FINDINGS REPORT

OPEN ACCESS REVENUE BACKCASTING

REVIEW OF OPEN ACCESS REVENUE GENERATION AND ABSTRACTION

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1. EXECUTIVE SUMMARY

1.1 Background

1.1.1 The Office of Rail and Road (ORR) determines track access decisions based on the individual merits of individual applications, informed by the balance of its statutory duties[1].

1.1.2 As part of its assessment of individual applications, ORR tests whether the services would be primarily abstractive of franchised operator revenue, because of the need to consider the impact on the funds available to the Secretary of State. This is assessed using ORR's Not Primarily Abstractive (NPA) Test, with published guidance setting out that ORR would not expect to approve applications with ratios of generation (i.e. revenue from rail journeys that would not have happened without open access entry) to abstraction (i.e. revenue earned by open access entrants at the expense of franchised operators) falling below 0.3 to 1.

1.2 Objectives

1.2.1 The objectives of this review were to arrive at estimates of the outturn level of revenue generation and abstraction for the four existing long-distance open access services (Hull Trains, Grand Central Sunderland, Grand Central Bradford, and Lumo). This is achieved by comparing the outturn franchise operator and open access operator revenue against a counterfactual scenario, whereby the current open access services had not launched at all. Through this approach we carried out an analysis of the open access services which had been approved in the past by ORR. Our approach did not enable us to assess those past ORR decisions in which open access applications had been declined. Our analysis only attempts to estimate historic generation and abstraction levels and does not consider any arguments about the impact of open access in terms of wider economic or social costs and benefits.

1.2.2 The counterfactual is not directly observable and can only be estimated indirectly using analytical methods. Our approach has involved the following:

- Undertaking a 'backcasting' exercise to forecast the expected revenue for franchised operators assuming that the open access services had not been introduced.
- Comparison of the backcast revenue with the actual revenue for franchised and open access operators to calculate the implied level of generation and abstraction that has occurred.
- Estimation, drawing on the previous steps, of the implied generation and abstraction for each individual flow, and the NPA test result for each open access service including how this has evolved over time.

1.3 Our Approaches - Overview

1.3.1 We have used three separate approaches to backcasting, listed here in order from the most to least resembling industry guidance and best practice:

- **PDFH Approach** - Modelling using the industry standard Passenger Demand Forecasting Handbook (PDFH) v6 elasticities.
- **Flow specific elasticities** – As a sensitivity to the standard approach, modelling using the PDFH approach but applying elasticities supplied to us by ORR specific to the flows on which open access services operate.

[1] See https://www.orr.gov.uk/sites/default/files/om/our-rail-and-road-duties.pdf

- **Control flows** - Estimating revenue growth based on the revenue growth seen on selected representative flows where no open access services have been introduced.

1.3.2 The reference point for the backcasting for each of the open access services is the last full year before the open access service started operating. Our results present the cumulative impact from the first year of each of these individual open access services until the end of 2018/19, the last full year before the impact of the Covid-19 pandemic. Due to concerns over the reliability of longer-term forecasts, in our final results we also present the results of shorter term 'reduced timeline' forecasts.

1.3.3 Lumo services were introduced during the pandemic which places increased uncertainty on the results. Therefore, we have compared the last year before the impact of the pandemic, 2018/19 to the last full year of data available, with just these two years used in our analysis.

1.3.4 Our modelling has been reviewed by an independent person as part of our quality assurance, with the methodology and results discussed and reviewed by our Independent Contractor and representatives of ITS Leeds.

1.4 Our Approach – Formulation

1.4.1 In this section we outline the arithmetic underpinning our methodology, as alluded to at paragraph 1.2.1 above. This helps to explain certain aspects of the detailed choices that we made in deciding which results to present in this summary and in Chapters 9 to 12 of this report.

1.4.2 The initial building blocks of our analysis are the observable historic revenues earned by incumbent and open access operators. For example, in a hypothetical case where a new open access service launches in year 1, and we are seeking to estimate the cumulative impact of open access as of year 10, our analysis begins with the following observed data for each flow impacted by open access:

A. Franchised revenues in the year before open access entry, i.e. year 0;
B. Franchised revenues in each year up to 10 (i.e. 10 years after the introduction of open access); and
C. Open access revenues in each year up to year 10.

1.4.3 In our hypothetical example we would then use backcasting techniques as detailed in paragraph 1.3.1 above, to arrive at estimates of:

D. Forecast franchised revenues as they would have been in each year up to year 10 had the open access service not launched at all.

1.4.4 Having obtained these forecasts, the next step is to infer abstraction and generation, under the implicit modelling assumption that open access entry can explain the difference between forecast and out-turn franchised revenues:

E. **Abstraction** can be inferred from the difference between actual franchised revenues and forecast 'no entry' franchised revenues in each year, i.e. by subtracting item D from item B above.
F. Since all open access revenue must be either generated or abstracted, **Generation** can be inferred from the difference between actual open access and the estimate of abstraction obtained in the previous step in each year, i.e. by subtracting item E from item C above.

1.4.5 The NPA ratio can therefore be defined as:

$$NPA\ Ratio = \frac{Open\ Access\ Revenue\ (C) - Abstraction\ (D - B)}{Abstraction\ (D - B)}$$

1.5 Our Approach – Adjustments

1.5.1 Our methodology implicitly assumes that the difference between forecast and outturn franchised revenues is the result of open access entry. But we recognise that, in practice, our forecasting (particularly using relatively crude control flows approaches) is not capable of taking into account all flow-specific factors which influence demand. Examples of factors that are not included in our approach are the impact of improved rolling stock and targeted marketing campaigns.

1.5.2 A key advantage of our approach it is that it closely mirrors the forecasting approaches that are widely used by practitioners within the transport industry. However, it is important to note that different characteristics of individual areas are not considered:

- Industry best practice modelling techniques apply average elasticities to a wide variety of individual flows and as such may not accurately forecast impacts on an individual flow.
- Through necessity, aggregated measures of population, employment and other demand drivers are typically used in forecasting. Such aggregation will often fail to accurately reflect the factors influencing individual flows.

1.5.3 It would not be realistic to expect the model results to account for all demand drivers, and the simplifications within our modelling lead to some results that at first glance would appear counterintuitive but can be explained, at least in part, by factors not included in or modelling. There are two main examples of this:

- **Negative Abstraction** when the actual franchised operator revenue in an individual year (B) is higher than our forecast franchised revenues as they would have been in year 10 had the open access service not launched at all (C).
- **Negative Generation** when the actual total level of revenue on an individual flow (B + C) is lower than our forecast of franchised revenues as they would have been in year 10 had the open access service not launched at all (D).

1.5.4 Candidate explanations of **negative abstraction**, i.e. open access entry seemingly driving an increase in franchised revenues, in our results include the following:

- Open access entry has indeed pushed franchised revenues to a level higher than they would have been without open access entry, for example through increasing passenger awareness of the benefits of rail travel; or
- Our forecasts of franchise revenue as it would have been in the absence of open access entry have been biased downwards as a result of our approach failing to properly take account of some of the key drivers of demand.

1.5.5 Candidate explanations of **negative generation,** i.e. open access entry seemingly leading to a contraction in the size of the total market aggregated across open access and franchised operators, in our results include the following:

- The strength of price competition between entrant and incumbent has been such that total revenues have been reduced despite an increase in the number of passenger journeys brought about by the introduction of a new service;
- Where a new open access service results in passengers changing the station they use due to improved services at a more accessible station (for example using

Hartlepool instead of Durham), there will be a genuine loss of revenue at the station the demand has moved from (Durham in this example).

- Our forecasts of franchise revenue as it would have been in the absence of open access entry have been biased upwards as a result of our approach failing to properly take account of some of the key drivers of demand.

1.5.6 In our view, the failure to fully take account of some of the key drivers of demand provides the only credible explanation of the negative abstraction seen in our results. Negative abstraction has therefore been removed from all of the results presented in this document. Where our results imply negative abstraction on an individual flow, we have manually made an upwards adjustment to our forecast of the franchised revenue without open access such that our estimate of abstraction is zero.

1.5.7 For negative generation the picture is less certain:

- We were able to rule out the impact of price competition as a candidate explanation. We carried out a detailed examination on the flows exhibiting negative generation which showed an impact that was no less pronounced for demand (i.e. passenger numbers) as for revenues.
- It is entirely plausible that some passengers will change the station they use to access services to London.
- We cannot rule out the potential upwards bias in our forecasts as detailed examination of some of the flows where this negative generation exists suggests that other factors are driving demand to be lower than in our forecasts. .

1.5.8 In the light of the considerations above, our approach has been to remove all instances of negative **abstraction** on individual flows from the model results, making our overall findings somewhat conservative in the sense that they omit certain results which tend to push up aggregate estimates of total abstraction. We present three sets of test results for the services modelled:

- **Initial** test results which retain all instances of negative **generation**.
- **Revised** test results where negative generation on frequent franchise service flows is removed, and negative generation on affected flows is limited to half the value of the revenue generation on the relevant flows with no direct franchise service. This has been done to retain instances that are potentially caused by passengers changing stations, but removing instances that are likely to be caused by impacts not accounted for in our modelling.
- **Reduced timeline** test results, calculated in order to reflect the impact of increased uncertainty in modelling over time. Where our modelling fails to properly take account of some of the key drivers of demand, the impact of this on the results will increase over time.

1.5.9 The period used for our reduced timeline tests takes into account the following factors:

- Levels of demand and revenue settling down after services were introduced, noting that generally the lagging of demand impacts suggests it takes up to 4 years for this to happen.
- Service levels have settled down, with major improvements completed and the above settling period having elapsed.

