CH2M HILL Report – "Assessment of Aspirations for Track Access on the East Coast Main Line – Review of all aspirations submitted" – May 2015

On 29 May 2015 we published this report to inform our industry hearing on 12 June 2015. Soon after publication an important error in the report was identified, and on 5 June we issued an errata note from CH2M HILL regarding this error. This errata note is now included at the end of the report, in pages 68 to 75.

Ahead of our industry hearing 3 stakeholders raised concerns around possible further errors in the report, its methodology and inputs, many of which we discussed at the industry hearing on 12 June. With CH2M HILL, we are now reviewing these concerns and we expect to publish a fully revised report that deals with them in due course. We will be writing to stakeholders about this review. The economic analysis contained in the CH2M Hill report is an important factor in our decision making, but it is not the only factor we consider in relation to economic analysis. For example, we will also consider stakeholders' submissions and may undertake our own supplementary analysis.

Final Report

Assessment of Aspirations for Track Access on the East Coast Main Line – Review of all aspirations submitted

Prepared for

Office of Rail and Road

May 2015

CH2MHILL®

Elms House
43 Brook Green
London W6 7EF

Version No	Version Name	Prepared by	Reviewed by	Approved by	Date
1	Draft	Oliver Haycock	Chris Judge	Jon Clyne	28th May 2015

SECTION 1

Contents

1. Introduction

1.1. Background

1.1.1. Track access applications received

The Office of Rail Regulation (ORR) has received several track access applications for use of capacity on the East Coast Main Line (ECML). These applications have been submitted by open access operator GNER owned by Alliance Rail Holdings (Alliance), by open access operator East Coast Trains Limited owned by First Group, and by Virgin Trains East Coast (VTEC), which commenced operation of the East Coast Franchise in March 2015.

1.1.2. Purpose of this report

The purpose of this report is to present a revenue assessment of services contained within the track access applications, and a WebTAG-based economic appraisal of the proposed services that require access to capacity constrained sections of the rail network.

These revenue projections will be used to inform ORR's Not Primarily Abstractive (NPA) test. ORR uses both the NPA test, and economic appraisal to help inform its decisions on track access applications.

1.1.3. Managing potential conflicts of interest

CH2MHILL, via its TRL-Halcrow Joint Venture, is currently Technical Advisor to DfT for the Northern and TransPennine Express re-franchising competitions. As part of this work we have assessed the implications of Alliance's proposed services (both GNER and GNWR services) on future franchise revenue.

We have implemented the following procedures to avoid potential conflicts of interest:

- Use of a ring-fenced project team with no involvement in the work to advise DfT on the implications of GNER's access applications on franchise revenue.
- All project files have been stored on password-protected computer servers, with access only granted to members of the project team.
- All paper files have been stored in locked drawers.
- All project meetings and telephone conferences have been held in meeting rooms, separate from open plan offices.
- Project team members have not discussed details of the project with other CH2M HILL colleagues.

CH2MHILL has had no involvement in the competition to re-let the East Coast franchise.

We have conducted our assessments on the basis of the information made available by ORR, by each of the applicants and using other available information sources. Where a lack of available evidence has required us to make assumptions we have stated these assumptions clearly, and we have estimated ranges of figures where these assumptions are subject to significant uncertainty and/or subjectivity. This is to enable ORR to consider the inherent risks in the revenue projections and economic appraisals, when forming its decisions.

1.2. Report structure

The remainder of this report is structured as follows:

- **Section 2** summarises the track access applications received by ORR.
- **Section 3** presents the demand and revenue forecasting methodology for the types of services contained within the track access applications.
- **Section 4** presents our revenue projections for services contained within Alliance's Yorkshire track access application.
- **Section 5** presents our revenue projections for services contained within Alliance's Edinburgh track access application.
- **Section 6** presents our revenue projections for services contained within VTEC's interim track access applications.
- **Section 7** presents our revenue projections for services contained within VTEC's long term track access application.
- **Section 8** presents our revenue projections for services contained within First Group's Edinburgh track access application.
- **Section 9** presents our economic appraisal.

2. Track access applications received by ORR

2.1. Track access applications from Alliance Rail Holdings

2.1.1. King's Cross – Yorkshire/Lincolnshire services

Alliance has submitted an application to operate services between King's Cross and Lincolnshire/Yorkshire comprising:

- Four return services per day from London King's Cross (King's Cross) to Cleethorpes, from December 2017.
- Six trains per day from King's Cross to Bradford and one per day from King's Cross to Ilkley, from 2018.

2.1.2. King's Cross – Edinburgh services

Alliance has submitted an application to operate services between King's Cross and Edinburgh comprising:

- An hourly fast service between King's Cross and Edinburgh, calling only at Newcastle and occasionally Stevenage, from May 2017 or soon thereafter.

2.2. Track access application from First Group

2.2.1. King's Cross – Edinburgh services

First Group has submitted an application to operate services between King's Cross and Edinburgh from 2019, comprising:

- Five King's Cross – Edinburgh services per day in each direction, calling at Newcastle, Morpeth and occasionally Stevenage.

2.3. Applications from Virgin Trains East Coast (VTEC)

2.3.1. Interim track access applications

An infrastructure upgrade programme is currently underway to enhance the capability and capacity of the ECML. This is scheduled to be completed by 2019 when we understand that VTEC will commence operation of new Intercity Express Programme (IEP) rolling stock. We further understand that introduction of IEP rolling stock will be phased, with the complete fleet in operation by 2020.

VTEC has submitted a number of track access application to operate a number of additional services in the period up to 2019. These applications, which are summarised below, are intended to commence from December 2015 unless stated:

- **Application 1.** Extension of one weekday King's Cross - Edinburgh service in each direction to/from Stirling.
- **Application 2.** Extension of one weekday King's Cross – Newcastle service in each direction to/from Sunderland
- **Application 3.** Addition of one service in each direction between King's Cross and Leeds on Saturdays

- **Application 4.** From May 2016, extension of four weekday King's Cross - Newcastle services in each direction to/from Edinburgh.
- **Application 5.** Addition of one Sunday King's Cross – Edinburgh service in each direction, via a combination of additional services and extension of existing services.

2.3.2. Long term track access application

VTEC has submitted a track access application to operate an enhanced frequency of trains, serving a wider range of stations than currently. This application, termed application 6, contains the following services intended to operate from May 2019 unless stated:

- Introduction of a half hourly King's Cross – Edinburgh service, replacing a two hourly service pattern comprising approximately three King's Cross – Edinburgh trains in each direction and one King's Cross - Newcastle train in each direction.
- Introduction of an additional hourly King's Cross – Newcastle stopping service.
- Replacement of the existing hourly King's Cross – Newark/York stopping service with an hourly stopping service between King's Cross and Lincoln/Harrogate on alternate hours. King's Cross - Harrogate services would operate via Hambleton Junction.
- Extension of one weekday King's Cross - Edinburgh service in each direction to/from Stirling.
- Extension of one weekday King's Cross – Newcastle service in each direction to/from Sunderland.
- Extension of some existing King's Cross – Leeds services to form a two-hourly King's Cross – Bradford Forster Square service. (One train per day in each direction is currently extended to/from Bradford Forster Square).
- Extension of one existing King's Cross – Leeds service to Huddersfield.
- From May 2020, introduction of a new two-hourly service between King's Cross, York, Northallerton and Middlesbrough.

At a quantum level the services contained within VTEC's interim applications would be met or exceeded by the services contained within the long term application.

3. Demand and revenue forecasting methodology

3.1. Introduction

A three stage demand/revenue forecasting methodology was developed for the purposes of this work.

The first stage estimates the amount of revenue likely to be newly generated and abstracted from other operators as a result of the introduction of new rail services. This approach considers factors such improvements to generalised journey time (GJT), e.g. journey times and frequency, the introduction of new fares, and operator's marketing expenditure. We have termed this the 'default forecasting approach' as it is used to estimate revenue changes relating to all flows (the market for travel between specific pairs of stations) affected by the introduction of new services.

The default forecasting approach uses the existing GB rail revenue base, and makes no attempt to adjust for factors which could constrain current levels of revenue, such as the absence of direct frequent services, or the presence of competition from domestic airlines.

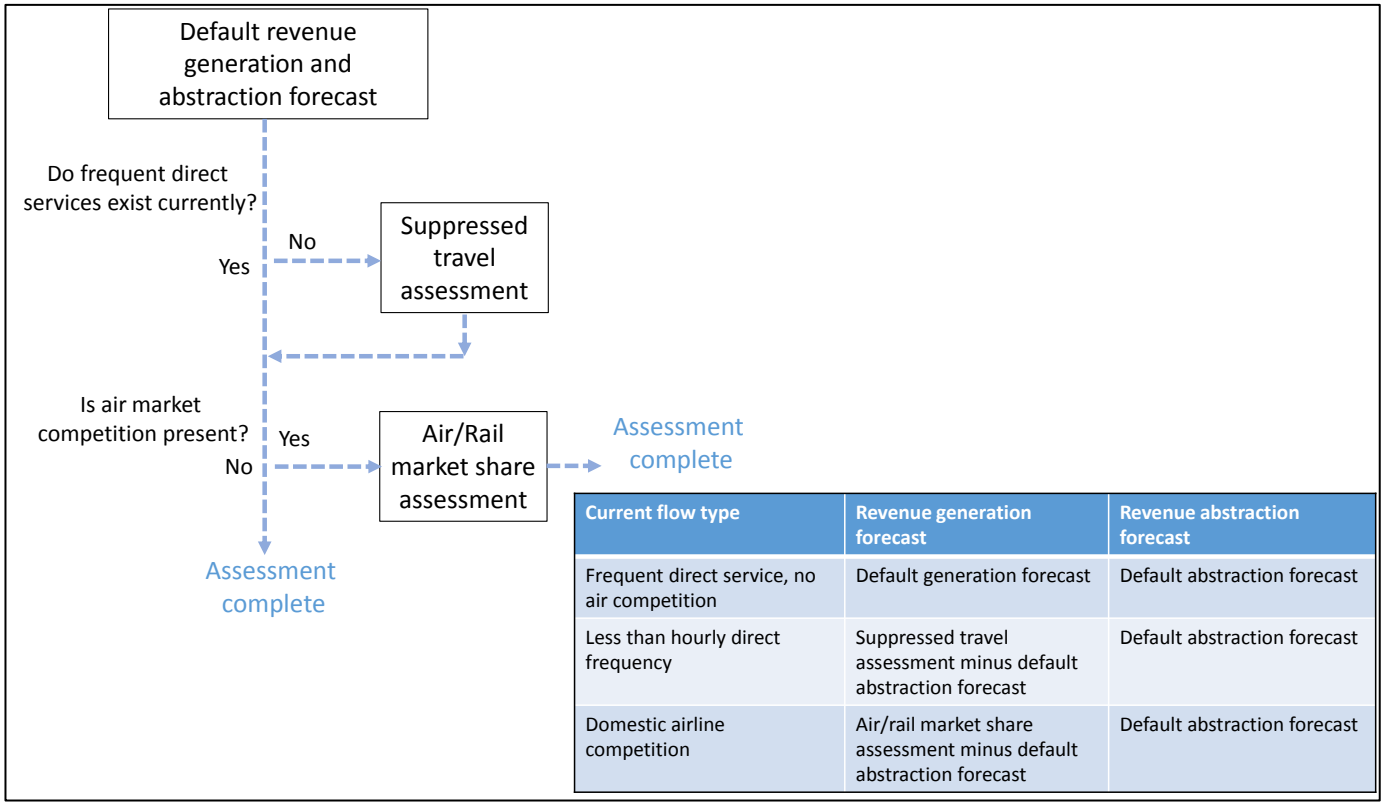
Stages two and three of the modelling, respectively, estimate the level of additional revenue that could be generated through providing poorly served flows with frequent direct services, and the level of revenue that could be generated through strengthening rail's competition with domestic airline travel. Some track access applications combine individual services which compete with air and serve new locations, requiring us to use both stage two and stage three of the assessment for specific flows.

We have two versions of stage three (the air market uplift). One allows us to estimate the impact of a change in journey times and the other allows us to test the impact of a change in fares. None of the applications propose a significant change in both journey times and fares, for flows where air competition is present.

Stages two and three produce higher revenue projections than stage one. This is intuitively correct since stage one is the only part of the methodology that does not attempt to model the release of supressed demand/revenue. We have therefore assumed that the difference between the total revenue assessment in stages two + three and in stage one is entirely newly generated revenue.

The rest of this section describes each section of the methodology in detail, and Figure 1 provides a summary of the methodology.

Figure 1 - Summary of the demand/revenue forecasting methodology



Current flow type	Revenue generation forecast	Revenue abstraction forecast
Frequent direct service, no air competition	Default generation forecast	Default abstraction forecast
Less than hourly direct frequency	Suppressed travel assessment minus default abstraction forecast	Default abstraction forecast
Domestic airline competition	Air/rail market share assessment minus default abstraction forecast	Default abstraction forecast

3.2. Default forecasting approach- well established /frequently served rail markets

The various stages of the forecasting approach were produced in sequence, starting with a run of the MOIRA software, followed by series of demand overlays. Each stage of the forecasting process is presented in the order of occurrence in this process.

3.2.1. Generalised journey time improvements

The MOIRA software application was used to estimate both the demand impact of changes in journey time and frequency, and the allocation of revenue resulting from these changes.

MOIRA is an appropriate tool for this activity because:

- It is an elasticity-based model, well-suited to assessing changes to established rail markets;
- It uses the same algorithm as the ORCATS system used to allocate ticket sales revenue between operators; and
- There is minimal competition between ECML long distance high speed (LDHS) services and modes of transport in the London travel card area, and limited on-train crowding. It is difficult to model interactions with the London Underground network or overcrowding using MOIRA.

The output of the MOIRA analysis is a demand and revenue projection by origin-destination flow.

3.2.2. Provision of alternative fares

A demand and revenue overlay to the MOIRA modelling has been produced to estimate the impact of operators' dedicated-ticketing fares strategies.

The fare differential is represented by the difference in the estimated yield for the new services and the average yield available from other existing services. Both the Alliance Yorkshire/Cleethorpes aspiration, and the First Group application include a reduction in fares, hence yield, versus current services.

For the Alliance West Yorkshire/Cleethorpes application, this reduction was estimated as the differential between VTEC yields and Grand Central yields for the relevant flows.

For the First Group application we have only applied the fares overlays to the revenue associated with the ticket types which First Group intends to offer (circa 58% of total revenue for the flows in question). The reduction in yield for these ticket types is broadly 50%-60%.

For flows where East Coast do no offer competition, MOIRA revenue/journeys is used as a proxy for yield. For the remaining Open Access options, MOIRA revenue/journeys is used as a proxy for yield.

Assessment of the impact of fares was conducted in two stages.

- The first part of the process reassigns revenue between Train Operating Companies (TOCs) through the application of the standard LOGIT function using the formula illustrated below, as recommended in PDFH[1]. The same methodology was used by MVA in their 2009 ECML capacity study[2]. We used the MVA spread parameter of 0.04, which they calibrated using Grand Central data at York. The formula was applied to each modelled flow.

  S = Market Share from MOIRA
  S^1 = New Market Share
  d = Fare Differential
  λ = Spread Parameter

$$S^1 = \frac{1}{1 + e^{-\lambda d}\left(\frac{1}{S} - 1\right)}$$

- Secondly, the current average fare and new average fare after the introduction of the new services will be calculated for each flow. The application of a PDFH fares elasticity to the average fare change allows total market growth to be calculated.

3.2.3. Marketing initiatives

The revenue impact of marketing spend is estimated on the basis of a ratio of revenue to marketing spend. This is the approach that is typically used in the rail industry, for example, in applications such as franchise bid submissions. We have assumed a ratio of revenue generation to marketing spend of 2:1.

The estimated revenue generation is assumed to follow the same split of generation and abstraction as the combined impact of the revenue generated by the GJT improvement and provision of alternative fares.

Each applicant has supplied is estimated marketing spend for the services contained within the long term applications. VTEC has not provided an allocation of this spend for the groups of services contained within its long term application (application 6), so we have allocated this spend evenly across the four sets of services (detailed in section 7).

[1] PDFH 5.1, Section B11.4

[2] MVA, 2009, "Assessment of Alternative Track Access Applications on the East Coast Mainline", report for the Office of Rail Regulation

3.3. Suppressed travel assessment - Rail markets with infrequent current service levels

A gravity model approach was used to estimate the total potential increase in demand, ergo revenue, by providing direct services between locations that are connected by a less than hourly frequency of direct services. This approach estimates a relationship between total annual journeys made and characteristics that influence the level of demand (e.g. catchment population). The resultant derived relationships were used to estimate the level of suppressed demand that could be released by the introduction of new services.

This approach, described in detail below was applied to all applications/service which increases the direct frequency of trains between stations with a current service frequency of less than hourly.

3.3.1. Base data

The base demand data used to calibrate the models relates to all ECML flows to/from stations in Yorkshire, the East of England, the East Midlands and the North East. The following data was used:

- Annual journeys from 2013/14 LENNON
- GJT from MOIRA, based on the May 2014 timetable
- Population data, from the Office of National Statistics (ONS) at the geographically disaggregate level of Lower Super Output Area (LSOA)
- Average wages data by Local Authority area, from ONS
- Gross Value Added (GVA) by LSOA, from ONS

Separate gravity models were produced for flows to/from London, and for non-London flows.

3.3.2. To/from London and the South East model

The model for flows to/from London and the South East has the following functional form.

$$Journeys = OriginPop_{5km}^{\alpha} OriginPop_{5-10km}^{\beta D} OriginWage_{LA}^{\gamma} GJT_{OD}^{\delta}$$

Where:

- Journeys is the annual journeys made between a station and London

And where, with respect to the non- London stations:

- Origin pop 5km is the population within a 5 km radius around the station
- Origin pop 10km is the population within a 10 km radius around a station, minus the population within a 5km radius around a station
- Average wages is the average wage in local authority area where the station is located
- GJT is the Generalised Journey Time to/from London King's Cross

The default in the model is a 5 km radial population, as based on a geographical analysis a 5 km radius appeared to cover the main populated catchment area of the majority of ECML stations and in scope stations that connect to the ECML. Non-ECML stations that fall within a 5 km radial catchment of other stations have been excluded as they are outliers in the data. This only affects a limited number of stations within urban Leeds, such as Bramley.

Some stations at the centre of large urban areas, and stations which act as railheads or parkways for other populated areas were assigned a larger 10km radial catchment population. These stations include Leeds, Doncaster, and Darlington.

We accept some stations may have a wider catchment than this, and that catchment populations may be a function of non-radial station access times. However use of a 5km and 10km catchments covers the majority of the likely catchment areas for the stations considered, and provided a good explanation of the variation in the number of journeys made.

Average wages are used as a proxy for a catchment population's propensity to travel over long distances, in recognition of the diversity of locations considered in the model.

Table 1 below shows the key model parameters, and statistics, and a complete list of flows in the model is provided in appendix A.

Figure 2 - Stations included in the London-based gravity model

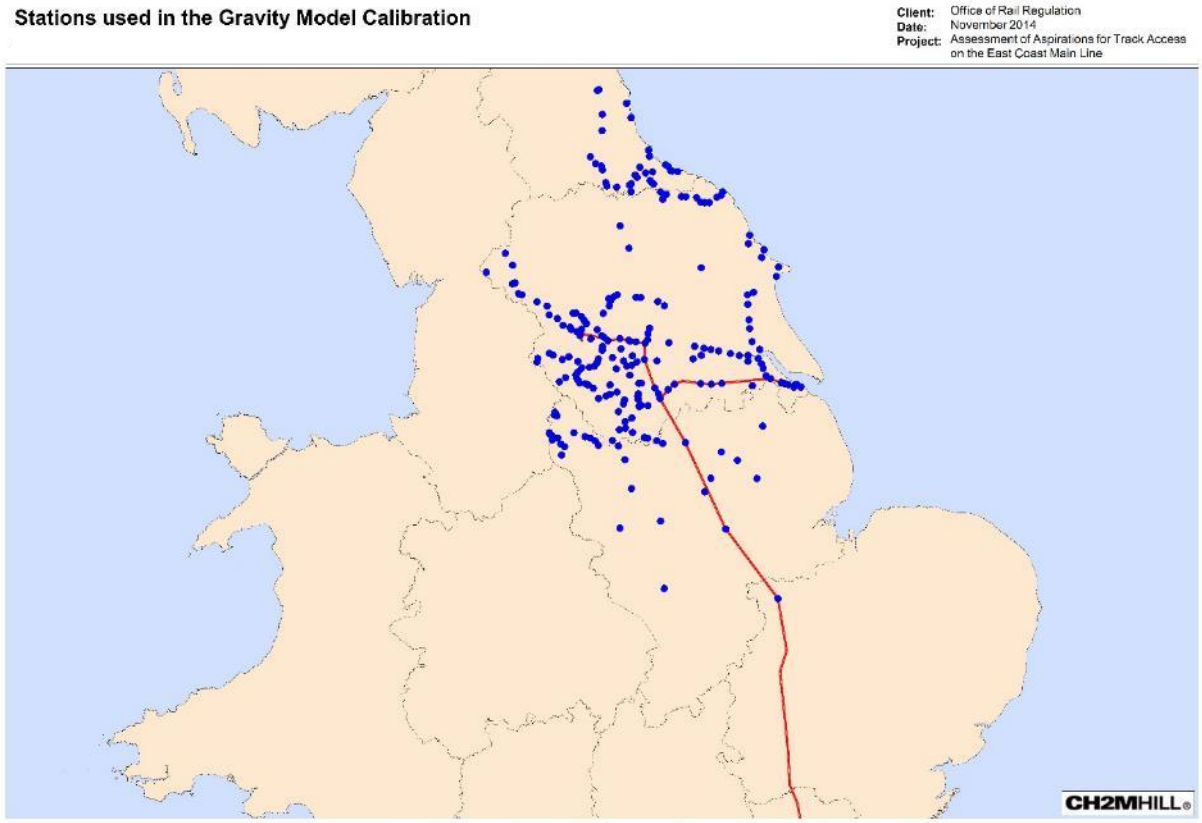


Table 1 - London model, parameters and statistics

Model parameters				Statistics	
A	B	γ	δ	Adj. R-squared	Observations
1.10	0.11	1.12	-2.39	0.9232	70

The model explains around 92 percent of the variation in journeys, as indicated by the adjusted R squared statistic, and all of the explanatory variables are statistically significant and of the correct sign.

