery of capacity up-grades of the M4 motorway and the A465 Heads of the Valleys Road. Extensive study of the potential to expand the capacity of the strategic road network in this corridor, including an M4 Relief Road, has indicated the level of difficulty and costs associated with further improvement of highway links to reduce traffic congestion. There is, however, an opportunity for investment in east/west rail links. Electrification to Swansea is one of a series of improvements to the rail corridor that could encourage mode shift, which would meet a number of important objectives for Welsh Government.

2.3.1 Rail Passenger Journeys

Station footfall data published by the Office of Rail Regulation (ORR) has been examined to understand levels of usage for GWML stations. Cardiff Central attracts by far the most trips, approximately 10.74m per annum (arrivals and departures) which averages around 30,000 passengers per day using main line and local services. The next busiest stations in South Wales are Newport (2.16m trips per annum), Swansea (2.05m), Bridgend (1.5m), Neath (0.76m) and Port Talbot Parkway (0.45m).

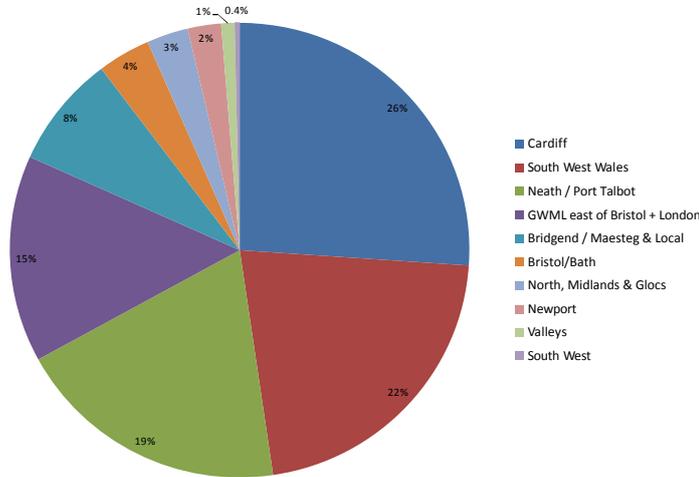
Separate analysis of passenger trip data to or from Swansea provides a further breakdown of trips in South West Wales. Figure 2.1 illustrates the distribution of trips with one trip end in Swansea, with the following summary:

Approximately three quarters of trips begin and end between Cardiff and South West Wales;

Approximately 15% of trips are travelling long distance, east of Bristol, 80% of these (approximately 12% of the total) are travelling to/from London;

More trips involve a journey to or from London than to or from Bridgend, Maesteg and other local stations.

Figure 2.1: Distribution of Passenger Journeys to/from Swansea



Source: Arup analysis of LENNON data, top 50 flows (grouped)

These data indicate the relative importance of connecting Swansea first with Cardiff by train and then with South East England and London. It is likely that these trip patterns are strongly conditioned on the availability of direct, fast and reliable services. The **Paddington to Cardiff / Swansea** service group attracts the single largest total journeys, rising from about █████ in 2000/1 to █████ in 2010/11 (45% increase).

2.3.2 Traffic Flows and Conditions

The M4 motorway provides the main east/west route through South Wales with the GWML as the rail alternative. When road conditions are free-flowing, the M4 enables fast journey times between Swansea and the Severn Estuary. The M4 corridor thus provides connectivity to Bristol, the Thames Valley and London via the two Severn Crossings.

However, analysis of recent traffic data shows that the M4 between Swansea and Newport experiences traffic congestion on a regular basis during weekday peak travel periods. This congestion leads to unreliable journey times for commuters and an increased potential for accidents. The lack of convenient alternatives and the geographic context creates major physical constraints on the potential opportunities to deliver additional road capacity.

2.4 Supporting Economic Growth in South Wales

Transport is crucial for access to jobs in South Wales, enabling the efficient distribution of freight and ensuring that barriers to future development, regeneration and growth are avoided in the most cost effective manner. A key driver for the economy of South Wales is connectivity between Swansea, Cardiff and Newport and, by extension, accessibility for South West Wales as well as links into Severnside and Greater Bristol. Throughout discussions of the benefits of electrification the need for improved connections to London and the South

East, including key hubs and international gateways such as Heathrow Airport, is acknowledged.

The South West Wales Integrated Transport Consortium (SWWITCH) has developed a Regional Transport Plan (RTP) that has Swansea at its heart and also as the gateway to South East Wales and beyond. One of the overarching goals of the RTP is to create more reliable internal connectivity and improved connectivity with rest of Wales, the UK and European neighbours. SWWITCH actively presses for improvements to the rail network in and beyond South West Wales to encourage more inward investment and support modal shift for passengers and freight. The South West Rail RTP identifies three priorities for rail, with specific issues, highlighted, of relevance to the GWML electrification:

Description	Detail
Improvements to rail services west of Swansea	Redoubling the line west of Swansea to secure improved services to West Wales, including: <ul style="list-style-type: none"> ○ 3 trains per hour between Swansea, Gowerton, Llanelli and Carmarthen ○ Hourly service from Carmarthen to Milford Haven ○ 5 trains per day to Fishguard Harbour
Improving rail services to Cardiff, Bristol and London	<p style="text-align: center;">Reduce the journey times to Cardiff, London and beyond</p> Improving access to and facilities at mainline stations drawing on all sources including National Station Improvement Programme funding and EU Convergence funding
Improving the access to and use of rail services	5 trains per day on the Heart of Wales Line (HOWL) <p style="text-align: center;">Improving the Swansea service</p> Developing new stations where justified and reviewing the long term role of smaller stations Maintenance and development of the South West Wales Community Rail Partnership

The continuing development of Swansea as a destination and social and economic hub is being achieved with the help of Strategic Regeneration Area status together with Welsh Government and EU Convergence funding. Nevertheless, compared with the situation in general in the UK, Swansea still suffers from substantial Output and Productivity gaps⁷. It is, therefore, not surprising that the overarching policy of the South West Wales Regional Transport Plan⁸ (RTP) is to improve access to facilitate a good quality of life and a viable and thriving regional economy.

The consequences of deferring the electrification to Swansea could severely impact on the economy of South West Wales and its contribution to the national economy. The competitive position of Swansea in comparison to other UK cities will be severely weakened without this investment, leading to a loss in business

⁷ Swansea 2020, Swansea’s Economic Regeneration Strategy, Swansea Economic Regeneration Partnership, 2007

⁸ ‘Progress in Partnership’ The South West Wales Regional Transport Plan, SWWITCH, 2009

confidence and a stifling of growth potential. By grasping the opportunity to improve the efficiency of rail services in South Wales, there is significant potential to realise agglomeration effects through improved links between Swansea, Cardiff and Newport and through stimulating greater integration with Severnside and Greater Bristol.

GWML Electrification extension to Swansea is fundamental to ensuring that the economic growth of South Wales is realised. Improving transport links to Bristol, Heathrow and London is an important priority for wealth creation and investment. The benefits of enhanced rail connections include maximising the opportunities to realise future growth and encouraging entrepreneurship and knowledge economy agglomerations.

Statistics for economic growth in the South Wales corridor illustrate the need for better east-west connections supporting the major urban centres:

There has been a 19% increase in jobs between 1995 and 2008 in South Wales, the highest increases have occurred in Cardiff and Swansea. Over a quarter of new jobs created in the study area are located in Cardiff, with a further 21% in Swansea.

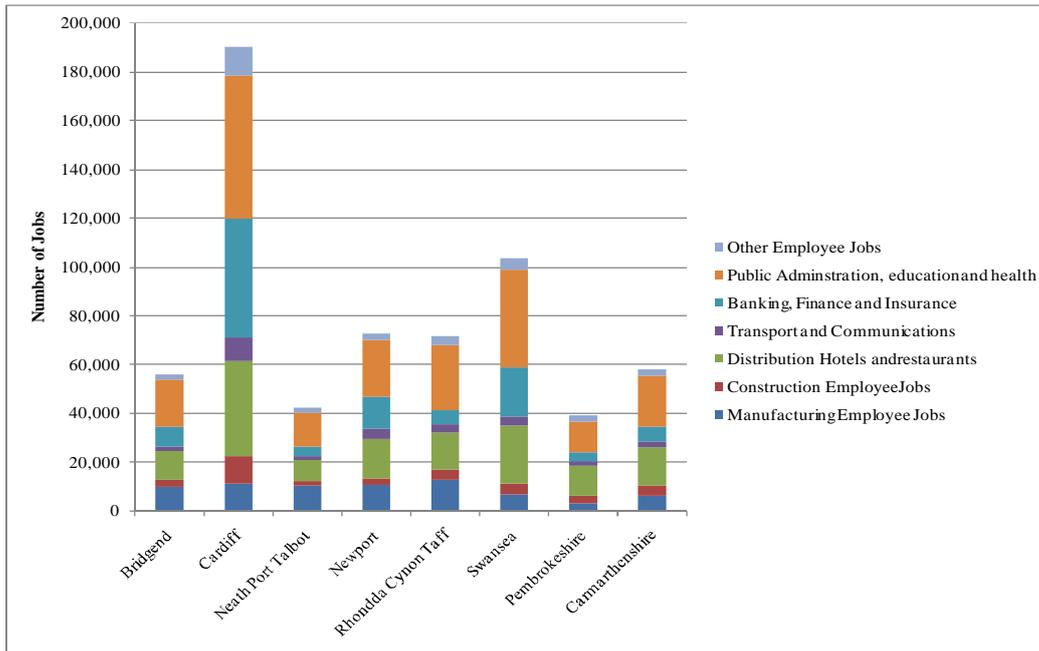
The service sector has begun to replace traditional industries and manufacturing in South Wales. The majority of the 54% increase in banking, finance and insurance sector jobs has occurred in Cardiff (15,000 jobs), Swansea (9,500) and Bridgend (4,200). This reinforces the importance of business services to Cardiff, Swansea and Bridgend and the potential for commuting and business trips between these centres.

About one-third of all the new jobs created between 1995 and 2008 have been in the public sector, with the largest concentrations in Cardiff and Swansea.