1.6 Overview of Findings

1.6.1 We have compared our estimates of outturn generation to abstraction ratios against:

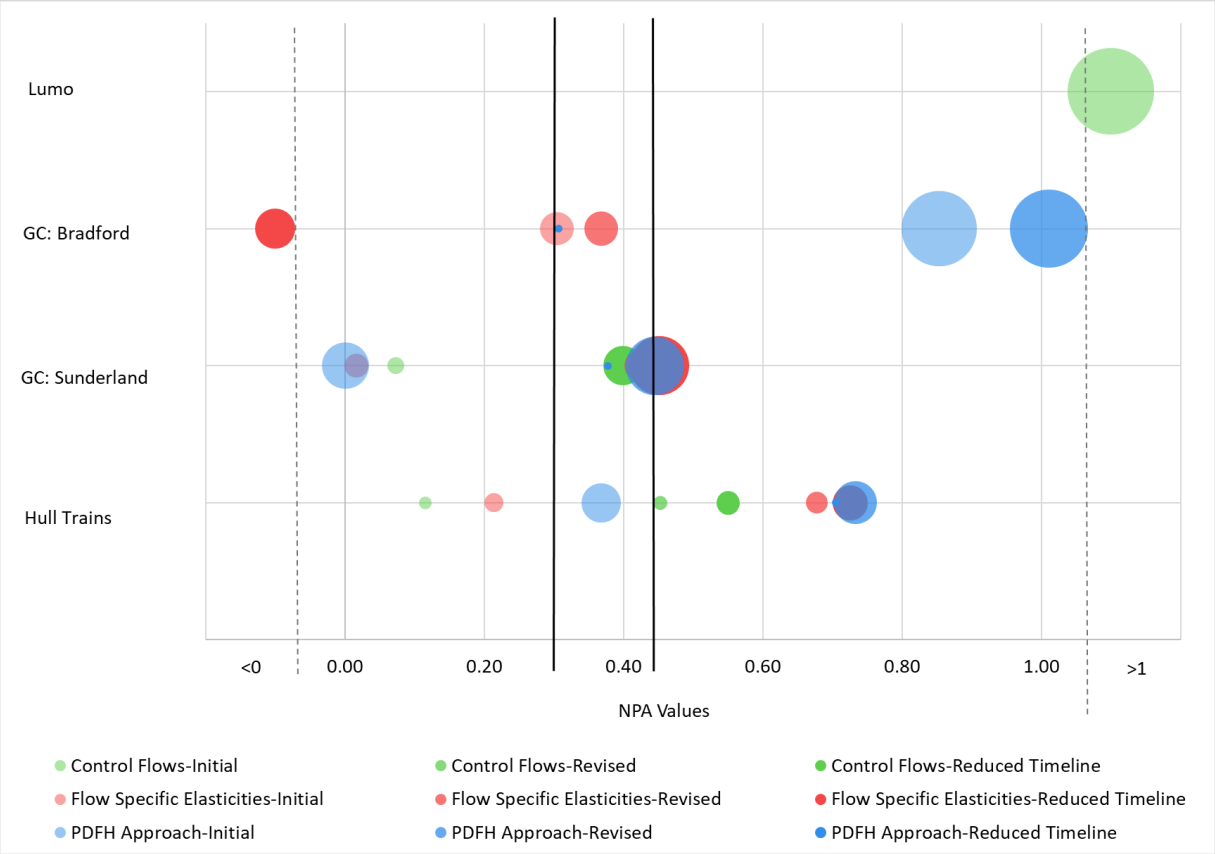
- ORR's indicative generation to abstraction ratio of 0.3, below which it has publicly stated that it is unlikely to grant access to open access applicants; and
- A further indicative range of 0.3 to 0.45, which during the course of this engagement ORR staff told us was reflective of the NPA estimates it had considered as part of the weighting of its statutory duties in its past decisions.

1.6.2 Figure 1 shows the NPA results for the four services which we have assessed. We have obtained a total of up to nine results for each service, based on all combinations of the three methodological approaches summarised at paragraph 1.3.1, the elasticities-based versions of which we were not able to use for Lumo, and the three different sets of calculations described at paragraph 1.5.8. We have used the diameter of the markers in Figure 1 to illustrate our confidence in the modelling that has produced the results, based on the following (with a large diameter marker indicating increased confidence):

- the closeness of the approach to modelling best practice;
- the presence of negative generation in the results; and
- the length of the modelling period.

1.6.3 We combine these measures of confidence into an index as described in Section 13 of this document.

Figure 1. Summary of NPA Values



1.6.4 Figure 1 shows that the results to which we attach the most confidence are generally above the 0.3 value with some individual exceptions. It is to be noted that some of the markers in this figure cannot be seen due to either being so small or being obscured by larger markers. The key observations that can be drawn for each of the open access services are set out below:

- Hull Trains:

- The initial results (on the basis of both elasticity and control flows methods) are all below an NPA test value of 0.45, but with the PDFH elasticity in the middle of the 0.3 to 0.45 range, the other approaches being below 0.3. The PDFH approach exhibits the lowest levels of negative generation as well as being the closest method to best practice and is therefore the result in which we place the most confidence.
- The revised test results, where the levels of negative generation have been reduced, are all above the 0.3 to 0.45 range, with the ratio values increasing with the closeness of the modelling to best practice.
- The reduced timeline results are all clustered around the 0.7 value.
- The results, apart from one in which we have the least confidence due to significant 'negative generation' on the Doncaster to London flow, are all above the 0.3 level. The results in which we have the most confidence are clustered around 0.7.
- We conclude that the evidence presented suggests that this service has resulted in NPA values above the 0.3 to 0.45 range.

- Grand Central Sunderland service:

  - The initial results for this service are all very low, even for the PDFH approach which most reflects industry best practice.
  - All other results, both the revised and reduced timeline results, are all clustered around the 0.4 to 0.45 range. Many of the individual points are hidden by the last result plotted on the chart which has a reasonably high level of confidence attached to it.
  - We conclude that the balance of evidence from these tests is that the NPA values for this service sit within the 0.3 to 0.45 range.

- Grand Central Bradford service:

  - The values from the PDFH approach are all above the 0.3 level, with the revised test and reduced timeline results above the 0.3 to 0.45 range.
  - All results that produce a positive NPA value are above a value of 0.3.
  - We conclude that this service produces values within or above the 0.3 to 0.45 range.

- Lumo

  - Only the results from a control flow approach are available.
  - The absence of negative generation in the results means that the result presented is attached a high level of confidence in our weightings despite the reliance on control flows.
  - The robustness of this result is, however, reduced by the limited data that is available (and hence our reliance on a control flow approach) and the fact that the service began during the Covid pandemic. As a result, we are obliged to consider the demand change between the last full year before the pandemic (2018/19) and the most recently available full year (2023/24).
  - The evidence that is available suggests NPA values that are substantially above the 0.3 to 0.45 range .

1.6.5 We have summarised these results in Table 1.

Table 1. Summary of NPA Findings by Service

OPEN ACCESS SERVICE	VS A 0.3 THRESHOLD	VS. AN INDICATIVE 0.3 TO 0.45 RANGE	NOTES
Hull Trains	Above	Above	Some low values driven by large levels of negative generation
GC – Sunderland	Above	Within	Some low values driven by large levels of negative generation
GC – Bradford	At or above	Within or above	Mixture of low values driven by negative generation and high values likely driven by low forecast demand growth. Overall least confidence in these results.
Lumo	Above	Above	Only control flow approach used, and uncertainty in the post-covid era.

1.7 Key Conclusions

1.7.1 Our key conclusions from this study are:

- It is difficult to draw definitive conclusions on precise generation to abstraction ratios due to the impact of factors not captured in our modelling. This is reflected in the levels of negative generation and negative abstraction that exist in modelling results prior to any adjustments.
- When considering the results in which we have the most confidence, our results suggest generation to abstraction ratios that are at or above the value of 0.3. While there are results lower than these levels, each of these examples includes levels of negative generation that limit our confidence in the results.
- Our results provide confidence that generation to abstraction ratios are within or above a range of 0.3 to 0.45 which has typically informed past decisions.

2. INTRODUCTION

2.1 Background

2.1.1 ORR determines track access decisions based on the individual merits of individual applications, informed by the balance of its statutory duties[2].

2.1.2 As part of its assessment of individual applications, ORR tests whether the services would be primarily abstractive of franchised operator revenue, because of the need to consider the impact on the funds available to the Secretary of State. This is assessed using ORR's Not Primarily Abstractive (NPA) Test, which is calculated as generated revenue divided by abstracted revenue. Published guidance[3] sets out that ORR would not expect to approve applications with ratios of generation (i.e. revenue from rail journeys that would not have happened without open access entry) to abstraction (i.e. revenue earned by open access entrants at the expense of franchised operators) falling below 0.3 to 1.

2.1.3 In summary, the approach used by ORR to forecast generation and abstraction is as follows:

- The use of PDFH methodologies to assess the level of revenue with and without the presence of the Open Access Operator service.
- The use of alternative approaches, such as gravity models, on flows where the levels of services improvement is such that PDFH approaches are not appropriate for forecasting the impact of service improvements.
- From these, forecast total Open Access revenue, and how much of this is generated revenue and how much is abstracted.

2.1.4 This work builds on work by Leigh Fisher[4] which followed a similar approach in generating a PDFH based counterfactual and sought to identify generation and abstraction. Our approach brings in additional years' worth of data, makes use of the comprehensive Open Access Analysis Dataset that is now available and considers alternative approaches to developing a counterfactual revenue forecast. Importantly, this study also uses the available data to assess the level of generation and abstraction on the recently introduced Lumo service.

2.2 Objectives

2.2.1 The objectives of this review were to arrive at estimates of the outturn level of revenue generation and abstraction for the four existing long-distance open access services (Hull Trains, Grand Central Sunderland, Grand Central Bradford, and Lumo). This is achieved by comparing the outturn franchise operator and open access operator revenue against a counterfactual scenario in which the current open access services had not launched at all. Through this approach we carried out an analysis of the open access services which had been approved in the past by ORR. Our approach did not enable us to assess those past ORR decisions in which open access applications had been declined. Our analysis only attempts to estimate historic generation and abstraction levels and does not consider any arguments about the impact of open access in terms of wider economic or social costs and benefits.

[2] See https://www.orr.gov.uk/sites/default/files/om/our-rail-and-road-duties.pdf

[3] See e.g. https://www.orr.gov.uk/sites/default/files/2024-04/costs-benefits-new-open-access-services-april-2024_0.pdf

[4] https://www.orr.gov.uk/media/10777/download

2.2.2 The counterfactual is not directly observable and can only be estimated indirectly using analytical methods. Our approach has involved the following:

- Undertaking a 'backcasting' exercise to forecast the expected revenue for franchised operators assuming that the open access services had not been introduced.
- Comparison of the backcast revenue with the actual revenue for franchised and open access operators to calculate the implied level of generation and abstraction that has occurred.
- Estimation, drawing on the previous steps, of the implied generation and abstraction for each individual flow, and the NPA test result for each open access service including how this has evolved over time.

2.2.3 As with any modelling exercise, the calculation of the NPA test prior to services being introduced includes significant uncertainty. However, our backcast exercise removes some of the uncertainty that exists prior to the services being introduced:

- Actual changes in the external factors driving forecasts can be used rather than forecasts of such changes.
- Actual changes in the service provided can be used to estimate demand changes, rather than forecasting how services are likely to change in the future.
- The outturn revenue, for both franchise and open access operators, following the introduction of open access operators is known.

2.2.4 It is important to understand that it is still impossible to be certain what revenue might have been in a situation where open access operators did not exist, and this review outlines these remaining uncertainties and their potential impact on the results.

3. OVERVIEW OF OUR APPROACH

3.1 Backcasting Approaches

3.1.1 We have used three separate approaches to backcasting, listed here in order from the most to least resembling industry guidance and best practice:

- **PDFH Approach** - Modelling using the industry standard PDFH v6 elasticities.
- **Flow specific elasticities** – as a sensitivity to the traditional PDFH approach, Modelling using PDFH approach but applying elasticities specific to the flows on which open access services operate. ORR supplied us with these elasticities as we discuss in Chapter 7 of this document.
- **Control flows** - Estimating revenue growth based on the revenue growth seen on selected representative flows where no open access services have been introduced.