The elasticity of journeys with respect to GJT was found to be -2.39, meaning that a 1% fall in GJT results in a 2.39% increase in journeys. However, as the relationship is non-linear, larger falls in GJT are accompanied by even larger increases in journeys. For example, a 5% fall in GJT results in a 13% increase in journeys and a 10% fall in GJT equates to a 29% increase in journeys.

The elasticities of journeys with respect to population and wage are also of the right sign and are intuitively correct. Further discussion of the results can be found in Appendix A.

3.3.3. Non-London model

The model for non-London flows has the following functional form.

$$Journeys = OrigPop_{5km}^{\alpha} GVA_{5km}^{\beta} GJT_{OD}^{\gamma}$$

Where:

- Journeys is the annual journeys made between each origin-destination flow
- Origin pop 5km is the population within a 5 km radius around the origin station
- GVA is the Gross Value Added measure of economic activity, within a 5 km radius around the destination station.
- GJT is the Generalised Journey Time between stations

Table 2 below shows the key model parameters and statistics. A complete list of flows in the model is provided in appendix A.

Table 2 - London model, parameters and statistics

Model parameters			Statistics	
A	B	γ	Adjusted R-squared	Obs
0.35	**0.73**	**-2.23**	**0.61**	**103**

The model explains around 60 percent of the variation in journeys, as indicated by the adjusted R squared statistic, and all of the explanatory variables are statistically significant and of the correct sign.

The elasticity of journeys with respect to GJT is -2.23. This is slightly less than the estimate found in the London model. Our findings show that gains in economic activity at the destination as measured by GVA have a larger variation with journeys than the populous at the origin.

3.3.4. Application of the model and results

The results of the direct demand models were used to estimate the proportionate demand uplift resulting from the introduction of new services. This uplift was calculated by populating the estimated demand functions (from above) with the relevant data before and after the change in GJT enabled by new services, and by increasing the catchment of a station from 5km to 10km where we believe that the introduction of new services to/from London would attract a significantly wider catchment population than currently.

The percentage uplifts from the gravity model were applied to 2013/14 journeys and revenue to estimate the new total demand and revenue by flow. As these are total estimates, the demand/revenue forecasts based on the combined, GJT, fares and marketing modelling were subtracted from these gravity model forecasts. The difference between these forecasts is our estimate of generated demand/revenue from released suppression.

3.4. Forecasting approach - competition with domestic airline travel (change in rail journey times)

Applications submitted by both Alliance and VTEC include a significant reduction in journey times between locations that are also served by airlines.

We have therefore estimated a range of potential demand/revenue abstraction from the domestic airline market, caused by improvements to Edinburgh/Newcastle – London journey times. This was done through the use of alternative GJT elasticities to those advocated in PDFH. We felt it necessary to produce a range of elasticities as the level of evidence available on the impact of competition between rail and air in Great Britain is one of the weakest areas in PDFH and other relevant research publications.

The range of elasticities used is as follows:

- Our central elasticity was derived on the basis of our estimated mode share using figure B2.1 in PDFH 5.1. This estimated mode share is produced as follows:
    - For the ECML we take the rail journey time to be the fastest regular service each hour;
    - We estimate the current mode share that corresponds to the existing rail journey time;
    - We estimate the mode share that corresponds to the future rail journey time;
    - We produce a demand forecast[3] by taking the difference between the current and new estimated mode shares and applying them to the current mode share. We therefore assume a continuation of any characteristics that cause current actual mode share to differ from the shares implied by PDFH. We view this approach as reasonable as the PDFH s-curve (figure B2.1) is almost linear at current and likely future rail mode shares.

  Having calculated future demand, we then back-calculate the elasticity required to achieve this additional demand, given the change in GJT. This back-calculation is done at a flow level, using the change in GJTs calculated by MOIRA.

  The back-calculation is applied to the set of the largest flows exported from MOIRA, as a means of keeping the model file size manageable and avoiding the need to populate the same demand model with two or more MOIRA runs. Our overall demand forecast is then applied on a pro-rata basis to the demand associated with the remaining smaller flows.

  The back-calculated GJT can vary from option to option. This variation is driven by the relationship between the change in journey time and the change in GJT calculated by MOIRA, and also by the size of the overall change in journey time.

- In setting our low and high elasticities (-1.55 and -3.5 respectively), we selected the lowest and highest elasticities, in absolute terms, that members of our study team had seen derived for the purposes of forecasting rail demand when air competition is present. Both elasticities are from unpublished studies.

  This approach is useful as a means of estimating the likely credible range of air market capture, and also as a sense check for our back-calculated central elasticities. – We would expect the value to be in the range of -1.55 to -3.5 unless there were a reasonable explanation to the contrary.

3.4.1. Application of the air/rail market share assessment

The current rail/air market model share was derived as follows:

- 2013 Civil Aviation Authority (CAA) data was provided by ORR showing annual passenger journeys between Edinburgh Airport, Newcastle Airport and London airports, split by point to point passengers and passengers connecting with other flights. The latter was included although the total abstraction from air in our modelling was limited to the size of the point to point

[3] This total demand is used to calculate our reported mode shares

market, as it is unlikely that passengers who connect with other flights could be attracted to travel between GB airports by rail.

- On this basis we estimate the total in scope air market that competes with the ECML between Scotland and London/the South East and between the North East and London/the South East as 2.98 million and 0.56 million journeys per annum respectively.
- 2013/14 annual journeys from Lennon were summed for all flows between stations in London/the South East and the North East/Scotland, where the ECML is the fastest rail route, and where Edinburgh Airport to any of the London airports is the fastest air route. We estimate that this covers the following geographical areas:
- The area around Edinburgh bounded by Airdrie, Sterling, Perth, Forfar and Dunbar (see Figure 3)
- Tyne and Wear, Sunderland and Alnmouth (see Figure 4)
- London
- The area around London bounded by Chichester, Basingstoke, Swindon, Northampton, Peterborough, Cambridge, the English Channel, and Brighton. (Excluding the area around Southampton which is more easily accessible via Southampton airport).

On this basis we estimate that the current air-competitive ECML rail market is 1.41 million annual journeys between Scotland and London/the South East and 2.98 million annual air journeys between the North East and London/the South East.

The current rail share of the combined rail and air market is therefore 32.1 percent for Edinburgh – London/the South East and 73.3 percent for the North East – London/the South East. This is shown below in Table 3.

The implied rail mode shares from for both Scotland – London/South East and the North East – London/South East were calculated on the basis of IEP enabled journey times, using current calling patterns.

Table 3 - Current rail/air mode shares

		Annual journeys	Mode share
Scotland–London/SE	Rail	1,411,363	32.1%
	Air	2,982,240	67.9%
NE–London/SE	Rail	1,546,412	73.3%
	Air	562,546	26.7%

As described above, the implied current rail mode shares differ from the current actual mode shares. New mode shares were therefore calculated by applying the proportionate shift in mode share implied by PDFH, to the actual current mode share. This was felt to be a reasonable approximation as the s-curve in PDFH figure B2.1 is almost linear to a rail mode share of around 90%, and tails off gradually until a mode share of 95% is reached.

Our estimated mode shares post the introduction of Alliance's proposed London – Edinburgh services and VTEC's 2020 core services are shown below in Table 4.

For the flows described above, where air competition is present, these forecasts are viewed as the total revenue forecast for these flows. As these are the total estimates, the forecasts based on the combined GJT, Fares, and Marketing impacts were subtracted from these total forecasts, with the difference representing the additional revenue from abstracted air passenger journeys.

Table 4 - Estimated rail air mode shares

	Journey	CH2M HILL		
		Journey time	Rail mode share PDFH implied	Rail mode share calculated using PDFH implied
Scotland–London/SE	Edinburgh – King's Cross current (limited stop hourly)	4hrs 22m	30.8%	32.1%*
	Edinburgh – King's Cross post IEP (limited stop hourly)	4hrs 14m	36.6%	37.9%
	Edinburgh – King's Cross post IEP and Alliance Edinburgh Option	3hrs 46m	51.0%	52.3%
	Edinburgh – King's Cross post IEP and 2020 core (limited stop hourly)	4hrs 10m	38.2%	39.5%
NE–London/SE	Newcastle – King's Cross current average	3hrs 7m	76.5%	73.3%*
	Newcastle – King's Cross post IEP average	3hrs 4m	78.5%	75.0%
	Edinburgh – King's Cross post IEP and Alliance Edinburgh Option	2hrs 30m	84.5%	81.3%
	Newcastle – King's Cross post IEP and 2020 core (limited stop ½ hourly)	2hrs 52m	79.7%	76.5%

* Actual share

Figure 3 - Edinburgh airport/Edinburgh Waverley catchment area

Figure 4 - Newcastle Airport/Newcastle station catchment area

3.5. Forecasting approach - competition with domestic airline travel (change in rail fares)

3.5.1. Revised air market overlay

The above approach uses a range of Generalised Journey Time (GJT) elasticities to estimate the potential abstraction from domestic air travel, with our central elasticity calibrated using the relationship between rail journey times and air/rail mode share from figure B2.1 and PDFH5.1.

As First Group's proposal is based on offering significantly lower fares than currently, rather than reductions in journey times, it was necessary to adopt a new approach to estimating the potential for abstraction from the domestic airlines. – First Group's own demand overlay was produced with the intent of modelling demand for the services in the application to ORR, and having reviewed this overlay we felt that the most efficient solution was to use a variant of this overlay as a replacement for our original version.

The new overlay is a binomial logit model which allocates demand to either rail or air based on the estimated Generalised Journey Cost (GJC) for each mode, split into the constituent elements. Spread parameters are included to reflect the range of GJCs faced by individual passengers, and randomness in travel patterns (e.g. some people don't like flying so would never choose to travel by air regardless of the relative GJC). The model was calibrated to replicate existing air/rail mode shares.

The component parts of GJC included in the model are listed below and, in our opinion, reflect the main choices passengers face when selecting a mode of travel.

- Journey times for air and for rail
- Headway penalties for air and for rail
- Wait times for air and for rail
- Access/egress times for air and for rail
- Fares for air and for rail, split by journey purpose
- Car parking charges for air
- A mode specific constant for air, for model calibration purposes.

We have reviewed the data sources used to produce these factors and believe them to be reasonable for the purposes of this work. We have also reviewed the parameters estimated by First Group to weight the impacts of the component parts of GJC. These parameters use WebTAG guidance and suggested values, and, in our opinion, have been estimated on a reasonable basis.

The model, as designed by First Group, produces an absolute and proportionate demand and revenue assessment. It then applies two revealed preference adjustments, which increases the level of demand and revenue.

The first adjustment increases London – Edinburgh demand and revenue, based on case study evidence. First Group suggests that the model under predicts the rail market share when compared to examples from Europe and from Great Britain. The majority of this evidence compares rail journey times with the air/rail mode share. So whilst it may be a reasonable adjustment to the modelled results for a change in rail journey times, it is less so for a change in fares. - Given that the model is calibrated to replicate current mode shares, and given the general paucity of evidence on the impacts of fares competition on

air/rail market shares, validation of the model results is difficult. However, it is possible to compare the rail journey time parameter with the S-curve from PDFH. We estimate that a change in rail journey times has roughly half of the impact on mode share implied by the PDFH S-curve. This suggests that the model in overall terms may under state the potential for air market capture through reductions in journey times although, as discussed above, it is difficult to isolate the impact for fares alone.

The second adjustment is to account for a reduction in the number of London – Newcastle flights since the data was collected. This adjustment is made on a simple pro-rata basis, and we are sceptical of the validity of this approach, given the likelihood that the least well used flights were withdrawn.

3.5.2. Application of the Air Market Overlay

The air market overlay was applied using the following process:

- With the exception of fares, all components of GJC were set to the same level in the base scenario as with the introduction of First Group's proposed services. This is because the new services will not offer a reduction in journey times, and a small proportionate change in frequency is rail unlikely to result in air market capture. – The overlay therefore models the potential for air market capture from a reduction in fares alone.
- The revealed preference adjustments were switched off for the reasons discussed above.
- The model was run as described above and applied resultant the percentage demand/revenue uplift to the rail revenue base used in our modelling suite.
- The implied air/rail mode shares were compared with CAA data and Lennon data.

  Our definition of the combined rail and air market includes passengers transferring from, or making connections with other flights. However, we would not expect interlining passengers to switch to rail, and have further capped the air market demand overlay to exclude these passengers for the rail demand forecasts. Our forecasts do not exceed this cap.

  Our assumed geographical catchment for the London – Edinburgh, and London – Newcastle combined air and rail market is as described for the previous air market overlay.
- The revenue assessment produced using the rest of our forecasting suite was subtracted from the revenue assessment produced using the air market overlay (on a flow by flow basis). We then took the difference between these figures as air market capture, hence newly generated rail revenue.

3.6. Assessment of the impact of overcrowding

We assessed the impact of overcrowding on revenue by producing unconstrained[4] demand/revenue forecasts and comparing these projections with the proposed level of train capacity, to understand whether there is sufficient capacity to avoid demand suppression.

Our approach, which is consistent with PDFH5.1, is less sophisticated than the development of a crowding model that would be produced, say, for the purposes of supporting activities such as a rail franchising competition, however we believe that it is adequate for the purposes of this exercise. This is for two reasons:

- We do not expect current and future levels of overcrowding that would constrain significantly the revenue projections that we have produced for the services contained with the track access

[4] Our forecasts assume that the level of capacity constraint in the current actual revenue base neither increases nor decreases

applications received. The exception to this is VTEC's interim application 5, for which we have made a bespoke assessment.

- When designing our approach we were unclear as to whether we would be given access to train load data, which would be required to support most assessments of overcrowding. (VTEC has since supplied us with current load data for services which operate via Newcastle).

4. Revenue projections – Alliance's West Yorkshire/Cleethorpes – London service

4.1. Introduction

This section presents our revenue assessment for services contained within Alliance's application for access rights to run trains between London – West Yorkshire/Cleethorpes. The revenue projections shown are based on 2013/14 Lennon revenue, and therefore represent the annual revenue that would be generated if the services had been implemented prior to 2013/14. No assumptions around demand ramp up have been made, so we have not adjusted our profile of forecast demand take up to account for the time it takes for people to adjust their travel patterns.

4.1.1. Base timetable

The base MOIRA timetable, against which the proposed new services were compared, is intended to match the timetable that would operate post the introduction of IEP rolling stock and the completion of the ongoing ECML upgrade, however with existing services only. We have therefore constructed a weekday, Saturday and Sunday timetable in MOIRA as follows:

- VTEC services are as per East Coast franchise services in the May 2014 timetable. All train departures from origin stations are as per the May 2014 timetable, with journey times reduced on the basis of likely IEP sectional running time improvements. We have used the 2019 and 2020 weekday MOIRA files provided by VTEC to estimate journey time improvements, with the IEP time savings published by DfT used as a sense check for these estimates. Our estimated journey time savings are shown below in Table 5.
- Other services which use the ECML are based on VTEC's 2019 and 2020 timetable files. These services have the same quantum and stopping pattern as in the May 2014 timetable. Journey times away from core sections of the ECML are as per the May 2014 timetable, however journey times have been reduced slightly on the core ECML (King's Cross – Doncaster – York – Edinburgh) to take advantage of infrastructure improvements. These reductions are based on the journey times provided in VTEC's timetable files. Some departure times have been adjusted to provide realistic intervals with VTEC's proposed 2019 and 2020 timetables (application 6). We understand that VTEC made both the adjustments to journey times and departure times on the basis of advice from DfT during the recently completed East Coast franchise competition.

We have included these adjusted departure times in the base timetable, so that changes in services operated by TOCs other than VTEC do not distort the analysis.

Table 5 - Assumed journey time savings enabled by IEP/ongoing ECML upgrade work (May 2014 service quantum and stopping patterns)

Station	Journey time saving to/from King's Cross*
Stevenage	1 minutes
Peterborough, Grantham	2 to 3 minutes
Newark North Gate, Retford, Lincoln	3 to 5 minutes
Doncaster, Selby, Hull, York, Leeds (Yorkshire)	2 to 6 minutes
Darlington	4 to 6 minutes
Durham, Newcastle	5 to 8 minutes
Morpeth, Alnmouth, Berwick	6 to 7 minutes

Dunbar	7 minutes
Edinburgh and beyond	8 minutes

* Journey time saving achieved dependent on stopping pattern.

4.1.2. Base demand for new stations

This application includes the use of two rail stations that are not currently in existence.

- East Leeds Parkway is a proposed station which is planned to be located near Thorpe Park, in the proximity of Junction 46 of the M1 between Cross Gates and Garforth.
- Kirkstall Forge is a station currently under construction, located 4.5 miles north of Leeds on the Wharfdale Line. It is due to open in autumn 2015.

To create a synthetic base demand for these stations, two MOIRA runs need to be produced for each option to identify the set of flows that could be attracted to use Alliance's services. The first run contains the Alliance services with no stops at East Leeds Parkway and Kirkstall Forge. The second run contains stops at Micklefield to represent East Leeds Parkway, and Headingley to represent Kirkstall Forge.

Comparing these two runs allows us to estimate which journeys/flows may switch from existing stations to the new stations.

It is assumed in the base that the opening of these stations will attract demand from catchment areas of surrounding stations. For the flows identified from the comparison of the two MOIRA runs, a share of demand has been apportioned from existing nearby stations to these new stations, based on the locational split of the catchment population for the existing stations. The proportion of demand extracted from the existing stations is shown in Table 6 and Table 7.

Whilst this will not account for all of the new station demand, it will account for all of the existing station demand in scope for Alliance services.

Table 6 - Demand Extracted to create Kirkstall Forge synthetic base

Donor Station	Demand Extracted (relevant flows only)
Horsforth	26%
Bramley	18%
Headingley	11%

Table 7 - Demand Extracted to create East Leeds Parkway synthetic base

Donor Station	Demand Extracted (relevant flows only)
Garforth	92%
East Garforth	83%
Micklefield	72%
Cross Gates	47%
Woodlesford	38%
Castleford	5%
Leeds	2%

The synthetic base is then grown in the model by the application of the uplift factors from the gravity model calculated from the change in GJT on the station flows with the introduction of the Alliance services, as described in section 3.3.4.

The forecast for East Leeds Parkway was calculated as described in section 3.3.4, except that the catchment area was increased from 5km in the base, to 10km when Alliance's services are introduced. This is based on the likelihood that East Leeds Parkway would be a more convenient point of access to/from London services following the introduction of services to/from London. A 10km catchment is a simplification, which excludes potential catchment areas to the north of Leeds, but includes some heavily populated deprived areas within east Leeds which are unlikely to generate significant travel to/from London.

4.2. Revenue projections - West Yorkshire/Cleethorpes – London service

4.2.1. Service proposition

Alliance's proposed new services on the ECML are as follows:

- Seven return services per day (broadly two hourly) between London King's Cross and West Yorkshire.
- All services would call at Doncaster, East Leeds Parkway, Leeds and Kirkstall Forge, with six out of the seven extending to/from Shipley and Bradford Forster Square, and one out of the seven extending to/from Guiseley and Ilkley.
- Four return services per day between London King's Cross and Cleethorpes, calling at Doncaster, Scunthorpe, Habrough, Grimsby Town, and Cleethorpes.

The above pattern will would provide nine return services per day (rather than 11) between Doncaster and London King's Cross, as two of the above services would be operated via splitting/joining at Doncaster with one half extending to/from Bradford Forster Square and Ilkley (one each), and the other half extending to/from Cleethorpes.

Alliance's application also includes the following services which are proposed as a means of balancing train diagrams stabled in the Doncaster area:

- One early morning non-stop service between Doncaster and London King's Cross
- One late evening non-stop service between London King's Cross and Doncaster
- One morning peak service between Doncaster and Bradford Forster Square (arriving Leeds at 08:22)
- One late evening service between Cleethorpes and Doncaster

The proposal involves use of new Hitachi Super Express Trains, fitted with bi-mode traction power. We understand that trains would operate in 5-car formation generally, with formations of 2 x 5 car on the portions of the journeys that are operated via splitting/joining at Doncaster.

On a Saturday, Alliance intends to operate a similar (but retimed) service provision as outlined above, with the following changes:

- One less AM London – Bradford service
- Additional AM service from Doncaster to Bradford Forster Square (assumed for diagram balancing)

- Additional AM Cleethorpes service joining a Doncaster – London service at Doncaster
- One less PM Bradford – London service
- Additional PM service from Bradford Forster Square to Doncaster (we assume this is for diagram balancing purposes)

On a Sunday, Alliance intends to operate the following service provision:

- 5 services in each direction between London and Bradford Forster Square
- 2 services in each direction between London and Ilkley
- 4 services from London – Cleethorpes and 3 services from Cleethorpes – London
- 2 services in each direction between London and Doncaster
- 1 service in each direction between Doncaster and Cleethorpes
- 1 service from Bradford – Doncaster
- 1 service from Doncaster – Ilkley

Three of the above services would be operated via joining at Doncaster with one half extending from Bradford Forster Square and the other half extending from Cleethorpes. Two of the above services would be operated via splitting at Doncaster with one half extending to Bradford Forster Square and the other half extending to Cleethorpes.

4.2.2. Revenue projections

We estimate that Alliance's Yorkshire/Cleethorpes – London services would attract around 2.3 million passenger journeys, and £60 million revenue per annum.

Of this revenue we estimate that around £15.1 million would be newly generated and £44.9 million would be abstracted from other TOCs. We therefore estimate that a ratio of newly generated revenue to abstracted revenue of 0.34. Table 8 below shows the total revenue split by newly generated revenue and abstracted revenue.

Table 8 - Estimated total annual revenue for Alliance's West Yorkshire/Cleethorpes option

Total revenue	Newly generated	Abstracted	(Generation)/ (Total Abstraction)
£60m	£15.1m	£44.9m	0.34

Figure 5 below illustrates total revenue by station that Alliance's new service would call at, split by abstracted revenue and newly generated revenue, and Figure 6 illustrates that split of revenue by source as a percentage of the total revenue for each station.

Around £29.8m is forecast to be generated by travel to/from Leeds station, which is equivalent to half of total revenue. Of this, around £2.7m is newly generated and £27.1m is abstracted from other TOCs. This abstracted revenue is the equivalent of 48% of total revenue for the Yorkshire/Cleethorpes – London service.