The importance of Cardiff and Swansea as the main employment centres in South Wales, and the percentage of jobs by sector is shown in Figure 2.3.

In addition to growth in employment opportunities in South Wales, the Ministry of Defence complex at Abbey Wood, Bristol is undergoing an expansion programme and is expected to eventually house more than 10,000 staff. This development is served directly by Filton Abbey Wood station on the line between Cardiff and Bristol Temple Meads.

Figure 2.3: Percentage of Jobs by Sector (2008)

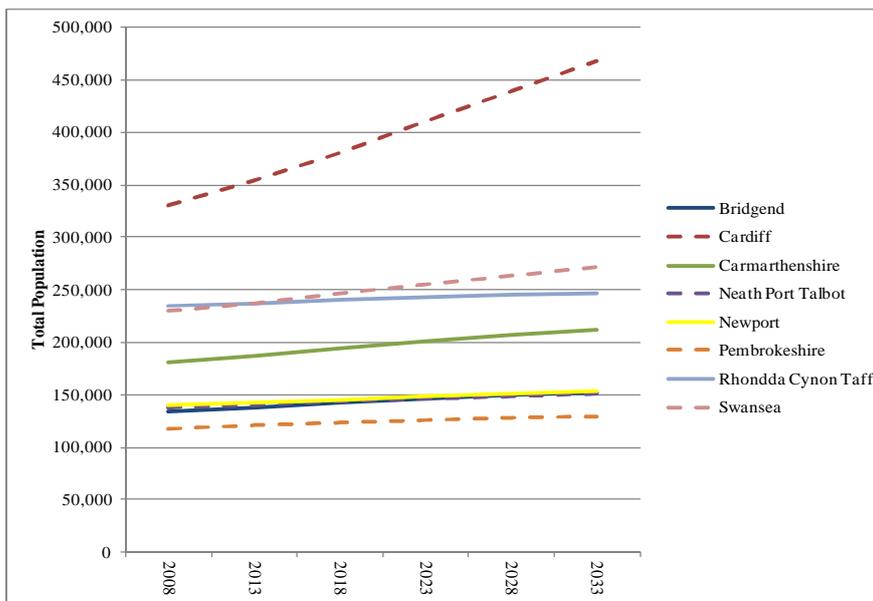


Source: ONS annual business inquiry employee analysis

Analysis using TEMPRO to consider future levels of employment growth indicates over 13% of new jobs by 2031 will occur in Swansea and around a third in Cardiff.

Population growth shows the same focus on the main centres of Cardiff and Swansea. By 2033, there will have been a 29% increase in households, with about 26% of the study area’s population living in Cardiff and 15% in Swansea.

Figure 2.4: Population Growth from 2008 to 2033



Source: Welsh Government, Local Authority Population Projections for Wales (2008-based), May 2010.

Behind these headlines lie more detailed statistics that reinforce the importance of Swansea within the polycentric nature of the South Wales economy:

At over 18,200 jobs Swansea is projected to contribute just under 20% of employment growth up to 2031, indicating that access between centres other than Cardiff will be increasingly important.

Population and employment growth planned in the major settlements along the Great Western Main Line is likely to result in increased patronage as commuters access job opportunities, particularly commuting into Cardiff.

Employment focus will be on Cardiff city centre and Cardiff Bay, West Newport and Swansea Riverside and City Centre. Major regeneration sites and Enterprise Zones will demand accessible, sustainable transport.

The Baglan Bay and Coed Darcy strategic employment sites (in Neath Port Talbot) are designated as strategic employment sites in the emerging Neath Port Talbot Local Development Plan and will serve a regional employment need. Both these areas could be well served by rail.

The planned expansion to Swansea University at Fabian Way (east of Swansea) and the continued popularity of the University of Cardiff, University of Swansea and the University of Wales at Newport offer continued trip generation.

The analysis of the potential demand drivers demonstrates the opportunities for increased rail demand associated with significant, planned population and employment growth. Cardiff's role as the main economic driver in South Wales is reinforced with the parallel growth in Swansea and Newport and increased commuting into each of the urban centres.

Rolling stock capacities will need to be reviewed on local and regional services to avoid overcrowding in the peak periods, especially as the catchment for commuting trips to Cardiff will inevitably expand. The employment growth in Swansea and along the M4 corridor between Bridgend and Neath will also need interventions to support the likely increase in rail trips, particularly to/from Swansea.

It is worthwhile highlighting the substantial employment growth planned for Bristol. Similar to the changing spatial distribution for Cardiff, it would be reasonable to assume that the journey to work catchment for Bristol would also increase to support this level of employment growth. This could increase the number of rail trips from South West Wales to Bristol via Cardiff.

2.5 Increasing Economic Interdependence across the Severnside Region

Recent developments, both commercial and governmental, are reinforcing the economic interdependence of the key cities in the wider Severnside region, which may be considered to extend from Swansea to Swindon. These developments are contributing to a need for greater connectivity as people increasingly seek access to employment across a wider geographical area. Pivotal to this connectivity are the infrastructure and services provided by the GWML between Bristol and Swansea as this artery connects some these developments, as described below.

Bristol Temple Meads Enterprise Zone

One of the Enterprise Zones for England was identified at Bristol. The initial expectation is that this location, adjacent to Bristol Temple Meads Station, could support the creation of 17,000 jobs and 400 new businesses to 2030+.

Cardiff Central Business District

In Wales, the first Enterprise Zone announced was at the Cardiff Central Business District which will be focussed on Financial Services.

Filton Abbey Wood

At Filton Abbey Wood, the Ministry of Defence (MOD) is concentrating its operation at a single site that will become one of the largest employment sites in whole of South Wales and South West England employing a projected 10,000 people by 2012. As such it will draw commuters from across the entire Severnside region from Swindon to Swansea.

Llanwern/Glan Llyn

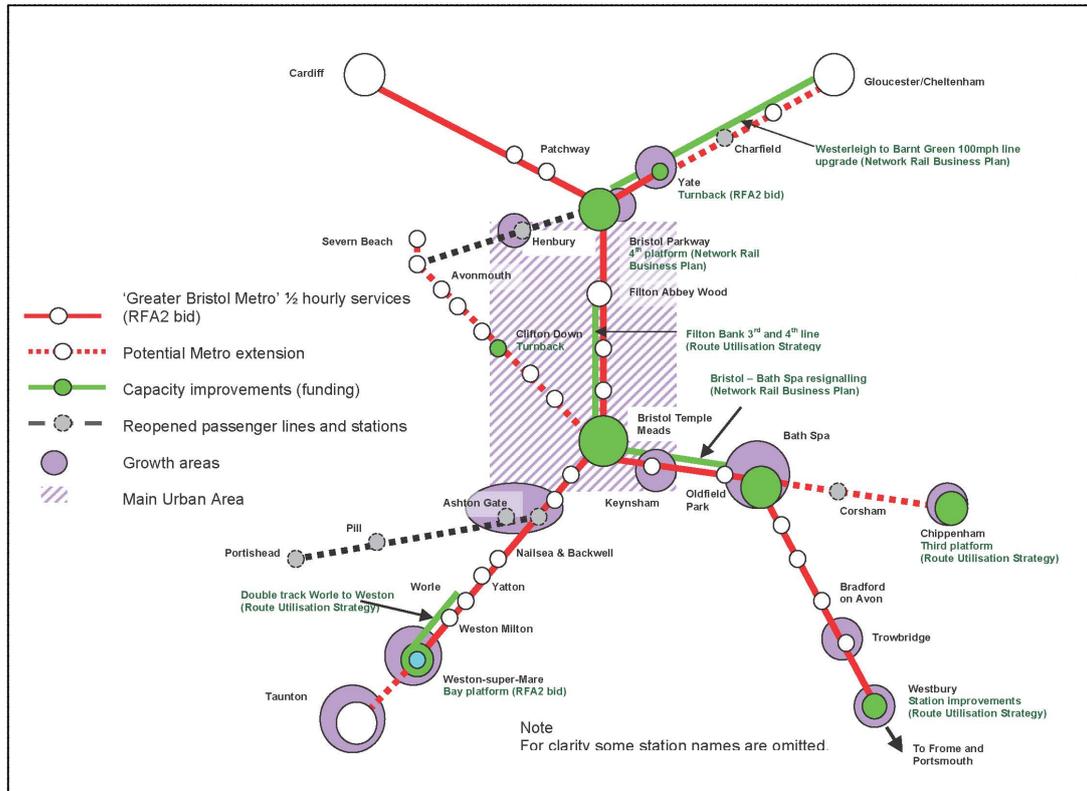
A private sector developer is currently developing 600 acres that formerly formed part of the site of the Llanwern steel works. The plans are to develop 4,000 new homes and 100 acres of commercial and industrial uses. The scheme also allows for a new rail station at Llanwern on the GWML, thereby placing the development at the heart of the wider Severnside region.