3.1.2 The reference point for the backcasting for each of the open access services is the last full year before the open access service started operating. Our results present the cumulative impact from the first year of each of these individual open access services until the end of 2018/19, the last full year before the impact of the Covid-19 pandemic. Due to concerns over the reliability of longer-term forecasts, in our final results we also present the results of shorter term 'reduced timeline' forecasts.

3.1.3 Lumo services were introduced during the pandemic which places increased uncertainty on the results. Therefore, we have compared the last year before the impact of the pandemic, 2018/19 to the last full year of data available, with just these two years used in our analysis.

3.1.4 Details on the application of each methodology are provided in the following sections.

3.1.5 Our modelling has been reviewed by an independent person as part of our quality assurance, with the methodology and results discussed and reviewed by our Independent Contractor and representatives of ITS Leeds.

3.2 Our Approach – Formulation

3.2.1 In this section we outline the arithmetic underpinning our methodology. This helps to explain certain aspects of the detailed choices that we made in deciding which results to present in this summary and in Chapters 9 to 12 of this report.

3.2.2 The initial building blocks of our analysis are the observable historic revenues earned by incumbent and open access operators. For example, in a hypothetical case where a new open access service launches in year 1, and we are seeking to estimate the cumulative impact of open access as of year 10, our analysis begins with the following observed data for each flow impacted by open access:

- **A.** Franchised revenues in the year before open access entry, i.e. year 0;
- **B.** Franchised revenues in each year up to 10 (i.e. 10 years after the introduction of open access); and
- **C.** Open access revenues in each year up to year 10.

3.2.3 In our hypothetical example we would then use backcasting techniques as detailed in paragraph 3.1.1 above, to arrive at estimates of:

- **D.** Forecast franchised revenues as they would have been in each year up to year 10 had the open access service not launched at all.

3.2.4 Having obtained these forecasts, the next step is to infer abstraction and generation, under the implicit modelling assumption (we discuss the limitations, including omitted factors and uncertainties, of our approach, in the next subsection) that open access entry can explain the difference between forecast and out-turn franchised revenues:

E. **Abstraction** can be inferred from the difference between actual franchised revenues and forecast 'no entry' franchised revenues in each year, i.e. by subtracting item D from item B above.

F. Since all open access revenue must be either generated or abstracted, **Generation** can be inferred from the difference between actual open access and the estimate of abstraction obtained in the previous step in each year, i.e. by subtracting item E from item C above.

3.2.5 The NPA ratio can therefore be defined as:

$$NPA\ Ratio = \frac{Open\ Access\ Revenue\ (C) - Abstraction\ (D - B)}{Abstraction\ (D - B)}$$

3.3 Our Approach - Adjustments

3.3.1 As noted above, our methodology implicitly assumes that the difference between forecast and outturn franchised revenues is the result of open access entry. But we recognise that, in practice, our forecasting (particularly using relatively crude control flows approaches) is not capable of taking into account all flow-specific factors which influence demand. Examples of factors that are not included in our approach are the impact of improved rolling stock and targeted marketing campaigns.

3.3.2 A key advantage of our approach it is that it closely mirrors the forecasting approaches that are widely used by practitioners within the transport industry. However, it is important to note that different characteristics of individual areas are not considered:

- Industry best practice modelling techniques apply average elasticities to a wide variety of individual flows and as such may not accurately forecast impacts on an individual flow.
- Through necessity, aggregated measures of population, employment and other demand drivers are typically used in forecasting. Such aggregation will often fail to accurately reflect the factors influencing individual flows.

3.3.3 It would not be realistic to expect the model results to account for all demand drivers, and the simplifications within our modelling lead to some results that at first glance would appear counterintuitive but can be explained, at least in part, by factors not included in or modelling. There are two main examples of this:

- **Negative Abstraction** when the actual franchised operator revenue in an individual year (B) is higher than our forecast franchised revenues as they would have been in year 10 had the open access service not launched at all (C).
- **Negative Generation** when the actual total level of revenue on an individual flow (B + C) is lower than our forecast of franchised revenues as they would have been in year 10 had the open access service not launched at all (D).

3.3.4 Candidate explanations of **negative abstraction**, i.e. open access entry seemingly driving an increase in franchised revenues, in our results include the following:

- Open access entry has indeed pushed franchised revenues to a level higher than they would have been without open access entry, for example as a result of increasing passenger awareness of the benefits of rail travel; or
- Our forecasts of franchise revenue as it would have been in the absence of open access entry have been biased downwards as a result of our approach failing to properly take account of some of the key drivers of demand.

3.3.5 Candidate explanations of **negative generation,** i.e. open access entry seemingly leading to a contraction in the size of the total market aggregated across open access and franchised operators, in our results include the following:

- The strength of price competition between entrant and incumbent has been such that total revenues have been reduced despite an increase in the number of passenger journeys brought about by the introduction of a new service;
- Where a new open access service results in passengers changing the station they use due to improved services at a more accessible station (for example using Hartlepool instead of Durham), there will be a genuine loss of revenue at the station the demand has moved from (Durham in this example).
- Our forecasts of franchise revenue as it would have been in the absence of open access entry have been biased upwards as a result of our approach failing to properly take account of some of the key drivers of demand.

3.3.6 In our view, the failure to fully take account of some of the key drivers of demand provides the only credible explanation of the negative abstraction seen in our results. Negative abstraction has therefore been removed from all of the results presented in this document. Where our results imply negative abstraction on an individual flow, we have manually made an upwards adjustment to our forecast of the franchised revenue without open access such that our estimate of abstraction is zero.

3.3.7 For negative generation the picture is less certain:

- We were able to rule out the impact of price competition as a candidate explanation. We carried out a detailed examination on the flows exhibiting negative generation which showed an impact that was no less pronounced for demand (i.e. passenger numbers) as for revenues.
- It is entirely plausible that some passengers will change the station they use to access services to London. For example, the open access services provide new direct rail services from some stations, the Grand Central service to Sunderland providing a new direct service from Hartlepool to London being one example. We would expect that prior to the introduction of open access services, some people who live in Hartlepool would drive to Durham to access a direct rail service rather than have to change trains. Therefore, when the new service is introduced these passengers would no longer make journeys from Durham, the overall revenue at Durham may reduce and therefore create genuine negative generation.
- We cannot rule out the potential upwards bias in our forecasts as detailed examination of some of the flows where this negative generation exists suggests that other factors are driving demand to be lower than in our forecasts. For example, the total demand growth at Doncaster, York and Darlington shows that demand growth is noticeably lower than on other flows across LNER and EMR services.

3.3.8 In the light of the considerations outlined above, our approach has been to remove all instances of negative abstraction on individual flows from the model results, and present three sets of test results for the services modelled:

- **Initial** test results which retain all instances of negative generation.
- **Revised** test results where negative generation on frequent franchise service flows is removed, and negative generation on affected flows is limited to half the value of the revenue generation on the relevant flows with no direct franchise service. This has been done to retain instances that are potentially caused by passengers changing stations, but removing instances that are likely to be caused by impacts not accounted for in our modelling.
- **Reduced Timeline** test results to reflect the impact of increased uncertainty in modelling over time. Where our modelling fails to properly take account of some of the key drivers of demand, the impact of this on the results will increase over time. Presenting results over a reduced timeline will limit, but not remove, the impact of this on our results.

3.3.9 The period used for our reduced timeline tests takes into account the following factors:

- Levels of demand and revenue settling down after services were introduced, noting that generally the lagging of demand impacts suggests it takes up to 4 years for this to happen.
- Service levels have settled down, with major improvements completed and the above settling period having elapsed.

4. MODEL FLOWS

4.1 Introduction

4.1.1 A significant number of flows are potentially impacted by the presence of open access operators. To reduce the complexity of the modelling we have focussed on the key flows that represent at least 85% of the revenue of the open access operators, plus additional key flows that are expected to have seen revenue abstraction. Note that all direct flows to London are included in our modelling.

4.1.2 We have categorised the model flows into the following four categories, based on the level of franchise service before the introduction of open access services. The response to the introduction of open access services is very different across these flow categories, as the relative change in the level of service provision is very different. These flow categories are:

- **No Franchise Service:** flows with an open access operator service where there was no direct franchise service prior to the introduction of the open access operator service. On these flows we would expect significant revenue generation with very little, or no abstraction.
- **Infrequent Franchise Service:** flows with an open access operator service where there were at most two direct franchised operator services per day per direction prior to the introduction of the open access operator service. We would still expect significant levels of generation on these flows but with a large proportion of franchise operator revenue abstracted.
- **Frequent Franchise Service:** flows with an open access operator service where there were more than two direct franchised operator services per day per direction prior to the introduction of the open access operator service. We would expect only small amounts of generation on these flows due to the good service already existing and would expect most of the open access operator revenue to be abstracted. However, this abstraction would be expected to be a relatively small proportion of the franchised operator revenue.
- **Affected flows:** flows with no open access operator services but where demand is expected to be abstracted from the flow due to Open Access services at other nearby locations. We would expect some negative generation on these flows where demand has switched to using a different station.

4.1.3 The flows for each open access operator service are listed in the remainder of this section, detailing which of the above categories they fall into. The PDFH flow category used in our modelling has also been shown.

4.2 Hull Trains

4.2.1 The modelled flows for Hull Trains open access services are shown in Table 2. Note that Doncaster is also served by the Grand Central Bradford service, and the modelling of this flow therefore also includes the impact of the Grand Central Bradford service.

Table 2. Hull Trains Modelled Flows

FLOW	FLOW TYPE	PDFH CATEGORY
Beverley to London	No Franchise Service	Rest of Country to London
Brough to London	Infrequent Franchise Service	Rest of Country to London
Cottingham to London	No Franchise Service	Rest of Country to London
Doncaster to London	Frequent Franchise Service	Rest of Country to London
Grantham to London	Frequent Franchise Service	Rest of Country to London
Howden to London	No Franchise Service	Rest of Country to London
Hull to London	Infrequent Franchise Service	Rest of Country to London
Retford to London	Frequent Franchise Service	Rest of Country to London
Selby to London	No Franchise Service	Rest of Country to London

4.3 Grand Central Sunderland Service

4.3.1 The modelled flows for the Grand Central service to Sunderland are shown in Table 3.

Table 3. Grand Central Sunderland Service Modelled Flows

FLOW	FLOW TYPE	PDFH CATEGORY
Eaglescliffe to London	No Franchise Service	Rest of Country to London
Hartlepool to London	No Franchise Service	Rest of Country to London
Northallerton to London	Frequent Franchise Service	Rest of Country to London
Sunderland to London	No Franchise Service	Rest of Country to London
Thirsk to London	No Franchise Service	Rest of Country to London
York to London	Frequent Franchise Service	Rest of Country to London
Hartlepool to York	No Franchise Service	Non-London to / from major cities
Sunderland to York	No Franchise Service	Non-London to / from major cities
Thirsk to York	Frequent Franchise Service	Non-London to / from major cities
Darlington to London	Affected Flow	Rest of Country to London
Durham to London	Affected Flow	Rest of Country to London

4.4 Grand Central Bradford Service

4.4.1 The modelled flows for the Grand Central service to Bradford are shown in Table 4. Note that Doncaster to London is modelled under Hull Trains, so this flow includes the cumulative impact of both the Hull Trains and Grand Central services at this location.