Broadly £3.6m is forecast to be generated by travel to/from Doncaster, and similarly to Leeds, the majority (82.8%) of revenue is forecast to be abstracted from other operators.

Around £20.7m (34% of total revenue) is forecast to be generated by travel to/from stations with new direct links, particularly travel to/from London (£16.8m). These stations are Bradford Forster Square, Shipley, Ilkley, Kirkstall Forge, East Leeds Parkway, Habrough, Scunthorpe, Grimsby and Cleethorpes. The

average split of abstraction and generation for these stations is broadly even. The remaining revenue is forecast to be generated from other stations

As discussed above, forecasting demand for the new rail stations is particularly difficult. Table 9 shows the base and option demand for the new stations. For East Leeds Parkway, our annual revenue projection for all TOCs is £9.25m, of which Alliance's share is forecast to be £5.32m. The Kirkstall Forge annual revenue projection for all TOCs is £1.15m, of which Alliance's share is forecast to be £0.45m. Kirkstall Forge demand is low is because we have not abstracted any demand from Leeds station when creating the synthetic base demand. This is a simplifying assumption.

Table 9 - Synthetic base and option demand for the new stations

Station	Base Revenue	Base Journeys	Option Revenue	Option Journeys
East Leeds Parkway	£6.13m	2.13m	£9.25m	2.19m
Kirkstall Forge	£0.91m	0.36m	£1.15m	0.37m

Finally, Figure 7 shows the split of annual revenue by source (abstraction and generation) and by contributory factor. The largest forecast source of abstraction is the improvement in GJT offered by Alliance, and the largest forecast source of generation is the release of supressed demand through an improved service to stations with currently infrequently services.

Figure 5 - Yorkshire/Cleethorpes Option - Annual Revenue by Source

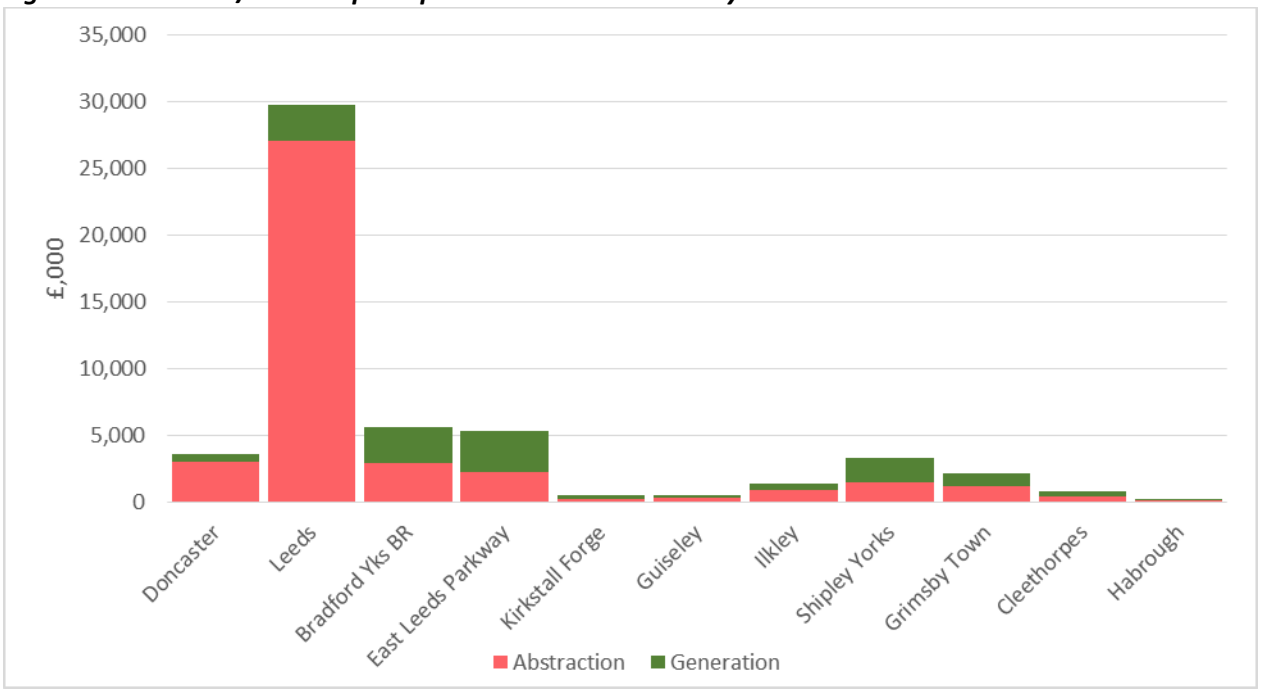


Figure 6 - Yorkshire/Cleethorpes Option - Percentage split of revenue generation by station and source

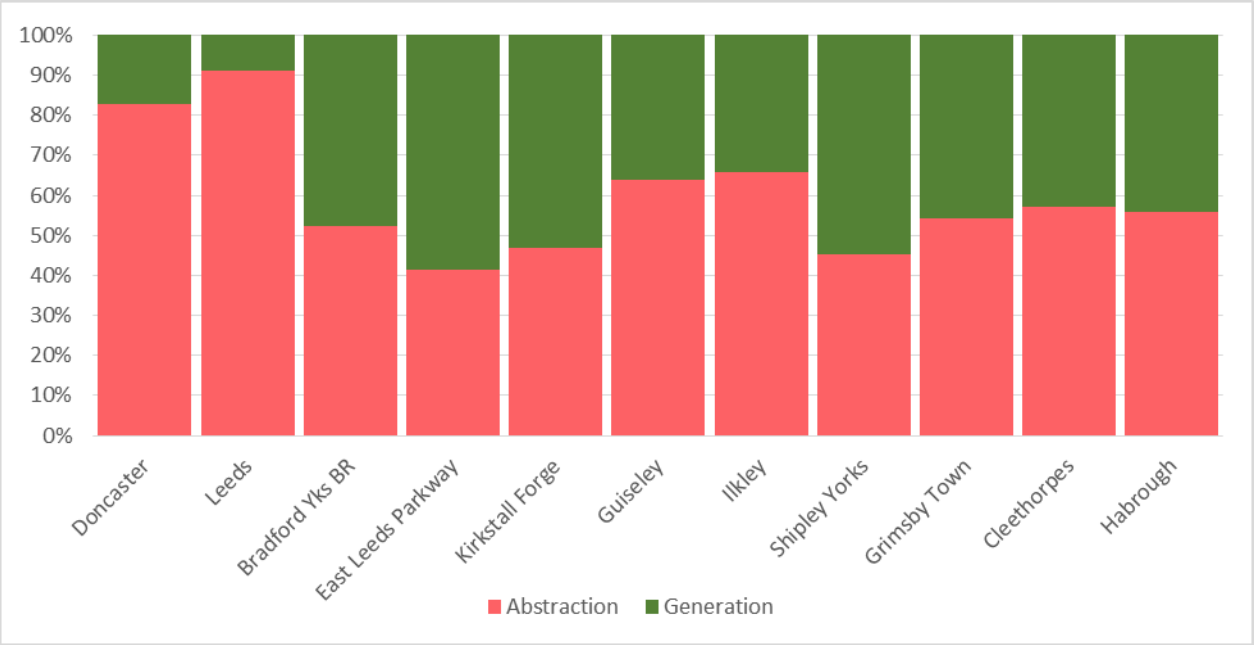
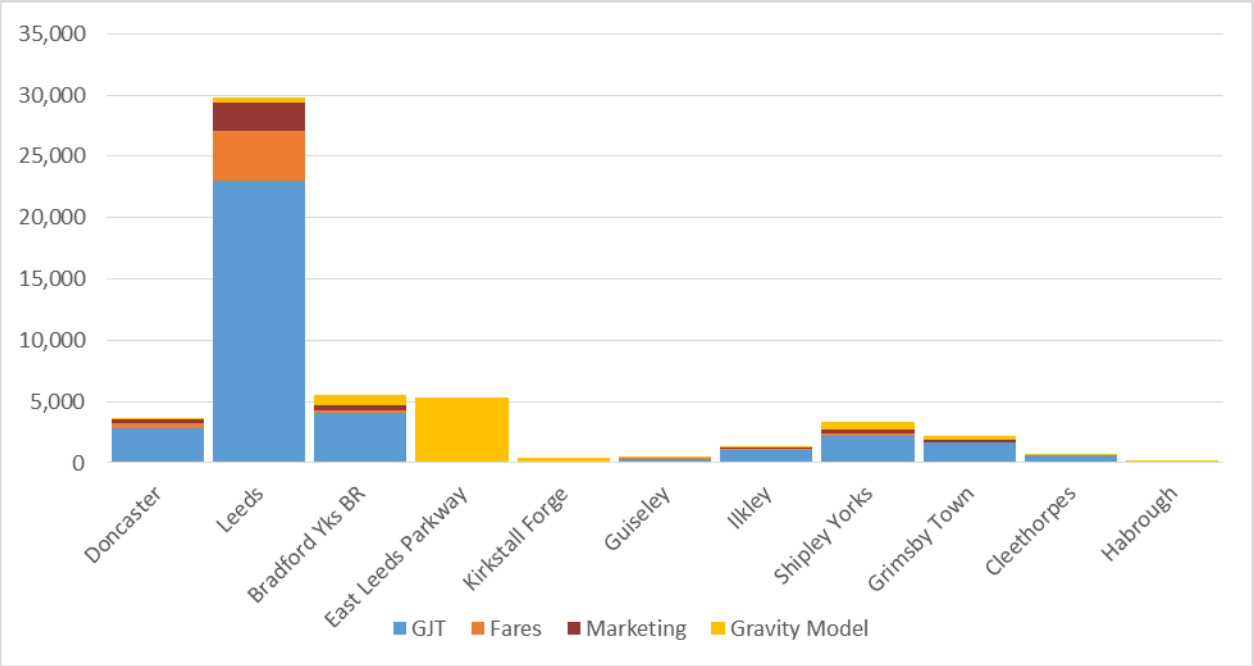


Figure 7 - Yorkshire/Cleethorpes Option - Annual revenue by source and by contributory factor



4.3. Revenue projections – Separate assessment of the West Yorkshire and Cleethorpes options

4.3.1. Introduction

At the request of the ORR, we have also assessed the Alliance application described in section 4.2 as two separate options:

- London Kings Cross – West Yorkshire
- London Kings Cross – Cleethorpes

We have built these options by separating out the above services, along with services between Doncaster – Yorkshire & Doncaster – Cleethorpes into two separate MOIRA options.

In the Yorkshire option, we have removed London – Cleethorpes trains, and the Doncaster – Cleethorpes legs of trains which split and join at Doncaster.

In the Cleethorpes option, we have removed London – Bradford/Ilkley trains, and the Doncaster – Bradford/Ilkley legs of trains that split and join at Doncaster.

Services between London – Doncaster only have been left in both options. These services, as well as the London – Doncaster leg of services which split/join at Doncaster are common to both options. **This means that the resultant revenue projections for the two options are not mutually exclusive.**

As in section 4.2, we have included Weekday, Saturday and Sunday timetables in our assessment.

The revenue projections shown are based on 2013/14 Lennon revenue, and therefore represent the annual revenue that would be generated if the services had been implemented prior to 2013/14. No assumptions around demand ramp up have been made.

4.3.2. Revenue projections - West Yorkshire Option

We estimate that Alliance's West Yorkshire – London services would attract around 2 million passenger journeys, and £52 million revenue per annum.

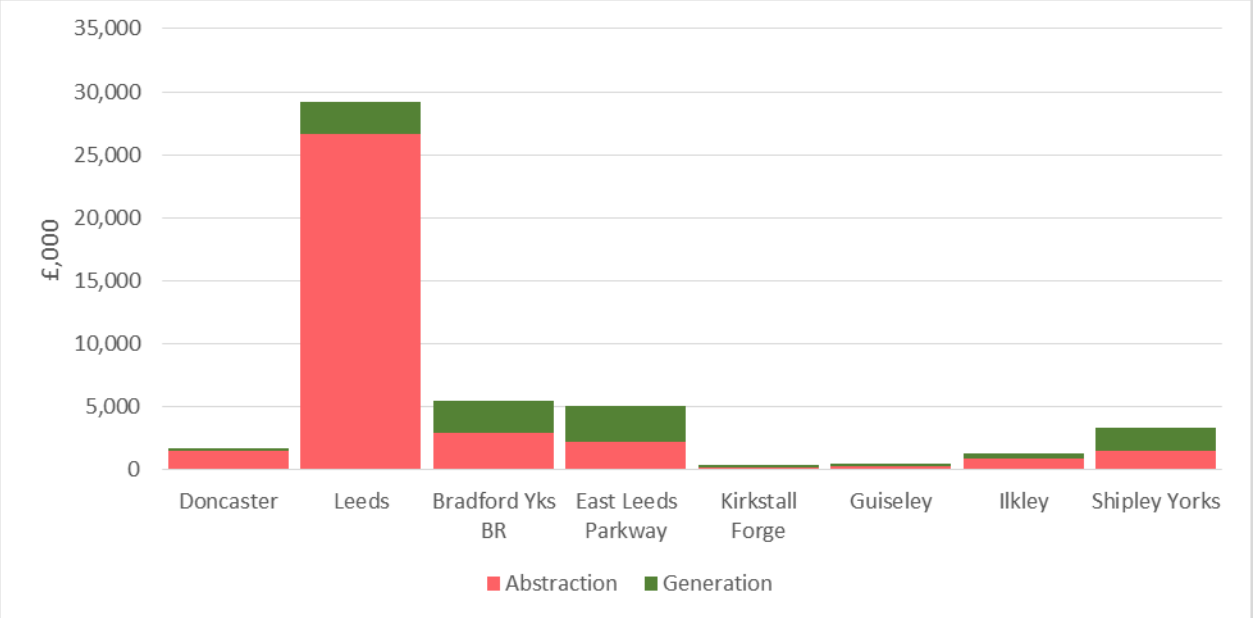
Of this revenue we estimate that around £12.0 million would be newly generated and £40.0 million would be abstracted from other TOCs. We therefore estimate a ratio of generation to abstraction of 0.30. Table 10 below shows the total revenue split by newly generated revenue and abstracted revenue.

Figure 8 below illustrates total revenue by station that Alliance's new service would call at, split by abstracted revenue and newly generated revenue. Around £29.2m is forecast to be generated by travel to/from Leeds station, which is equivalent to 56% of total revenue.

Table 10 - Estimated total annual revenue for Alliance's West Yorkshire option

Total revenue	Newly generated	Abstracted	(Generation)/ (Total Abstraction)
£52m	£12.0m	£40.0m	0.30

Figure 8 – West Yorkshire Option - Annual Revenue by Source



4.3.3. Revenue projections – Cleethorpes Option

We estimate that Alliance's West Yorkshire – London services would generate around 0.3 million passenger journeys, and £9.5 million revenue per annum.

Of this revenue we estimate that around £2.6 million would be newly generated and £6.9 million would be abstracted from other TOCs. We therefore estimate a ratio of generation to abstraction of 0.37. Table 11 below shows the total revenue split by newly generated revenue and abstracted revenue.

Figure 9 below illustrates total revenue by station that Alliance's new service would call at, split by abstracted revenue and newly generated revenue. Around £3.4m is forecast to be generated by travel to/from Doncaster station, which is equivalent to 36% of total revenue.

Table 11 - Estimated total annual revenue for Alliance's Cleethorpes option

Total revenue	Newly generated	Abstracted	(Generation)/ (Total Abstraction)
£9.5m	£2.6m	£6.9m	0.37

Figure 9 - Cleethorpes Option - Annual Revenue by Source

5. Revenue projections – Alliance's London - Edinburgh service

5.1. Introduction

This section presents our revenue assessment for services contained within Alliance's application for access rights to run trains between London – Edinburgh. The revenue projections shown are based on 2013/14 Lennon revenue, and therefore represent the annual revenue that would be generated if the services had been implemented prior to 2013/14. No assumptions around demand ramp up have been made.

5.1.1. Base timetable

The base MOIRA timetables, against which the proposed new services were compared are identical to those used for the Alliance London – Yorkshire/Cleethorpes options (see section 4). These timetables are intended to match the timetable that would operate post the introduction of IEP rolling stock and the completion of the ongoing ECML upgrade, however with existing services continued.

5.2. Revenue projections – London – Edinburgh service

5.2.1. Service proposition

Alliance's proposed pattern of new services on the ECML is as follows:

- Hourly services between London King's Cross and Edinburgh (15 services per day southbound and 14 services per day northbound).
- All services would call at Newcastle, with two early morning northbound services and three evening southbound services calling at Stevenage to pick up and set down passengers respectively.

In addition, Alliance's proposal includes the following early morning/late evening short workings:

- One early morning service between Newcastle and London King's Cross
- Two late evening services between London King's Cross and Newcastle
- Three early morning services between Newcastle and Edinburgh
- Two late evening services between Edinburgh and Newcastle

On a Saturday, Alliance intends to operate a similar (but retimed) service provision as outlined above, with the following changes:

- 1 fewer service from London – Edinburgh
- 2 fewer services from Edinburgh – London
- 1 additional service from Newcastle – Edinburgh (assumed for diagram balancing)
- 1 fewer southbound Stevenage calls

On a Sunday, Alliance intends to operate the following service provision:

- 12 services in each direction between London – Edinburgh
- 2 services in each direction between London – Newcastle

- 3 services from Newcastle – Edinburgh
- 2 services from Edinburgh to Newcastle

The proposal involves operation of new Class 390 Pendolino rolling stock in a 9-car formation.

We have modelled the journey times provided in Alliance's MOIRA files with small adjustments to comply with time allowances show in the current Train Planning Rules. These journey times are broadly 3 hrs 43 London – Edinburgh and 2 hrs 28 mins London – Newcastle in the northbound direction assuming no call at Stevenage, and 1-2 minutes slower in the southbound direction. These journey times are not possible given the current and committed future capability of the infrastructure. The journey times are therefore dependent on an infrastructure upgrade, which Alliance would fund. The total cost of this upgrade.

5.2.2. Revenue projections

As this service provides direct competition with domestic air travel, we have applied the methodology described in section 3.4. This option has been run with three scenarios, each with a different set of GJT elasticities to calculate abstraction from the aviation market (see section 3 for an explanation of this):

- **Low**: elasticity of -1.55
- **Central**: elasticity -3.27 for Edinburgh. For Newcastle, the application of the default forecast resulted in an implied mode share greater than the total combined rail and point to point air market. We have therefore not applied the aviation abstraction calculation.
- **High**: elasticity of -3.5

Unless otherwise stated, the results reported below are from the Central scenario.

We estimate that Alliance's Edinburgh – London services would attract around 3.2 million passenger journeys, and £155.6 million revenue per annum.

Of this revenue, we estimate that around £40.8 million would be newly generated and £114.8 million would be abstracted from other TOCs. We therefore estimate a generation to abstraction ratio of 0.36. Table 12 below shows the total revenue split by newly generated revenue and abstracted revenue.

Table 12 - Estimated total annual revenue for Alliance's Edinburgh option

Scenario	Total revenue	Newly generated	Abstracted	(Generation)/ (Total Abstraction)
Low	£145.1m	£30.3m	£114.8m	0.26
Central	£155.6m	£40.8m	£114.8m	0.36
High	£157.1m	£42.3m	£114.8m	0.37

Figure 10 below illustrates total revenue by station that Alliance's new service would call at, split by abstracted revenue and newly generated revenue, and Figure 11 illustrates that split of revenue by source as a percentage of the total revenue for each station.

Around £86.3m is forecast to be generated by travel to/from Edinburgh station, which is equivalent to 55% of total revenue. Of this, around £30.9m is newly generated and £55.3m is abstracted from other TOCs.

Travel to and from Newcastle station is forecast to generate £63.9 m, which is equivalent to 41.1% of total revenue. Of this, around £10.6m is newly generated and £53.3m is abstracted from other TOCs.

Finally, Figure 12 shows the split of annual revenue by source (abstraction and generation) and by contributory factor. This illustrates the level of additional demand generation from air market abstraction, which generates an additional £18.0m on air competitive flows from Edinburgh, and £0m on air competitive flows from Newcastle.