Greater Bristol Metro

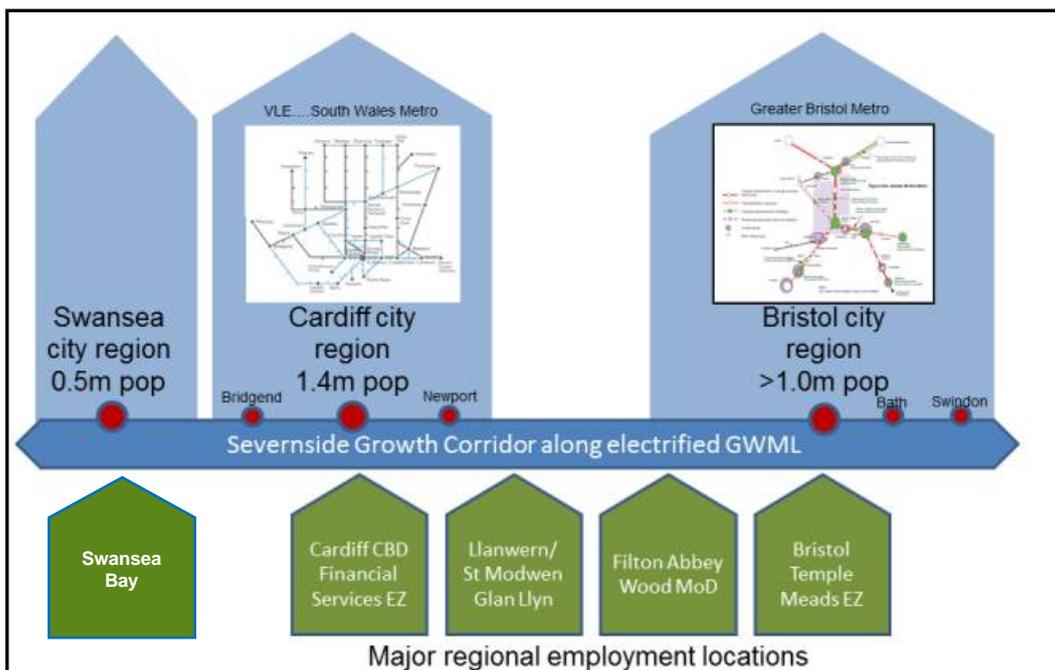
In 2009, the West of England Partnership published plans to development a Greater Bristol Metro as shown in Figure 2.5. As can be seen, a key component of this vision is greater connectivity and services between Bristol and Cardiff and beyond. In a similar way to the Valley Lines, The Greater Bristol Metro would better connect Bristol hinterland with its commercial core – and especially key employment locations such as Bristol Temple Meads and Filton Abbey Wood.

All of the above proposed developments, being focused as they are around key transport nodes, will inevitably draw employees from across the wider Severnside region. This will stimulate further the increasingly important regional economic interdependence, greater agglomeration effects and increased output.

Figure 2.5: Greater Bristol Metro Proposed Network



Greater connectivity along the GWML between Bristol and Swansea will contribute to making a reality of a commercial and commuting Severnside region. The electrification of the GWML between Bristol and Swansea provides a means of introduction high quality and high capacity rail services that will help make this a reality, as illustrated below.



There is no doubt therefore, that this emerging Severnside region will provide an attractive proposition to potential rail franchisees as it is likely that passenger volumes on this corridor will increase above trend over the next twenty years as these key developments are implemented.

2.6 Electrification of the Rail Network in South Wales

Electrification of GWML between London and Cardiff will result in the first section of the rail network in South Wales being electrified and hence linked to the wider electrified rail network in the south east of England and beyond to Continental Europe. Having taken this first step, it is likely that electrification will be extended to other parts of the rail network in South Wales in due course. The programming of such schemes will be dependent upon the economic case and the availability of funding.

Further electrification of the rail network in South Wales would result in benefits to rail users and to the taxpayers through efficiency gains. There would also be environmental benefits and potential for electrified freight haulage in South Wales.

The Valley Lines rail network is a strong candidate for electrification and this could include electrification of GWML between Cardiff and Bridgend. If this were to be the case, then the further electrification of GWML between Bridgend and Swansea would be a logical next step in the electrification of the rail network in South Wales.

2.7 Improving Value for Money

The overall vision for the project focuses on developing enhanced services that deliver efficiency savings, which can realise improved value for money for passengers and for Government.

As well as the direct industry costs, which link back to the franchise payment mechanism, there are direct out-of-pocket value for money benefits to passengers based on the quality of their rail service purchased through the farebox.

2.7.1 Operating and Maintenance Costs

One of the main benefits of electrification is improving the value for money of operating rail services, and also ensuring a fairer deal for passengers, who contribute to the franchise costs through the farebox. The parallel procurement of the IEP rolling stock further enhances efficient and cost-effectiveness with the introduction of new electric trains.

The UK and Welsh Governments share a commitment to improving value for money. The recent Rail Value for Money Study⁹ led by Sir Roy McNulty highlighted a number of areas where cost efficiencies could be achieved.

The terms of reference for the Rail Value for Money Study were *“to identify options for improving value for money ... while continuing to expand network*

⁹ Realising the Potential of GB Rail, Report of the Rail Value for Money Study (DfT/ORR)

capacity as necessary". At the heart of this is a target to achieve a 30% unit cost reduction by 2018/19 based on current estimates of future demand. The recommendations of the study are *"intended to clear the path to growth and allow the railway industry to give passengers and taxpayers the fair deal they deserve."*

The study recommendations fall into three inter-related parts, namely:

Changes to create an enabling environment

These include a clearer link between rail policy, objectives and strategies, stronger and more cohesive industry leadership, improvements to the ways rail organisations and people work together, incentives that are more effective and better aligned, a review of fares policy and structures, and greater transparency as to what Government subsidy is buying.

Changes which deliver the major savings

These focus principally on achieving best-practice in asset management, programme, resource and project management, supply chain management, standards and technology, pursuing initiatives in the areas of capacity utilisation, information systems, and new approaches to enable lower-cost regional railways.

Effective approaches to drive implementation

Key to achieving the delivery of the plans contained in the Rail Value for Money study is an implementation plan developed with commitment across the industry

The proposals for electrification of the GWML to Cardiff and Swansea align well with the first two solutions. The involvement and support of Welsh Government, and its commitment to delivering the projected improvements in partnership with the DfT, Network Rail and the train operating companies reflects an effective approach to implementation.

Of particular relevance is the holistic approach to reducing maintenance and renewals effort and the long term investment in whole life solutions and cost reduction approaches that could arise through electrification. This could also result in more effective or innovative procurement of rolling stock for local services in addition to the approach being taken for the IEP procurement.

2.7.2 Delivering a Better Deal for Passengers

The current service pattern along the relevant section of the GWML comprises the following:

Maesteg to Cardiff Central (1tph), with trains continuing to Cheltenham Spa via Newport and Chepstow every 2 hours;

Swansea to London Paddington via Newport and Bristol Parkway: 1tph;

South West Wales (Carmarthen / Milford Haven to Manchester Piccadilly via Newport and Abergavenny: 1tph;

Cardiff to Swansea (local service): every 2 hours.

Welsh Government has made a commitment in the National Transport Plan to strengthening the connections to South West Wales by increasing the frequency of the local Cardiff to Swansea service from every two hours to hourly. This service change is assumed in the do-minimum reference case.

Welsh Government is also committed to facilitating improved connectivity between South Wales and Greater Bristol/Severnside. The existing South West Wales to Manchester service will thus be re-defined to provide a Cardiff to Manchester hourly service and a Swansea to Bristol via Cardiff express hourly service.

The combination of economic growth, distribution of population and employment in South Wales and pressure on the M4 leading to congestion is likely to lead to rail passenger growth. It is important that capacity is kept under review during the franchise specification process and that sufficient capacity is provided in order to cater for this future growth. This capacity needs to be available before behaviour around using the private car for regular journeys becomes entrenched.

2.7.3 Capturing Value for Money Benefits

Within the business case, an attempt is made to quantify and monetise as many of the value for money benefits as possible, and to ensure that all potential impacts are identified even if they cannot be quantified.

The advice from the DfT regarding the treatment of the Cardiff-Swansea electrification as an increment to the electrification between London and Cardiff requires the main GWML project to be considered as a committed scheme. The parallel IEP procurement is also treated as a committed scheme for the delivery of rolling stock in the do-minimum. These have both been fixed for the reference case and only incremental changes are put forward for the preferred option.

The full electrification has wider benefits and opportunities for efficiency, most notably in the fleet requirement under the IEP procurement and the relative importance of two different bi-mode types. It is anticipated that, without the need for long bi-modes to Swansea, significant efficiency savings could be considered.

Key assumptions behind the derivation of benefits for electrification are summarised as:

Efficiency and Value for Money: Heavy maintenance is a significant cost component for rail operations and routine maintenance costs are generally 30% to 40% higher for diesel fleets compared with electric rolling stock. The McNulty Rail Value for Money Study suggested that the rail industry should be aiming to achieve 30% reductions in costs per passenger by 2018/19. Electrification is the only option which offers the potential of reducing costs to this level whilst delivering improvements for passengers.

Journey Times and Passenger Experience: Achieving running time reductions through higher performance electric units will allow an improved and more even timetable to Swansea. Electrification offers the opportunity to maximise the potential of the network following CASR improvements and is in line with the ethos of 'making better use of existing system capacity'.

Mode Shift: A shift to rail will result from more competitive journey times compared with a congested road network. Electrification and better rolling

stock can stimulate higher demand as people relocate closer to the railway. This ‘sparks effect’ can result in significant additional demand, as witnessed on the line between Leeds and Skipton, where rail mode shares of up to 75% have been achieved during peak travel times.

Environmental Performance: Electrification delivers environmental benefits by switching fuel use to less carbon intensive sources, whilst also reducing emissions from road transport and improving air quality. The existing diesel engines dating from the 1980s are non-compliant to current European emissions directives, have no facility for energy recovery from braking and emissions are discharged locally into the environment. There is no reasonable prospect for improving the energy consumption or emissions performance of diesel fleets and their use will progressively become discontinued thereby increasing maintenance costs.

Table 2.1 lists the range of value for money benefits attributable to the scheme.

Table 2.1: - Potential Value for Money Benefits of Electrification

Internal Railway Benefits	Source of Benefit
Operating costs	New trains and upgraded systems
Maintenance costs	Maintenance costs for both trains and infrastructure is reduced
Fuel costs	Reduced through switching from diesel to electric operation
Revenue	Generation of new rail trips
Customer Benefits	
Journey time	Improved performance and reduced dwell time
Ride quality and other changes in comfort and ambience	New trains
Delays and cancellations	Improvements to all systems (electric trains have higher reliability targets than diesel)
Information, safety, security and facilities at stations	Improvements to stations
External Benefits	
Highway congestion	Mode switch from car to rail
Accidents and injuries	Mode switch from car to rail
CO ₂ emissions	Switch from car and electrification of trains
Air Quality	Avoided production of particulates at stations
Noise	Quieter trains
Wider Economic Impacts	
Regeneration Impacts	Improved access to employment and catalyst to local regeneration
Wider Impacts	Improved accessibility and agglomeration effects

2.8 Other Drivers of Change

Whilst the current proposal to electrify to Cardiff brings important benefits, including the use of new rolling stock for Swansea services, the timing of a decision to electrify to Swansea is an important consideration.