Table 4. Grand Central Bradford Service Modelled Flows

FLOW	FLOW TYPE	PDFH CATEGORY
Bradford to London	Infrequent Franchise Service	Rest of Country to London
Brighouse to London	No Franchise Service	Rest of Country to London
Halifax to London	No Franchise Service	Rest of Country to London
Mirfield to London	No Franchise Service	Rest of Country to London
Wakefield[5] to London	Frequent Franchise Service	Rest of Country to London
Leeds to London	Affected Flow	Rest of Country to London
Pontefract to London	No Franchise Service	Rest of Country to London

4.5 Lumo

4.5.1 The modelled flows for the Lumo service to Edinburgh are shown in Table 5.

Table 5. Lumo Modelled Flows

FLOW	FLOW TYPE	PDFH CATEGORY
Edinburgh to London	Frequent Franchise Service	Rest of Country to London
Morpeth to London	Frequent Franchise Service	Rest of Country to London
Newcastle to London	Frequent Franchise Service	Rest of Country to London
Edinburgh to Newcastle	Frequent Franchise Service	Non-London to / from core cities
Stevenage to Edinburgh	Frequent Franchise Service	Non-London to / from core cities
Stevenage to Newcastle	Frequent Franchise Service	Non-London to / from core cities

[5] Note Open Access and Franchise operator serve different stations in Wakefield, but tickets to London are valid at either, so the two stations are treated as one in the analysis

5. DATA SOURCES

5.1 Introduction

5.1.1 The data used within this review has been taken from three sources:

- The Open Access Analysis Dataset
- The Rail Usage and Drivers Dataset
- LENNON Data

5.2 Open Access Analysis Dataset (OAAD)

5.2.1 The Open Access Analysis Dataset is a comprehensive set of data held by ORR, that contains data for a large number of variables that potentially have an impact on rail demand. The variables include data on rail usage, exogenous data, generalised journey time data, and rail performance data. The dataset is at a disaggregated level for a subset of 6,600 rail flows that are likely to have some interaction with Open Access operators and their routes.

5.2.2 We have used the OAAD (Dataset_Final_v13.dta) as the source of all data within this study, except where specified that alternative data has been used. The data used is detailed in Table 6, setting out the fields within the data that have been used.

Table 6. OAAD Fields Used

DATA TYPE	FIELDS USED
National Rail Demand	e.g. m_erngs_jnys_2f (up to 2003/04) e.g. erngs_jnys_2f (2004/05 onwards)
National Rail Revenue	e.g. m_erngs_arev_2f (up to 2003/04) e.g. erngs_arev_2f (2004/05 onwards)
Open Access Operator Revenue	e.g. m_erngs_arev_2f (up to 2003/04) e.g. erngs_arev_2f (2004/05 onwards)
RPI	o_rpi
Population	o_population_nuts2
Employment	e.g. d_emp_occ_1_wp_district_rdfe
GVA per Capita	o_rgdsp_inc_nuts2
Fuel Price	o_pumpprice
Participation	o_wk_age_popln_district o_employment_district_rdfe
Performance	e.g. nr_aml_f e.g. nr_dml_f
National Rail Generalised Journey Time	e.g. wed_nr_gjt_f e.g. sat_nr_gjt_f e.g. sun_nr_gjt_f
TOC Generalised Journey Time	e.g. wed_toc_gjt_f e.g. sat_toc_gjt_f e.g. sun_toc_gjt_f

5.2.3 In utilising the OAAD we noted issues with the MOIRA (an industry-standard model used for analysing changes in timetables and rolling stock initiatives) based demand and revenue, exhibiting a lack of consistency with the LENNON based data. We took the decision not to use the National Rail Revenue and National Rail Demand from these datasets for flows where data was required before 2004/05. This is all flows required for Hull Trains analysis.

5.3 Rail Usage and Drivers Dataset (RUDD)

5.3.1 We have used RUDD 2019 National Rail Demand and Revenue data (from Flows Dataset vFinal2.csv) for all flows required for modelling Hull Trains, as this data was more complete and more consistent for the whole period. RUDD is owned by DfT and contains flow data, ticket type categorization, as well as aggregate data on car costs, car ownership, population and employment data, including breakdowns by age band, occupation and sector.

5.3.2 The following fields were used:

- National Rail Revenue: e.g. revn_2f
- National Rail Demand: e.g. jnys_2f

5.4 LENNON

5.4.1 For the Lumo Control Flow analysis, National Rail Demand, National Rail Revenue and Lumo revenue was extracted directly from LENNON.

5.5 Adjustment to Real Prices

5.5.1 We have adjusted all revenues to be in 2023/24 prices using RPI. RPI is the industry standard measure of inflation for all versions of PDFH up to and including version 6. It is noted that there are limitations to using RPI in this context, and ORR and industry best practice are moving to the use of CPI.

6. MODELLING USING PDFH V6 ELASTICITIES

6.1 Introduction

6.1.1 Our approach uses key elements of the modelling of the change in demand on a year-by-year basis as set out within PDFH v6. This section outlines the data and elasticities applied but does not go into detail on the formulae set out in PDFH as this is fully detailed within the PDFH documentation. We have used the standard application of PDFH, utilising the simplified framework due to the complexities in calculating the data required for the more detailed approaches. We have chosen this approach to forecasting as this is the industry standard approach.

6.1.2 We have used the following demand drivers in our approach, with data taken from the OAAD dataset as shown in Table 6:

- Population
- Employment
- GVA per Capita
- Petrol Price
- Participation
- Performance
- Generalised Journey Time
- Fares.

6.1.3 We have undertaken the modelling set out within this section for the demand segmented into the following ticket types (to allow consistency across the OAAD and RUDD datasets):

- First Non Seasons
- First Seasons
- Standard Full
- Standard Reduced
- Standard Advanced
- Standard Seasons

6.1.4 We have used the above approach to forecast demand; we have forecast revenue by applying the average yield in each year to the forecast demand. This is based on our assumption that average yield is unaffected by the presence of Open Access operators. It is not possible to isolate the impact of Open Access operators on average yields, so this assumption is the only practical approach that can be taken.

6.1.5 We have not applied the PDFH approach for Lumo, as the OAAD and RUDD datasets are only available prior to the start of Lumo services and the impact of the Covid pandemic means that a PDFH forecasting approach is unlikely to be appropriate.

6.2 Population

6.2.1 We have modelled the impact of population change based on the change in population from the previous year using the simplified framework (see PDFHv6). Elasticities were taken directly from PDFH v6 using the PDFH categories specified in this document. Note that we have assumed that all flows are over 20 miles. The population elasticities are shown in Table 7.

Table 7. PDFH v6 Population Elasticities (Source: PDFH v6 Tables B2.3b and B2.4b)

PDFH CATEGORY	FULL	REDUCED	ADVANCE	SEASONS
Rest of Country to/from London	[redacted]	[redacted]	[redacted]	[redacted]
Non-London between major cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London to / from core cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London other flows	[redacted]	[redacted]	[redacted]	[redacted]

6.3 Employment

6.3.1 We have modelled the impact of employment based on the change in employment from the previous year using the simplified framework. Elasticities were taken directly from PDFH v6 using the PDFH categories specified in this document and are shown in Table 8. Note that we have assumed that all flows are over 20 miles.

Table 8. PDFH v6 Employment Elasticities (Source: PDFH v6 Tables B2.3b and B2.4b)

PDFH CATEGORY	FULL	REDUCED	ADVANCE	SEASONS
Rest of Country to/from London	[redacted]	[redacted]	[redacted]	[redacted]
Non-London between major cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London to / from core cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London other flows	[redacted]	[redacted]	[redacted]	[redacted]

6.4 GVA per Capita

6.4.1 We have modelled the impact of GVA per capita, adjusted to be in 1998/99 prices using RPI, based on the change in GVA per capita from the previous year using the simplified framework. Elasticities were taken directly from PDFH v6 using the PDFH categories specified in this document and are shown in Table 13. Note that we have assumed that all flows are over 20 miles.

Table 9. PDFH v6 GVA per Capita Elasticities (Source: PDFH v6 Tables B2.3b and B2.4b)

PDFH CATEGORY	FULL	REDUCED	ADVANCE	SEASONS
Rest of Country to/from London	[redacted]	[redacted]	[redacted]	[redacted]
Non-London between major cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London to / from core cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London other flows	[redacted]	[redacted]	[redacted]	[redacted]

6.5 Petrol Price

6.5.1 We have modelled the impact of petrol prices, adjusted to be in real prices using RPI, based on the change in petrol price from the previous year using the simplified framework. We have used the "Pump Price" as provided in OAAD and have not adjusted the data provided for the impact of fuel efficiency. DfT's Transport Analysis Guidance shows an average change of fuel efficiency for petrol cars of 0.7% per annum over the period we are typically looking at. Applying the elasticity of [redacted] (Long distance to/from London), gives a reduction of rail travel of [redacted] per annum due to this cause. Rail demand growth in

our backcast could therefore be [redacted] per annum higher than if fuel efficiency was included.

6.5.2 We have taken the elasticities directly from PDFH v6 using the PDFH categories specified in this document, these are shown in Table 10. Note that we have assumed that all flows are over 20 miles.

Table 10. PDFH v6 Petrol Price Elasticities (Source: PDFH v6 Tables B2.3b and B2.4b)

PDFH CATEGORY	FULL	REDUCED	ADVANCE	SEASONS
Rest of Country to/from London	[redacted]	[redacted]	[redacted]	[redacted]
Non-London between major cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London to / from core cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London other flows	[redacted]	[redacted]	[redacted]	[redacted]

6.6 Participation

6.6.1 We have modelled the impact of participation (in the workforce), defined as shown in the formula below, based on the participation in the relevant year and using the simplified framework. Elasticities were taken directly from PDFH v6 using the PDFH categories specified in this document, as shown in Table 11. We have assumed that all flows are over 20 miles.

$$Participation = \frac{Workers}{Working\ Age\ Population}$$

Table 11. PDFH v6 Participation Elasticities (Source: PDFH v6 Tables B2.3b and B2.4b)

PDFH CATEGORY	FULL	REDUCED	ADVANCE	SEASONS
Rest of Country to/from London	[redacted]	[redacted]	[redacted]	[redacted]
Non-London between major cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London to / from core cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London other flows	[redacted]	[redacted]	[redacted]	[redacted]

6.7 Performance

6.7.1 In modelling the performance impact we have used a combination of Average Minutes Lateness and Deemed Minutes Lateness (a proxy for the minutes lateness result from a cancellation) as the Average Performance Minutes (APM) for the formula set out in PDFH Chapter B5. Note that as it is not possible to isolate the impact of Open Access Operators on performance, we have made assumed that performance is not impacted by the presence of open access services. This is the most appropriate approach given the data that is available.

