Welsh Government

Great Western Main Line Electrification - Cardiff to Swansea

Demand Forecasting and Economic Appraisal Technical Note

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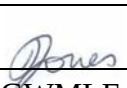
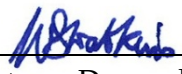
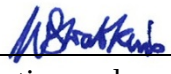
		Signature			
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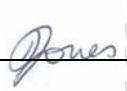
		Signature			
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1 Great Western Main Line Electrification

1.1 Background

The Welsh Government is taking forward a business case for Great Western Main Line Electrification (GWMLE) between Cardiff and Swansea for consideration by the Department for Transport for inclusion in its High Level Output Specification (HLOS2) for Control Period 5.

An Outline Business Case (OBC) document has been produced which summarises the cases for the investment.

This technical note provides detail on the method and results of the demand forecasting and economic appraisal.

1.2 Overview

The economic appraisal has been undertaken in line with WebTAG 3.12[1] guidance which further satisfies Welsh Government appraisal requirements (WelTAG[2]).

Demand Forecasting and Economic Benefits

The demand forecasting methodology and assessment of project benefits is built on the following:

- existing demand and revenue based on data provided by Arriva Trains Wales and First Great Western;
- modelling of demand responses due to changes in journey times and timetabling through application of the MOIRA model provided by Arriva Trains Wales;
- baseline demand forecasts linked to changes in exogenous factors (GDP, population, fuel prices etc) based on Welsh and UK Government forecasts and WebTAG guidance;
- an overall demand and revenue forecast model built by Arup based on the guidance and elasticity parameters (for both endogenous and exogenous factors) provided in the Passenger Demand Forecasting Handbook (PDFH);
- a crowding model, based on guidance in PDFH, for valley Lines to establish the level of suppressed demand and crowding benefits for existing passengers, when new rolling stock and timetable scenarios are delivered[3].
- benefits of reduced car use assessed in line with WebTAG 3.9.5;
- estimation of transport user benefits consistent with TUBA method and based on values of time and vehicle operating costs provided in WebTAG 3.5.6;

[1] Web-based Transport Appraisal Guidance: Guidance on Rail Appraisal
[2] Welsh Transport Appraisal Guidance
[3] Crowding benefits on the Cardiff-Swansea mainline are assumed to be zero (crowding benefits are relevant only for Valley Lines services in the combined GWMLE+VLE package)

Wider Economic Impacts have not been calculated, though the potential for through electric services between Swansea, Bridgend and Filton Abbey Wood would be expected to generate a positive agglomeration impact.

Capital and Operating Costs

Investment and ongoing subsidy costs have been estimated through use of data from the following sources:

- infrastructure cost estimates from GRIP Stage 2 study undertaken by Network Rail (NR), which were refreshed and updated (December 2011) by NR;
- existing operating costs provided by Arriva Trains Wales' current operation;
- rolling stock costs based on up to data provided by rolling stock leasing companies, and;
- track access charges and energy costs based on data and guidance provided by Network Rail.

Economic Appraisal

An economic appraisal of discounted costs and benefits was undertaken in line with WebTAG guidance.

The outputs of the economic appraisal are summarised in a Transport Economic Efficient (TEE) table.

2 Appraisal Options

2.1 Scenarios

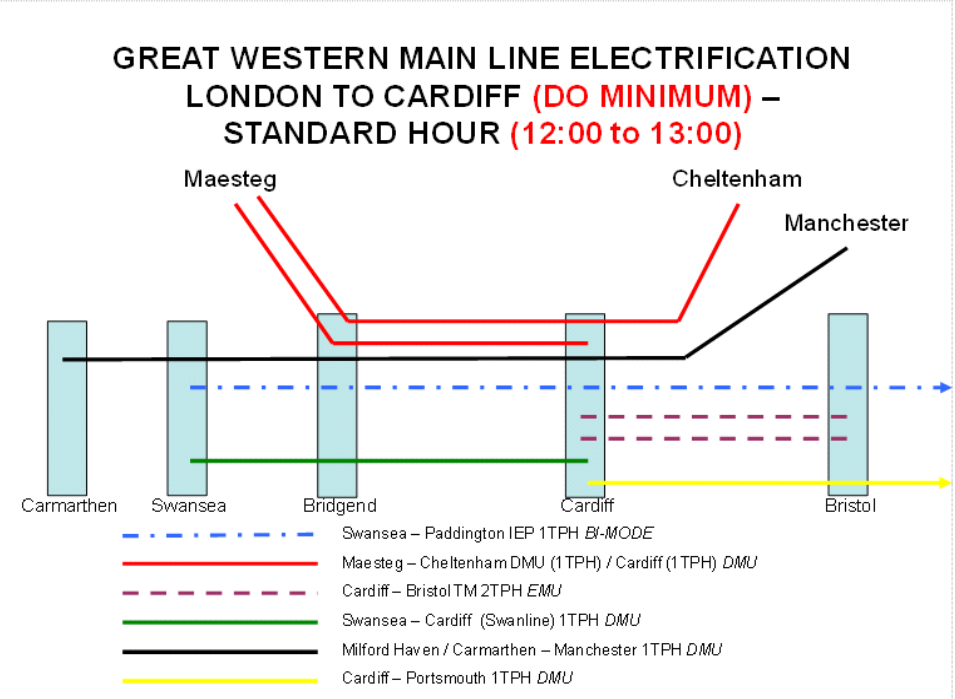
The options taken forward for demand modelling and economic appraisal are as follows:

2.1.1 Do Minimum

The basis upon which service patterns were to be derived for the Great Western Main Line Electrification between Cardiff and Swansea (GWMLE) OBC was the provisional IEP timetable provided by DfT. Subsequently, in December 2011, it was confirmed by DfT that, in the Secretary of State's document, DfT had assumed that Cardiff to Weston services would be split at Temple Meads so that they would run Temple Meads to Weston (Taunton etc) only. The Cardiff/ Bristol section would be covered by a 2tph EMU calling all stations with the Cardiff Portsmouth continuing to run through as today but speeded up to call at Newport only.

In addition to the service pattern set out by the Department for Transport, the Welsh Government is proposing an increase in the frequency of the Cardiff to Swansea stopping service (the Swanline) to 1tph. The Do Minimum service pattern also includes an increase in the frequency of services between Maesteg and Cardiff Central.

Figure 2.1 - Do Minimum Service Pattern



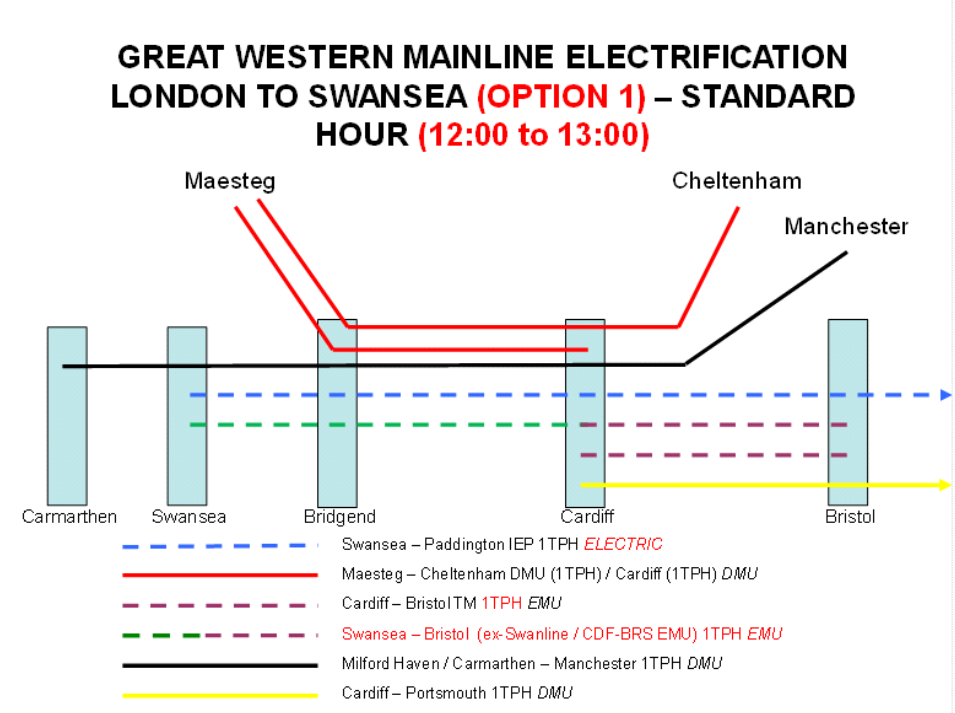
In summary, the following Do Minimum service pattern has thus been used as a basis for further economic appraisal of electrification of the main line between Cardiff and Swansea:

- 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

2.1.2 Electrification Service Pattern – Option 1

Following electrification of the line between Cardiff and Swansea, the proposal is to convert the Swansea – Cardiff hourly stopping train (the Swanline) to EMU operation and linking it with one of the 2tph EMU trains between Cardiff and Bristol to provide a through service between Swansea and Bristol.