There is a good rationale, within the context of enhancing the rail network in Wales and meeting both value for money and low carbon agendas, for the aspiration to electrify to Swansea in the near future. Specific issues associated with growth in the South Wales economy, deteriorating air quality and congestion will determine when this imperative is justified by other policy drivers. However, it is the view of Welsh Government that electrification must take place to Swansea, and that the optimum opportunity is in conjunction with the current planned electrification and the IEP procurement.

To delay the implementation of the incremental improvement is likely to result in a worse business case for the following reasons:

The IEP procurement will have been completed and the deal will tie in the use of long bi-mode trains for this route for a considerable number of years.

The new Wales and GWML franchises will be let under the current proposal without a fixed timetable for changing to electric rolling stock.

It is the premise of this Outline Business Case that rail operations would be more efficiently delivered on GWML through full electrification to Swansea, creating capacity and opportunities for future growth. This also achieves important social and environmental benefits.

2.8.1 Desired Outcomes

In order to gauge the effectiveness of options likely to be put forward for investment, it is useful to consider the high level network outcomes that such options would be expected to achieve:

If passengers and the taxpayer are to get a better deal, operating the GWML and associated services between Swansea and Cardiff will need to become more efficient and more cost effective. The desired **outcome** would be **reduced operating and maintenance costs**;

In order to provide the necessary stimuli to the local economy, the case for electrification is linked to accessibility to jobs, services and leisure. The desired **outcome** would be **growth in passenger demand**, requiring increased capacity from new rolling stock and service patterns;

In order to make GWML train services more attractive to encourage growth in passenger demand, the performance of vehicles will need to be improved. The desired **outcome** would be **shorter journey times**, achieved through using electric rolling stock; and

If the costs of highway congestion are to be held in check, the rail network will need to increase its mode share, especially during peak periods. The desired **outcome** would be **a higher modal share by rail**, achieved through more attractive services, minimising interchange and using rolling stock better able to compete with the car.

2.9 Summary of Strategic Case

The following summarises the Strategic Fit of the project:

A strong fit with Welsh Government priorities for economic growth and agglomeration in South Wales, facilitating commuting into the key centres and connectivity with Greater Bristol/Sevenside;

Consistency with priorities for rail contained in the National Transport Plan;

Correspondence with the principles of the Rail Value for Money Study recommendations;

A good fit with Network Rail policies and plans such as the Electrification RUS, Initial Industry Plan and achievable under the GRIP 2 analysis;

Consistency with DfT electrification priorities and business plans, including the efficient delivery of the IEP rolling stock procurement;

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 Welsh Government.

3 Value for Money (Economic Case)

3.1 Introduction

The Value for Money (VfM) Case for the GWML electrification proposal is focused only on the extension between Cardiff and Swansea. It includes any consequential rolling stock or service changes, over and above those contained in the current electrification scheme between London and Cardiff that may optimise the economic case.

A 60 year economic appraisal has been undertaken in line with WebTAG 3.12¹⁰ guidance which is also in line with Welsh Government appraisal requirements for proposed transport interventions (WelTAG¹¹).

The development of the business case is consistent with the Five Case Business Case Model recommended by HM Treasury and, in turn, in line with WebTAG and WelTAG guidance. The business case is being promoted by Welsh Government on a collaborative basis with DfT and Network Rail. In this regard, following discussions with DfT, the approach for the economic appraisal has been agreed in principle in advance of the completion of the Outline Business Case.

Due to the on-going procurement process by IEP, not all information relevant to a complete business case analysis is currently available. This includes information that is currently commercially sensitive. This means that, at this stage, there may be further cost savings and other benefits which have yet to be included in this Outline Business Case. The outputs of the economic appraisal are presented in Table 3.2 showing the Net Present Value and Benefit to Cost Ratio. Any non-quantifiable benefits are also clearly identified.

The economic case for electrifying the GWML from London to Cardiff has been established by the Department for Transport. This OBC considers the case for extending the electrification project from Cardiff to Swansea. Therefore, the economic appraisal takes, as its starting point the electrification from London to Cardiff with bi-mode trains operating between London and Swansea.

At the request of DfT, work has been undertaken to justify a Do Minimum service pattern as a suitable baseline against which electrification service options might be tested.

There are current plans to introduce an additional hourly service between Maesteg and Cardiff in line with the Welsh Government's National Transport Plan. The economic case for the introduction of this service (with a benefit cost ratio of 1.6) has been previously established by the Welsh Government and has been subject to a separate business case assessment¹².

Provision of an hourly stopping service between Swansea and Cardiff as opposed to a two hourly service has been tested using MOIRA. This indicated that, not only was this in line with Welsh Government policy, but that it would also be based on sound economic grounds, providing a Net Present Value of £20.6

¹⁰ Web-based Transport Appraisal Guidance: Guidance on Rail Appraisal

¹¹ Welsh Transport Appraisal Guidance

¹² Maesteg Line Rail Enhancement Scheme – Business Case Update. Jacobs Consultancy (May 2010)

million and a Benefit to Cost Ratio (BCR) of 2.5. This increased frequency of stopping services between Swansea and Cardiff has thus been included in the Do Minimum service pattern for this business case.

The following Do Minimum service pattern has thus been used as a basis for further economic appraisal of electrification of the main line between Cardiff and Swansea:

GWML half hourly (peak, peak direction only) and hourly (off-peak) IEP service London to Swansea with bi-mode rolling stock (diesel powered from Cardiff to Swansea)

Half hourly electric (EMU) service Bristol to Cardiff

Hourly diesel service between Milford Haven/Carmarthen and Manchester

Hourly stopping diesel service Swansea to Cardiff (Swanline)

Half hourly service from Maesteg to Cardiff: alternate trains continuing to Cheltenham

Hourly diesel service Cardiff to Portsmouth

3.2 Electrification Service Pattern Options

Since an incremental approach has been adopted for the development of this OBC, following discussions with DfT, a future service pattern on GWML between Cardiff and Swansea has been based on the following:

Compatibility with the IEP timetable proposed for London/Bristol to Cardiff;
Regional Swansea to Cardiff/Bristol services;
Local Swansea to Cardiff stopping services; and
Maesteg to Cardiff services.

The resultant service patterns developed for an electrified GWML involve only relatively limited changes to the Do Minimum service pattern, namely:

Option 1: Do Minimum with London to Swansea electric IEP service and replacement of the hourly Swanline (Swansea/Cardiff) diesel service with extension of a Bristol/Cardiff EMU to provide an hourly electric stopping service Bristol to Swansea;

Option 2: as Option 1 but replacement of an hourly diesel service Maesteg to Cardiff with extension of a Bristol/Cardiff EMU through to Maesteg. This option would require electrification of the line between Bridgend and Maesteg.

For the purposes of this business case, the headline results of the economic appraisal are based on Option 1 and Option 2 is considered as a sensitivity test.

3.3 Economic Appraisal

3.3.1 Assumptions

As this is being treated as an incremental intervention over and above the committed project to electrify GWML from London to Cardiff, the baseline assumptions for the economic appraisal are as follows:

For IEP services, journey time savings between Cardiff and Swansea have been estimated at 3 minutes compared with the current diesel operations. The resulting benefits have already been captured in the business case for electrification to Cardiff on the basis that the bi-mode operation to Swansea would realise these benefits. No further journey time benefits for IEP services are assumed in this business case;

There will be environmental benefits arising as a result of electrification between Cardiff and Swansea. These will apply to IEP services between Cardiff and Swansea and to local and regional rail services if these are converted from diesel operation to electric;

This business case considers the impact of using electric trains for the IEP service between London and Swansea as opposed to the bi-mode trains assumed with electrification to Cardiff.

With improvement in train performance and design, existing non-IEP services between Swansea and Cardiff/Bristol, which may be converted from diesel operation to electric, are likely to result in an estimated journey time saving of 3 minutes between Swansea and Cardiff. No other journey time savings are assumed.

3.3.2 Investment and Operating Costs

Initially capital costs for electrification of GWML between Cardiff and Swansea were checked with DfT and Network Rail to ensure consistency with the earlier business case for electrification to Cardiff. Where information had not been provided to establish the build up of these costs, it was assumed that they represented the best information available. The initial capital cost estimate was based on a GRIP 2 exercise which was reported in September 2010.

In January 2012, Network Rail revised the capital cost estimate for GWML electrification between Cardiff and Swansea. These costs are shown below in Table 3.1. The appraisal assumes that the costs of electrification would be financed through the Regulatory Asset Base (RAB) at a rate of 4.75% per annum.

Basic assumptions are as follows:

Application of infrastructure cost estimates based on GRIP Stage 2 study but revised by Network Rail in December 2011;

Rolling stock costs based on up to date lease cost data estimates provided by IEP and leasing companies; and

Operating costs based on operating assumptions and adjusted to reflect rolling stock performance and proposed timetables.

A key consideration regarding the extent of electrification is the frequency of diesel services that can be sensibly converted to electric operation and the likely growth of passenger demand. Following electrification to Swansea, it is proposed to convert one Swansea to Cardiff diesel service per hour to electric operation with the potential to convert a further two diesel services per hour (from Maesteg) should Valley Lines Electrification go ahead. Together with the hourly IEP electric service, this could result in 2 electric trains per hour throughout the day between Swansea and Bridgend and up to 4 electrical trains per hour between Bridgend and Cardiff.