Figure 10 - Edinburgh Option - Annual Revenue by Source

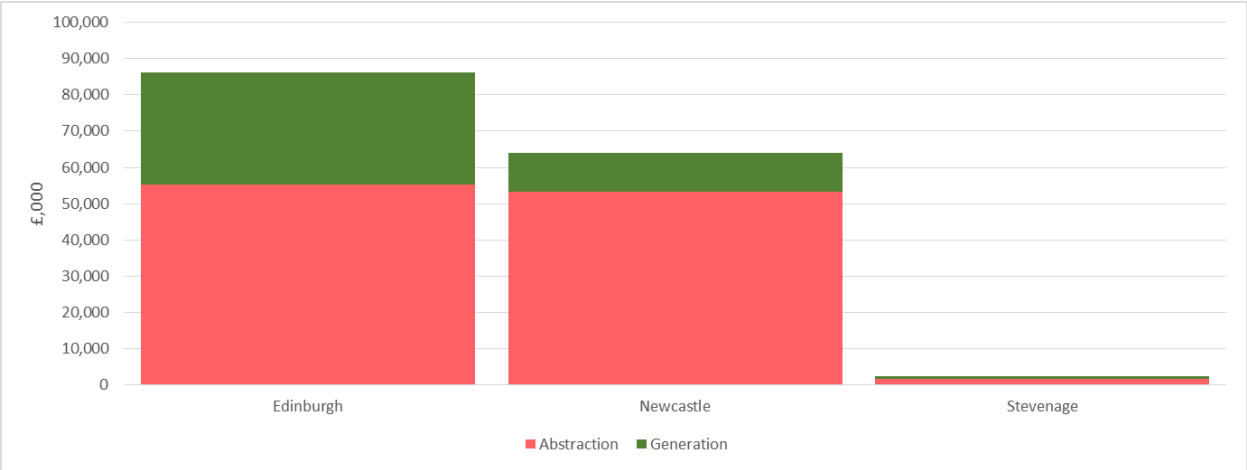


Figure 11 - Edinburgh Option - Percentage split of revenue generation by station and source

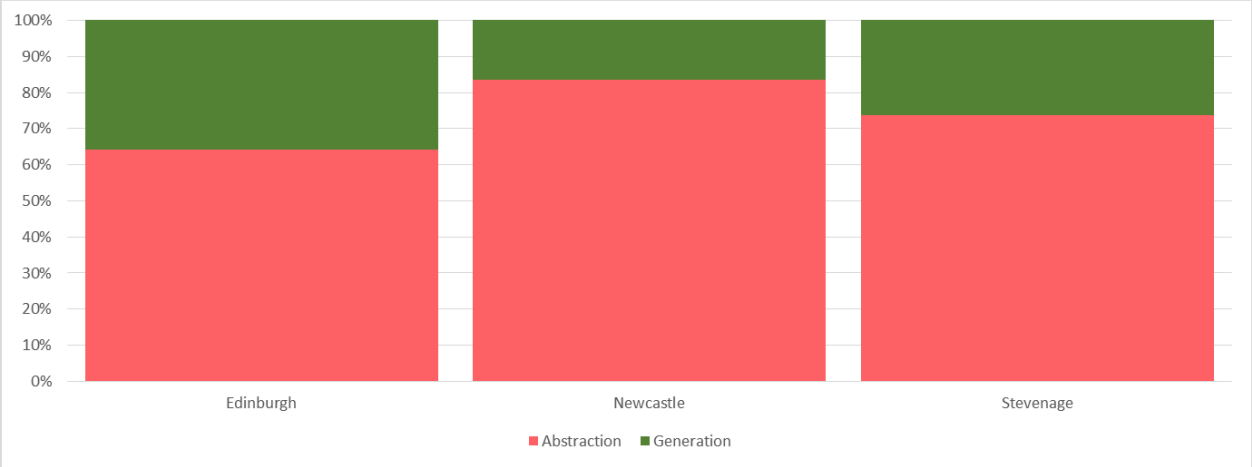
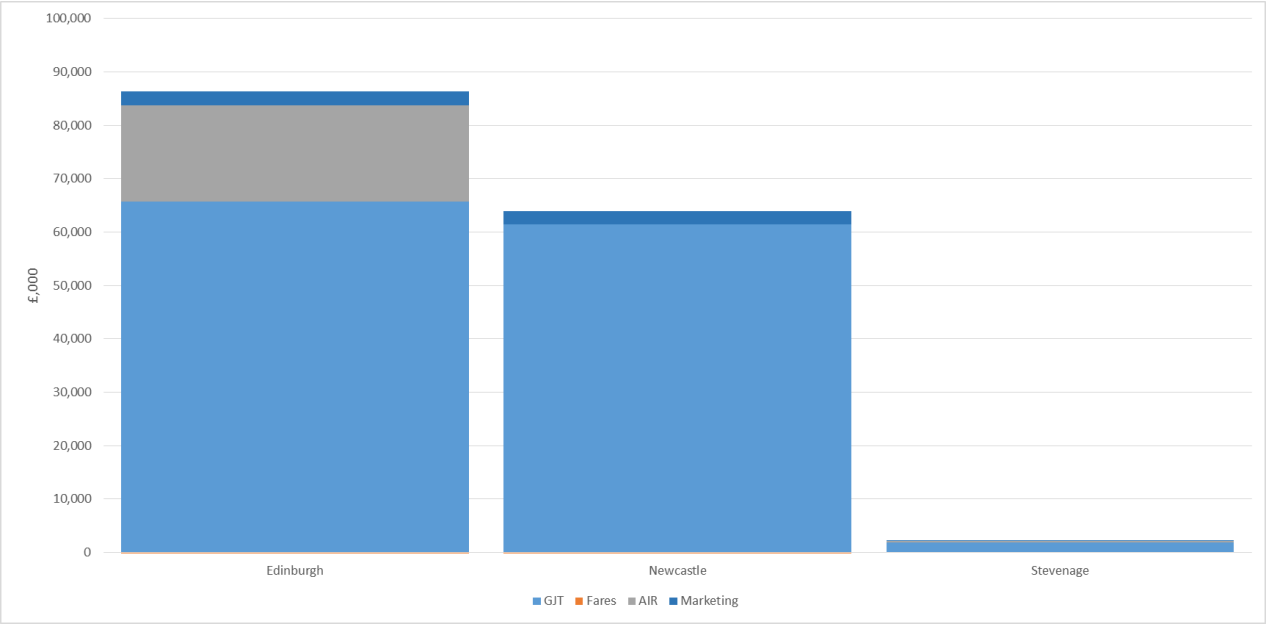


Figure 12 – Edinburgh Option - Annual revenue by source and by contributory factor



6. Revenue projections - VTEC's interim track access applications

6.1. Introduction

This section presents our revenue assessment for services contained within VTEC's applications for access rights covering the period up to 2019. We have not assessed application 1 on the instruction of ORR. We understand that is because the application is not competing for capacity.

6.1.1. Base timetable

The base timetable against which the proposed new services were compared is the May 2014 timetable. This was the most recent timetable available upon commencement of the work for ORR. We believe it to be a reasonable representation of the likely timetable for LDHS services that currently operate, prior to the introduction of IEP and the completion of the ECML upgrade programme.

6.2. Revenue projections - Application 2 (Sunderland extensions)

6.2.1. Service proposition

Application 2 involves the extension of one weekday King's Cross – Newcastle service in each direction to/from Sunderland, namely:

- 05:40 ex Sunderland, departing Newcastle 06:00 and arriving King's Cross 09:07 (06:30 Newcastle – Kings Cross 09:37 retimed 30 minutes earlier).
- 20:00 ex King's Cross departing Newcastle 22:55, and arriving Sunderland 23:20.

Our revenue projections are based on both the 'default forecasting approach' and the 'supressed travel assessment'. The latter was used as Sunderland and London are connected by a current service frequency of less than one train per hour.

VTEC's services will provide direct connections between Sunderland and King's Cross, which can currently only be made directly using Grand Central, or via an interchange with VTEC services at Newcastle.

Our revenue modelling assumes that fares on VTEC's new services generate the same revenue per Sunderland - London journey as VTEC's current average for this flow. This is higher than Grand Central's average revenue per journey for Sunderland – London. We understand that this difference is because a greater proportion of VTEC's passengers use 'any operator' tickets rather than discounted 'operator-specific' tickets, to make use of VTEC's higher service frequency (via an interchange at Newcastle). We therefore believe that the use of the existing yield is a reasonable assumption.

6.2.2. Revenue projections

Table 13 below summarises our revenue assessment.

We estimate that the extension to Sunderland in Application 2 would attract 6,000 passenger journeys per annum, and produce £180k revenue per annum. Sunderland – London accounts for over half of the forecast journeys and three quarters of our forecast revenue. Our estimated ratio of generated revenue to abstracted revenue is 0.4.

Table 13 - Estimated total annual revenue for VTEC's Application 2

Total revenue	Newly generated	Abstracted (all TOCs)	(Generation)/ (Total Abstraction)
£180k	£51k	129k	0.4

6.3. Revenue projections - Application 3 (Leeds Saturdays)

6.3.1. Service proposition

Application 3 involves the addition of one service in each direction between King's Cross and Leeds on Saturdays, specifically:

- 09:40 ex Leeds arriving King's Cross 11:56
- 19:05 ex King's Cross arriving Leeds 21:22

Our revenue assessment was conducted using the 'default forecasting approach' only.

6.3.2. Revenue projections

Table 14 below summarises our revenue assessment.

We estimate that application 3 would attract around 11k passenger journeys per annum, resulting in £364k revenue per annum.

Of this revenue, we estimate that around £165k would be newly generated, £199k would be abstracted from all TOCs, of which £168k would be abstracted from operators that are not franchised by DfT. We therefore estimate that the ratio of generated revenue to abstracted revenue is 0.83 including DfT franchised operators, and 0.98 excluding DfT franchised operators.

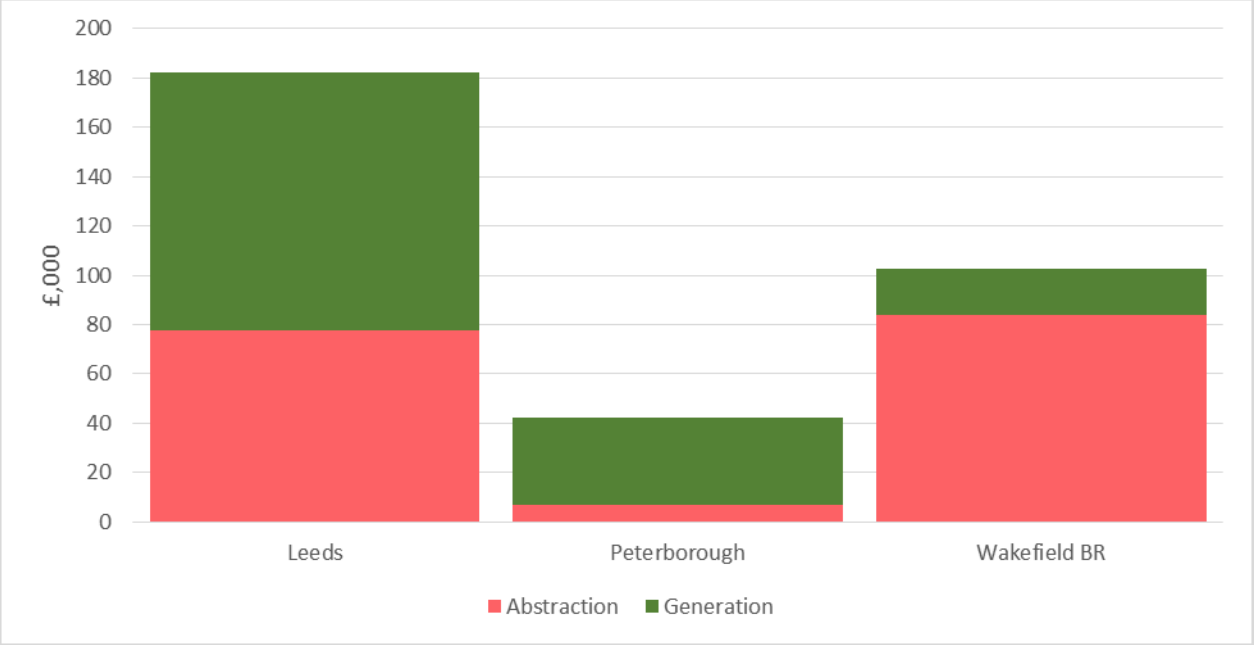
Figure 13 below illustrates total revenue by station that VTEC's application would impact the greatest, split by abstracted revenue and newly generated revenue. We expect that open access revenue would be abstracted for these stations, as the proposed VTEC services provide new opportunities to travel

between London and West Yorkshire at similar times of day to Grand Central's King's Cross – Bradford Interchange services. This is particularly true for the proposed Saturday morning service.

Table 14 - Estimated total annual revenue for VTEC's Application 3

Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
£364k	£165k	£199k	£168k	0.83	0.98

Figure 13 - Application 3 revenue by key station and source



6.4. Revenue projections - Application 4 (Edinburgh weekday extensions)

6.4.1. Service proposition

Application 4 involves extension of four weekday King's Cross - Newcastle services in each direction to/from Edinburgh, namely:

- Depart King's Cross 06:15, depart Newcastle 09:45, arrive Edinburgh 11:14
- Depart King's Cross 10:30, depart Newcastle 13:45, arrive Edinburgh 15:16
- Depart King's Cross 13:30, depart Newcastle 16:45, arrive Edinburgh 18:14

- Depart King's Cross 17:30, depart Newcastle 20:32, arrive Edinburgh 22:02
- Depart Edinburgh 08:58, depart Newcastle 10:25, arrive King's Cross 13:42
- Depart Edinburgh 12:58, depart Newcastle 14:25, arrive King's Cross 17:41
- Depart Edinburgh 15:58, depart Newcastle 15:25, arrive King's Cross 20:47
- Depart Edinburgh 19:35, depart Newcastle 21;15, arrive King's Cross 01:03

In addition to the above, the Berwick-upon-Tweed call would be moved from the 17:00 ex King's Cross to the 17:30.

We estimate that the introduction of these services would increase VTEC's revenue by around £2.3m per annum, and total GB rail revenue by £0.7m. This increase in revenue would be a result of 83k additional journeys to VTEC and a net increase of 22k journeys for all GB operators.

6.5. Revenue projections - Application 5 (Edinburgh Sundays)

6.5.1. Service proposition

Application 5 involves the addition of one Sunday King's Cross – Edinburgh service in each direction, via a combination of additional services and the extension of existing services. The proposed new services are:

- 13:20 Edinburgh to King's Cross, arriving 17:46 (calling at Berwick-upon-Tweed, Newcastle, Darlington, York and Grantham)
- 18:27 King's Cross to Newcastle, arriving 21:28 (calling at York, Darlington, Durham).

In addition to this, the 18:30 King's Cross to Newcastle would be extended to Edinburgh (arriving 23:13), omitting Peterborough and calling additionally at Berwick-upon-Tweed. The 18:00 King's Cross to Edinburgh would call additionally at Peterborough.

Our revenue assessment has been produced on the basis of the 'default forecasting approach' only. We did not believe that it was necessary to augment this approach with the 'air/rail market share assessment' as the proposed services will not reduce Edinburgh or Newcastle – London journey times.

VTEC has stated that these services will provide crowding relief on busy Sunday afternoon services. VTEC have provided a significant number of train counts for Sunday services that support the claim of overcrowding. We have done some off-model analysis to estimate the release in demand currently supressed by overcrowding, due to the introduction of the additional Sunday services.

6.5.2. Revenue projections

Table 15 below summarises our revenue assessment.

We estimate that application 5 would attract around 11k passenger journeys, resulting in £443k revenue per annum.

From the annual forecasts above, 4k of passenger journeys and £208k of revenue can be attributed to demand generated from crowding reduction.

Forecast changes in revenue are spread across a large number of small flows, with London – Edinburgh (£226k) the largest single increase for VTEC.

Of the total revenue projection, we estimate that around £258k would be newly generated and £185k would be abstracted from other TOCs. We therefore estimate that the ratio of generated revenue to abstracted revenue is 1.39 including DfT franchised operators.

The main abstraction from DfT franchised operators is via a reallocation of revenue from CrossCountry to VTEC. This is because VTEC's proposed new services would compete directly with CrossCountry services between Newcastle and Edinburgh.

Figure 14 below illustrates total revenue by station that VTEC's application would impact the greatest, split by abstracted revenue and newly generated revenue. Figure 15 presents key station revenue by demand driver.

Table 15 - Estimated total annual revenue for VTEC's Application 5

Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
£443k	£258k	£186k	£54k	1.39	4.78

Figure 14 - Application 5 revenue by key station and source

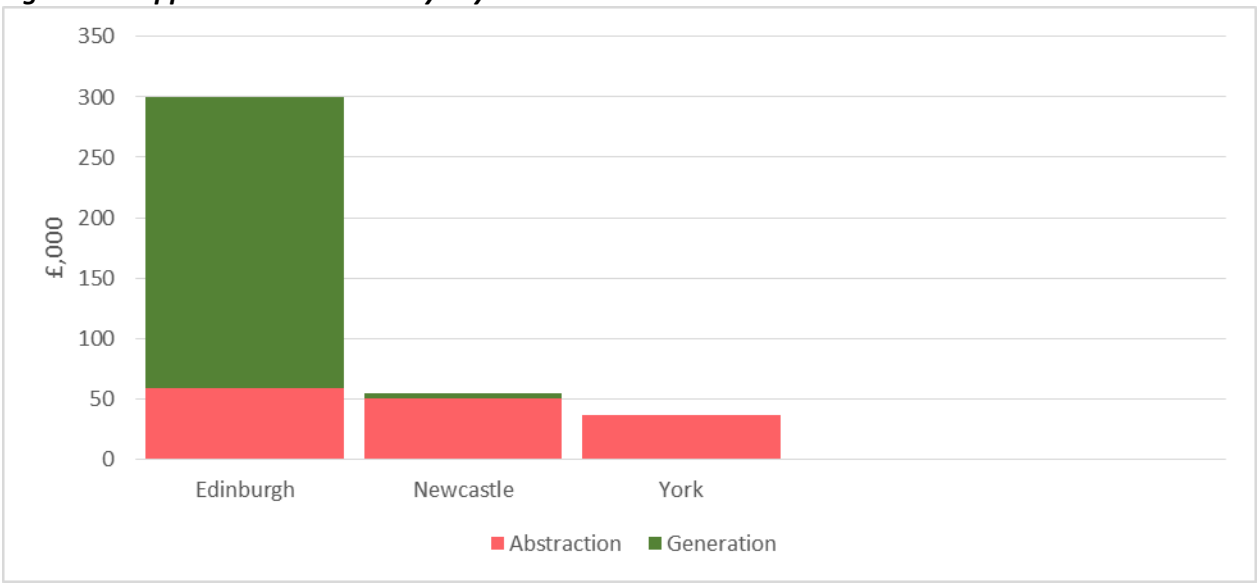
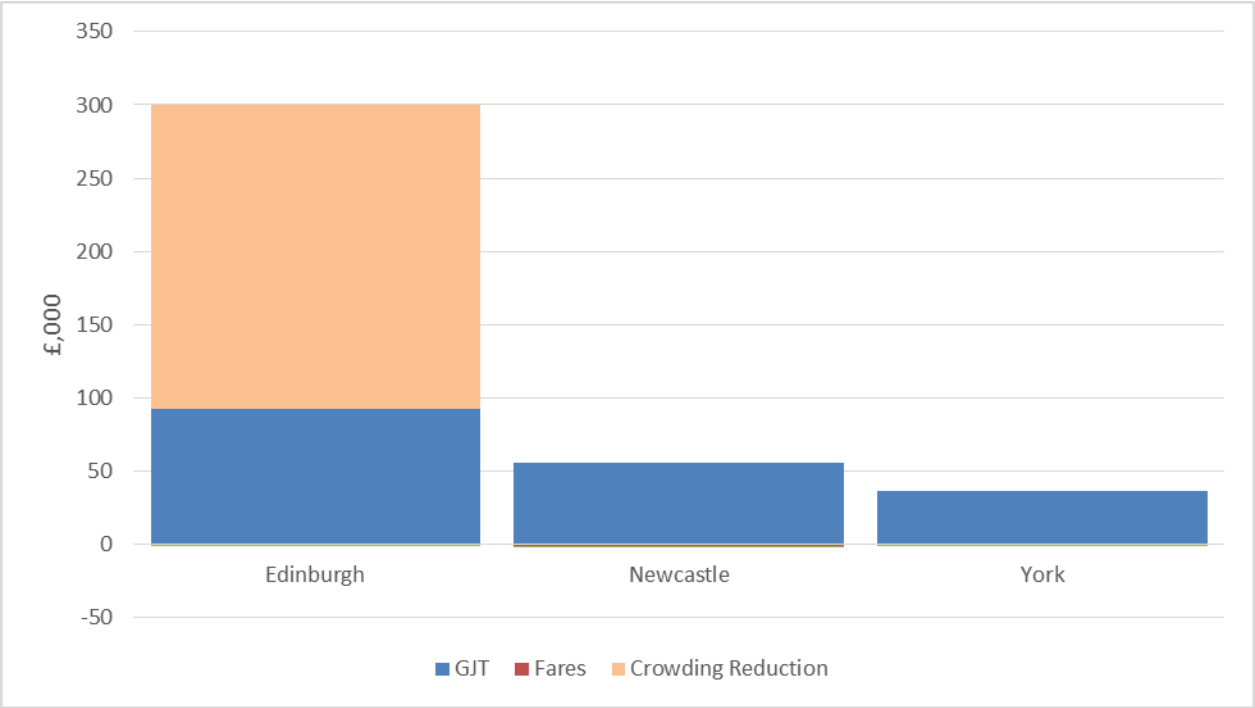


Figure 15 - Application 5 revenue by key station and source



7. Revenue projections - VTEC's long term track access applications

7.1. Introduction

This section presents our revenue assessment for services contained within VTEC's long term track application (application 6), covering the period from 2019 onwards unless stated.

7.1.1. Base timetable

The base weekday MOIRA timetable, against which the proposed new services were compared is identical to those used for the Alliance options (see sections 4 and 5). This timetable is intended to match the timetable that would operate post the introduction of IEP rolling stock and the completion of the ongoing ECML upgrade, however with existing services continued. We have modelled the weekday timetable as a proxy for both weekdays and weekends, using the full weekday, Saturday and Sunday demand and revenue matrices.

7.2. Revenue projections – 2020 ECML core (additional King's Cross – Newcastle/Edinburgh services)

7.2.1. Service proposition

VTEC's proposed service differs from current services broadly as follows:

- Introduction of a half hourly King's Cross – Edinburgh service, replacing a two hourly service pattern comprising approximately three King's Cross – Edinburgh trains in each direction and one King's Cross - Newcastle train in each direction.
- Introduction of an additional hourly King's Cross – Newcastle stopping service.
- Replacement of the existing hourly King's Cross – Newark/York stopping service with an hourly stopping service between King's Cross and Lincoln/Harrogate on alternate hours. King's Cross - Harrogate services would operate via Hambleton Junction.
- Extension of one weekday King's Cross - Edinburgh service in each direction to/from Stirling.
- Extension of one weekday King's Cross – Newcastle service in each direction to/from Sunderland.

At a quantum level the services contained within VTEC's interim applications would be met or exceeded by the services contained within the long term application.

7.2.2. Construction of the 2020 core option in MOIRA

We do not believe that it is reasonable to produce revenue assessments for only the services which are additional to the quantum of current services. This is because VTEC's proposed addition to the quantum of core ECML services will enable intermediate station calls to be transferred from some current King's Cross – Edinburgh and King's Cross – Leeds services, thereby reducing journey times between these locations. We therefore view both VTEC's additional services described above, and its proposed King's Cross – Newcastle/Edinburgh and King's Cross – Leeds services as a single package of services. We have therefore constructed an option in MOIRA as follows:

- Deletion of VTEC King's Cross – Newcastle/Edinburgh services from our base timetable, and replacement with King's Cross – Newcastle/Edinburgh services described above. These new services are taken directly from VTEC's 2019 weekday MOIRA file (2 tph King's Cross - Edinburgh and 1tph King's Cross – Newcastle).
- Deletion of the King's Cross – Leeds core leg of King's Cross – Yorkshire services in our base timetable. Replacement of these services with the King's Cross – Leeds leg of King's Cross - Yorkshire services that operate via Wakefield in VTEC's 2019 weekday MOIRA file. This maintains the current quantum of services King's Cross – Leeds services, but improves journey times via switching some intermediate station calls to other services. Extensions to/from Leeds (e.g. Skipton) are as per the base timetable, timed to fit with the equivalent train in the base.