Figure 1 - Option 1 Service Pattern

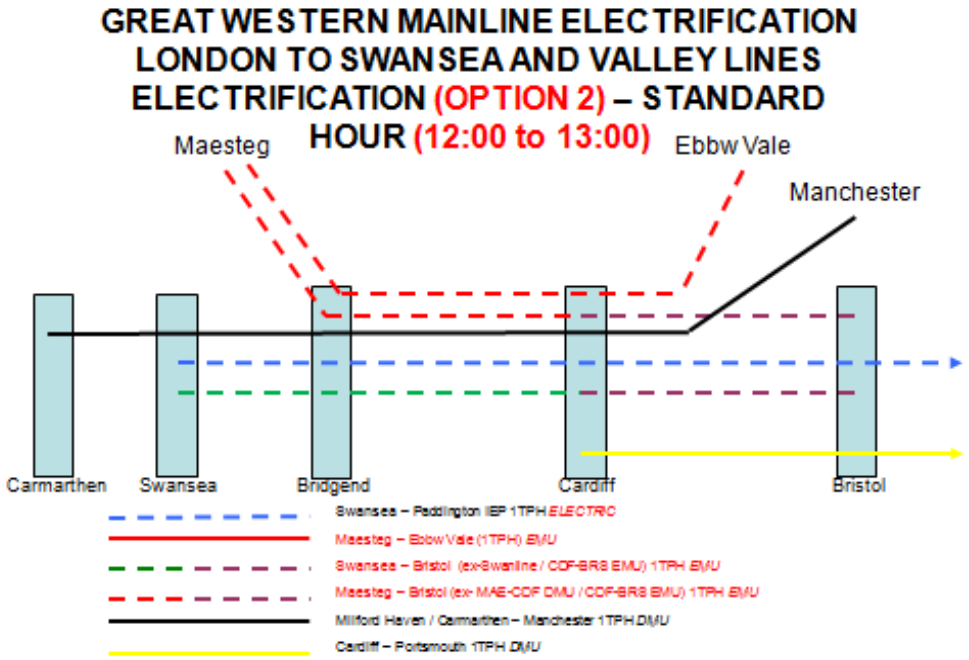


***Option 1**: Do Minimum with London to Swansea electric IEP service and replacement of the hourly Swanline (Swansea/Cardiff) diesel service with extension of a Bristol/Cardiff EMU to provide an hourly electric stopping service Bristol to Swansea;*

2.1.3 Electrification Service Pattern – Option 2

A second electrification option has been developed based on the electrification of the branch line between Bridgend and Maesteg in addition to the main line between Cardiff and Swansea. Option 2 builds on Option 1. Under Option 2 it is

proposed that the service between Maesteg and Cardiff Central would be electrified and extended such that it replaces one of the hourly EMUs between Bristol and Cardiff.



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.*

3 Demand Forecasting Approach

3.1 Overview

A baseline forecast has been produced based on current demand expanded to take account of growth in 'exogenous factors' such as new jobs, residents and growth in GDP.

The MOIRA model was used to predict the changes in demand arising from changes in the timetable.