Table 3.1 - GWMLE Capital Cost Estimate, Cardiff to Swansea

	Cardiff to Bridgend	Bridgend to Swansea	Total (Cardiff to Swansea)
GRIP 2 Spot Cost Estimate			
Total Cost Including Risk Allowance (20%)			
Total Cost Including Optimism Bias	£75.0m	£80.6m	£155.7m
Present Value Costs (2002 Market Prices / Values) Including RAB Repayment Costs	£50.5m	£54.3m	£104.7m

3.3.3 Passenger Benefits

WebTAG 3.15.4 (Rail Passenger Demand Forecasting), as drafted, provides the guidance for preparing demand forecasts for rail journeys. A baseline or ‘do minimum’ demand forecast has been developed for rail services affected by main line electrification. Both high (‘Continued Growth’) and low (‘Constrained Growth’) forecasts have been derived in order that the sensitivity of the results to lower than expected demand can be assessed. The main or central case results included in this business case are based on the ‘Constrained Growth’ forecast with a cap on demand and revenue growth set at 2032.

The demand forecasting exercise is based on a MOIRA model which calculates the impact of changes in service frequency or travel times. The electrification option has been compared with the do-minimum using MOIRA to determine the effect on passenger demand of replacement of local diesel services with electric operation.

The use of electric trains is likely to result in more efficient access and egress for passengers at stations, which, potentially, results in reduced journey times. This will generate user benefits and, by making services more attractive, will be expected to attract additional passengers. These effects are shown to be the case in the MOIRA analysis, whereby journey time savings, decongestion benefits and increased revenue are forecast (see Table 3.2).

A technical note¹³ on demand forecasting and passenger demand is included as a separate appendix to this business case.

3.3.4 Environmental Benefits

The Welsh Government has a statutory duty to promote sustainable development and is seeking to radically reduce Greenhouse Gas emissions to which transport is a major contributor. Similarly, one of the DfT's goals is to achieve a balance between economic and environment objectives with a commitment to reduce carbon emissions and make best use of existing assets.

Wales currently has a relatively carbon intensive transport system. In respect of rail operations, electric traction would result in a much lower carbon production per vehicle track kilometre than diesel traction. Currently, none of the rail network is electrified in Wales, in contrast to the 40% of the overall rail network across the UK that has been electrified¹⁴.

Under legislation enabled by the Environment Act 1995, the City of Swansea established an Air Quality Management Area (AQMA) in the Lower Swansea Valley. It was recognised that part of the area, at Hafod, would fail to meet NO_x emissions standards. The AQMA contains the site of the railway sidings and maintenance facility at Landore, where the operation of diesel trains, including overnight stabling, contributes to the environmental issues in the valley.

The mitigation of any future deterioration of air quality in the AQMA is a statutory responsibility of the local authority and efforts to reduce the transport emissions in this area, including as a result of road traffic and rail transport, is an important objective, consistent with wider environmental policy.

3.3.5 Value for Money Assessment

A 60 year economic appraisal has been undertaken and the results are summarised in Table 3.2. The Appraisal Summary Table shows the result of the economic appraisal of electrification from Cardiff to Swansea, alongside the appraisal of extending the electrification project to Swansea and operating fully electric trains between London and Swansea. The results in Table 3.2 are on the basis of the service pattern described as 'Option 1'.

Column 1 in Table 3.2 reproduces the economic appraisal undertaken by DfT for the electrification of the GWML between London and Cardiff. Column 2 in Table 3.2 demonstrates that there is a positive economic case for electrifying the main line between Cardiff and Swansea. The Net Present Value of Option 1 is 15.2 with a benefit-cost ratio of 1.4.

The appraisal result given in Column 2 includes the cost of electrification of GWML between Cardiff and Bridgend. However, this section of track would also form part of Valley Lines Electrification (VLE). Column 3 shows the economic appraisal assuming that electrification of the main line builds on VLE. If VLE

¹³ Great Western Main Line Electrification Cardiff to Swansea: Demand Forecasting, Arup (January 2012)

¹⁴ Network Rail, Network RUS: Electrification Strategy, 2009

were to go ahead, then the electrification of GWML between Bridgend and Swansea would be likely to be delivered at no net cost to government with a net present value of £68.6 million.

Table 3.2: Economic Appraisal Summary Table (Option 1)

	Electrification London to Cardiff and Bi- Mode IEP trains to Swansea¹⁵ £m	Electrification Cardiff to Swansea and IEP Electric Trains to Swansea¹⁶ £m	Electrification Bridgend to Swansea, building on VLE¹⁷ £m
(a) Time Benefits	470	37.0	37.0
(b) Crowding Benefits	550	-	-
(c) Highway User Benefits	605	3.5	3.5
(d) Environment Benefits	110	20.2	20.2
(e) Other Benefits	160	-	-
(f) Indirect Tax	-200	-7.3	-7.3
(1) Present Value Benefits (a+b+c+d+e+f)	1695	53.5	53.5
(g) Rail Revenue	1075	11.3	11.3
(h) Operating Costs	1270	-55.1	-58.0
(i) Infrastructure Costs	555	104.7	54.3
(2) Present Value Costs (-g+h+i)	750	38.3	-15.1
NPV (1) - (2)	945	15.2	68.6
BCR (1) / (2)	2.3	1.4	No net cost to government

Notes

HM Treasury's 'Green Book' on the Appraisal and Valuation in Central Government sets down clear standards for the economic appraisal of spending and policies by Government departments. WebTAG is the DfT's transport specific guidance. Benefit to Cost Ratio (BCR) calculations are compliant with these documents.

"User benefits" takes account of attributes such as time benefits arise from faster journeys for customers, crowding benefits arise from more capacity being provided and other benefits include reduced noise and increased quality benefits arising from the conversion from diesel to electric traction.

Figures presented are discounted £m 2002-03 prices

Figures for London to Cardiff are rounded to nearest £5m. BCRs are calculated from unrounded figures.

¹⁵ For electrification of London to Cardiff, values are taken from the Department for Transport's business case (House of Commons Library, 'Railway investment on the Great Western Main Line and in Wales'). The format of the Appraisal Summary Table and calculation of the BCR have been amended to reflect current WebTAG guidance.

¹⁶ For electrification of Cardiff to Swansea, values are taken from Arup's analysis for this Outline Business Case

¹⁷ For electrification of Bridgend to Swansea, values are taken from Arup's analysis for this Outline Business Case.

Figures assume a cap in rail demand growth in 2032-33 for electrification of London to Cardiff and 2026 for electrification of Cardiff to Swansea

3.3.6 Sensitivity Tests

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:

Electrification Service Pattern – An economic appraisal of electrification assuming the service pattern described above as ‘Option 2’; and

Demand Growth – A version of the appraisal has been undertaken employing the ‘Continued Growth’ scenario to assess the sensitivity of the business case to the level of future passenger demand growth.

Option 2 Service Pattern

Under Option 2, an hourly diesel service between Maesteg and Cardiff would be replaced by an hourly electric service operating between Maesteg and Bristol. If this service pattern were to be employed, the benefits of electrification would be strengthened with a slight increase in the Present Value Benefits of approximately £3m. There would also be a further reduction in operating costs on top of the cost saving forecast for Option 1.

If the full costs of electrifying from Cardiff to Swansea and Bridgend to Swansea are included, Option 2 has a positive economic case with a BCR of 1.3. However, if Valley Lines Electrification were to go ahead, GWMLE would be delivered at no net cost to Government.

Table 3.3: Economic Appraisal Summary Table – Option 2 Service Pattern

	Electrification Cardiff to Swansea and Bridgend to Maesteg £m	Electrification Bridgend to Swansea building on VLE £m
(a) Time Benefits	40.7	39.4
(b) Crowding Benefits	-	-
(c) Highway User Benefits	3.9	3.6
(d) Environment Benefits	20.2	20.2
(e) Other Benefits	-	-
(f) Indirect Tax	-8.2	-8.2
(1) Present Value Benefits (a+b+c+d+e+f)	56.6	54.9
(g) Rail Revenue	13.0	12.0
(h) Operating Costs	-56.9	-59.8
(i) Infrastructure Costs	115.0	54.3
(2) Present Value Costs (-g+h+i)	45.1	-17.5
NPV (1) - (2)	11.5	72.4
BCR (1) / (2)	1.3	No Net Cost to Government

Demand Growth

Under conditions of higher future growth in demand for rail services in South Wales, the benefits of electrification would be increased. The benefit cost ratio for electrification from Cardiff to Swansea increases under the ‘Continued Growth’ forecast from 1.4 to 1.6.

Table 3.4: Economic Appraisal Summary Table – ‘Continued’ Demand Growth (Option 1)

	Electrification Cardiff to Swansea and Bridgend £m	Electrification Bridgend to Swansea building on VLE¹⁸ £m
(a) Time Benefits	41.3	41.3
(b) Crowding Benefits	-	-
(c) Highway User Benefits	3.9	3.9
(d) Environment Benefits	20.2	20.2
(e) Other Benefits	-	-
(f) Indirect Tax	-7.3	-7.3
(1) Present Value Benefits (a+b+c+d+e+f)	58.2	58.2
(g) Rail Revenue	12.6	12.6
(h) Operating Costs	-55.1	-58.0
(i) Infrastructure Costs	104.7	54.3
(2) Present Value Costs (-g+h+i)	37.0	-16.4
NPV (1) - (2)	21.2	74.6
BCR (1) / (2)	1.6	No Net Cost to Government

3.4 Summary of Economic Case

The economic appraisal has shown that the operating cost savings as a result of electrification of GWML between Cardiff and Swansea are not likely to out-weigh the estimated capital costs necessary to provide the electrification infrastructure. Electrification will be expected to generate user benefits and relatively modest additional revenues as well as providing significant environmental benefits. When these benefits and rail revenues are taken into account, the net present value of the scheme is estimated to be £15.2 million with a Benefit to Cost Ratio (BCR) of 1.4. This evaluation includes the cost of electrification of GWML between Cardiff and Bridgend.

As the present value cost (2002) of electrification of GWML between Cardiff and Bridgend is estimated to be £50.5 million, if Valley Lines Electrification (VLE) were to go ahead, then the electrification of GWML between Bridgend and Swansea would be likely to be delivered at no net cost to government with a net present value of £68.6 million.

The GRIP 2 work by Network Rail and earlier business case work by the DfT for the whole London to Swansea scheme illustrate that the scheme is feasible and has

¹⁸ For electrification of Bridgend to Swansea, values are taken from Arup’s analysis for this Outline Business Case

a range of potential benefits, which supports the current economic appraisal findings.