7.2.3. Revenue projections

As this service provides direct competition with domestic air travel, we have applied the methodology described in section 3.4. This option has been run with three scenarios, each with a different set of GJT elasticities to calculate abstraction from the aviation market:

- **Low**: elasticity of -1.55
- **Central**: elasticity -3.2 for Edinburgh. We have not applied the air market uplift to London – Newcastle as the forecast demand using the other parts of the forecasting suite exceeds mode share calculated using PDFH.
- **High**: elasticity of -3.5

Table 16 below summarises our revenue assessment.

In our central scenario we estimate that the 2020 Core option would attract around 1.0m passenger journeys per annum, resulting in a total annual revenue of £32.9m.

Of this total revenue in our central scenario, we estimate that around £19.8m would be newly generated, £13.0m would be abstracted from all TOCs, and £5.2m would be abstracted from operators that are not franchised by DfT. We therefore estimate that the ratio of generated revenue to abstracted revenue is 1.52 including DfT franchised operators, and 3.80 excluding DfT franchised operators.

Figure 16 below illustrates total revenue by station that VTEC's application would impact the greatest, split by abstracted revenue and newly generated revenue.

Figure 17 presents key station revenue by demand driver.

We estimate that 32% (£2.2m) of the revenue will be as a result of attracting passenger journeys that would otherwise have been made by air travel.

Table 16 - Estimated total annual revenue for VTEC's application 6 – 2020 core services

Scenario	Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation) / (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
Low	£31.2m	£18.1m	£13.0m	£5.2m	1.39	3.46
Central	£32.9m	£19.8m	£13.0m	£5.2m	1.52	3.80
High	£33.2m	£20.2m	£13.0m	£5.2m	1.55	3.87

Figure 16 - VTEC core 2020 option, revenue by key station and source

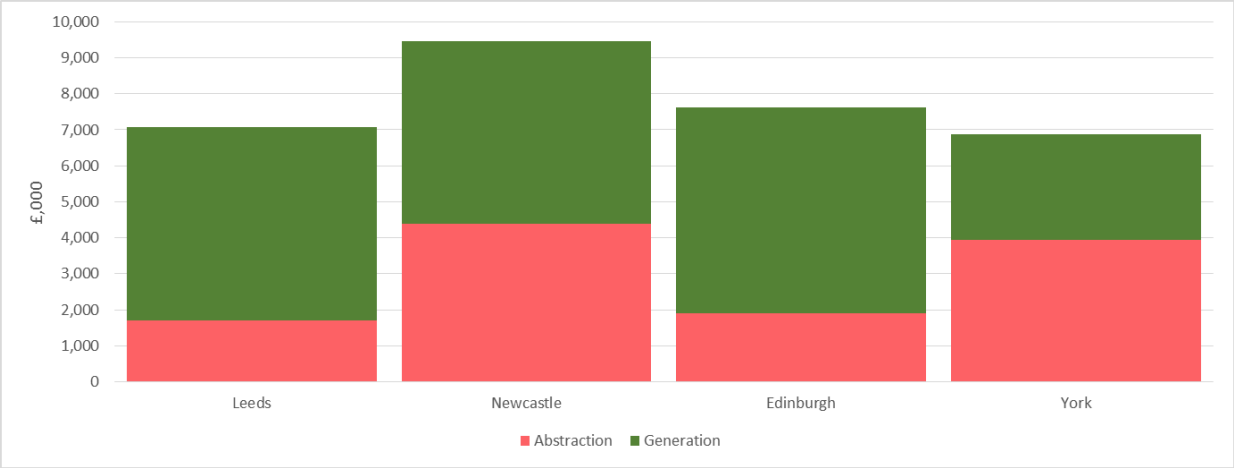
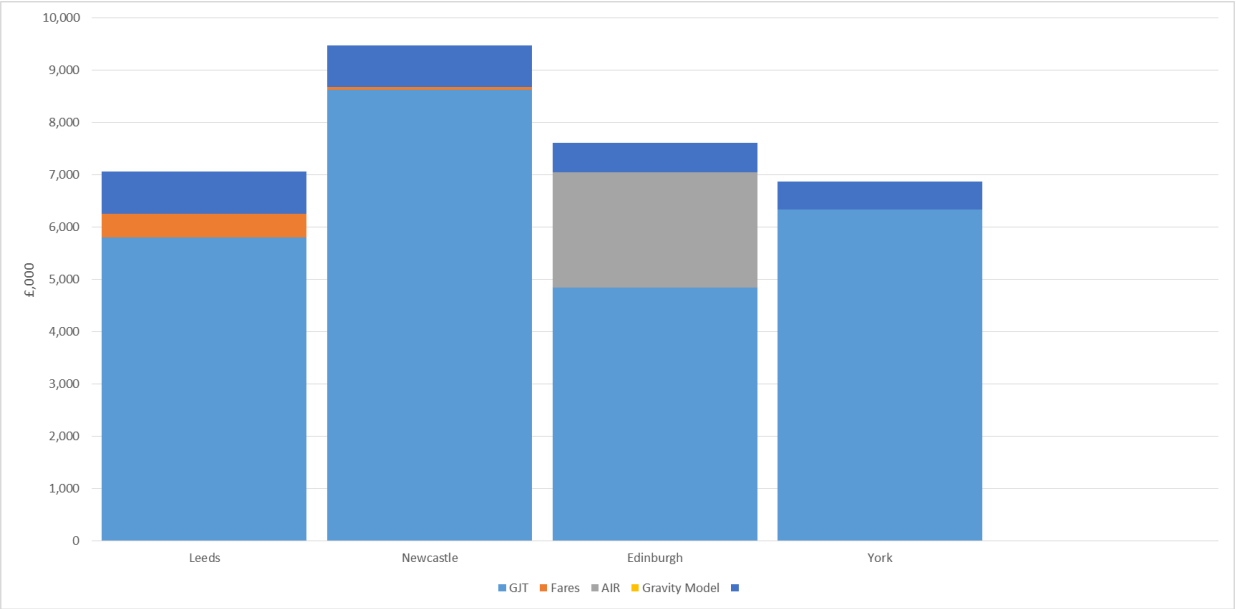


Figure 17 - VTEC 2020 option, revenue by key station and demand driver



7.3. Revenue projections – King's Cross - Middlesbrough service

7.3.1. Service proposition

This service proposition involves introduction of a new two-hourly service between King's Cross, Peterborough, York, Northallerton and Middlesbrough. The York stop would be switched from the corresponding fast Edinburgh service, enabling faster journey times between Edinburgh and London. This has been modelled using the air market uplift methodology described in section 3.4. Similarly, the Peterborough stop would be moved from the corresponding semi-fast London – Edinburgh service.

Our revenue projections are based on the 'default forecasting approach' plus the 'suppressed travel assessment' for London – Middlesbrough and London – Northallerton, and the 'air/rail market share assessment' for London – Edinburgh/Newcastle flows.

We understand that a significant proportion of the catchment area for Middlesbrough station is shared by Eaglescliffe. We have therefore assessed Middlesbrough revenue by grouping Middlesbrough, Eaglescliffe (and Stockton on Tees) as a single station in MOIRA, and then applying the forecasting methodology as described in section 3. – A catchment population radius of 10km was assumed for Middlesbrough post introduction of VTEC services.

7.3.2. Construction of the King's Cross – Middlesbrough option in MOIRA

We have assumed that the track access application for this service is conditional upon the 2020 core option. We have therefore produced a revenue assessment using the 2020 core option timetable as the base. This service in intended to commence in May 2020.

7.3.3. Revenue projections

As this service provides direct competition with domestic air travel, we have applied the methodology described in section 3.4. This option has been run with three scenarios, each with a different set of GJT elasticities to calculate abstraction from the aviation market. Due this scenario being so similar to the VTEC core option, the same derived elasticities have been used:

- **Low**: elasticity of -1.55
- **Central**: elasticity of -3.2 for Edinburgh and -1.9 for Newcastle
- **High**: elasticity of -3.5

Table 17 below summarises our revenue assessment

In our central scenario we estimate that the 2020 Middlesbrough option would attract around 172k passenger journeys per annum, resulting in a total annual revenue of £7.9m.

Of this total revenue in our central scenario, we estimate that around £7.3m would be newly generated, £0.6m would be abstracted from all TOCs, with £1.9m abstracted from operators that are not franchised by DfT. This figure is higher for non-franchised operators as our assessment suggests that the proposed new services revenue would increase revenue for other DfT franchised operators. We estimate that the ratio of generated revenue to abstracted revenue is 11.99 including DfT franchised operators, and 3.88 excluding DfT franchised operators.

Almost all of the abstraction from non-DfT franchised TOCs, would be from a transfer of a proportion of Grand Central's Eaglescliffe – London passengers, to VTEC's Middlesbrough – London service.

Figure 18 below illustrates the key station revenue for the new service, showing generated and abstracted revenue separately. Figure 19 presents revenue for key stations by demand driver. Due to the York stop being emitted from the xx:00 service in the hours when the Middlesbrough train runs, VTEC lose £1.0m of revenue on flows between York – Newcastle and York – Edinburgh. The majority of this loss is absorbed by CrossCountry. The loss from VTEC to other operators is displayed in Figure 18 & Figure 19.

Table 17 - Estimated total annual revenue for VTEC's application 6 – 2020 Middlesbrough extension

Scenario	Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
Low	£7.3m	£6.7m	£0.6	£1.9m	10.56	3.56
Central	£7.9m	£7.3m	£0.6m	£1.9m	11.99	3.88
High	£8.6m	£8.0	£0.6m	£1.9m	13.87	4.29

Figure 18 - VTEC King's Cross – Middlesbrough service, revenue by key station and source

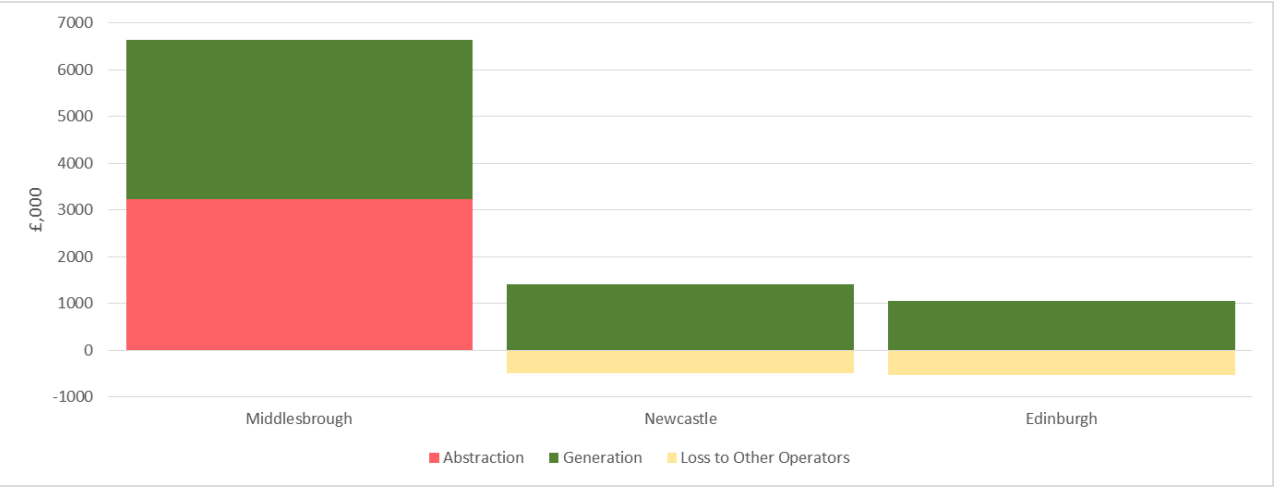
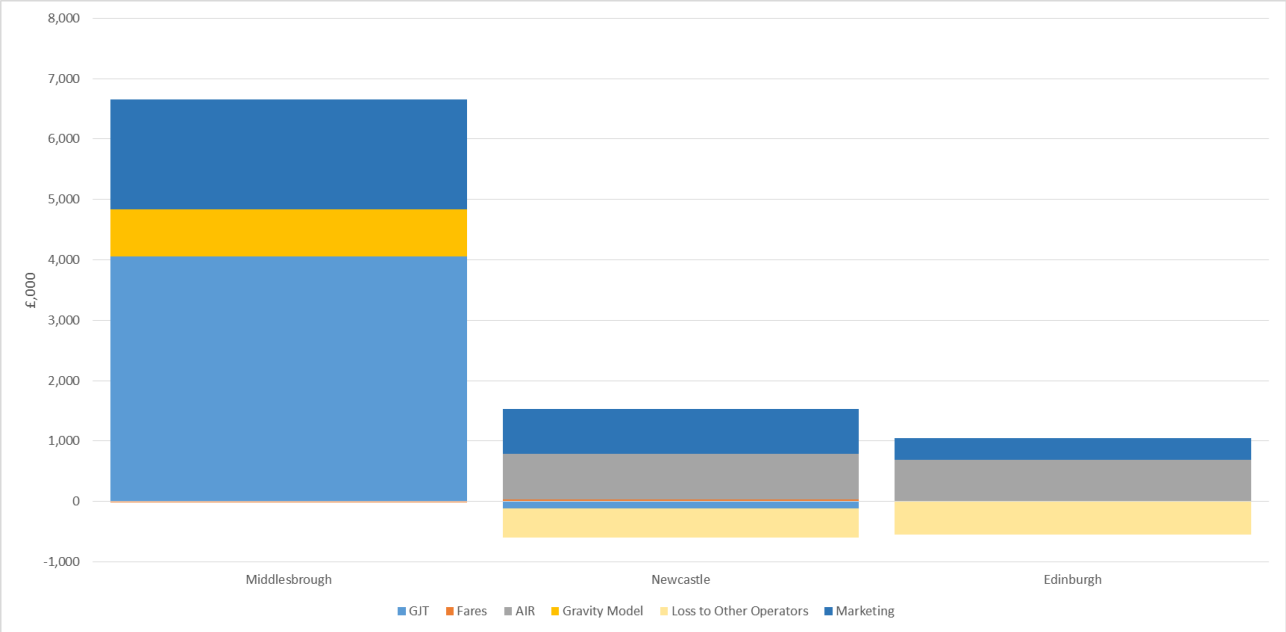


Figure 19 - VTEC King's Cross – Middlesbrough service, revenue by key station and demand driver



7.4. Revenue projections – Kings Cross – Lincoln / Harrogate service

7.4.1. Service proposition

This proposition involves the introduction of an additional hourly service between King's Cross and Lincoln/Harrogate on alternate hours. King's Cross - Harrogate services would operate via Hambleton Junction.

7.4.2. Construction of the King's Cross – Lincoln/Harrogate option in MOIRA

We have added the extension of this service north of Newark North Gate, as per VTEC's 2019 weekday MOIRA file, to our base timetable.

7.4.3. Revenue projections

Our revenue projections are based on the 'default forecasting approach' and the 'supressed travel assessment'.

Figure 21 presents revenue for key stations by demand driver.

Table 18 below summarises our revenue assessment

We estimate that the King's Cross – Lincoln/Harrogate service would result in around 1.5m passenger journeys, and £21.3m revenue per annum.

Of this revenue, we estimate that around £14.3m would be newly generated, £7.0m would be abstracted from all TOCs, and £2.3m would be abstracted from operators that are not franchised by DfT. We therefore estimate that the ratio of generated revenue to abstracted revenue is 2.05 including DfT franchised operators, and 6.11 excluding DfT franchised operators

Figure 20 below illustrates the key station revenue for the new service, showing generated and abstracted revenue separately.

Figure 21 presents revenue for key stations by demand driver.

Table 18 - Estimated total annual revenue for VTEC's application 6 – King's Cross – Lincoln/Harrogate service

Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
£21.3m	£14.3m	£7.0m	£2.3m	2.05	6.11

Figure 20 - VTEC King's Cross – Lincoln/Harrogate service, revenue by key station and source

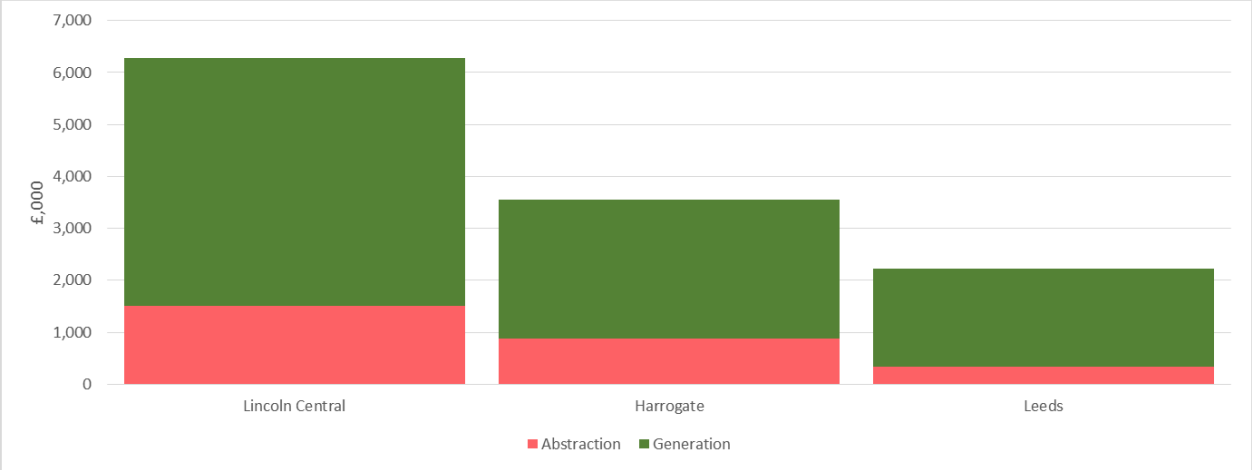
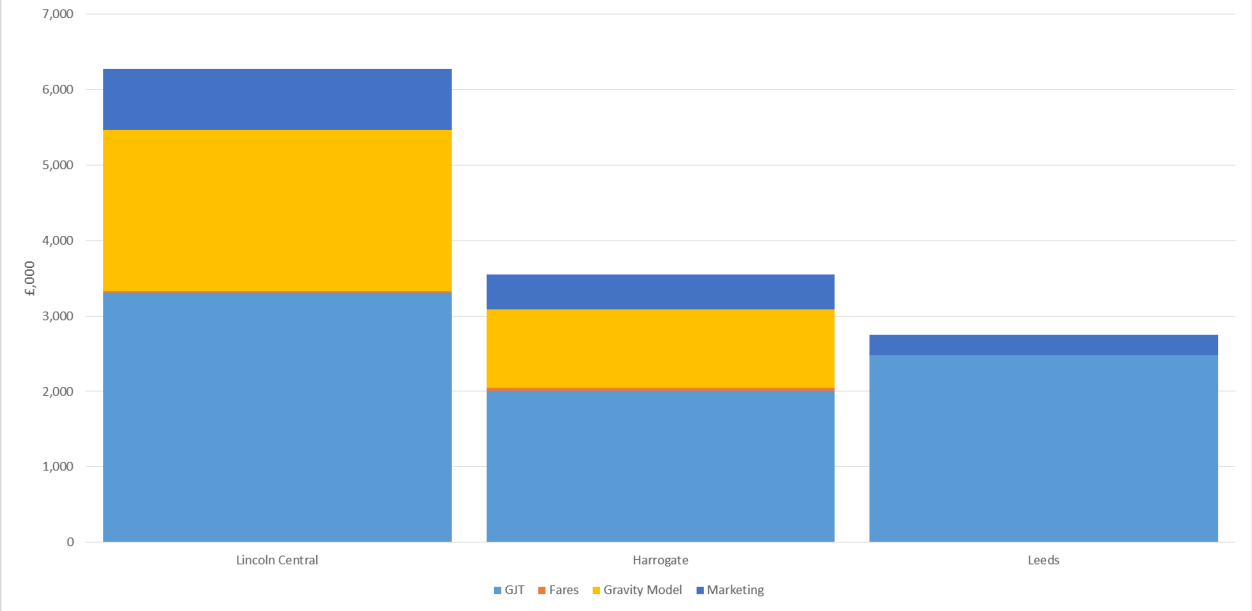


Figure 21 - VTEC King's Cross – Lincoln/Harrogate service, revenue by key station and demand driver



7.5. Revenue projections – Bradford Forster Square extensions

7.5.1. Service proposition

This proposition involves the extension of some existing King's Cross – Leeds services to form a two-hourly King's Cross – Bradford Forster Square service. (One train per day in each direction is currently extended to/from Bradford Forster Square).

7.5.2. Construction of the Bradford Forster Square extensions in MOIRA

We have assumed that the train diagramming for this option requires the enhanced King's Cross - London journey times enabled by the 2020 core option. We therefore assume that the Bradford Forster Square option is conditional upon the 2020 core option.

Our revenue assessment therefore uses the 2020 core option timetable as the base.

7.5.3. Revenue projections

Table 19 below summarises our revenue assessment

We estimate that the extension of King's Cross – Leeds services to/from Bradford Forster Square would result in around 484k passenger journeys, and £7.2m revenue per annum.

Of this revenue, we estimate that around £5.6m would be newly generated, £1.6m would be abstracted from all TOCs, of which £0.5m would be abstracted from operators that are not franchised by DfT. We therefore estimate that the ratio of generated revenue to abstracted revenue is 3.44 including DfT franchised operators, and 12.15 excluding DfT franchised operators

Figure 22 below illustrates the key station revenue for the new service, showing generated and abstracted revenue separately.

Figure 23 presents revenue for key stations by demand driver.