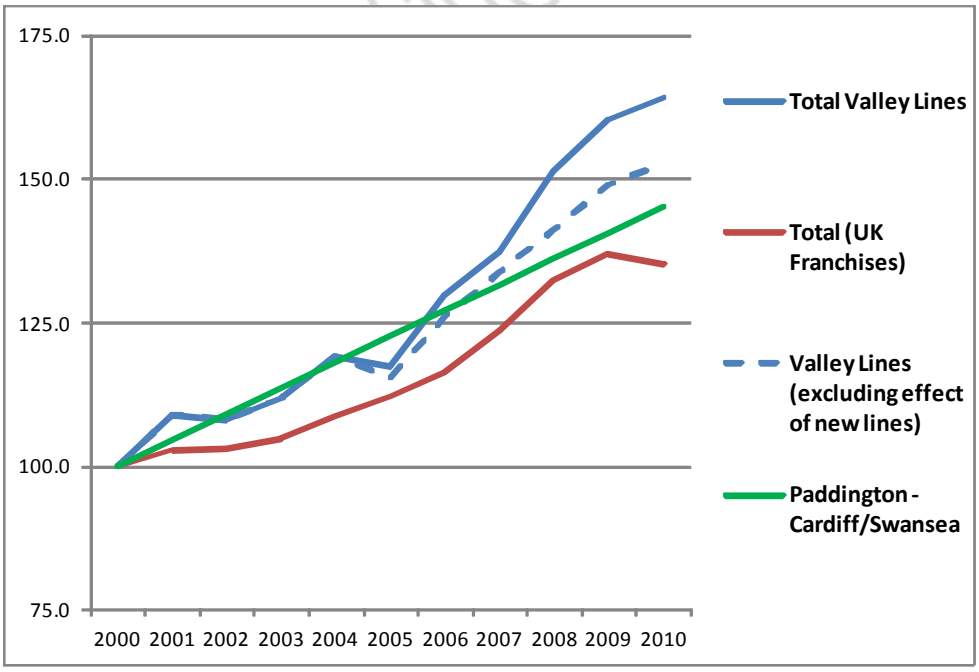
Demand for crowding relief or for journey ambiance effects have not been applied for any GWML services.

3.2 Demand growth

The Wales Rail Utilisation Strategy *(Network Rail, 2008)*, based on analysis undertaken in 2007, contains 'Wales wide' forecasts of 23% growth from 2007/8 to 2018/19 (1.9% per annum) and 34% from 2007/8 to 2025/26 (1.2% per annum). Commuting flows to and from Cardiff were forecast to grow by 7-8% in 2007/8 per annum, steadily falling to 1.5% per annum by 2014. The forecasts in the RUS were developed on relatively conservative assumptions.

Demand growth has exceeded these expectations in recent years, as shown in Figure 3.1. Patronage on the Cardiff/Swansea mainline services has grew by 45% in the 10 years to 2010/11, an average growth rate of 3.8% a year.

Figure 3.1 – Historical Demand Growth



UK Regional Rail Demand (MVA / ATOC)

In 2010, ATOC commissioned research to explain high levels of demand growth on regional rail services in the UK. One of the case studies was Cardiff. The key conclusions of the study with respect to Cardiff were as follows:

- *'Devolution has created an increased focus on Cardiff as a hub for administration, business and leisure within Wales. This has stimulated increased demand for interurban travel with Cardiff increasingly central to these movements. Regeneration has been focused on central locations; but there has also been a conscious decision to focus developments as close to the city centre as possible.'*
- *'Cardiff is now a much greater centre for employment opportunities, but residential locations have not changed in the same quantum to match this shift. Resulting longer travel-to-work distances favour rail and Cardiff is comparatively well served by a regional rail network that is competitive to road travel. The demand for rail has also been enhanced by a historical policy of low fares to support employment amongst communities who have suffered most from declines in heavy industries.'*
- *'In Cardiff, car parking and traffic controls have increased, but changes are still behind other comparable UK cities. The main factor driving any mode shift from the car has therefore been increasing congestion on the roads, and the resulting variability in journey times.'*

The study finds that the elasticities defined in PDFH 4.0 have under predicted growth in regional rail demand. Econometric analysis suggests that, for a range of journey types, elasticities would need to be significantly higher to fit with recent experience.

An alternative set of elasticities with respect to GDP were proposed ranging from 0.4 to 3.48, in comparison to PDFH recommended elasticities of between 0.85 and 1.5. These higher elasticities are based on an assumption that future economic growth is matched by continued structural change in the economy (shifts from manufacturing to service employment) and further increases in the costs of car travel and parking.

The study notes that for the UK as a whole, the shift in employment from manufacturing to services may begin to bottom out. However, in the case of South Wales, manufacturing employment makes up a much higher proportion of total employment and therefore there is good reason to believe that current trends will continue.

3.2.1 Approach Adopted

A baseline forecast, independent of any changes to rolling stock or timetables, has been constructed based on forecast levels of GDP, population, employment and changes in the cost/speed of competing modes.

The MVA analysis shown above provides evidence that the standard rail PDFH demand modelling guidance has failed to predict the growth on the Valley Lines (and other regional rail services) in recent years. For this reason, we define two growth scenarios: a ***'constrained growth'*** scenario using standard DfT and PDFH assumptions, and a ***'continued growth'*** scenario to provide a better fit with recent growth trends and making use of recent research into the drivers of regional rail demand.