Importantly, there are year on year operating cost savings compared with the minimum diesel operation and further industry cost savings that have not been valued for this business case which are likely to be significant.

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

4 Feasibility (Commercial Case)

4.1 Introduction

A market analysis has been undertaken for the Great Western Main Line rail network in South Wales, including the local services between Swansea and Cardiff and Bristol. This has considered current service patterns, existing passenger numbers and historic growth trends. This has indicated that there is only limited crowding on peak trains, despite considerable growth in demand from a relatively low base patronage.

The existing road network in South Wales is operating near to capacity during peak periods, which impacts on journeys that include the M4 and produces variable journey times on commuter routes into Cardiff, Swansea and Newport. It is noted that the potential to increase highway capacity is severely constrained.

The potential for future rail demand is dependent on growth of the economy in South Wales, particularly in the main centres of Newport, Cardiff, Bridgend and Swansea. However, increasing pressure on the M4 and the main commuter routes raises the possibility of an increasing mode share for rail as comparative journey times become more attractive.

Electrification to Swansea will impact upon services that are currently either in the Great Western Main Line Franchise operated by First Great Western or in the Wales and Borders Franchise, which is operated by Arriva Trains Wales and managed by Welsh Government in co-operation with the DfT. Both franchises are due for renewal by 2018. It is assumed that the output specifications following electrification will form an important part of the new franchise arrangements.

4.2 Output Based Specification

A draft timetable for GWML services has been prepared by DfT ready for implementation in December 2017, assuming electrification to Cardiff. This is subject to review and confirmation in respect of the IEP rolling stock procurement. As this business case is for the incremental change between Cardiff and Swansea, no alterations to this timetable have been made. The timetable for local Swansea-Cardiff stopping trains has been reviewed and optimised to an even, clockface service. Further work on the integration of the new timetables with other services will take place as part of the Full Business Case and will need to be discussed as part of negotiations with bidders for the new franchise.

4.3 Contracting and Procurement Strategy

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

Infrastructure Capital Works

The procurement of the electrification infrastructure works is part of the wider GWML improvement, which will be managed through Network Rail. As part of the GRIP 2 assessment, the programme for delivering an electrified railway to Swansea was confirmed by Network Rail as being achievable by December 2017. However, this would require further design work (GRIP 3) to commence in the Spring/Summer of 2012.

At present only the electrification to Cardiff is scheduled for December 2017, with installation as far as Bristol scheduled for delivery a year earlier. The procurement of the High Output OLE Plant has recently been approved, thereby mitigating one potential risk to the programme.

Rolling Stock

Rolling stock for the GWML services is subject to ongoing negotiations on the IEP procurement, which aim for financial close in Spring 2012.

For the local Swansea-Cardiff-Bristol services, there is scope for new financing and procurement models to be introduced, in line with the Welsh Government's commitment to reducing costs.

Available cascaded electric rolling stock for the local Swansea-Cardiff-Bristol services will depend on different deployment requirements. As parts of the network become newly electrified the demand for cascades grows as does pressure on upgrading existing fleets to allow flexibility. 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).

The benefits of traditional or innovative approaches will be considered further for the Full Business Case.

Train Operations

The concept of electrification to Swansea has already been discussed with the existing franchisee. First Great Western has provided comments to the DfT in respect of the current proposal and IEP procurement, and to Welsh Government in respect of this Outline Business Case, and is supportive of the enhancement.

Whilst changes can be negotiated via the Franchise Change mechanism in the Franchise Agreement, it would be advisable to endeavour to anticipate likely changes and to include for these 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). This emphasises the timely opportunity for considering the full electrification to Swansea now, in the run up to franchise change, rather than as part of a future extension.

Other issues surrounding this, including allowing innovation and ensuring performance and efficiency targets, create the incentive mechanism for Government to capture the financial benefits of electrification.

4.4 Resources

Energy Security

There is growing awareness of the vulnerability of reliance on diesel supplies as future energy source to run UK railways. Since the UK is not self sufficient in oil supplies, reliance on diesel for rail operations will be a risk in the future in relation to availability and price. Conversely, use of electricity as the energy source means that Government has a measure of control over long term supplies, mix of generation source (a sustainability/environmental/cost issue) and tariffs/costs to end users.

Future Availability of Diesel Trains

For rail operations worldwide, the focus has moved to provision of electric traction for rail operations. As a consequence of this, rolling stock manufacturers are increasingly interested in developing new models for electric units and are becoming less interested in manufacturing diesel traction vehicles for rail operations. This will be reflected in both availability and cost of new diesel units in the future. In the short term, cascaded diesel units may be available, however, these will have limited useful life, so that planning for future diesel rail operations will result in risk in relation to both availability and cost.

Electrification Power Supply

As part of the commitment to electrification of the Great Western Main Line from London to Cardiff by December 2017, a high voltage power source will be provided at Imperial Park, just west of Newport. This will make available sufficient power to supply the extension of the main line electrification to Swansea as well as the potential electrification of the Valley Lines.

As part of the GRIP 2 work, investigation of feasible sites for a depot and operations base for the High Output OLE Plant train has been carried out. Of the four potential sites considered only two meet the high level assessment criteria, one at Swindon and one at Margam, 15 miles from Swansea. This is the only feasible site in South Wales from which to serve the western part of the network electrification. Its location makes it ideally suited to facilitate the incremental electrification to Swansea as efficiently as possible.

Capacity to Deliver Electrification Infrastructure

The procurement of the High Output OLE Plant allows flexibility in the delivery of the necessary infrastructure for electrification. Essentially, this process will be an east to west programme working along the line to install poles, wires and

lineside equipment. Network Rail has confirmed that installation to Swansea is achievable to meet the programme for a timetable update in December 2017.

Any risk to the completion of the infrastructure works could be mitigated through the availability of diesel powered trains to cover any interim period. For the GWML this could be achieved in two ways:

Retain Intercity diesel locomotives (or full train sets) to operate until the electrification is complete. Note that this will delay the whole timetable update as the slower Intercity 125 trains would not permit the new IEP trains to achieve the projected time savings.

Operate with bi-mode trains from the IEP procurement. This would require significant additional investment in spare power cars for a relatively short period of time. Whilst future electrification projects may realise onward cascade of these vehicles this would be less efficient than the proposed delivery of rolling stock.

For the local Swansea to Cardiff services, the option to delay the replacement of existing diesel rolling stock with electric rolling stock must be considered. It is not anticipated that the existing rolling stock will be cascaded to elsewhere on the network, therefore it is important to avoid any inefficient refurbishment or heavy maintenance costs in this period.

Welsh Government will co-operate with Network Rail and the DfT to optimise the infrastructure delivery, including alternative methods to procuring additional resources.

4.5 Need for Immediate Action

The commitment to electrification of the Great Western Mainline from London to Cardiff by December 2017, together with the ending of the existing Great Western Franchise and need to replace the existing life-expired high speed trains has created a once in a generation window of opportunity for investment in, and improvement of, rail operations on GWML throughout South Wales. If the opportunity is not seized at this time, then the obstacles set in place through the new Franchise Agreement, rolling stock leasing agreements and government priorities (budgeting, commitments under investment programmes etc) will mean that electrification of GWML from Cardiff to Swansea will not occur within the foreseeable future. In reality, this is likely to be 30 years or more.

It is, therefore, vitally important to the continuing economic and social well-being of Wales/South Wales, in general, and South West Wales, in particular, that every effort is made to secure the investment and resources necessary to deliver electrification from Cardiff to Swansea during CP5 (2014 - 2019). In order to achieve this, it is necessary to commission GRIP 3 works to commence no later than Spring/Summer 2012. These works will need to be undertaken by Network Rail and it is vitally important that Welsh Government maintains dialogue with Network Rail to ensure that these works are commissioned.

4.6 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.

As the GWML and Wales Franchises come up for renewal it may be possible to develop ways of evaluating bids to promote innovation and franchise development over and above the basic 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. This could also increase the incentive for re-investment directly into the franchise or into infrastructure used by the train operating company involved, based on a clear output specification.

The proposed payment mechanism for the new franchises will be established during the preparation for letting the franchises, involving both Welsh Government and the DfT. This will need to take full account of electrification projects and any other changes to rail operations, including geographic coverage. The franchise payments will subsequently provide some insulation to the Welsh Government and DfT budgets from the ups and downs of franchise revenues and costs.

4.7 Risk and Value Management

Management of risk is an on-going process throughout the life of the project. Many of the risks associated with the electrification project are borne pro rata by the London to Cardiff electrification and, as such, a robust approach to the management and mitigation of risk is already assumed. The full business case will identify any pertinent risks associated with the incremental project for electrification between Cardiff and Swansea.

The chief risk is associated with the timescale for delivery of the infrastructure in order to comply with a timetable update in December 2017. Completion against this risk will be a requirement for Network Rail, who have confirmed, through the GRIP2 assessment, that the programme is deliverable.

Another specific risk is the requirement for re-signalling at Port Talbot West. This section still retains 1970s signalling infrastructure and the worst case assessment is for full replacement, which presents a better option than complicated protection of existing circuits. These works are currently programmed for CP6 (2019-2024) but the costs for electrification include a sum for advancing these works into CP5. Further analysis of the feasibility and detailed programming of these works is required as part of GRIP 3 work and for the full business case.

Other aspects of the project that may have specific risks for the Cardiff-Swansea section not pro-rata to the remainder of the GWML electrification may include the following:

- Land and access
- Consents

Mining stability and environmental mitigation
Ground works
Listed structures
Electrical power distribution sites

These have already been considered as part of the GRIP 2 work by Network Rail, so management of any potential risks is ongoing.

In conjunction with the rail electrification programme, the IEP rolling stock procurement will deliver the new electric and bi-mode trains to operate across the GWML network. The current plan is for three train types of which, the long bi-mode trains (8-car trains) are predominantly allocated to cover the service to Swansea, which requires diesel operation if electrification only goes as far as Cardiff. If electrification to Swansea were to be implemented, there may be an opportunity to adopt a two train type fleet. In this case, parts of the network not electrified will be operated with short bi-modes (5-car trains) or coupled bi-modes (two x 5-car trains). This would be likely to significantly reduce risk to timely completion of the IEP rolling stock procurement and would certainly lead to reduced costs of development and manufacture.