Table 19 - Estimated total annual revenue for VTEC's application 6 – Bradford Forster Square service extensions

Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
£7.2m	£5.6m	£1.6m	£0.5m	3.44	12.15

Figure 22 - VTEC Bradford Forster Square service extensions, revenue by key station and source

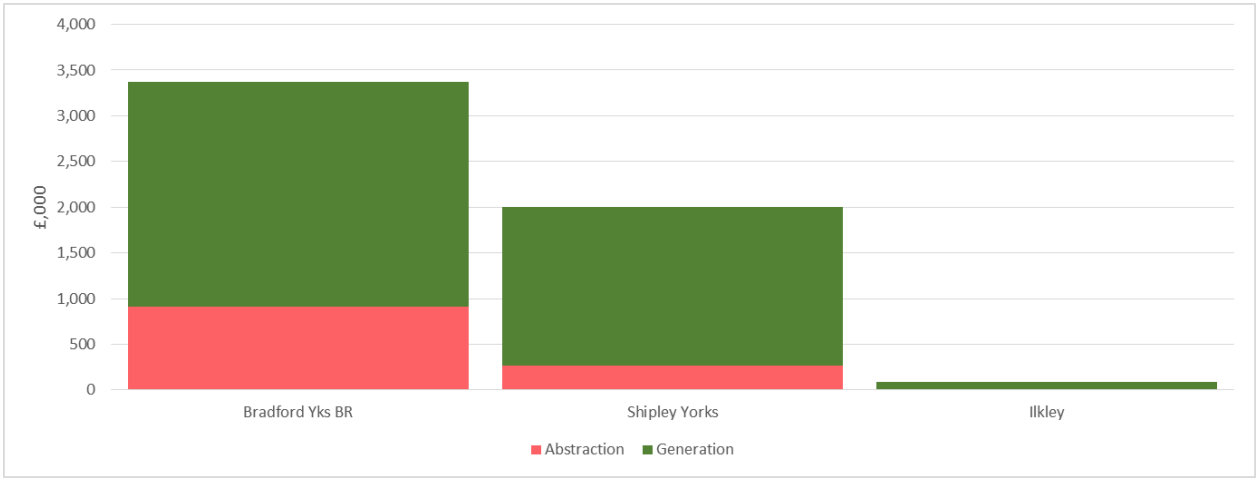
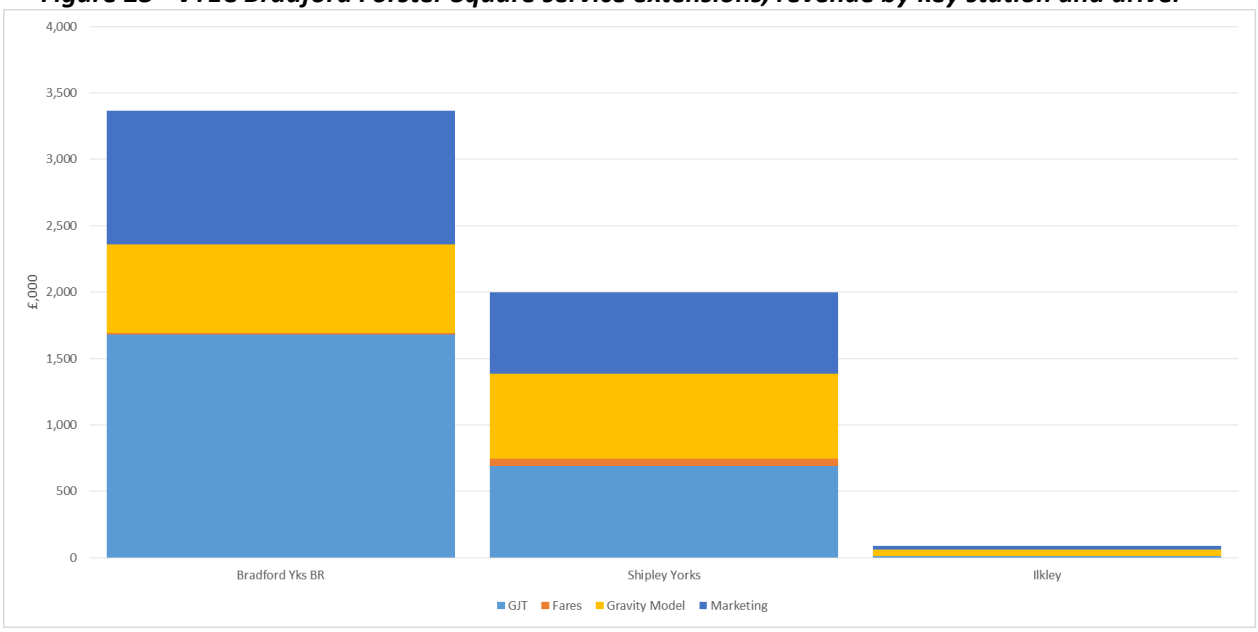


Figure 23 - VTEC Bradford Forster Square service extensions, revenue by key station and driver



8. Revenue projections – First Group's King's Cross – Edinburgh application

8.1. Introduction

This section presents our revenue assessment for services contained within First Group's application for access rights.

8.1.1. Service proposition

First Group's service proposition is as follows:

- Five King's Cross – Edinburgh services per day in each direction, calling at Newcastle, Morpeth and occasionally Stevenage. The service would operate seven days per week, with some omitted station calls on Saturdays and particularly Sundays.

First Group's business plan suggests that key characteristics of the service offer will be:

- An early morning northbound departure, aimed at meeting a perceived gap in the market in terms of desired arrival times at Newcastle and Edinburgh.
- Significantly lower fares than those offered by VTEC, aimed principally at competing with low cost airlines.
- Improved connectivity to/from Morpeth, which First Group believes to be a significant potential rail head with poor current rail connectivity and strong current air connectivity.

8.2. Revenue projections

8.2.1. Base timetable

First Group has proposed an indicative timetable that is intended to dovetail with VTEC's proposed 2020 timetable contained within application 6, and hence to minimise the track capacity used. Northbound services are scheduled to depart King's Cross immediately after the XX:00 VTEC departure to Edinburgh, running approximately 10 minutes slower to King's Cross. Southbound departures from Edinburgh are scheduled to depart immediately before the fast VTEC hourly service to King's Cross, and are overtaken by the VTEC service en route.

We have therefore compared First Group's proposed services against a timetable containing all of VTEC's proposed future services. The MOIRA files used to do this were supplied by First Group, and we have checked that the timings and stopping patterns match the equivalent files supplied by VTEC. We believe this is a more effective way to model the services, than the alternative of using our IEP base timetable, and extending the journey times of First Group's services.

8.2.2. Overall Revenue Projections

Table 20 below summarises our revenue assessment for the First Group's track access application. Our revenue projections use a 2013/14 base, with no ramp-up assumptions.

Our estimated total annual journeys and revenue for the new services is 1.2m and £25.9m respectively. Our forecast of 1.2m journeys is broadly equivalent to 80% of the likely number of seats provided across all services. An average load factor of 80% could lead to overcrowding on some services due to unevenly distribution of passengers across trains, however we understand that First Group will utilise a sophisticated seat and capacity allocation process to balance train loads, and accommodate this level of demand.

We estimate that around £7.3m per annum would be newly generated and £18.6m would be abstracted from other TOCs. We therefore estimate that the ratio of generated revenue to abstracted revenue is 0.39.

We estimate that the proposed low fares relative to other operators, will account for around 31% of total journeys, 70% of newly generated journeys (both new travel and abstraction form air travel), and 55% of abstracted journeys.

Our central scenario assumes that competitor TOCs do not adjust their fares in response to First Group's fares strategy. We feel that this is a prudent assumption as we cannot, at this stage, validate the likely response from competitors.

We have attempted to model the potential revenue maximising competitor response from VTEC. Our model is not designed for this purpose, and we have not analysed the extent to which VTEC's fares for other flows, e.g. London – York would constrain its ability to reduce longer distance fares, e.g. London – Newcastle. Therefore we have not included a scenario based on this modelling

On the basis of discussing this with Frist Group, and the ORR, we have included a scenario in which VTEC reduces fares which compete with First Group products by around 15% in response.

Assuming a 15% competitor response would have a large impact on generated revenue, increasing total industry revenue generation to £17.4m and increasing the generation/abstraction ratio to 2.15.

Table 20 - Estimated total annual revenue for First Group's proposed King's Cross – Edinburgh service

Scenario	Total revenue	Newly generated	Abstracted	(Generation)/ (Abstraction)
Central	£25.9	£7.3	£18.6	0.39
High	£25.5	£17.4	£8.1	2.15

8.2.3. Overall revenue projections by flow

Figure 24 below illustrates our revenue projections split by (2-way) flow for the stations that First Group proposes to serve, showing generated and abstracted revenue separately.

Figure 25 presents revenue for the same flows by demand driver.

We estimate that the largest earning flows would be London – Edinburgh (£10.3m) and London – Newcastle (£6.4m). This is unsurprising, given the size of the current market for travel between these locations and the prevalence of competition from domestic airlines. Proportions of generated to abstracted revenue for these flows are 0.61 and -0.13 respectively. The figure for Newcastle – London is a negative as the introduction of very low fares causes a small overall loss of GB rail revenue.

For Stevenage – Edinburgh and London - Morpeth, which are the other flows where air competition is present, we estimate a total annual revenue of £0.4m and £2.8m respectively. Proportions of generated to abstracted revenue for these flows are 1.07 and 0.92 respectively

Table 21 below illustrates our estimated mode share of journeys made by rail and air, currently, after the introduction of our base timetable, and after the introduction of First Group's services.

We estimate that the introduction of First Group's services would increase the rail's share of the total rail and market from 37.3% to 43.4% for London – Edinburgh and from 75.0% to 80.5% for London – Newcastle.

Table 21 - Estimated rail/air mode shares

	Current	Base	Base + First Group
London - Edinburgh	32.1%	37.3%	43.4%
London - Newcastle	73.3%	75.0%	80.5%

Our estimated annual revenue for all flows to/from Morpeth station is £4.0m, split 52% generation and 47% abstraction. Our gravity model has calculated a 460% demand increase over the base for the relevant flows to and from London. A significant factor behind this large uplift is an assumption that the catchment area of Morpeth would increase from 5km in the base, to 10km when First Group's services are introduced. This is based on the likelihood that Morpeth would be a more convenient point of access for travel to from London following the introduction of First Group's services, versus currently. This assumption is consistent with the way in which we have forecast demand for other track access applications which propose to serve stations with a low current service frequency and a potentially wide catchment area.

Figure 26 below shows the share of all revenue for relevant flows to/from Morpeth, split by demand driver, and Figure 27 shows our assumed station catchment area before and after the introduction of services.

Finally, we estimate an annual Newcastle – Edinburgh revenue at £1.2m split 58% generation and 42% abstraction.

Figure 24 - First Group revenue by flow and source

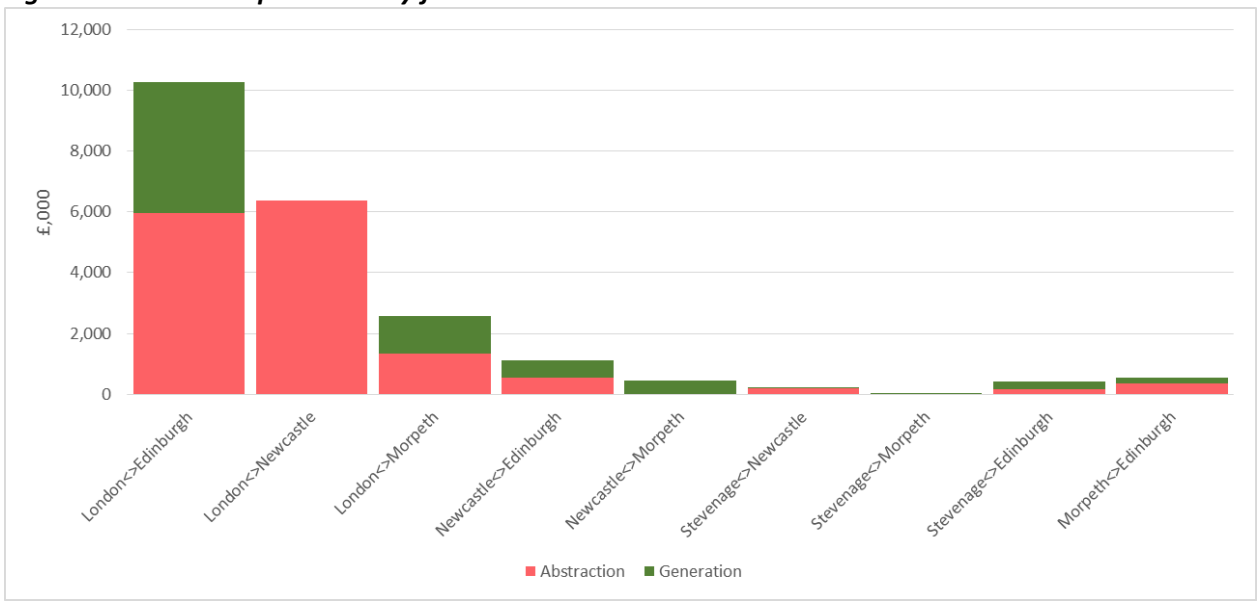


Figure 25 - First Group revenue by flow and driver

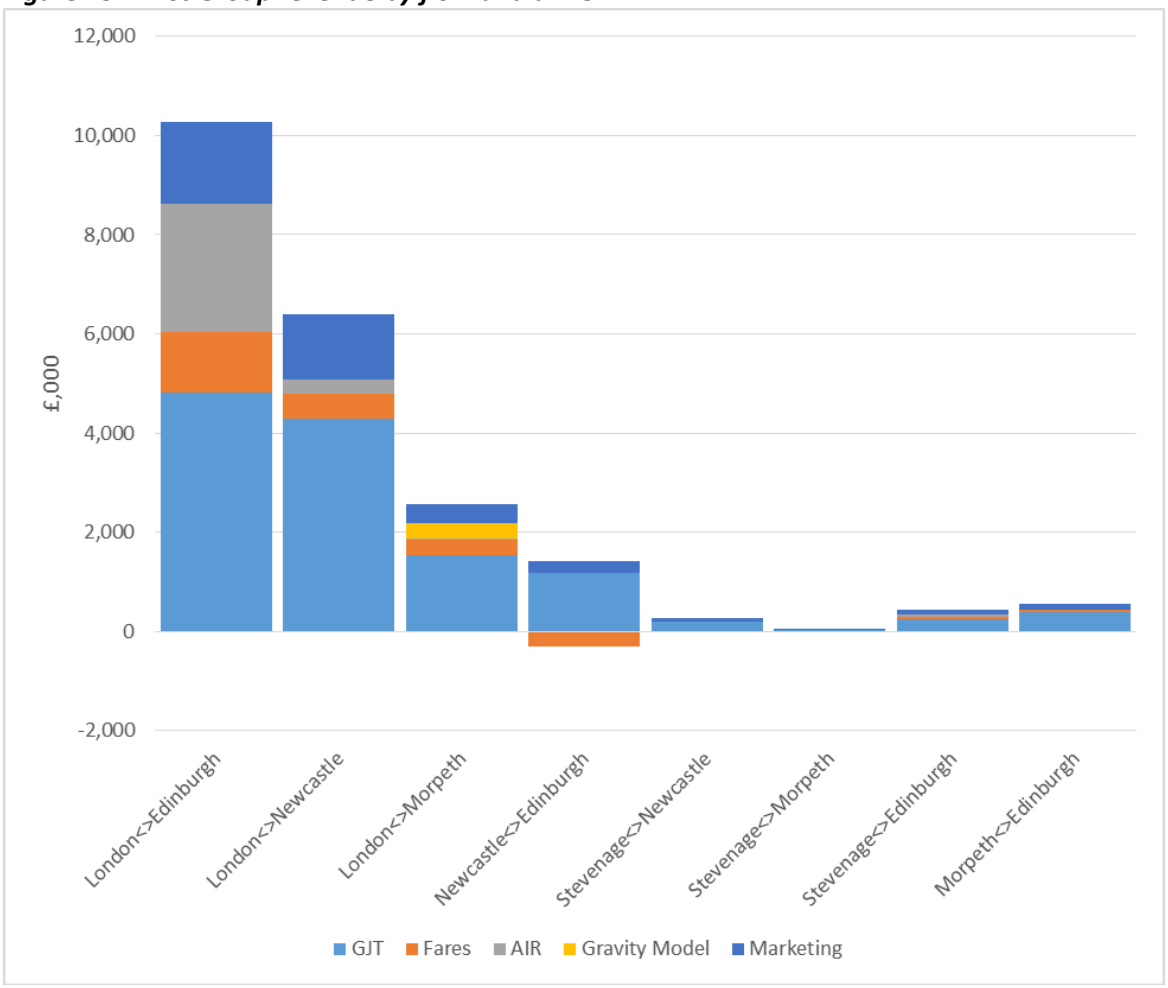


Figure 26 - Split of Morpeth revenue by demand driver

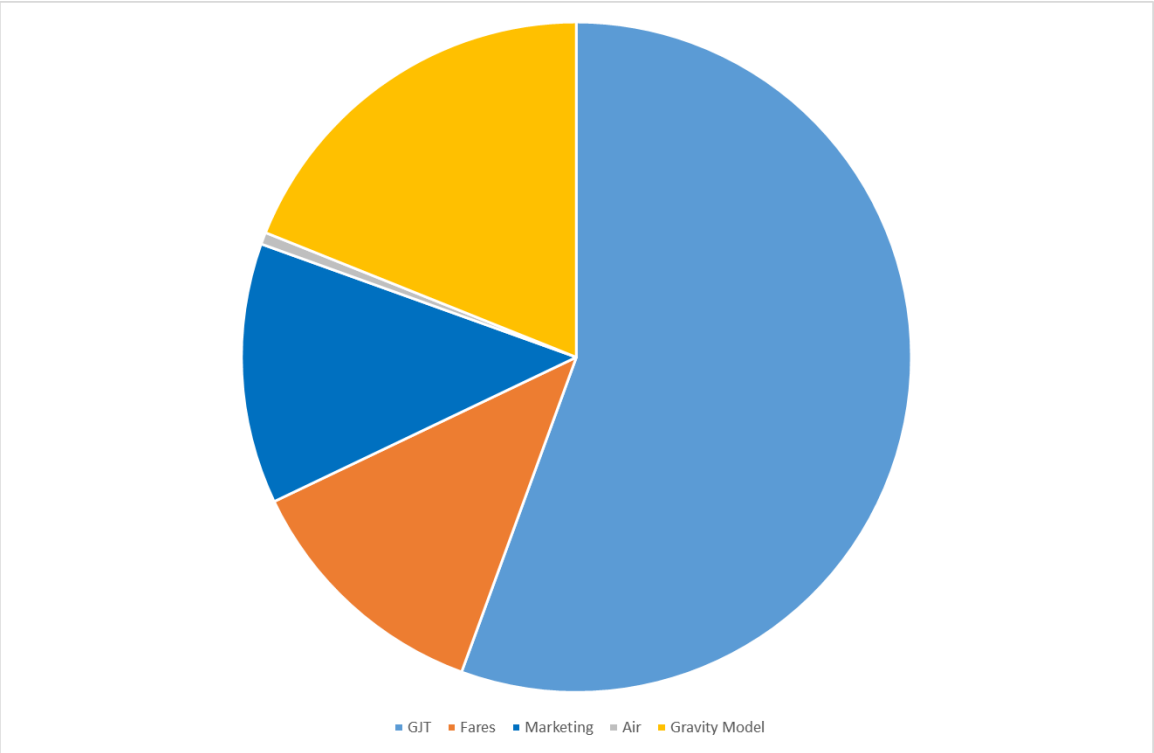
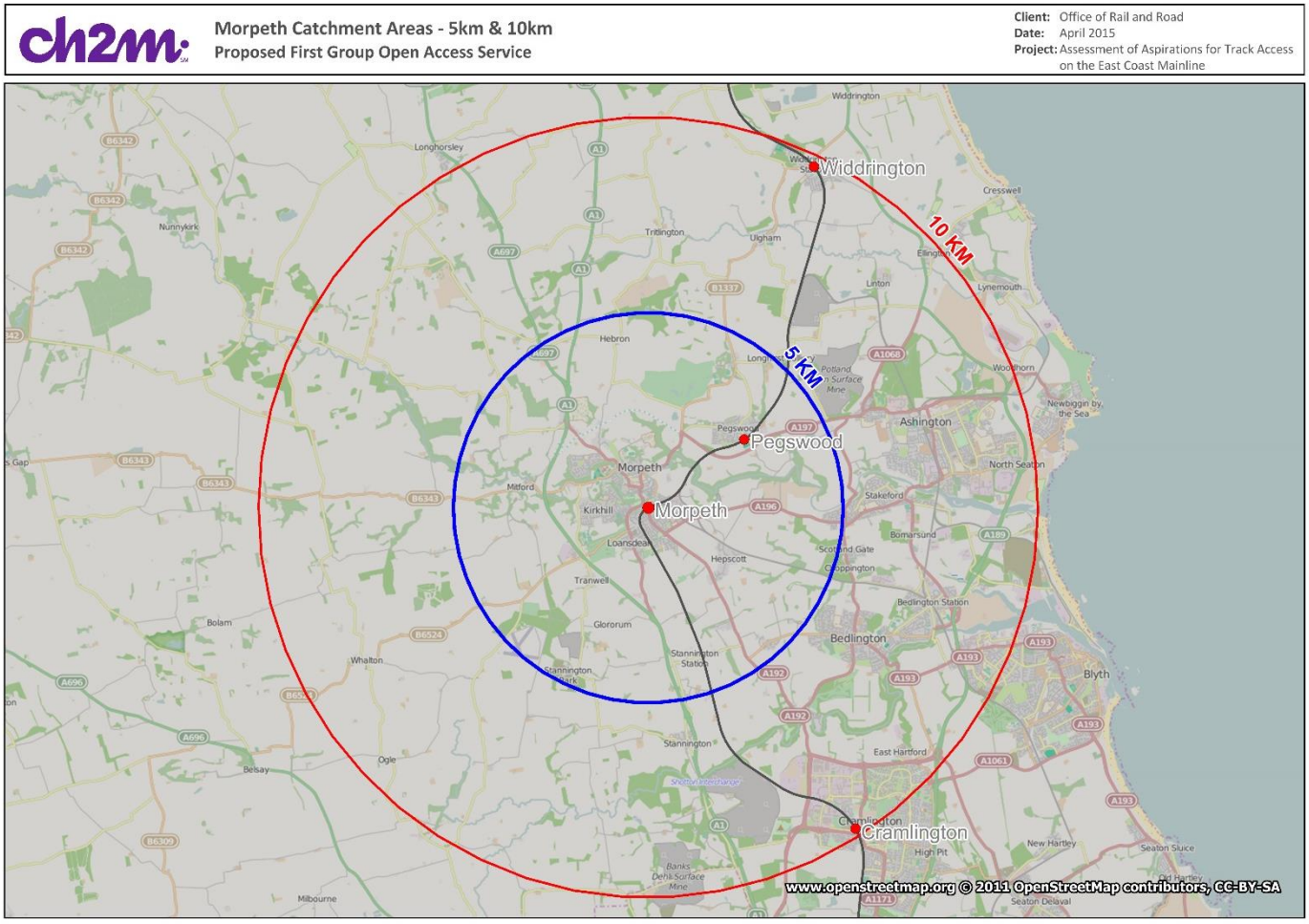


Figure 27 - Assumed Morpeth station catchment area before and after the introduction of First Group's proposed services



9. Economic Appraisal

9.1. Background

9.1.1. Purpose

As discussed in chapter 1, ORR uses economic appraisal to provide an indication of the value to the UK that rail services contained within track access applications can generate. ORR then uses this assessment of value to support its decision of whether to grant track access rights.