Under the 'continued growth' scenario, it is assumed that structural change in the economy of South Wales and growing congestion on the road network will continue to drive mode shift to rail. This scenario adopts Welsh Government forecasts of employment and population growth. The assumptions behind each of these assumptions are described further below.

Demand Forecasting Framework

The baseline forecast applies the standard PDFH forecasting framework set out below:

$$I_E = \left(\frac{GDPPercapita_{new}}{GDPpercapita_{base}}\right)^g \times \left(\frac{EMP_{new}}{EMP_{base}}\right)^e \times \left(\frac{POP_{new}}{POP_{base}}\right)^p \times \exp\left(n \times \left(NC_{new} - NC_{base}\right)\right) \times \left(\frac{RAILFARE_{new}}{RAILFARE_{base}}\right)^r \times \left(\frac{FUELCOST_{new}}{FUELCOST_{base}}\right)^f \times \left(\frac{CARTIME_{new}}{CARTIME_{base}}\right)^c \times \left(\frac{BUSCOST_{new}}{BUSCOST_{base}}\right)^b \times \left(\frac{BUSTIME_{new}}{BUSTIME_{base}}\right)^t \times \left(\frac{BUSHEAD_{new}}{BUSHEAD_{base}}\right)^b \times \left(\frac{PARKINGCOST_{new}}{PARKINGCOST_{base}}\right)^k$$

Where:

- I_E is the external factors index for the change in volume between the base period and the future period.
- The parameters are all elasticities with the exception of n, which determines car-ownership.

Current rail demand was extracted from MOIRA on a station to station basis. Trip origins and destinations were assigned to 'zones' in the demand model. In south east Wales, these are local authority areas. Outside this area, the zoning system is coarser, typically at regional (NUTS 1) levels.

Each of the above demand drivers has been forecast and applied within this zoning system. Some growth drivers are linked to the origin end of the trip (e.g. population growth) whilst others are linked to the destination (e.g. employment growth). Switches within the model allow the origin or destination to be determined for each station to station pair.

In some cases, different elasticity values apply to seasons and other ticket types. These ticket types are mapped to journey purposes (business, commuting and other) for demand forecasting.

Demand Drivers

The data sources and assumptions behind the exogenous inputs are set out in table 3.1 for constrained and continued growth scenarios.

Table 3.1 – Key Inputs to exogenous growth model

Growth Driver	Continued Growth Scenario	Constrained Growth Scenario	Applied to	Data Sources
GDP per capita	Office of Budget Responsibility Forecast		Non-commuter trips, zone of destination	Office of Budget Responsibility
Employment	Welsh Government Forecast	Welsh Government forecast constrained to TEMPRO forecast for South East Wales	Commuter trips, zone of destination	Welsh Government Department for Transport
Population	Welsh Government Forecast	Welsh Government forecast constrained to TEMPRO forecast for South East Wales	All ticket types, zone of origin	
Car Ownership	TEMPRO car ownership projections		All ticket types, zone of origin	
Rail Fares	RPI + 1% growth per annum		All ticket types	Welsh Government
Car Travel Times	South Wales Strategic Highway Model travel time forecast		All ticket types, zone of origin & destination	Arup / Welsh Government
Motoring Costs	WebTAG fuel costs		All ticket types, zone of origin & destination	WebTAG
Bus fares, travel times and headways	Assumed to grow at the same rate as rail fares. Bus travel times are assumed change at the same rate as car travel times. Bus headways are assumed to remain constant.		All ticket types	As above

Elasticities

Under the constrained growth scenario, the elasticities with respect to each of the above drivers were taken from PDFH version 4.0, with the exception of the fares elasticity, as agreed with DfT.

Given the fact that PDFH version 4.0 elasticities would have under predicted growth in demand on the Valley Lines over the last decade, we have applied a higher elasticity of rail demand with respect to GDP for the continued growth scenario (an elasticity of 1.88 rather than 0.7). This is based on an econometric

estimation for regional rail demand undertaken by MVA for ATOC in 2010[4]. For conservatism and to reflect uncertainty in the longer term, this higher elasticity is applied only for the first ten years of the forecast to 2021.