Risk management plans will need to be in place to deal with new 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. The rail industry has established mechanisms for allocating, managing and transferring risk including suitable arrangements through the franchise process. These allow for strategies and incentives aimed at managing risk in a way that aligns them specifically to network or service outcomes.

Value management will provide a structured approach to obtaining the optimum balance of benefit in relation to cost and risk.

4.8 Efficiency and Innovation

In seeking to achieve the cost reductions called for by McNulty, Welsh Government is promoting the GWML electrification to Swansea alongside electrification of the Valley Lines 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, First Great Western 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 rail services and infrastructure improvements for Wales.

4.9 Summary of Commercial Case

The electrification of the GWML to Swansea is feasible as an increment to the proposed scheme to electrify as far as Cardiff. Established contractual and procurement processes are in place and known processes would be employed. There is some scope for innovation and efficiency, some of which arise specifically in relation to the full scheme to Swansea.

Resources are likely to be available to undertake the project and no additional programme risks have been identified that are not already considered in the GRIP 2 work by Network Rail, which establishes the feasibility of the project. A number of risks are identified, all of which relate equally or pro-rata to the approved scheme to Cardiff. Specific risks associated with the Cardiff-Swansea section of the GWML are identified in the GRIP 2 work and are manageable.

The timetable and resources for completion have been confirmed, subject to further work by Network Rail in GRIP 3. It is vitally important that these GRIP 3 works are commissioned and under way by Spring/Summer 2012 and that Welsh Government takes the initiative in dialogue with Network Rail to ensure that this is the case. There is an existing and robust approach to risk management and relevant risks have already been identified.

Market interest in operating an electrified railway to Swansea has been established through discussions with the existing franchise operator and will be tested during the franchise process.

The involvement and support of Welsh Government, and its commitment to delivering the projected improvements in partnership with the DfT, Network Rail and the train operating companies reflects an effective approach to implementation.

Of particular relevance is the holistic approach to reducing maintenance and renewals effort and the long term investment in whole life solutions and cost reduction approaches that could arise through electrification. This could also result in more effective or innovative procurement of rolling stock involving Welsh Government.

5 Affordability (Financial Case)

5.1 Introduction

Affordability has been assessed in the context of the ongoing costs of operations, as a key input to franchise subsidy calculations, as well as the affordability of the upfront capital investment. In respect of this incremental business case, a number of cost savings are already captured in the case for London-Cardiff electrification and have not been double counted.

5.2 Capital Costs

The capital costs for full electrification from London to Swansea were estimated by Network Rail to GRIP 2 standard (Governance for Railway Investment Projects, Level 2), which is suitable for input to a business case of this type. Furthermore, these costs have been previously used by the DfT to develop the business case for the full electrification to Swansea (conducted in 2010), which identified a benefit to cost ratio range of 1.6-1.9 (compared with 1.6-2.0 for London to Cardiff). These GRIP 2 point estimate costs, excluding optimism bias, are shown in Table 5.1.

Table 5.1: GRIP 2 costs for GWML Electrification (Source: Network Rail)

Cost Heading	Point Estimate London-Swansea (£m)	Estimated Costs London-Cardiff (£m)	Difference – Cardiff-Swansea (£m)
Civil Engineering	█	█	█
OLE	█	█	█
Distribution	█	█	█
Power Supply	█	█	█
Signalling	█	█	█
High Output OLE Plant	█	█	█
Network Rail Staff Costs	█	█	█
Point Total	█	█	█
Contingency	█	█	█
Schedule 4 (possessions)	█	█	█
Newbury works (incl. signalling)	█	█	█
Signalling works acceleration	█	█	█
Consents	█	█	█
Total	█	█	█
Grand Total	766.0	703.5	62.5

Note that the costs for electrification to Cardiff were not subject to a separate GRIP 2 exercise but are indicative values derived from estimating the reduced scope of work this would entail.

The total capital cost for electrification of the GWML project (London to Swansea, excluding the section from London Paddington already electrified) was estimated at a point cost of £766m (Q4 2008 prices), including contingency and risk but excluding optimism bias. This sum included a number of enabling works including the programme acceleration of re-signalling. The works cover the whole 248 total route miles and 622 track miles from Maidenhead to Swansea.

Network Rail has recently revised the capital cost estimate for GWML electrification between Cardiff and Swansea to be “in excess of £100m excluding any additional BSP/DNO requirements”. This is based on unit rates from the GWML Electrification GRIP 3 Output and actual delivery costs being incurred on the North West Electrification Project.

The latest (January 2012) capital cost estimates provided by Network Rail are shown in Table 5.2.

Table 5.2: Updated High Level Estimate

	Cardiff to Bridgend	Bridgend to Swansea	TOTAL
DIRECT COSTS			
Civils (Bridge clearance & Parapets)			
Platform Extensions			
Overhead Line Equipment			
Distribution			
Power Feeder Cable			
Signalling			
Control & Systems			
DIRECT COSTS – SUB TOTAL			
Contractors Indirects			
CONSTRUCTION COST – SUB TOTAL			
Survey & Design			
Network Rail PM / Sponsor			
Land Acquisition			
Schedule 4			
THREE POINT ESTIMATE	41,690,193	44,795,017	86,485,210
Risk to Pmean (20%)	8,338,039	8,959,003	17,297,042
PROPOSAL ESTIMATE	50,028,232	53,754,021	103,782,252
Risk Pmean to P80 (10%)	5,002,823	5,375,402	10,378,225
PROGRAMME ESTIMATE	55,031,055	59,129,423	114,160,477

Source: Network Rail

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, acknowledging the commitment to electrification made by the DfT and the parallel rolling stock investment for the IEP procurement.

5.3 Operating Costs

The business case for electrification beyond Cardiff to Swansea includes only incremental changes in operating costs. By taking the committed electrification from London to Cardiff as the do-minimum reference case, the majority of the operating costs, which are expended to cover the London-Cardiff segment, are already accounted for. In both the do-minimum and the electrification option, a similar service to the existing service is offered, but with an updated timetable incorporating journey time savings along the route.

The following operating cost impacts are included in the business case assessment:

- Fixed track access charges represent Network Rail's fixed cost (determined at periodic review) to maintain the network. The business case includes the additional fixed maintenance costs required to maintain electrification assets;

- Variable track access charges recover the variable costs of running traffic on the network, which vary by train type. The business case includes the reduced cost of these charges that result from running electric rolling stock;

- Rolling stock charges (non-IEP) represent the change in capital and non capital leasing costs associated with leasing non-IEP trains. These are made up of the difference between leasing diesel trains and bi-mode trains compared to electric trains;

- Rolling stock capital lease charges (IEP) represent the capital leasing costs of IEP trains. Savings in this area are due to the lower capital cost of an IEP electric train compared to a IEP bi-mode train;

- Rolling stock maintenance charges (IEP) represents the ongoing maintenance costs for IEP trains, which are lower for IEP electric trains compared with IEP bi-mode trains;

- Diesel fuel costs;

- Electricity supply charges.

The estimated values of these impacts (discounted over the life of the 60 year appraisal) are shown in Table 5.3.

Table 5.3: Estimated Operating Cost Savings for Electrification to Swansea – Option 1 (2002 Prices/Values)

Cost Heading	Electrification Cardiff to Swansea (£m)	Electrification Bridgend to Swansea (£m)
Fixed track access charges	■	■
Variable track access charges	■	■
Rolling stock charges (non-IEP)	■	■
Rolling stock capital lease charges	■	■
Rolling stock maintenance charges	■	■
Diesel fuel costs	■	■
Electricity supply charges	■	■
Total	55.1	58.0

A technical note¹⁹ on operational cost modelling used in this appraisal is included as a separate appendix to this business case.

These cost savings relate to both GWML and local services but are specific to the benefits of a change in operation between Cardiff and Swansea or from the marginal benefits of operating fully electric vehicles rather than bi-modes between London and Swansea.

The timing of these benefits is also important in that they optimise the benefits that electrification offers in terms of future franchises. A reduction in operating cost, and the potential to increase ridership through more attractive services, leads to more cost-effective future franchises. It is noted that the fuel and power supply costs include for electricity being retained to the National Grid through regenerative braking.

It is relevant to note that, in addition to the operating cost savings noted here, the benefits that could accrue to the DfT from taking the opportunity afforded by electrification to Swansea to simplify the IEP fleet requirement to just two train types are not included. These benefits could subsequently be taken into account depending upon on-going negotiations regarding rolling stock procurement by DfT.

5.4 Revenues

In addition to the increases in revenue forecast due to electrification, further additional revenue from passenger growth may occur as a result of accelerating the rate of growth expected for rail travel. Growth in demand for rail is anticipated for the Cardiff-Swansea corridor as a result of the following:

- Employment growth increasing the amount of commuting to Cardiff;
- Population growth in the major communities across South Wales;

¹⁹ Great Western Main Line Electrification Cardiff to Swansea, Technical Note on Operational Cost Modelling, Arup (January 2012)

Increasing congestion on the M4 corridor and on the main commuter routes into Cardiff, Swansea and Newport;

Increase in the relative competitiveness of rail as a direct result of service enhancement such as a journey time improvement associated with the conversion from diesel to electric operation; and

The “sparks effect” of an additional demand response associated with a step change improvement such as electrification.

Growth associated with the first three factors, being economy based, applies equally to the do-minimum and do-something scenarios. The last two factors capture the benefit of investment aimed at making rail travel a more attractive option for regular journeys.

The benefits from journey time savings for IEP services are already captured in the business case for London-Cardiff electrification due to operating bi-mode trains for Swansea services.

Benefits from the conversion of local Swansea-Cardiff services from every two hours to hourly are also captured in the do-minimum, so the direct revenue benefits from service enhancement is the marginal improvement from running electric trains on local services. This is likely to result in modest journey time savings which, in turn, will result in additional revenue.