ORR has commissioned CH2MHILL to conduct an economic appraisal of the services contained with track access applications, which it believes may use sections of track which are capacity-constrained. The purpose of our economic appraisal is therefore twofold, namely to:

- Assess whether the services contained within the track access applications received are likely to generate a positive economic value; and
- To enable a comparison of the economic value of the services within track access applications which would be likely to compete for usage of the same constrained track capacity.

Given the requirement for a comparative economic appraisal, the presentation of our analysis is grouped by the sections of capacity constrained track for which the various track access applications are competing. This is based on our understanding of capacity constraints, and is not necessarily the view of other organisations. All of the services for which an appraisal has been produced use the constrained section of the ECML south of Huntingdon. We have therefore grouped by other constrained sections. Our grouping is as follows:

- The track section between Hambleton Junction and Leeds
    - Alliance's London - Yorkshire/Cleethorpes track access application
    - The London – Harrogate/Lincoln services contained within VTEC's application 6.
    - The London – Bradford Forster Square/Ilkley services contained within Alliance's London - Yorkshire/Cleethorpes application
- The ECML north of Northallerton
    - Alliance's London – Edinburgh application
    - First Group's London – Edinburgh application
    - The 2020 core services from VTEC's application 6
- ECML south of Huntingdon only
    - The London – Cleethorpes services contained within Alliance's London - Yorkshire/Cleethorpes application
    - The London – Middlesbrough services from VTEC's application 6

9.1.2. Approach

The economic appraisal of services contained within the above track access applications was conducted using an approach that is consistent with both DfT's WebTAG guidance[5].

[5] Our approach is also broadly consistent with Transport Scotland's STAG appraisal guidance

The results of our economic appraisal are presented in a slightly different way to standard WebTAG appraisal summary tables. This is because WebTAG was designed, in part, to estimate the impact on the broad transport budget (DfT's/ budget), whereas our appraisal does not consider explicitly the transfer of revenue between DfT and private sector transport providers, focussing only on the incremental costs and benefit to the UK as a whole. For this reason we report the Net Present Value (NPV) of each of the applications, but do not report the Benefit to Cost Ratio (BCR), since the cost in this ratio is expressed as the cost to DfT/TS.

We also report the two further appraisal measures:

- NPV divided by the number of train paths[6] used per weekday. This is a means of assessing the economic value of proposed services, versus a measure of the track capacity that they would be likely use. This is a simple approach to the measurement of capacity used, as capacity usage varies by service characteristics such as train speed, acceleration and stopping pattern.

- Present Value of Benefits (PVB) divided by the number of paths[7] used per weekday. This is as per the previous measure, but excluding operating costs which are difficult to prepare on a consistent basis across applications at this stage. – This potential uncertainty is discussed below.

The impacts that were quantified in our economic appraisals are listed below. Our demand and revenue projections presented above form the basis of our assessment of the benefits and revenue generated by the new services, and an assessment was undertaken to estimate the likely operating costs.

- **User benefits.** We have quantified three main benefits:
    - The saving in generalised journey time (GJT) from journey time and frequency improvements, made by both existing rail passengers and passengers who are attracted to rail by the new services. The benefit to new passengers is assumed to be half of the improvement in GJT. This is consistent with WebTAG/STAG appraisal convention.
    - The reduction in time spent on crowded trains, expressed as GJT saving. We have estimated this by assessing future train loads for the VTEC services contained within our IEP base timetable before and after the introduction of the services contained within each of the track access applications. We then apply the equivalent change in GJT to the whole demand base. We therefore make the simplifying assumption that load factors on the new services equal the average load factors for other services post introduction of the former.

      Our estimate of future train loads uses a combination of current train load data supplied by VTEC for services which operate via Newcastle, and MOIRA load data for all current VTEC trains.
    - The benefit to passengers from a reduction in rail fares. In a manner consistent with WebTAG this is calculated as (current journeys x the average change in fares) + (new journeys x ½ x the average change in fare). These benefits are only calculated for the applications which offer a significant discount on current fares (either through offer lower individual fares, or through offering a product mix that would reduce overall average fares). The applications which we understand would do this are First group's application, and Alliance's Yorkshire/Cleethorpes application (plus the Yorkshire and Cleethorpes components assessed separately in this report).

[6] Paths in either direction through one or more constrained track sections as described above

[7] Paths in either direction through one or more constrained track sections as described above

- **Non-user benefits.** This is the benefit to people other than existing or newly attracted rail passengers. The main benefits to non-users from the introduction of new rail services is a reduction in road congestion, and hence highway journey times savings, generated through a switch from road to rail travel. Other associated impacts include reductions in the number of road accidents and small improvements in vehicle emissions and local air quality. We calculate the switch away from road travel using a factor of a 0.26km reduction in road vehicle km for every 1km increase in rail passenger km. This assumption is consistent with WebTAG. For services where we have estimated directly the abstraction of air passenger journeys, we have reduced our estimate of non-user benefits by the proportion of total generated journeys that is abstracted from air.
- **Revenue.** This is the net increase in GB rail revenue generated by the introduction of the proposed new services.
- **Other government impacts.** Three impacts are quantified, when applicable, on the basis of the guidance in WebTAG/STAG. These are:
    - Foregone VAT from the forecast switch from road to rail travel, as WebTAG/STAG state that increased expenditure on rail travel (which does not incur VAT), is funded through an equivalent reduced expenditure on goods and services which do incur VAT.
    - The foregone indirect taxation paid on fuel caused by the forecast switch from road to rail travel
    - Increased fuel duty from an increase in diesel train mileage

  We have also estimated a reduction in highway maintenance costs to local authorities and Highways England. For simplicity, this estimated cost saving is included in this category. This is a typically very small impact resulting from the switch from road to rail travel mentioned above.
- **Operating costs.** This is the net increase in operating costs required to provide the proposed new services. The following sub-categories are included.
    - **Staff costs.** This is the estimated cost of the net increase in drivers and conductors required to operate the proposed new services. The total cost per full time equivalent employee was estimated based on our previous experience, and validated in the case of drivers using information published on the ASLEF website. We have excluded both the cost of catering staff and catering revenue, on that simplifying assumption that these costs and revenues cancel each other out.
    - **Rolling stock costs.** This is the net cost of procuring and maintaining the rolling stock that is required to operate the proposed new services. We have estimated the per vehicle cost of rolling stock procurement (capital and non-capital/maintenance) based on market tested prices, and where necessary have validated this information using evidence submitted by track access applicants. **Our unit cost estimates, and the information used to produce them are confidential, and are not shown in this report.**

      Separate costs have been estimated for the types of rolling stock contained within or implied by the various track access applications. These are:
        - **Class 390 Pendolino**
        - **IC225 (Current ECML loco hauled electric stock + mark 4 coaches and DVT)**
        - **Class 800/801 Super Express (IEP).** The information we have access to suggests that the cost of trains procured via the order currently being produced by Hitachi is likely to differ from the cost of trains procured via a future order. We have therefore produced separate cost estimates for trains currently on order and trains that would require a future order.

Where applicants have shared their train diagrams we have conducted our own exercise to validate these estimates, and adjusted the requirement where necessary. Otherwise, our assumed rolling stock requirement is based on our estimated number of diagrams.

Where applicants have not stated their spare stock requirements, we have included a notional 10% increase in rolling stock costs to include the cost of providing maintenance spares. Actual rolling stock availability will depend on a number of factors which we are unable to model at this stage.

Finally, we discussed with ORR whether to exclude rolling stock lease costs for VTEC class 800/801 rolling stock, on the basis that the order for this rolling stock has already been placed. ORR's advice at this stage was that this cost should be included.

- **Network Rail charges.** This comprises the main variable usage changes payable to Network Rail, calculated on the basis of the estimated net change in vehicle mileage by rolling stock type. This includes the Capacity Charge, Variable Usage Charge (VUC), EC4T and the Electrification Asset Usage Charge (EAUC). Unit costs were estimated using Network Rail's CP5 price list, with the most appropriate category of rolling stock and current services groups used as a proxy for the characteristics of the proposed future services.

  Station access charges have been excluded from this category as we are unable to estimate them as this stage, although we would expect these charges to be broadly in proportion to other variable usage charges.

- **Other operating costs.** This is the cost of diesel (bi-mode) traction for the proposed services which would operate on track sections which are not electrified.

As the economic appraisal is required to assess the incremental impacts of the proposed new services, fixed costs have been excluded from the assessment. We acknowledge that the main types of fixed costs are likely to differ in order of magnitude between Franchised Operators and Open Access Operators, however we believe our approach to be reasonable for the purposes of ORR's assessment.

Finally, capital costs, for example funding improvements in rail infrastructure has been excluded for the appraisal, as we do not understand the total funding required to enable the infrastructure capability needed to accommodate some of the proposed services that we have assessed. The impact of this exclusion is discussed where relevant in the following sections.

9.1.3. General appraisal assumptions

A list of generic appraisal assumptions is provided below.

- Appraisal period. An appraisal period of 10 years was selected based on our assumption of the potential duration that track access rights could be granted for.
- Services under all applications have been assumed to commence operation on 1st April 2019. These assumptions have been made to simplify the comparison between options.
- The ramp-up profile of demand for all new services was taken from PDFH 5.1, comprising 70% of the total demand forecast realised in year 1, 85% in year 2, 95% in year 3 and 100% in year 4 onwards.
- Exogenous passenger demand growth is estimated at 2.25% per annum for all flows. This is an assumption and was sense checked using forecasts published in *Network Rail's Long Distance Passenger Market Study*.

All figures in the remainder of this report are presented in £ 2010 present values unless stated. This is consistent with WebTAG/STAG.

9.2. Economic appraisal results: services using the track section between Hambleton Junction and Leeds

9.2.1. Alliance's London - Yorkshire/Cleethorpes track access application

Table 20 below presents a summary of the appraisal results for Alliance's London – Yorkshire/Cleethorpes service.

Our estimated NPV for these services of the 10 year appraisal period is £135.0m. This comprises £160.5m of user benefits, £38.7m of non-user benefits, a £125.6m net increase in GB rail revenue, a net £25.6m reduction in income to HM treasury, and an £164.2m increase in total operating costs.

The largest quantified beneficial impact is the increase in user benefits. This is split broadly 48% from GJT savings, 47% from a reduction in fares, and 5% from reduced overcrowding on existing services.

The increase GB rail revenue is the next largest beneficial impact. This is estimated at broadly £8.9m per annum in year 1, £13.2m in year 5 and £13.7m in year 10.

The largest quantified negative impact on the NPV is the operating costs. We estimate these costs at around £19.1m per annum in year 1, £16.7m in year 5, and £13.7m in year 10. This is driven by an estimated annual staffing requirement of 32 drivers and 30 guards, a rolling stock requirement of six units in five car formation and an annual vehicle mileage of 8.9m.

This track access application includes a proposal to call services at East Leeds Parkway. This is a new station which does not yet have a binding commitment from stakeholders to provide the funding necessary to enable its construction. We understand that Alliance intends to provide some of the required funding, however at this stage our appraisal excludes this funding, and the potential benefit of the new station itself.

Table 22 - Appraisal Summary: Alliance's London – Yorkshire/Cleethorpes service

Impact category	**£m 2010**
User benefits	£160.5
Non-user benefits	£38.7
Other Govt impacts*	-£25.6
Revenue (GB rail total)	£125.6
Operating Costs	-£164.2
Net Present value	**£135.0**

*Lost taxation net of reduced highway funding

9.2.2. Alliance's London - Yorkshire track access application

Table 21 below presents a summary of the appraisal results for only the London – Bradford Forster Square/Ilkley services within Alliance's London – Yorkshire/Cleethorpes service.

Our estimated NPV for these services over the 10 year appraisal period is 168.6m. This comprises £159.9m of user benefits, £36.5m of non-user benefits, a £95.4m net increase in GB rail revenue, a net £20.8m reduction in income to HM treasury, and an £102.4m increase in total operating costs.

The largest quantified beneficial impact is the increase in user benefits. This is split broadly 49% from a reduction in fares, 47% from a GJT saving, and 4% from reduced overcrowding on existing services.

The increase in GB rail revenue is the next largest beneficial impact. This is estimated at broadly £6.7m per annum in year 1, £10.0m in year 5 and £10.4m in year 10.

The largest quantified negative impact on the NPV is the operating costs. We estimate these costs at around £11.8m per annum in year 1, £10.4m in year 5, and £8.6m in year 10. This is driven by an estimated annual staffing requirement of 22 drivers and 20 guards, a rolling stock requirement of three units in five car formation and an annual vehicle mileage of 6.0m.

As above, this track access application includes a proposal to call services at East Leeds Parkway. At this stage our appraisal we have excluded any funding of this station contributed by Alliance, and the potential benefit of the new station itself.

Table 23 - Appraisal Summary: Alliance's London – Yorkshire service

Impact category	**£m 2010**
User benefits	£159.9
Non-user benefits	£36.5
Other Govt impacts*	-£20.8
Revenue (GB rail total)	£95.4
Operating Costs	-£102.4
Net Present Value	**£168.6**

*Lost taxation net of reduced local highway funding

9.2.3. VTEC's London – Harrogate/Lincoln services (part of application 6).

Table 22 below presents a summary of the appraisal results for only the London – Harrogate/Lincoln services within VTEC's application 6.

Our estimated NPV for these services over the 10 year appraisal period is £190.8m. This comprises £119.4m of user benefits, £50.0m of non-user benefits, a £153.0m net increase in GB rail revenue, a net £31.0m reduction in income to HM treasury, and an £100.7m increase in total operating costs.

The largest quantified beneficial impact is the increase GB rail revenue. This is estimated at broadly £10.8m per annum in year 1, £16.0m in year 5 and £16.6m in year 10.

The largest quantified negative impact on the NPV is the operating costs. We estimate these costs at around £12.1m per annum in year 1, £10.2m in year 5, and £8.1m in year 10. This is driven by an

estimated annual staffing requirement of 10 drivers and 9 guards, a rolling stock requirement of three units in nine car formation and an annual vehicle mileage of 4.9m.

Table 24 - Appraisal Summary: VTEC's London – Harrogate/Lincoln services

Impact category	**£m 2010**
User benefits	£119.4
Non-user benefits	£50.0
Other Govt impacts*	-£31.0
Revenue (GB rail total)	£153.0
Operating Costs	-£100.7
Net Present Value	£190.8

*Lost taxation net of reduced highway funding

9.3. Economic appraisal results: services using the ECML north of York

9.3.1. Alliance's London – Edinburgh track access application

Table 23 below presents a summary of the appraisal results for Alliance's London – Edinburgh service.

Our estimated NPV for these services over the 10 year appraisal period is £201.6m. This comprises £266.2m of user benefits, £227.0m of non-user benefits, a £436.1m net increase in GB rail revenue, a net £73.4.1m reduction in income to HM treasury, and an £654.4m increase in total operating costs.

The largest quantified beneficial impact is the increase GB rail revenue. This is estimated at broadly £30.8m per annum in year 1, £45.7m in year 5 and £47.8m in year 10.

The largest quantified negative impact on the NPV is the operating costs. We estimate these costs at around £77.1m per annum in year 1, £66.7m in year 5, and £53.9m in year 10. This is driven by an estimated annual staffing requirement of 57 drivers and 53 guards, a rolling stock requirement of 12 units in nine car formation and an annual vehicle mileage of 40.2m.

The journey times stated in Alliance's track access application and used in both our revenue assessments and our economic appraisal cannot be provided using current ECML infrastructure. Part of Alliance's proposal includes a contribution of funding to enhance the capability of the infrastructure to enable these journey times. At this stage our appraisal excludes this funding, and the potential benefit of the new station itself.

Table 25 - Appraisal Summary: Alliance's London – Edinburgh services

Impact category	**£m 2010**
User benefits	£266.2
Non-user benefits	£227.0
Other Govt impacts*	-£73.4
Revenue (GB rail total)	£436.1
Operating Costs	-£654.4
Net Present Value	£201.6

*Lost taxation net of reduced local highway funding

9.3.2. First Group's London – Edinburgh service

Table 25 below presents a summary of the appraisal results for First Group's London - Edinburgh service.

Our estimated NPV for these services over the 10 year appraisal period is £201.8m. This comprises £213.8m of user benefits, £58.3m of non-user benefits, a £72.4m net increase in GB rail revenue, a net £16.0m reduction in income to HM treasury, and an £132.7m increase in total operating costs.

The largest quantified beneficial impact is the increase in user benefits. Over 80% of this is accounted for by benefit to passengers of a reduction in fares (existing passengers who switch to First Group would save circa £40 per journey, and new rail passengers would save around £20 per journey). The remaining benefits comprise of journey time savings and reduce crowding on other ECML services.

The next largest quantified beneficial impact is the increase in non-user benefits, driven largely by a forecast switch from road to rail travel.

The increase is generated revenue is modest compared to the other benefits as the increase in revenue generated by new travel is offset by the reduction in fares.

The largest quantified negative impact on the NPV is the operating costs. We estimate these costs at around £15.4m per annum in year 1, £13.5m in year 5, and £11.1m in year 10. This is driven by an estimated annual staffing requirement of 27 drivers and 25 guards, a rolling stock requirement of five units in five car formation and an annual vehicle mileage of 7.1m.

As discussed in section 4, we estimate that train loads of crudely 80% of seats provided across all trains. This figure could suggest that some services will be overcrowded due to unevenness in passenger loads across trains, however we understand that First Group will utilise a sophisticated seat and capacity allocation process to balance train loads, and accommodate this level of demand.

Part of First Group's proposal includes a contribution of funding to improve the infrastructure at Morpeth station. At this stage our appraisal excludes this funding, and the potential benefit of this infrastructure to passengers who use other services.

Table 26 - Appraisal Summary: First Group's London – Edinburgh services

Impact category	**£m 2010**
User benefits	£213.8
Non-user benefits	£58.3
Other Govt impacts*	-£16.0
Revenue (GB rail total)	£78.4
Operating Costs	-£132.7
Net Present value	£201.8

*Lost taxation net of reduced highway funding

9.3.3. VTEC's 2020 Core services from application 6

Table 24 below presents a summary of the appraisal results for VTEC's 2020 core services contained within application 6. From section 7.2.1 these are:

- Introduction of a half hourly King's Cross – Edinburgh service, replacing a two hourly service pattern comprising approximately three King's Cross – Edinburgh trains in each direction and one King's Cross - Newcastle train in each direction.
- Introduction of an additional hourly King's Cross – Newcastle stopping service.
- Replacement of the existing hourly King's Cross – Newark/York stopping service with an hourly stopping service between King's Cross and Lincoln/Harrogate on alternate hours. King's Cross - Harrogate services would operate via Hambleton Junction.
- Extension of one weekday King's Cross - Edinburgh service in each direction to/from Stirling.
- Extension of one weekday King's Cross – Newcastle service in each direction to/from Sunderland.

Our estimated NPV for these services over the 10 year appraisal period is £15.1m. This comprises £152.0m of user benefits, £82.2m of non-user benefits, a £212.1m net increase in GB rail revenue, a net £41.1m reduction in income to HM treasury, and an £390.1m increase in total operating costs.

The largest quantified beneficial impact is the increase in GB rail revenue. This is estimated at broadly £15.0m per annum in year 1, £22.2m in year 5 and £23.0m in year 10.

The next largest beneficial impact is the increase in user benefits. This is estimated at broadly £14.7m per annum in year 1, £21.8m in year 5 and £22.6m in year 10.

The largest quantified negative impact on the NPV is the operating costs. We estimate these costs at around £45.8m per annum in year 1, £39.7m in year 5, and £32.3m in year 10. This is driven by an estimated annual staffing requirement of 51 drivers and 47 guards, a rolling stock requirement of nine units in nine car formation and an annual vehicle mileage of 29.7m.

Table 27 - Appraisal Summary: VTEC's 2020 core services

Impact category	**£m 2010**
User benefits	£152.0
Non-user benefits	£82.2
Other Govt impacts*	-£41.1
Revenue (GB rail total)	£212.1
Operating Costs	-£390.1
Net Present value	£15.1

*Lost taxation net of reduced local highway funding

9.4. Economic appraisal results: ECML south only

9.4.1. Alliance's London - Yorkshire/Cleethorpes application (London – Cleethorpes services only)

Table 27 below presents a summary of the appraisal results for only the London – Cleethorpes services within Alliance's London – Yorkshire/Cleethorpes service.

Our estimated NPV for these services of the 10 year appraisal period is £10.0m. This comprises £36.0m of user benefits, £9.4m of non-user benefits, a £27.3m net increase in GB rail revenue, a net £5.3m reduction in income to HM treasury, and an £57.3m increase in total operating costs.

The largest quantified beneficial impact is the increase in user benefits. This is split broadly 63% from a GJT saving, 32% from a reduction in fares and 5% from reduced overcrowding on existing services.

The next largest quantified beneficial impact is the increase GB rail revenue. This is estimated at broadly £1.9m per annum in year 1, £2.9m in year 5 and £3.0m in year 10.

The largest quantified negative impact on the NPV is the operating costs. We estimate these costs at around £9.6m per annum in year 1, £8.5m in year 5, and £7.1m in year 10. This is driven by an estimated annual staffing requirement of 11 drivers and 10 guards, a rolling stock requirement of three units in five car formation and an annual vehicle mileage of 2.9m.

Table 28 - Appraisal Summary: Alliance's London – Cleethorpes service

Impact category	**£m 2010**
User benefits	£36.0
Non-user benefits	£9.4
Other Govt impacts*	-£5.3

Revenue (GB rail total)	£27.3
Operating Costs	-£57.3
Net Present Value	**£10.0**

*Lost taxation net of reduced local highway funding

9.4.2. VTEC's London - Middlesbrough services from application 6

Table 25 below presents a summary of the appraisal results for VTEC's London - Middlesbrough services contained within application 6.