6.7.2 We have used the elasticities in PDFH Chapter B5, taking the values for Long Distance to/from London and Non-London interurban, as shown in Table 12.

Table 12. PDFH v6 Performance Elasticities (Source: PDFH v6 Table B5.1)

PDFH CATEGORY	FULL	REDUCED	ADVANCE	SEASONS
Rest of Country to/from London	[redacted]	[redacted]	[redacted]	[redacted]
Non-London between major cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London to / from core cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London other flows	[redacted]	[redacted]	[redacted]	[redacted]

6.7.3 As the data for this metric is available for full, reduced and seasons, we have allocated the APM values to ticket types as shown in Table 13.

Table 13. Mapping Between Ticket Types and Performance/GJT

MODELLED TICKET TYPE	PERFORMANCE TICKET TYPE
First Non Seasons	Full
First Seasons	Seasons
Standard Full	Full
Standard Reduced	Reduced
Standard Advanced	Reduced
Standard Seasons	Seasons

6.7.4 The OAAD data on performance is missing for some years, where data doesn't exist in one year or its previous year, we have assumed no impact from performance.

6.7.5 This measure also is impacted significantly by the Hatfield rail crash, which coincides with the first year of the data in 2000/01. Applying this in 2001/02 will result in an increase in demand, but without the corresponding decrease in 2000/01 (as there is no data for the previous year). Therefore, we have assumed that the impact of performance starts in 2002/03.

6.7.6 Note that the forecasts for 2000/01 and into the next couple of years, will not contain the impact of Hatfield and are therefore likely to be too high.

6.8 Generalised Journey Time

6.8.1 We have modelled the impact of changes in service levels through the change in Generalised Journey Time (GJT). We have applied the approach set out in PDFH section B4, using the Rest of Country to/from London Travelcard Area and Non-London over 20 miles elasticities as appropriate, as shown in Table 14.

Table 14. PDFH v6 GJT Elasticities (Source: PDFH v6 Tables B4.4 and B4.5)

PDFH CATEGORY	FULL	REDUCED	ADVANCE	SEASONS
Rest of Country to/from London	[redacted]	[redacted]	[redacted]	[redacted]
Non-London between major cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London to / from core cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London other flows	[redacted]	[redacted]	[redacted]	[redacted]

6.8.2 The GJT is available segmented by weekday, Saturday and Sunday. We have calculated an average GJT and used the number of days in a week to calculate the average (so 5/7 weekday + 1/7 Saturday + 1/7 Sunday).

6.8.3 The ticket type GJTs are applied using the mappings to modelled ticket types shown in Table 13.

6.8.4 As well as using the National Rail GJT, we have extracted the TOC specific GJT. The reason for this is to try and model the impact without the open access service. There are limitations with the TOC specific GJTs, and these can only be used where there is a regular direct service with the TOC, as it does not take into account the possibility of using other TOCs to connect into the TOC being considered. We have therefore used the LNER GJT on a limited basis, with GJTs being used as follows:

- Frequent Franchise Service: The LNER GJT has been used, as in this instance it is reliable and helps to remove the impact of the open access service.
- Infrequent Franchise Service: No change in GJT has been assumed over the franchise period.
- No Franchise service: No change in GJT has been assumed over the franchise period.
- Affected flows: The National Rail average GJT has been used.

6.9 Fares

6.9.1 Data on the historic fares used for each flow and ticket type was not available for use in this study is not readily available, so we have used the average yield for each flow (in real prices) in each year as a proxy for fares. Following the approach used by Leigh Fisher in 2016 (see paragraph 2.1.4) we used the actual/outturn average yields in the counterfactual scenario rather than attempting to incorporate an increase in yields in our counterfactual (without OA scenario) in order to strip out any impact that competitive responses have had on the out-turn.

6.9.2 We have applied the approach set out in Chapter B3 of PDFH v6 for own price demand elasticities, applying the Seasons elasticity to seasons tickets, and the non-seasons elasticities to full, reduced and advanced tickets. These elasticities are shown in Table 15.

Table 15. PDFH v6 Fare Elasticities (Source: PDFH v6 Tables B3.3 and B3.5)

PDFH CATEGORY	FULL	REDUCED	ADVANCE	SEASONS
Rest of Country to/from London	[redacted]	[redacted]	[redacted]	[redacted]
Non-London between major cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London to / from core cities	[redacted]	[redacted]	[redacted]	[redacted]
Non-London other flows	[redacted]	[redacted]	[redacted]	[redacted]

6.9.3 Note that for reduced and advance tickets we have used a combined average yield due to the scale of movement between these ticket types.

6.10 Base Year

6.10.1 The Base Year for each flow was selected as the year before the first open access service operated on that flow. The Base Year being the last full rail year before the open access service started. All forecasting starts in the year after the base year for a flow, with the

forecast demand and revenue set to the actual up to and including the base Year. The Base Years are:

- Hull Trains: 1999/2000
- Grand Central Sunderland service: 2006/07
- Grand Central Bradford service: 2009/10

6.10.2 The last forecast year for all flows using this method is 2018/19, as the last year with a complete data set, since during the pandemic rail passenger journeys started to decline from the beginning of March 2020, as explained within ORR statistical updates from that time[6].

[6] Regulator's rail finance report highlights impact of pandemic | Office of Rail and Road (orr.gov.uk)

7. FLOW SPECIFIC ELASTICITIES

7.1 Introduction

7.1.1 The flow specific elasticities used as a sensitivity in this study have been supplied by ORR from its work in the unpublished "Open Access Revenue Generation Study". ORR's aim in carrying out this research was to attempt to measure any impact of open access on the way passengers respond to changes in fares and generalised journey times.

7.1.2 We have used the following demand drivers in this approach, with the same demand driver data used as in the PDFH approach.:

- Population
- GVA per Capita
- Performance
- Generalised Journey Time
- Fare

7.2 Elasticities

7.2.1 The elasticities used are set out in Table 16, showing the elasticities that apply to each flow type. These elasticities are applied across all ticket types within each flow category, making it difficult to compare these directly to the PDFH elasticities set out in Chapter 6.

Table 16. ORR Estimated Elasticities

	FRANCHISE ONLY	FRANCHISED IN OA, BEFORE OA ENTRY: HIGH FREQUENCY	FRANCHSIED IN OA, BEFORE OA ENTRY: LOW FREQUENCY
GVA per Capita	[redacted]	[redacted]	[redacted]
Population	[redacted]	[redacted]	[redacted]
Performance	[redacted]	[redacted]	[redacted]
Average Yield	[redacted]	[redacted]	[redacted]
GJT	[redacted]	[redacted]	[redacted]

7.3 Application of Elasticities

7.3.1 We have applied the elasticities in Table 16 to the modelled flows as follows:

- Frequent Franchise Service Flows: Franchised in OA, before OA entry: High Frequency
- Infrequent Franchise Service Flows: Franchised In OA, Before OA Entry: Low Frequency
- No Franchise Service Flows: Franchise only
- Affected Flows: Franchise only

8. CONTROL FLOW APPROACH

8.1 Introduction

8.1.1 The Control Flow approach is an alternative to modelling the expected revenue on a flow using elasticities as described in Chapters 6 and 7. It is based on the assumption that, had no open access services been introduced, revenue would be expected to increase at the same rate as it has done on similar (in terms of the key drivers of demand and economic characteristics) flows that have not been impacted by the introduction of open access services. This approach simply increases the revenue for an individual flow from the baseline in line with the growth seen on the control flows, using the total revenue across all identified control flows.

8.1.2 Although this approach sounds simple, it does rely on choosing representative flows with similar characteristics. This involved considering factors such as:

- Are the locations of similar size, with similar access to rail markets?
- Have potential control flows seen changes to services that have not been seen on the flow itself?
- Are there any factors that have influenced the potential control flows that may not have influenced the flow itself, such as performance issues or one-of events?

8.1.3 The control flows used for each of the modelled flows are set out within the remainder of this section.

8.1.4 One advantage that this approach has is that the counterfactual growth assumptions use flows where the average yields and other characteristics (such as performance levels) are not impacted by the presence of open access operators.

8.2 Hull Trains

8.2.1 The control flow used to model the revenue growth for the Hull Trains flows are shown in Table 17.

Table 17. Hull Trains Control Flows

Flow	Control Flow 1
Beverley to London	Carlisle to London Preston to London Newcastle to London
Brough to London	Carlisle to London Preston to London Newcastle to London
Cottingham to London	Carlisle to London Preston to London Newcastle to London
Doncaster to London	Carlisle to London Preston to London Newcastle to London
Grantham to London	London to Newark
Howden to London	Carlisle to London Preston to London Newcastle to London
Hull to London	Carlisle to London Preston to London Newcastle to London
Retford to London	London to Newark
Selby to London	Carlisle to London Preston to London Newcastle to London

8.3 Grand Central Sunderland Service

8.3.1 The control flow used to model the revenue growth for the Grand Central Sunderland Service flows are shown in Table 18.

Table 18. Grand Central Sunderland Service Control Flows

Flow	Control Flow
Eaglescliffe to London	Newcastle to London
Hartlepool to London	Newcastle to London
Northallerton to London	Newcastle to London
Sunderland to London	Newcastle to London
Thirsk to London	Newcastle to London
York to London	Newcastle to London
Hartlepool to York	Liverpool to Preston
Sunderland to York	Liverpool to Preston
Thirsk to York	Liverpool to Preston
Darlington to London	Newcastle to London
Durham to London	Newcastle to London

8.4 Grand Central Bradford Service

8.4.1 The control flow used to model the revenue growth for the Grand Central Bradford Service flows are shown in Table 19.

Table 19. Grand Central Bradford Service Control Flows

Flow	Control Flow
Bradford to London	Newcastle to London
Brighouse to London	Newcastle to London
Halifax to London	Newcastle to London
Mirfield to London	Newcastle to London
Wakefield to London	Newcastle to London
Leeds to London	Newcastle to London
Pontefract to London	Newcastle to London

8.5 Lumo

8.5.1 The control flow used to model the revenue growth for the Lumo flows are shown in Table 20.

Table 20. Lumo Control Flows

FLOW	CONTROL FLOW
Edinburgh to London	Glasgow to London
Edinburgh to Newcastle	Edinburgh to Leeds
Edinburgh to Stevenage	Glasgow to Milton Keynes
Newcastle to London	Leeds to London Liverpool to London
Newcastle to Stevenage	Milton Keynes to Preston
Morpeth to London	Alnmouth to London Berwick to London

9. HULL TRAINS RESULTS

9.1 Introduction

9.1.1 This section presents our analysis of the results for the testing of Hull Trains using each of the approaches set out in this note. In addition to the initial results, we have presented some more detailed analysis relating to the key flows and the results of a revised test that has been specified based on the initial results.