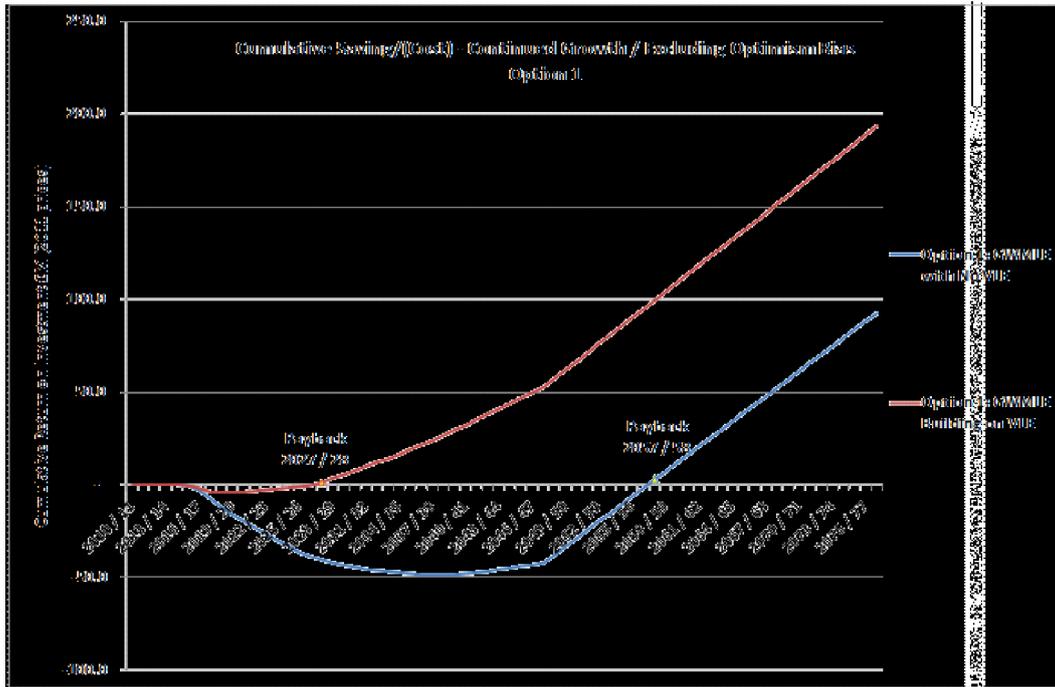
Experience from elsewhere in the UK indicates a potentially higher rate of demand growth and revenue stimulated by a step change in the quality of service offered. A strong example is the introduction of new electric trains on services between Leeds and Skipton in West Yorkshire. This “sparks effect” is shown to be a sustainable increase.

The proposal for electrification to Swansea, creates the opportunity to re-focus South Wales main line services to take account of passenger demand as described in 3.2. This will result in an electrified Swansea to Cardiff to Bristol service and, potentially, an electric service between Maesteg and Bristol.

5.5 Financial Return on Investment

By comparing the operating cost savings and revenue resulting from the GWMLE with the cost of repaying (via the RAB) the capital costs of investment, it is possible to estimate when a financial return on investment for Government might occur. Figure 5.4 illustrates the ‘break-even’ period for GWML under Option 1. The chart shows that a positive financial return might be expected by around 2057/58, around 30 years after the initial investment. If, however, GWMLE is considered to build on VLE and the costs of electrification from Bridgend to Swansea only are included, the breakeven period is much sooner and would be achieved after only 10 years.

Figure 5.4 – Financial Return on Investment (Cumulative Saving/Cost)



5.6 Budgets and funding

The capital costs used in this business case analysis derive from the DfT and Network Rail, utilising the resource allocation and budget approach to apportionment. No further interrogation of capital costs has been undertaken.

The availability of funding for the project, and the budgeting of costs, is related to the forthcoming CP5 investment period (2014-2019) and meeting the aspirations of the Initial Industry Plan. It is also related to the affordability of the GWML electrification project to Cardiff and the cost of the associated IEP fleet procurement.

5.7 Summary of Financial Case

With electrification, the operating costs for both GWML and local services are reduced through the use of electric trains, which have lower fuel costs and less impact on infrastructure maintenance (shown in variable access charges). There is the possibility of significant additional operating cost savings to the UK rail industry through efficiencies in the IEP procurement that are supported by the electrification to Swansea.

The overall affordability of the scheme is set within the context of the current proposal to electrify to Cardiff and in the procurement of new rolling stock as part of the IEP. Electrification will significantly reduce the overall future costs of subsidising the franchise and therefore the project is considered to be affordable.

6 Achievability (Management Case)

6.1 Introduction

Achieving the proposed outcomes for GWML electrification requires meeting a series of correlated milestones, summarised as follows:

- Timely approval and completion of GRIP 3 study by Network Rail;
- Financial close and completion of IEP procurement
- 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;
- Negotiation on re-tender of Great Western Main Line and Wales franchises
- Preparation of output specification for new Great Western Main Line and Wales franchises;
- Completion of Cardiff Area Signal Renewal (CASR) and Port Talbot West re-signalling by Network Rail.

6.2 Programme/Project Dependencies

Welsh Government is the sponsor for this project (electrification between Cardiff and Swansea) but the works will require integration with the DfT-sponsored electrification between London and Cardiff and additional support from DfT and Network Rail. The timing for decisions on the business case is integrated with the need to progress with a GRIP 3 study on the electrification and for working to financial close on the IEP procurement, both of which need to take place early in 2012.

Programming of the re-signalling work for Port Talbot West by Network Rail also requires approval to bring it forward from CP6 to CP5.

6.3 Governance and Organisation

Throughout the development and delivery of the electrification of GWML between Cardiff and Swansea, 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 also assist to procure services in an efficient manner and to provide contributory funding.

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 and for ensuring the continued heritage of train maintenance expertise based in Swansea.

Welsh Government intends to build upon its existing internal resources to establish its Rail Division that will, amongst other things, contribute to the management and delivery of the GWML electrification and the establishment of the new Wales Franchise. Welsh Government recognises the need for further resources and skills in rail operations, planning, and management and is in the process of reinforcing capabilities in these skill areas.

In order to facilitate electrification of GWML from Cardiff to Swansea, a **Project Board** has been established, comprising of senior managers in Welsh Government with ultimate responsibility for ensuring an effective contribution to delivering GWML electrification. The Project Board reports to a **Senior Management Team** within the Welsh Government at key stages of the project's development; and who in turn liaise directly with the appropriate Minister to achieve approval for any expenditure and delivery.

6.4 Project Plan

The programme for this project is dependent on decision making by Welsh Government and the DfT over the procurement and funding of services, with several important and parallel work streams. In particular, urgent liaison between Welsh Government and the DfT is required to secure the GRIP 3 work from Network Rail and to investigate IEP procurement options. Following these discussions, a project delivery plan will be established. The project delivery plan will include key assurance and approval milestones.

6.5 Communications and Stakeholder Management

GWML electrification has strong 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 extension of electrification to Swansea has considerable political and public backing. 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, a Wider Stakeholder group has been identified and these will be invited to participate in stakeholder events as the project is taken forward.

6.6 Risk Management Strategy

In order to facilitate efficient delivery of the GWML electrification to Swansea within the CP5 investment programme, a risk management strategy will be rolled out to assist Welsh Government, DfT and Network Rail 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 project.

6.7 The Planning Process

A review of the planning process and potential planning risks with respect to electrification has been undertaken at a preliminary level. Network Rail is generally afforded development rights under the General Permitted Development Order 1995 (GPDO) where development is restricted to Network Rail land.

The GRIP 2 study has concluded that a Transport & Works Act (TWA) application may be required for work in Wales, where the recently created Infrastructure Planning Commission (IPC) for England does not extend. Specific consents will be required in respect of prior approvals, listed buildings, conservation areas and permitted development.

The IPC has created a new process for dealing with planning issues relevant to nationally significant infrastructure projects, with a single, co-ordinated consent strategy. Although more detail is required at the start of the IPC process, once an application has been submitted the decision-making is more streamlined than for a TWA application. However, the planning process, with commensurate stakeholder consultation, is likely to take up to twelve months.

Where aspects of the project fall outside permitted development rights afforded by the GPDO, a planning application will be required to be made to the relevant Local Planning Authority. Given that a significant number of structures will require alteration, the requirement for planning applications could, potentially, require additional financial and time costs to be included in the project implementation process.

Whilst generally it is acknowledged that electrification is unlikely to give rise to significant environmental effects, it should be noted that a development proposal may require an Environmental Impact Assessment and the preparation of an Environmental Statement.

Consistent with a comprehensive approach to understanding the planning requirements, an initial review of planning risks has been undertaken. This has identified the following aspects for consideration:

- Environmental Designations
- Heritage designations and listed buildings
- Economic Issues
- Community Impacts
- Community Safety

However, it is considered that there are no significant planning risks that would jeopardise the delivery of GWML electrification.

6.8 Summary of Management Case

Delivery of GWML electrification to Swansea is dependent upon its integration with electrification between London and Cardiff, with Network Rail re-signalling work and with the IEP procurement. Welsh Government will provide leadership and any support to the DfT and Network Rail in order to realise the investment under CP5. The options for delivery are generally understood at this stage, but decisions will need to be taken in a timely manner 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 electrification projects in Wales.

7 Conclusions

This Outline Business Case has demonstrated that the electrification of GWML between Cardiff and Swansea is likely to have a sound economic basis as it would result in significant operating cost savings and environmental benefits. This is particularly the case if the cost of electrification of GWML between Cardiff and Bridgend were to be covered, either as a result of Valley Lines Electrification, or through an alternative funding source.

The efficiency improvements that would accrue due to electrification align with government policy.

The project is shown to be a good strategic fit with economic, social and environmental goals. It is seen to be feasible, achievable and, as part of HLOS 2, affordable. In addition, there are benefits that are not captured in this Outline Business Case, due to the current stage and confidentiality of the IEP rolling stock procurement process.