Our estimated NPV for these services of the 10 year appraisal period is £29.0m. This comprises £23.7m of user benefits, £9.6m of non-user benefits, a £77.8m net increase in GB rail revenue, a net £11.4m reduction in income to HM treasury, and an £70.6m increase in total operating costs.

The largest quantified beneficial impact is the increase GB rail revenue. This is estimated at broadly £5.5m per annum in year 1, £8.1m in year 5 and £8.5m in year 10.

The largest quantified negative impact on the NPV is the operating costs. We estimate these costs at around £8.1m per annum in year 1, £7.2m in year 5, and £6.0m in year 10. This is driven by an estimated annual staffing requirement of 10 drivers and 9 guards, a rolling stock requirement of three units in nine car formation and an annual vehicle mileage of 5.6m.

We understand that a small upgrade of the infrastructure in the Middlesbrough station area is required to accommodate the proposed services, which VTEC intends to finance. We have not included the cost or potential other benefits of this upgrade in the appraisal.

Table 29 - Appraisal Summary: VTEC's London – Middlesbrough services

Impact category	**£m 2010**
User benefits	£23.7
Non-user benefits	£9.6
Other Govt impacts*	-£11.4
Revenue (GB rail total)	£77.8
Operating Costs	-£70.6
Net Present Value	£29.0

*Lost taxation net of reduced local highway funding

9.5. Comparison of the applications assessed

Table 31 below presents a comparison of the results of the economic assessments discussed above.

Table 30 – Comparison of the economic assessment results £2010m

	NPV	PVB	Weekday paths*	NPV/paths	PVB/paths
Alliance W Yorks/Cleethorpes	135.0	299.1	20	6.8	15.0
Alliance W Yorks only	168.6	271.0	16	10.5	16.9
VTEC Application 6 (Harrogate)	190.8	291.4	12	15.9	24.3
VTEC Application 6 (Core)	15.1	405.2	18	0.8	22.5
Alliance Edinburgh	201.6	856.0	32	6.3	26.8
First Group	201.8	334.5	10	20.2	33.5
Alliance Cleethorpes only	10.0	67.3	9	1.1	7.5
VTEC Application 6 (Middlesbrough)	29.0	99.7	6	4.8	16.6

*Additional paths through at least one capacity constrained track section

Errata note to the CH2M HILL report "Assessment of Aspirations for Track Access on the East Coast Main Line – Review of all aspirations submitted"

An important error in the CH2M HILL report "Assessment of Aspirations for Track Access on the East Coast Main Line – Review of all aspirations submitted" has been identified following its distribution by ORR on 29 May 2015. Consequently, we have agreed to amend the report as shown in this errata note.

Correction of the error, which concerns the choice of timetable for the VTEC core application, has the consequence of a very substantial increase in the estimated net benefits for core services in VTEC's long-term application. When this error was initially identified we believed it would have a modest impact on the VTEC NPV results and discussed this with applicants. On receiving the final results from CH2M HILL, however, it is clear that this results in a significant change to the VTEC Application 6 (Core) NPV results, going from £15.1m in the CH2M HILL report as circulated on 29 May, to £287.8m.

Further information describing this error is as follows:

- VTEC's long term track access application 6 was submitted on the basis of the 2020 timetable, which would be implemented following the deployment of the full IEP fleet, and is designed to be operated by a fleet comprising predominantly IEP rolling stock, with a small sub fleet of legacy rolling stock.
- In constructing a timetable for the VTEC core option as described in the report (part of application 6) CH2M HILL used a version of the 2019 file with changes to rolling stock to account for IEP. However, this process led to a significant overestimate of journey times for the services in the VTEC core option. This is primarily because services with identical rolling stock and identical stopping patterns will achieve faster journey times in the 2020 timetable than the 2019 timetable (e.g. due to a more even train speed and acceleration profiles across more homogenous fleet, and lower performance time allowances), and due to a misallocation of the rolling stock type for some services.
- In broad terms London - Edinburgh journey times were overstated by 3-7 minutes per train, and London – Leeds journey times were overstated by around 2 minutes per train. These over-estimates led to a significant under-estimate of the incremental time savings enabled by the VTEC core option versus the base timetable. There was also a smaller knock on-effect on the other options tested that form part of VTEC's long term application 6.

The revenue forecasts and economic appraisal for these options were therefore reproduced using the corrected timetable files. During this re-run CH2M HILL also took the opportunity to reallocate its assumed allocation of VTEC's total incremental marketing budget across the options tested. This

was based on advice received from VTEC and was consistent with the way in which marketing spend was applied for applications submitted by the other applicants.

Below is a list of the changes that follow from correcting this error (in addition to an inversion of rows on Table 4). All references are to the version of the report issued on 29 May 2015. We do not intend to re-issue the amended report in advance of the hearing, but will do so afterwards following a full review.

Summary of changes

Section 7.2.2

Construction of the 2020 core option in MOIRA: this section should state that the base timetable is based on services from VTEC's 2020 timetable not VTEC's 2019 timetable.

Table 16

New revenue projections are:

Table 16 - Estimated total annual revenue for VTEC's application 6 – 2020 core services

Scenario	Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
Low	£49.6m	£32.9m	£16.5m	£6.5m	1.97	5.01
Central	£54.7m	£38.2m	£16.5m	£6.5m	2.31	5.84
High	£56.2m	£39.8m	£16.5m	£6.5m	2.41	6.11

Figure 16

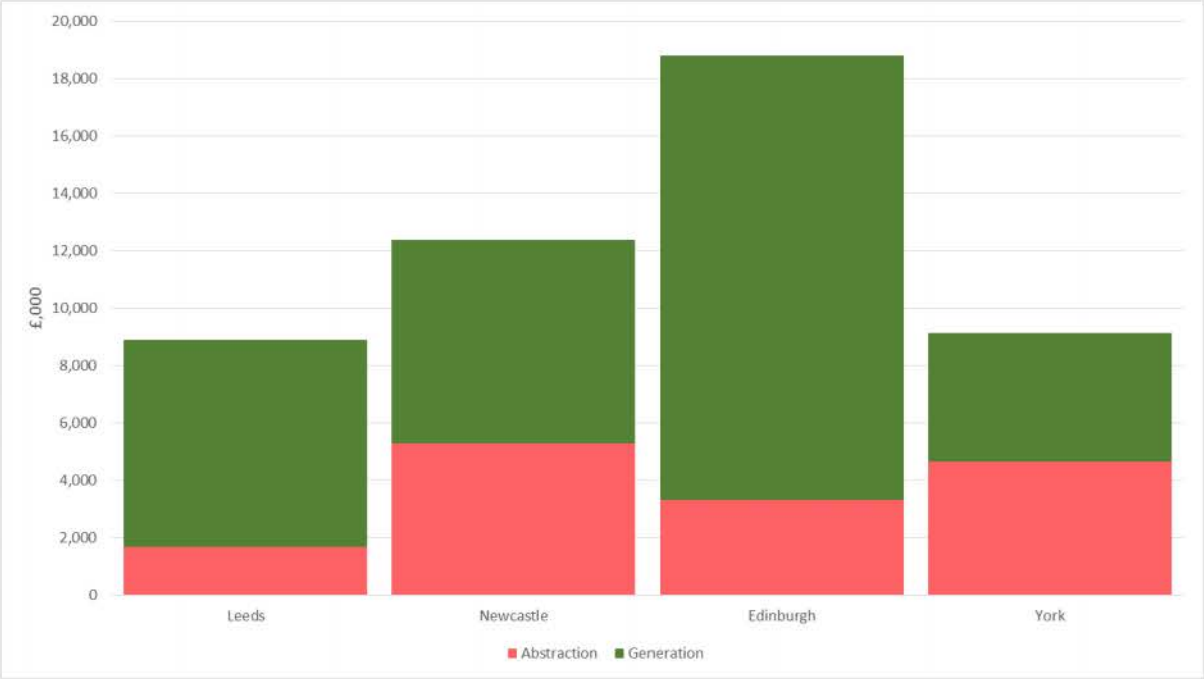
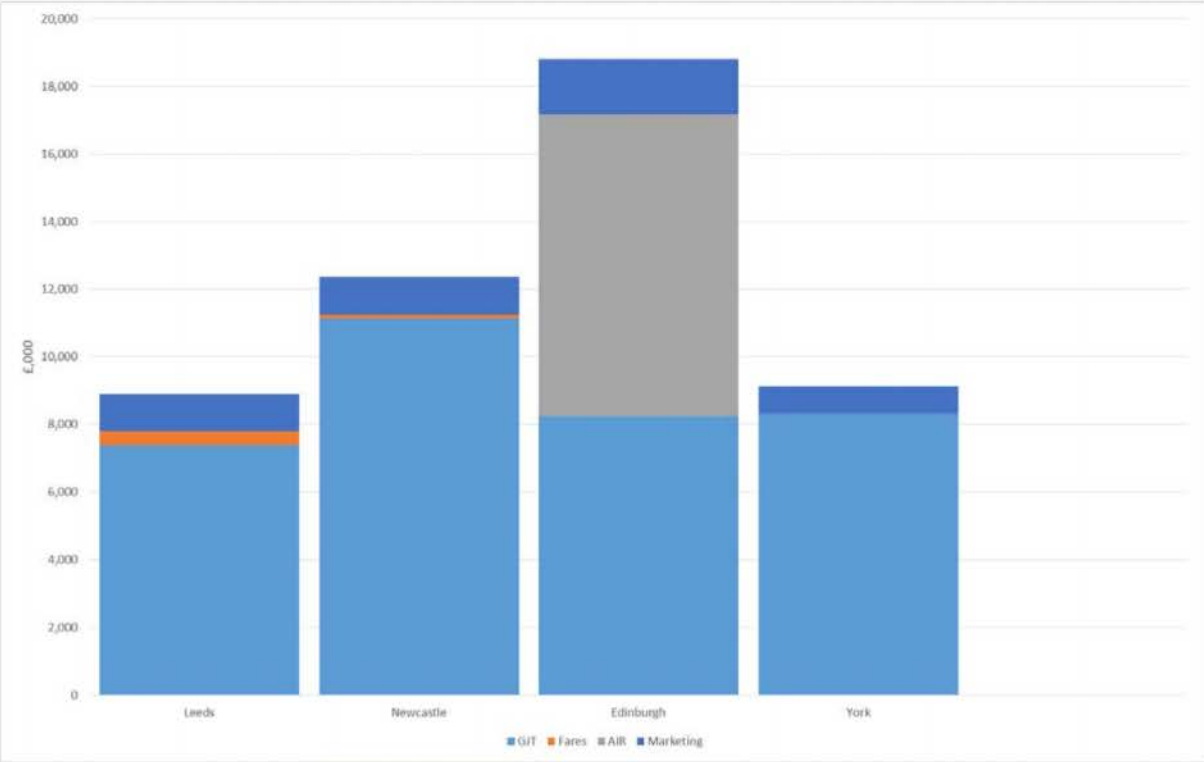


Figure 17



Section 7.3.3

The central elasticity to calculate abstraction from the aviation market has changed to -3.5 from -3.2 for Edinburgh. The air market uplift to London – Newcastle has not been applied as the forecast demand using the other parts of the forecasting suite exceeds mode share calculated using PDFH.

Table 17

Table 17 - Estimated total annual revenue for VTEC's application 6 – 2020 Middlesbrough extension

Scenario	Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
Low	£6.3m	£4.1m	£2.1m	£2.7m	1.90	1.53
Central	£6.8m	£4.7m	£2.1m	£2.7m	2.23	1.76
High	-	-	-	-	-	-

Note: the central scenario now uses the highest permitted elasticity to calculate abstraction from the aviation market, therefore there is no high scenario.

Table 18

Table 18 - Estimated total annual revenue for VTEC's application 6 – King's Cross – Lincoln/Harrogate service

Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
£15.1m	£9.0m	£6.1m	£2.3m	1.45	3.94

Figure 20

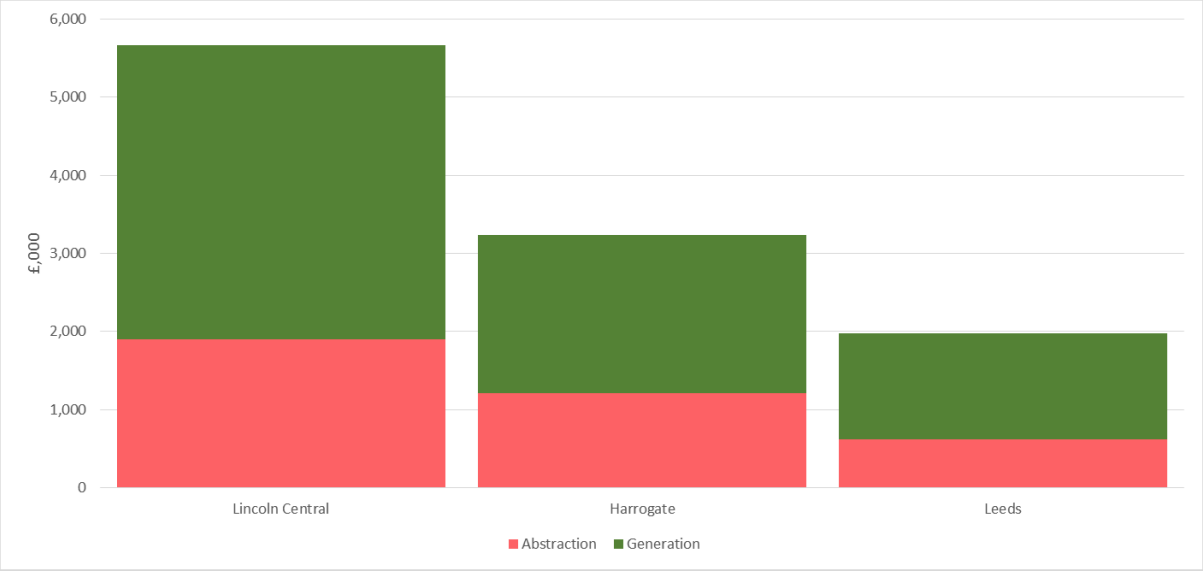


Figure 21

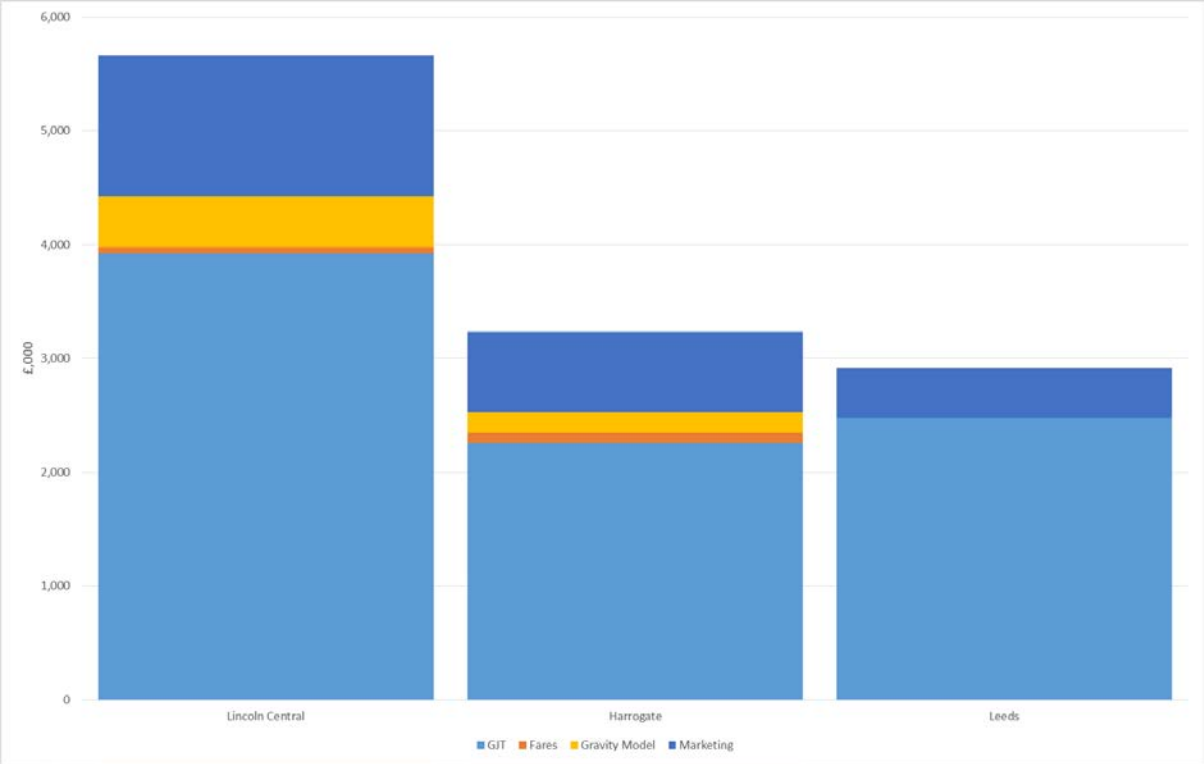


Table 19

Table 19 - Estimated total annual revenue for VTEC's application 6 – Bradford Forster Square service extensions

Total revenue	Newly generated	Abstracted (all TOCs)	Abstracted from non-DfT franchised TOCs	(Generation)/ (Total Abstraction)	(Generation)/ (Abstraction non-DfT franchised TOCs)
£7.5m	£5.2m	£2.3m	£0.8m	2.26	6.22

Figure 22

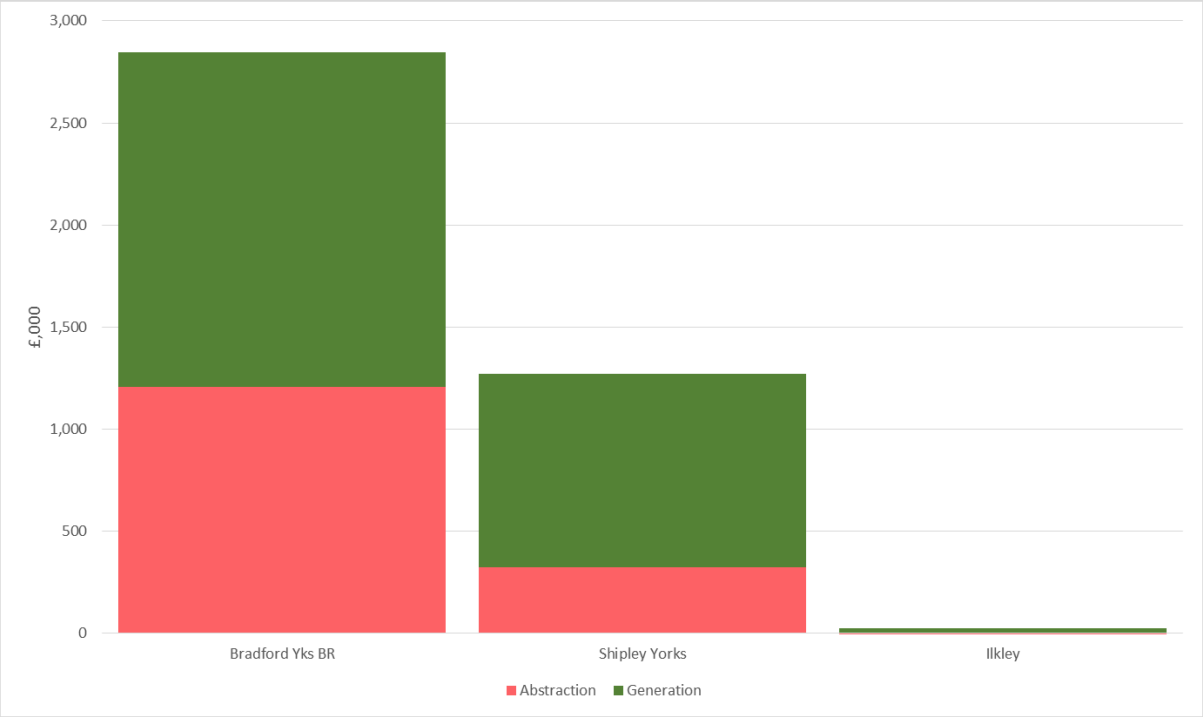


Table 24

Table 24 - Appraisal Summary: VTEC's London – Harrogate/Lincoln services

Impact category	**£m 2010**
User benefits	£140.8m
Non-user benefits	£39.7m
Other Govt impacts*	-£20.8m
Revenue (GB rail total)	£96.0m
Operating Costs	-£100.7m
Net Present Value	£154.9m

Table 27

Table 27 - Appraisal Summary: VTEC's 2020 core services

Impact category	**£m 2010**
User benefits	£240.6m
Non-user benefits	£91.6m
Other Govt impacts*	-£62.3m
Revenue (GB rail total)	£407.9m
Operating Costs	-£390.1m
Net Present value	£287.8m

Table 29

Table 29 - Appraisal Summary: VTEC's London – Middlesbrough services

Impact category	**£m 2010**
User benefits	£40.4m
Non-user benefits	£8.5m
Other Govt impacts*	-£7.6m
Revenue (GB rail total)	£50.4m
Operating Costs	-£70.6m
Net Present Value	£21.1m

Table 30

Table 30 – Comparison of the economic assessment results £m 2010

	NPV	PVB	Weekday paths*	NPV/paths	PVB/paths
Alliance W Yorks/Cleethorpes	135.0	299.1	20	6.8	15.0
Alliance W Yorks only	168.6	271.0	16	10.5	16.9
VTEC Application 6 (Harrogate/Lincoln)	154.9	255.6	12	12.9	21.3
VTEC Application 6 (Core)	287.8	677.9	18	16.0	37.7
Alliance Edinburgh	201.6	856.0	32	6.3	26.8
First Group	201.8	334.5	10	20.2	33.5
Alliance Cleethorpes only	10.0	67.3	9	1.1	7.5
VTEC Application 6 (Middlesbrough)	21.1	91.7	6	3.5	15.3

General

References to the base timetable used to assess Alliance, First Group and VTEC's long-term applications should state that the base timetable was based on services in VTEC's 2020 timetable, and not VTEC's 2019 timetable. This is a clarification only, and does not affect the revenue projections for Alliance or First Group.

Separate issue with Table 4

Please note that it has also been drawn to our attention that in Table 4 the estimated rail mode shares for 'Alliance post IEP' and '2020 core' were mistakenly the wrong way around.