9.1.2 Initial examination of results at a flow level highlighted that the impact of the necessary simplifications in our modelling approach are significant. Negative abstraction has been removed from all results presented here, and we have undertaken some detailed analysis of instances of negative generation before undertaking revised testing with some of the negative generation on individual flows removed.

9.1.3 All revenues are presented in 2023/24 prices unless stated otherwise.

9.2 Initial Results

9.2.1 The initial results using the PDFH modelling approach are presented in Table 21. This shows the general pattern that we would expect from an open access service:

- A small level of generation, with high abstraction, and low NPA values for frequent franchise service flows,
- A higher NPA value with significant generation and abstraction on infrequent franchise service flows,
- High generation and low abstraction on no franchise service flows.

9.2.2 The overall NPA value of 0.37 suggests that while some revenue is abstracted from franchised operators, there is also a significant improvement in services for people who previously did not have access to a frequent direct service to London.

Table 21. Hull Trains PDFH Modelling Initial Results (Cumulative over the period 2001/02 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.11
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.37
No Franchise Service	[redacted]	[redacted]	[redacted]	18.90
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.37**

9.2.3 The results from the flow specific elasticity approach, presented in Table 22 are very different but exhibit a similar pattern. The key difference in this approach being that the modelling indicates negative generation on the frequent franchise service flows. We do not believe that this is just caused by the addition of the Open Access service which improves the overall level of service. Even if there is some impact from changing average yields, the fare elasticity being close to 1 suggests that this would have minimal impact on revenue. It is to be noted that the calculation of the flow specific elasticities excluded the early years of Hull Trains, and there is therefore a case for excluding these results from our analysis.

Table 22. Hull Trains Flow Specific Elasticity Approach Initial Results (Cumulative over the period 2001/02 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	-0.21
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.62
No Franchise Service	[redacted]	[redacted]	[redacted]	31.49
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.21**

9.2.4 The initial results for the Control Flow Approach shown in Table 23 show a similar pattern to the flow specific elasticities test.

Table 23. Hull Trains Control Flow Approach Initial Results (Cumulative over the period 2001/02 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	-0.30
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.61
No Franchise Service	[redacted]	[redacted]	[redacted]	38.84
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.12**

9.2.5 The initial testing as presented suggests NPA values in the region of 0.12 to 0.37, although the plausibility of the lower values is questionable based on the negative generation on frequent franchise service flows. Examination of the trend in the cumulative NPA values shown in Table 24, shows significant variations in all approaches before settling down in 2008/09. Looking at NPA values in 2011/12 would suggest values in the range of 0.21 to 0.33. As time goes on, and the impact of uncertainty in modelling becomes greater, the three approaches diverge further.

Table 24. Trend in Cumulative NPA Values for Hull Trains Initial Results

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
PDFH Modelling	-0.79	-0.60	-0.40	-0.12	0.00	-0.01	0.08	0.20	0.31	0.30	0.31	0.33	0.32	0.32	0.31	0.31	0.32	0.34	0.37
Revised Elasticities	-0.77	-0.58	-0.38	-0.13	-0.01	-0.01	0.05	0.14	0.24	0.21	0.22	0.25	0.25	0.24	0.23	0.20	0.20	0.20	0.21
Control Flow Approach	7.06	1.04	1.29	1.48	0.83	0.51	0.35	0.29	0.28	0.25	0.22	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.12

9.2.6 Our recommendation is to consider the cumulative impact of Hull Trains around five years after the full service is introduced. This allows for any lagging impact to have been felt and limits the impact of the reduction in modelling accuracy over time. Hull Trains service levels became stable from 2006 and we suggest looking at 2011/12 would be a useful cut off.

9.3 Analysis of Frequent Franchise Service Flows

9.3.1 Examination of the detail of the frequent franchise service flows is shown in Figure 2 to Figure 4, which show the generation and abstraction in each year on the individual flows for each modelling approach. In each of the approaches, the dominance of abstraction on the Doncaster to London flow is clear. This is accompanied by significant levels of negative

generation, where the total revenue on the flow has fallen compared to the counterfactual revenue.

9.3.2 The PDFH and Flow Specific Elasticity approaches both show generation but to varying extents for Grantham to London and Retford to London. Generation on these flows is more likely than Doncaster to London due to the lower levels of service that exist before Open Access, particularly Retford to London. Grantham to London has negative generation in the Control Flow approach, but like the other approaches this approach does suggest generation for Retford to London.

Figure 2. Abstraction on Hull Trains Frequent Franchise Service Flows: PDFH Approach

[redacted]

Figure 3. Generation on Hull Trains Frequent Franchise Service Flows: PDFH Approach

[redacted]

Figure 4. Generation on Hull Trains Frequent Franchise Service Flows: Flow Specific Elasticity Approach

[redacted]

Figure 5. Abstraction on Hull Trains Frequent Franchise Service Flows: Flow Specific Elasticity Approach

[redacted]

Figure 6. Abstraction on Hull Trains Frequent Franchise Service Flows: Control Flow Approach

[redacted]

Figure 7. Generation on Hull Trains Frequent Franchise Service Flows: Control Flow Approach

[redacted]

9.3.3 The total actual journey growth (including both franchise operator and open access) for these flows compared to other LNER and EMR flows is shown in Figure 8. This shows that Doncaster to London is on the low side of growth over the period compared to the other flows, with a notable dip in revenue from 2008/09, and this is driving the high levels of negative generation in the results. This low level of growth is likely to be, at least partly, driven by factors that are not included in our modelling. This graph also helps to demonstrate the high variability in growth across flows, and the difficulty in selecting representative flows; different flows would give very different results.

Figure 8. Journeys Growth on LNER and EMR Flows (2000/01 = 1)

[redacted]

9.4 Revised Test

9.4.1 Our examination of the individual flows has shown that there are significant levels of negative generation that exist on selected flows. We would not expect the introduction of open access services to reduce the overall level of revenue on a flow, unless other factors are causing this impact. While some level of negative generation may exist if demand moves to using other stations or where average yields have reduced, the large levels being seen for Doncaster to London are likely to be due to factors that are not included in our modelling. This makes it difficult to assess the effect of Open Access on franchised operator revenue, especially where this occurs on flows with high levels of franchise revenue.

9.4.2 To understand the impact of this negative generation, we have undertaken revised tests with negative generation removed an individual flow level. We have tested the sensitivity of the model results to this negative generation through:

- Removing any negative generation on individual flows in all years where it exists.
- Retaining positive generation that is forecast on these flows.

9.4.3 The revised test does not impact the infrequent franchise service flows and no franchise service flows, so only the frequent franchise service flows are updated. Table 25 shows that the impact of this test is now significant generation on frequent franchise service flows using the PDFH approach, and an NPA value higher than seen on the infrequent franchise service flows.

Table 25. Hull Trains PDFH Modelling Revised Test Results (Cumulative over the period 2001/02 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.87
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.37
No Franchise Service	[redacted]	[redacted]	[redacted]	18.90
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.73**

9.4.4 The level of generation on frequent franchise service flows in the flow specific elasticity approach, shown in Table 26 is higher with the level of abstraction on these flows lower.

Table 26. Hull Trains Flow Specific Elasticity Approach Revised Test Results (Cumulative over the period 2001/02 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.40
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.62
No Franchise Service	[redacted]	[redacted]	[redacted]	31.49
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.68**

9.4.5 With the control flow approach shown in Table 27, the total level of generation and NPA values for frequent franchise service flows are much lower than in the other methods, and at a total level appear more plausible when compared with the open access revenue on these flows as we would not expect high levels of generation. The difference between the three approaches is the level of generation for Grantham to London.

Table 27. Hull Trains Control Flow Approach Revised Test Results (Cumulative over the period 2001/02 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.07
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.61
No Franchise Service	[redacted]	[redacted]	[redacted]	38.84
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.45**

9.4.6 The revised test as presented suggests NPA values in the region of 0.45 to 0.73, depending on the level of generation for Grantham to London. Examination of the trend in the NPA values, shows that limiting the time period considered once stability is achieved achieves NPA values in the range of 0.55 to 0.73 in 2011/12. Considering the more plausible results from the original test and the revised test provides evidence that the NPA values could be in the range of 0.25 to 0.55, and there is evidence to believe that the NPA values could well be above 0.3.

Table 28. Trend in Cumulative NPA Values for Hull Trains Revised Test Results

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
PDFH Modelling	-0.49	-0.14	0.16	0.53	0.54	0.44	0.50	0.59	0.68	0.67	0.69	0.70	0.70	0.70	0.70	0.69	0.69	0.72	0.73
Revised Elasticities	-0.38	-0.01	0.33	0.62	0.64	0.54	0.58	0.65	0.73	0.70	0.71	0.73	0.72	0.72	0.70	0.67	0.66	0.67	0.68
Control Flow Approach	8.27	1.15	1.37	1.66	1.07	0.78	0.65	0.61	0.61	0.59	0.56	0.55	0.53	0.52	0.51	0.49	0.48	0.47	0.45

9.5 Reduced Timeline Results

9.5.1 The results presented have focussed on the cumulative revenue impact over the whole period for which data is available. The impact of factors not included in our modelling on results will increase with the length of the forecasting period, and so we have recommended focussing on a shorter period to reduce these impacts. Our recommended period considers the following factors:

- Levels of demand and revenue settling down after services were introduced, noting that generally the lagging of demand impacts suggests it takes up to 4 years for this to happen.
- Service levels have settled down, with major improvements completed and the above settling period having elapsed.

9.5.2 We have chosen the period for the Hull Trains services as the period to 2011/12, and the results for the revised test of this limited timeline are shown in Table 29 to Table 31, suggesting NPA values in the range 0.55 to 0.73. The variability remaining around the level of generation on frequent franchise service flows is the main driver of differences, but considering the impacts of both sets of tests suggests that an outturn NPA in the region of 0.55 is plausible. These high values are driven by the fact that there is evidence of potential high levels of generation on some of the frequent franchise service flows.

Table 29. Hull Trains PDFH Modelling Revised Test Results (Cumulative over the period 2001/02 to 2011/12)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.94
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.39
No Franchise Service	[redacted]	[redacted]	[redacted]	10.28
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.70**

Table 30. Hull Trains Flow Specific Elasticities Revised Test Results to 2011/12 (Cumulative over the period 2001/02 to 2011/12)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.49
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.61
No Franchise Service	[redacted]	[redacted]	[redacted]	16.03
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.73**

Table 31. Hull Trains Control Flow Approach Revised Test Results to 2011/12 (Cumulative over the period 2001/02 to 2011/12)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.07
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.73
No Franchise Service	[redacted]	[redacted]	[redacted]	21.30
Affected Flow	[redacted]	[redacted]	[redacted]	0.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.55**

10. GRAND CENTRAL SUNDERLAND SERVICE RESULTS

10.1 Introduction

10.1.1 This section presents our analysis of the results for the testing of the Grand Central Sunderland service using each of the approaches set out in this note. In addition to the initial results, we have presented some more detailed analysis relating to the key flows and the results of a revised test that has been specified based on the initial results.