Table 3.2 - Elasticities

Elasticity	Continued Growth Scenario	Constrained Growth Scenario
GDP per capita	1.88 (MVA 2010) to 2021 0.7 (PDFH 4) after 2021	0.7 (PDFH 4)
Employment	1.0 (PDFH 4)	
Population	1.0 (PDFH 4)	
Car Ownership	0.63 (PDFH 4)	
Rail Fares	Commuters – -0.7, Other – -1.0 (PDFH 5.0)	
Car Travel Times	0.3 (PDFH 4)	
Motoring Costs	0.2 (PDFH 4)	
Bus fares and travel times	0.13 (PDFH 4)	

Demand capping

Current DfT guidance was followed on capping demand in 2026 for the constrained growth scenario. For the continued growth scenario, the demand cap is applied in 2032, which we consider appropriate given the timescale for the intervention[5].

3.3 Impacts of Service Improvement

The forecasting approach to timetable changes is compliant with advice in WebTAG unit 3.15.4 (Rail Passenger Demand Forecasting). The PDFH approach of applying elasticities to the percentage difference in generalised journey times was followed. The Arriva Trains Wales (ATW) version of the MOIRA model was used, validated against passenger count data provided by ATW.

3.4 Revenue Forecasts

The demand growth drivers are applied through a revenue model which has been built to a best practice specification, conforming to current DfT and PDFH

[4] MVA estimated elasticities of rail demand with respect to GDP between 0.4 and 3.48. The relevant category for most SE Wales journeys is 'to core cities from others' for which the elasticity is 1.88 for journeys of less than 20 miles.
[5] The DfTs recent economic appraisal of the case for electrifying the Great Western Main Line capped growth at 2033 (www.parliament.uk/deposits/depositedpapers/2011/DEP2011-0587.doc)

guidance on rail demand forecasting. It has been applied previously for franchise bids.

The revenue model applies growth rates from exogenous demand drivers and from timetable enhancement (from MOIRA) to baseline LENNON ticket sales data provided by Arriva Trains Wales and First Great Western.

4 Economic Appraisal

4.1 Monetised Benefits

4.1.1 User Benefits

The economic appraisal has been undertaken using consistent values applied in the demand forecasting model and in line with recommended values of time in WebTAG unit 3.5.6. A summary of the approach taken to quantifying benefits is given in Table 4.1.

Table 4.1 - Appraisal Parameters - Benefits

Parameter	Approach	Source Data / Guidance
User Benefits		
Demand forecast	Continued growth scenario – 2.7% per annum, growth capped at 2031	Passenger Demand Forecasting Handbook Welsh Government Population and Employment projections MVA/ATOC: Regional Rail Demand Study
	Constrained growth scenario – 1.7% per annum, growth capped at 2026	PDFH, TEMPRO
Time savings (existing passengers)	Application of MOIRA software employing WebTAG Values of Time	WebTAG 3.5.6
Time savings (new passengers)	As above employing the 'rule of half'	WebTAG 3.5.6
Non-User Benefits		
Mode shift	National Diversion Factor for Rail Demand (-0.26%)	WebTAG 3.13
Reduced car use	Pence per kilometre values dues reduction in car use for decongestion, accidents and carbon emissions.	WebTAG 3.13
Rail Sector Carbon emissions	Emissions per litre of diesel fuel based on ATOC estimate. Emissions per KWH of electricity based on DECC carbon intensity factors.	ATOC Department for Energy and Climate Change (DECC) DECC Spreadsheet Tool
Indirect taxation	VAT and excise duty on rebated oils.	HM Revenue and Customs

4.1.2 Benefits of Reduced Car Use

The improvement in train service quality and capacity following electrification will drive up rail demand. A proportion of the increase in rail trips will be a result of mode switch from car to rail.

Mode switching effects have been controlled to the 'national average diversion factor' of -26% given in WebTAG unit 3.13.2. In compliance with WebTAG

guidance, average (per km) values for decongestion benefits, accidents and emissions have been applied.

4.1.3 Rail Sector Emissions Benefits

Carbon dioxide emissions from diesel rolling stock and from electricity generation have been valued in accordance with WebTAG guidance and using the carbon reduction toolkit provided by the Department of Energy and Climate change (DECC) with the October 2011 guidance.

4.2 Project Costs

4.2.1 Capital Costs - Risk and Optimism Bias

Initially capital costs were checked with DfT and NR 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 December 2011, NR revised the capital cost estimate to be "*in excess of £100m excluding any additional BSP/DNO requirements*". This was based on unit rates from the GWML Electrification GRIP 3 Output and actual delivery costs being incurred on the North West Electrification Project. The resultant cost estimates used in the economic appraisal are given in Table 4.2 below.