10.1.2 As with the presentation of the Hull Trains results, we have made the following assumption about the level of generation and abstraction on flows to remove negative abstraction on some flows:

- The level of demand and revenue generated on each individual flow cannot be higher than the demand and revenue seen for the Open Access Operator on the flow.

10.1.3 All revenues are presented in 2023/24 prices.

10.2 Initial Results

10.2.1 The initial results using the PDFH modelling approach are presented in Table 32. The impacts seen can be summarised as:

- Overall negative generation, with high abstraction, and negative NPA values for frequent franchise service flows.
- A high NPA value with significant generation and some abstraction on no franchise service flows.
- A significant level of negative generation and abstraction on affected flows. Note that the negative generation here is almost the same as the total level of generation seen on no franchise service flows.

10.2.2 The overall NPA value of 0 suggests significant abstraction as a result of this service.

Table 32. Sunderland Service PDFH Modelling Initial Results (Cumulative over the period 2007/08 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	-0.06
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	5.39
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.00**

10.2.3 The results from the flow specific elasticity approach, presented in Table 33, show a similar pattern to the PDFH elasticities.

Table 33. Sunderland Service Flow Specific Elasticity Approach Initial Results (Cumulative over the period 2007/08 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	-0.07
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	5.16
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.02**

10.2.4 The initial results for the Control Flow Approach are shown in Table 34. Although the values presented are very different, a similar pattern occurs. The significant levels of negative generation and abstraction on affected flows are dominating the results, along with the significant abstraction on the frequent franchise service flows.

Table 34. Sunderland Service Control Flow Approach Initial Results (Cumulative over the period 2007/08 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	-0.05
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	10.89
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.07**

10.2.5 The initial testing as presented suggests NPA values in the region of 0 to 0.07, although the plausibility of the results is questionable based on the negative generation on frequent franchise service flows and the scale of negative generation on the affected flows. Examination of the trend in the NPA values, shows significant variations in all approaches in the first few years. Once the NPA values settle down, the values tend to decrease over time as modelling accuracy reduces. Looking at the values in 2012/13, five years after the service introduction, suggests NPA values in the range of 0.01 to 0.18.

Table 35. Trend in Cumulative NPA Values for Sunderland Service Initial Results

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
PDFH Modelling	0.04	0.76	0.08	0.01	0.07	0.01	-0.06	-0.11	-0.11	-0.09	-0.05	0.00
Revised Elasticities	0.07	0.71	0.10	0.05	0.14	0.09	0.03	-0.01	-0.03	-0.04	-0.02	0.02
Control Flow Approach	-0.44	-0.14	0.03	0.17	0.19	0.18	0.16	0.16	0.11	0.08	0.07	0.07

10.2.6 Our recommendation is to consider the cumulative impact of the Sunderland service around five years after introduction (i.e. 2012/13). This allows for any lagging impact to have been felt and limits the impact of the reduction in modelling accuracy over time.

10.3 Analysis of Frequent Franchise Service Flows

10.3.1 Examination of the detail of the frequent franchise service flows is shown in Figure 9 to Figure 12, showing the generation and abstraction in each year on the individual flows for each modelling approach. In each of the approaches, the dominance of abstraction on the York to London flow is clear. This is accompanied by significant levels of negative generation, suggesting that revenue has reduced, an impact that in our view is likely to be largely due to factors not included in our modelling approach.

10.3.2 Each of the approaches show some generation on Northallerton to London, and Thirsk to York although not evident in the figures. As Northallerton to London has fewer franchise operator services than York to London, generation is expected as the increase in overall services is more noticeable on this flow. The extent of this generation does vary between the approaches and between years.

Figure 9. Abstraction on Sunderland Service Frequent Franchise Service Flows: PDFH Approach

[redacted]

Figure 10. Generation on Sunderland Service Frequent Franchise Service Flows: PDFH Approach

[redacted]

Figure 11. Abstraction on Sunderland Service Frequent Franchise Service Flows: Flow Specific Elasticity Approach

[redacted]

Figure 12. Generation on Sunderland Service Frequent Franchise Service Flows: Flow Specific Elasticity Approach

[redacted]

Figure 13. Abstraction on Sunderland Service Frequent Franchise Service Flows: Control Flow Approach

[redacted]

Figure 14. Generation on Sunderland Service Frequent Franchise Service Flows: Control Flow Approach

[redacted]

10.4 Analysis of Affected Flows

10.4.1 The negative generation on the affected flows is large compared to the total open access operator and the generation seen on the no franchise service flows. The open access service does not directly impact the affected flows, the only impact we can expect to see is if people using these flows have transferred to another flow as they can now access a direct service from a station closer to where they are starting or ending their journey.

10.4.2 Examination of the detail of the Affected flows is shown in Figure 15 to Figure 17, showing the abstraction in each year on the individual flows for each modelling approach. The generation on affected flows is not shown as this is simply the mirror image of the abstraction; every £1 of abstraction shows as £1 in negative generation.

10.4.3 In each of the approaches, the dominance of abstraction on the Darlington to London flow is clear. This is accompanied by significant levels of negative generation, suggesting that revenue has significantly reduced as a result of the introduction of Open Access services. The scale of this impact is, in our view, implausible given the scale of generation seen on the flows with no franchise service prior to open access entry and is likely due to factors not included in our modelling. Furthermore, the level of abstraction is in many cases higher than the total flow on the Open Access services from the nearby stations.

Figure 15. Abstraction on Sunderland Service Affected Flows: PDFH Approach

[redacted]

Figure 16. Abstraction on Sunderland Service Affected Flows: Flow Specific Elasticity Approach

[redacted]

Figure 17. Abstraction on Sunderland Service Affected Flows: Control Flow Approach

[redacted]

10.5 Actual Demand Growth

10.5.1 The total actual change in journeys over time for the frequent franchise service and affected flows, compared to other LNER and EMR flows is shown in Figure 18. Northallerton, York and Durham to London are all around the same range as most flows, with the largest flow of York to London being at the bottom of this group. Again, this chart shows the variability of growth across modelled flows and the difficulty in selecting an appropriate control flow.

10.5.2 Darlington to London has seen a drop in demand over the period 2007/08 to 2011/12 and has never recovered. It is unlikely that this impact will be entirely down to the presence of open access services and is expected to be more related to local economic circumstances. This will be driving the modelled abstraction being seen, and therefore in our opinion it is

implausible to consider all this impact to be a result of the introduction of open access services.

Figure 18. Journeys Growth on LNER and EMR Flows (2006/07 = 1)

[redacted]

10.6 Revised Test

10.6.1 Our analysis has highlighted that there are significant levels of negative generation on some flows, which in our view is down to factors not included in our modelling. We have therefore carried out a revised test to test the impact of adjusting the negative generation forecast on individual frequent franchise service flows and the abstraction (and negative generation) forecast on affected flows.

10.6.2 On the frequent franchise service flows, this revised test does the following:

- Removes "negative generation" on individual flows in all years where it exists.
- Retains any positive generation that is forecast on these flows.

10.6.3 We would expect a maximum of half the generated revenue to come from affected flows. We have tested the impact of adjusting the scale of abstraction on Affected flows using the following approach:

- We have identified the Open Access service flows that are likely to abstract demand from each affected flow.
- We have assumed that half of the open access demand has been abstracted from the relevant Affected flow.
- We have capped the revenue loss on affected flows at the identified level of abstracted demand multiplied by the average yield on the affected flow.

10.6.4 Note that this revised test only caps the level of abstraction (and negative generation). We would expect there to be some level of abstraction on these flows as some demand that previously used these flows will switch to using stations that now have a direct open access service which previously had either an infrequent or no franchise service.

10.6.5 The mapping of Open Access service flows to affected flows for the purposes of this test are:

- We have assumed that Eaglescliffe to London and Hartlepool to London have abstracted from Darlington to London
- We have assumed that Sunderland to London has abstracted from Durham to London.

10.6.6 The revised test does not impact the infrequent franchise service and no franchise service flows, so only the frequent franchise service and affected flows are updated. Table 36 shows that the impact of this test is now a mixture of generation and abstraction on frequent franchise service flows, with the generation coming from Northallerton to London. The negative generation on the affected flows has been significantly reduced, resulting in an overall NPA of 0.44.

Table 36. Sunderland Service PDFH Modelling Revised Test Results (Cumulative over the period 2007/08 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.21
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	5.39
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.44**

10.6.7 The flow specific elasticity results in Table 37 show a similar NPA effect, with a value of 0.42. Although there are similar results on each flow type, the numbers vary, but the three tests are in overall agreement as to the scale of the NPA values.

Table 37. Sunderland Service Flow Specific Elasticity Approach Revised Test Results (Cumulative over the period 2007/08 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.19
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	5.16
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.42**

10.6.8 With the control flow approach shown in Table 38, a similar pattern of impact is shown, with an overall NPA value of 0.45.

Table 38. Sunderland Service Control Flow Approach Revised Test Results (Cumulative over the period 2007/08 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.13
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	10.89
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.45**

10.6.9 Considering the trend in NPA value shown in Table 39, shows some increases in the values in later years but a general stability after the first few years. Considering the five-year period to provide results when lagged impacts have been realised and limiting the impact of modelling accuracy, suggests NPA values in the range 0.38 to 0.45 in 2012/13.

Table 39. Trend in Cumulative NPA Values for Sunderland Service Revised Test Results

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
PDFH Modelling	0.21	0.91	0.46	0.38	0.41	0.38	0.35	0.34	0.34	0.35	0.38	0.44
Revised Elasticities	0.21	0.81	0.47	0.38	0.50	0.45	0.42	0.40	0.39	0.39	0.39	0.42
Control Flow Approach	-0.02	0.14	0.23	0.35	0.39	0.40	0.41	0.42	0.43	0.44	0.44	0.45

10.7 Reduced Timeline Results

10.7.1 The results presented have focussed on the cumulative revenue impact over the whole period for which data is available. Data variability and modelling accuracy have a significant impact on results, and so we have recommended focussing on a shorter period to reduce these impacts. Our recommended period considers the following factors:

- Levels of demand and revenue settling down after services were introduced, noting that generally the lagging of demand impacts suggests it takes up to 4 years for this to happen.
- Service levels have settled down, with major improvements completed and the above settling period having elapsed.

10.7.2 We have selected the period to 2012/13 for the Sunderland service, with the results for the revised test over this period presented in Table 40 to Table 42. The results, which have plausible impacts on both frequent franchise service flows and affected flows, suggest NPA values are in the range of 0.38 to 0.45.