Table 4.2 - GWMLE Capital Cost Estimate, Cardiff to Swansea

	Cardiff to Bridgend	Bridgend to Swansea	Total (Cardiff to Swansea)
GRIP 2 Spot Cost Estimate	[redacted]	[redacted]	[redacted]
Total Cost Including Risk Allowance (20%)	[redacted]	[redacted]	[redacted]
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**

4.2.2 Operating and Maintenance Costs

An operating cost model has been constructed to capture staff costs, diesel fuel costs, electric current for traction, rolling stock lease or purchase costs (including refurbishment or upgrade costs), rolling stock heavy and running maintenance costs, fixed track access charge; and variable track access charges.

Operating cost estimates have been informed by Network Rail, Arriva Trains Wales and data provided by rolling stock leasing companies. Key assumptions are outlined in Table 4.3.

Table 4.2 - Operating Cost Assumptions

Item	Assumption	Source
Staff costs	Staff costs as per existing rates for drivers and conductors	Arriva Trains Wales
Diesel fuel consumption	Average actual fuel consumption of diesel stock types	Arriva Trains Wales and other sources
Electricity consumption	Electricity consumption based on the train performance. Regenerative braking to provide a 20% saving	Network Rail
Diesel costs	Current cost per litre for existing franchise	Arriva Trains Wales
Electricity costs	Average EC4T pence per KWh rates paid by TOCs	Network Rail
Future energy costs	Electric traction rates to 2013 based on NR expectations. Other fuel cost forecasts from DECC - central scenario.	Network Rail DECC / Department for Transport
Rolling stock costs	Lease charges, refurbishment or upgrade costs and maintenance costs	Rolling Stock leasing companies
Fixed track access charge	£4,800 per track mile	Network Rail
Variable track access charge	VTAC for proxy rolling stock types based on quoted vehicle mile costs in Control Period 4	Network Rail, CP4 Price List

Further details on methodology and results are provided in the Operational Cost technical note.

4.3 Reporting

The appraisal has been undertaken over a 60 year period from 2018, with demand capped at 2026 level (constrained growth scenario) or 2031 level (continued growth scenario). All values are in 2002 market prices. Benefits and costs accruing over the appraisal period are discounted to 2002 using the social discount rate outline in the Green Book: 3.5% for the first 30 years of the appraisal period and 3.0% thereafter.

The results of the appraisal are summarised in the Transport Economic Efficiency (TEE) Table and DfT Public Accounts Table (PA). All impacts are calculated as the change relative to the do minimum.

The changes in timetables and rolling stock, for each scenario, take place from April 2018 at the start of the next franchise period. As such, all forecast changes in revenue and operating cost are realised by Government through changes in the overall subsidy requirement of the franchise.

The overall Benefit to Cost Ratio is the ratio of Present Value Benefits (consumer and business benefits and impacts on private sector operators) to Present Value Costs (the net cost to government taking into account the cost of investment and the impact on the subsidy requirement).

4.4 Results

4.4.1 Transport Economic Efficiency (TEE) Table

Results of the TEE table are summarised in Tables 4.3 (continued growth scenario) and 4.4 (constrained growth scenario). These tables present the changes brought about by each option relative to the corresponding do minimum case, in monetary terms. The continued growth scenario best reflects the current and expected demand trajectory in SE Wales.

Continued Demand Growth

Table 4.3 - Economic Appraisal Summary: Continued Growth Scenario (2002 Values and Market Prices, £Ms)

	Option 1A Electrification Cardiff to Swansea and IEP Electric Trains to Swansea £m	**Option 1B** Electrification Bridgend to Swansea, building on VLE £m	**Option 2A** Electrification Cardiff to Swansea and Bridgend to Maesteg IEP Electric Trains to Swansea £m	**Option 2B** Electrification Bridgend to Swansea, building on VLE £m
a. User Time Savings	41.3	41.3	45.4	41.3
b. Crowding Benefits	-	-	-	-
c. Rolling Stock Quality Factors	3.9	3.9	4.4	3.9
d. Benefits of Reduced Car Use	20.2	20.2	20.2	20.2
e. Rail Sector Carbon Emissions and Air Quality Benefits*	-	-	-	-
1. Present Value Benefits (a+b+c+d+e)	**65.4**	**65.4**	**70.0**	**65.4**
f. Revenue	12.6	12.6	14.5	12.6
g. Operating Costs	-55.1	-58.0	-56.9	-59.8
h. Capital Costs	104.7	54.3	115.0	54.3
2. DfT financial impact (f+g+h)	**-37.0**	**16.4**	**-43.6**	**18.1**
3. Non-DfT financial impact	-7.3	-7.3	-8.2	-8.2
Net Present Value (1)+(2)+(3)	**21.2**	**74.6**	**18.2**	**75.3**
BCR (1) / - [(2)+(3)]	**1.5**	**No net cost to Government**	**1.4**	**No Net Cost to Government**

** Based on DECC 14 October 2011 publication using the 'Toolkit for guidance on valuation of energy use"*
*** Based on VLE Option 2 (Cascaded EMUs)*
 # Under this scenario, access charges for electric infrastructure are assumed to be paid entirely by Valley Lines operators. In practice, access charges would be shared across franchises. These costs are included in the VLE economic appraisal and are excluded here to avoid double counting.

Constrained Demand Growth

Table 4.3 - Economic Appraisal Summary: Constrained Growth Scenario (2002 Values and Market Prices, £Ms)

	Option 1A Electrification Cardiff to Swansea and IEP Electric Trains to Swansea £m	**Option 1B** Electrification Bridgend to Swansea, building on VLE £m	**Option 2A** Electrification Cardiff to Swansea and Bridgend to Maesteg IEP Electric Trains to Swansea £m	**Option 2B** Electrification Bridgend to Swansea, building on VLE £m
a. User Time Savings	33.2	33.2	36.5	35.5
b. Crowding Benefits	-	-	-	-
c. Rolling Stock Quality Factors	3.1	3.1	3.5	3.2
d. Benefits of Reduced Car Use	20.2	20.2	20.2	20.2
e. Rail Sector Carbon Emissions and Air Quality Benefits*	-	-	-	-
1. Present Value Benefits (a+b+c+d+e)	**56.6**	**56.6**	**60.2**	**58.9**
f. Revenue	10.3	10.3	11.8	10.9
g. Operating Costs	-55.1	-58.0	-56.9	-59.8
h. Capital Costs	104.7	54.3	115.0	54.3
2. DfT financial impact (f+g+h)	**-39.3**	**14.1**	**-46.4**	**16.4**
3. Non-DfT financial impact	-7.3	-7.3	-8.2	-8.2
Net Present Value (1)+(2)+(3)	**10.0**	**63.4**	**5.6**	**67.1**
BCR (1) / - [(2)+(3)]	**1.2**	**No Net Cost to Government**	**1.1**	**No Net Cost to Government**

** Based on DECC 14 October 2011 publication using the 'Toolkit for guidance on valuation of energy use"*
*** Based on VLE Option 2 (Cascaded EMUs)*
 # Under this scenario, access charges for electric infrastructure are assumed to be paid entirely by Valley Lines operators. In practice, access charges would be shared across franchises. These costs are included in the VLE economic appraisal and are excluded here to avoid double counting.

4.4.2 Public Accounts (PA) Table

Impact to the public account is described as the net costs incurred by central and local government. The PA table calculates the impact on Broad Transport Budget and on Wider Public Finances separately.

The appraisal has been undertaken assuming that costs are financed through the Regulatory Asset Base which allows Network Rail to borrow the necessary funds and for the Government to make regular payments to Network Rail to allow

servicing of the debt. Therefore, both revenues and costs are summarised under the Government's Broad Transport Budget.

Change to indirect tax revenue is presented under the Wider Public Finances as it would benefit the Government as a whole but does not directly affect the Broad Transport Budget.

Results of the public accounts are summarised in Table 4.5 for continued growth scenarios.

Table 4.5: Public Account Table: Continued Growth Scenario (2002 Values and Market Prices, £Ms)

	Option 1A Electrification Cardiff to Swansea and IEP Electric Trains to Swansea £m	**Option 1B** Electrification Bridgend to Swansea, building on VLE £m	**Option 2A** Electrification Cardiff to Swansea and Bridgend to Maesteg IEP Electric Trains to Swansea £m	**Option 2B** Electrification Bridgend to Swansea, building on VLE £m
a. Revenue	12.6	12.6	14.5	12.6
b. Operating Costs	-55.1	-58.0	-56.9	-59.8
c. Capital Costs	104.7	54.3	115.0	54.3
d. Central Government Broad Transport Budget (a+b+c)	**-37.0**	**16.4**	**-43.6**	**18.1**
e. Indirect Tax Revenues	-7.3	-7.3	-8.2	-8.2
Wider Public Finance (e)	**-7.3**	**-7.3**	**-8.2**	**-8.2**

** Based on VLE Option 2 (Cascaded EMUs)*