Table 40. Sunderland Service PDFH Modelling Revised Test Results (Cumulative over the period 2007/08 to 2012/13)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.17
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	4.17
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.38**

Table 41. Sunderland Service Flow Specific Elasticities Revised Test Results to 2012/13 (Cumulative over the period 2007/08 to 2012/13)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.27
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	3.90
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.45**

Table 42. Sunderland Service Control Flow Approach Revised Test Results to 2012/13 (Cumulative over the period 2007/08 to 2012/13)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.14
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
No Franchise Service	[redacted]	[redacted]	[redacted]	7.41
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.40**

11. GRAND CENTRAL BRADFORD SERVICE RESULTS

11.1 Introduction

11.1.1 This section presents our analysis of the results for the testing of the Grand Central Bradford service using each of the approaches set out in this note. In addition to the initial results, we have presented some more detailed analysis relating to the key flows and the results of a revised test that has been specified based on the initial results.

11.1.2 As with the presentation of results for other services, we have made the following assumption about the level of generation and abstraction on flows to remove the negative abstraction on some flows:

- The level of demand and revenue generated on each individual flow cannot be higher than the demand and revenue seen for the Open Access Operator on the flow.

11.1.3 All revenues are presented in 2023/24 prices.

11.2 Initial Results

11.2.1 The initial results using the PDFH modelling approach are presented in Table 43. This shows the general pattern that we would expect from an open access service:

- Some generation and abstraction on frequent franchise service flows, but a higher NPA ratio than would be expected.
- A higher NPA value with significant generation and abstraction on infrequent service flows.
- High generation and low abstraction on no franchise service flows.
- Some negative generation on the affected flows

11.2.2 The higher overall NPA value of 0.85 is driven by the levels of generation on frequent franchise service flows.

Table 43. Bradford Service PDFH Modelling Initial Results (Cumulative over the period 2010/11 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.49
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.63
No Franchise Service	[redacted]	[redacted]	[redacted]	5.71
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.85**

11.2.3 The overall NPA value for the flow specific elasticity approach, shown in Table 44, is 0.3 and in the range we would expect. However, the breakdown of the results highlights issues. There is a high level of generation on the frequent franchise service flows, and consequently a higher NPA value than we have seen for these flows in the other services. In addition, the affected flow negative generation is high compared with the overall generation and is higher than we would expect.

Table 44. Bradford Service Flow Specific Elasticity Approach Initial Results (Cumulative over the period 2010/11 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.51
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.42
No Franchise Service	[redacted]	[redacted]	[redacted]	4.74
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.30**

11.2.4 The initial results for the Control Flow Approach are shown in Table 45. The general pattern is similar to the other methods for the Infrequent franchise service and no franchise service flows, even if the numbers are different. The generation on the infrequent franchise services does seem low. There is significant negative generation on frequent franchise service flows, and as we have concluded with the other services, this is not a plausible impact in our view. Similarly, the scale of negative generation on the affected flows is not plausible being more than twice the total generation seen on no franchise service flows.

Table 45. Bradford Service Control Flow Approach Initial Results (Cumulative over the period 2010/11 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	-0.66
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.25
No Franchise Service	[redacted]	[redacted]	[redacted]	4.71
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**-0.55**

11.2.5 The initial testing as presented suggests wide ranging NPA values and it is difficult to draw any conclusions from these results. Examination of the trend in the NPA values, shows no 'settling down' of values. The Control Flow approach, with its negative NPA value is more settled but is simply not a plausible result in our view. It is important to note that due to the short timescales of data for this service, more focus will be on the early year results, but it has been demonstrated that there is variability in these early years in each of the services analysed.

Table 46. Trend in Cumulative NPA Values for Hull Trains Initial Results

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
PDFH Modelling	0.85	1.08	0.79	0.12	0.07	0.19	0.41	0.63	0.85
Elasticity Approach	1.26	0.35	-0.23	-0.33	-0.26	-0.16	-0.02	0.15	0.30
Control Flow Approach	1.03	-0.38	-0.49	-0.55	-0.53	-0.56	-0.56	-0.55	-0.55

11.2.6 The variability in the NPA values over time casts doubt over the ability of the modelling methodologies employed to forecast the counterfactual situation for Bradford services without taking other factors into account. It is difficult to draw firm conclusions from these

tests. Our view is that these results would merit more detailed examination before strong conclusions were drawn.

11.3 Analysis of Frequent Franchise Service Flows

11.3.1 The only frequent franchise service flow on this route in Wakefield to London, and the abstraction and generation on this flow is shown in Figure 19 to Figure 22. The PDFH and flow specific elasticity approaches show negative generation, which in our view is implausible, in the early years but that this shifts to generation in the later years. This generation is equally as implausible as the introduction of open access services cannot be solely responsible for this level of revenue increase later in the period. This likely explains the significant variations in the NPA test results for this service using these approaches.

11.3.2 The control flow approach also shows significant negative generation, but is much more stable, as we have seen with the stability of the NPA values. As with the other services, such a level of negative generation is unlikely to be caused by the introduction of open access services and we do not believe this level of impact is plausible.

Figure 19. Abstraction on Bradford Service Frequent Franchise Service Flows: PDFH Approach

[redacted]

Figure 20. Generation on Bradford Service Frequent Franchise Service Flows: PDFH Approach

[redacted]

Figure 21. Abstraction on Bradford Service Frequent Franchise Service Flows: Flow Specific Elasticity Approach

[redacted]

Figure 22. Generation on Bradford Service Frequent Franchise Service Flows: Flow Specific Elasticity Approach

[redacted]

Figure 23. Abstraction on Bradford Service Frequent Franchise Service Flows: Control Flow Approach

[redacted]

Figure 24. Generation on Bradford Service Frequent Franchise Service Flows: Control Flow Approach

[redacted]

11.4 Analysis of Affected Flows

11.4.1 Examination of the detail of the affected flows is shown in Figure 25 to Figure 27, showing the abstraction in each year on the individual flows for Leeds to London as the only modelled affected flow on this service. As noted previously, the generation is just the mirror image of abstraction with every £1 abstracted being £1 of negative generation.

11.4.2 The PDFH and Flow Specific Elasticity approaches both show abstraction, but of differing scales, over the period to 2015/16, but then no impact beyond. The lack of impact in the last 3 years is due to the positive impact on generation having been removed due to it causing negative abstraction. The pattern seen here will also help explain the large movements in the cumulative NPA values that are seen. The control flow approach shows significant, and in our view implausible, levels of abstraction and negative generation throughout the modelled period.

Figure 25. Abstraction on Bradford Service Affected Flows: PDFH Approach

[redacted]

Figure 26. Abstraction on Bradford Service Affected Flows: Flow Specific Elasticity Approach

[redacted]

Figure 27. Abstraction on Bradford Service Affected Flows: Control Flow Approach

[redacted]

11.5 Actual Demand Growth

11.5.1 The actual growth in journeys for the frequent franchise service flows and affected flows compared to other LNER and EMR flows is shown in Figure 28. Both Wakefield and Leeds to London are at the bottom end of the growth ranges and saw a reduction in journeys over the period 2009/10 to 2012/13. It is implausible that such an impact can be entirely due to the presence of open access operations, and other factors are likely to be driving this impact. As with the other services, the range of growth across flows highlights the difficulty in selecting control flows for use in the modelling.

Figure 28. Journeys Growth on LNER and EMR Flows (2006/07 = 1)

[redacted]

11.6 Revised Test

11.6.1 As with the other services, there are significant forecast levels of negative generation which, in our opinion, are going to at least be partly caused by factors not included in our modelling. We have therefore tested the impact of adjusting the level of negative generation on frequent franchise service flows and the level of abstraction (and negative generation) on affected flows.

11.6.2 On the frequent franchise service flows, we have made the following changes in the revised test:

- Removed any "negative generation" on individual flows in all years where it exists.
- Retained any positive generation that is forecast on these flows.

11.6.3 In addition, the scale of abstraction on affected flows is implausible in our view when the level of open access operator revenue is considered. We would expect a maximum of half the Open Access revenue to come from affected flows. We have tested the impact of adjusting the scale of abstraction (and negative generation) on Affected flows using the following approach:

- We have identified the no franchise service flows that are likely to abstract demand from each affected flow.
- We have assumed that half of the open access demand on the Open Access service flow has been abstracted from the relevant Affected flow.
- We have capped the revenue loss on affected flows at the identified level of abstracted demand multiplied by the average yield on the affected flow.

11.6.4 Note that this revised test only caps the level of abstraction (and negative generation). We would expect there to be some level of abstraction on these flows as demand that previously used these flows will switch to using stations that now have a direct open access service which previously had either an infrequent or no franchise service.

11.6.5 The mapping of Open Access service flows to affected flows for the purposes of this test are:

- We have assumed that Bradford to London, Brighouse to London, Halifax to London and Mirfield to London have all abstracted from Leeds to London.

11.6.6 The revised test does not impact the infrequent franchise service and no franchise service flows. Table 47 shows that the impact of this test is now a mixture of generation and abstraction on frequent franchise service flows using the PDFH approach, with generation higher than abstraction. Given the flow is Wakefield to London, we do not believe this level of generation, which all occurs in the last few years. The affected flow negative generation is not impacted as this is already lower negative generation than implied by the constraint in the revised test. The result is that the NPA values are higher than we would expect at the end of the period.

Table 47. Bradford Service PDFH Modelling Revised Test Results (Cumulative over the period 2010/11 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	1.13
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.63
No Franchise Service	[redacted]	[redacted]	[redacted]	5.71
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**1.01**

11.6.7 The results of the revised test using the flow specific elasticity approach are shown in Table 48. As with the PDFH approach there is more generation than we would expect and there is little impact on the affected flows. Although the NPA value of 0.37 might at first sight seem acceptable, the underlying values driving this are not plausible in our view.

Table 48. Bradford Service Flow Specific Elasticity Approach Revised Test Results (Cumulative over the period 2010/11 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.95
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.42
No Franchise Service	[redacted]	[redacted]	[redacted]	4.74
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.37**

11.6.8 The results of the revised test on the control flow approach are shown in Table 49. The impact on the frequent franchise flows is to effectively remove all generation impacts, in line with our expectation that revenue will not be lost due to open access, but it is unlikely that there would be any generation. While there is an impact on the affected flow, this still appears implausible given the scale of generation in total, although average yields could explain some negative generation. These results still do not seem plausible.

Table 49. Bradford Service Control Flow Approach Revised Test Results (Cumulative over the period 2010/11 to 2018/19)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.25
No Franchise Service	[redacted]	[redacted]	[redacted]	4.71
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**-0.35**

11.6.9 Ignoring the last 3 years in the NPA values shown in Table 50, still shows NPA values from which it is difficult to draw conclusions. The NPA values are volatile and there is a lack of stability throughout.

Table 50. Trend in Cumulative NPA Values for Bradford Service Revised Test Results

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
PDFH Modelling	1.00	1.15	1.00	0.29	0.20	0.31	0.53	0.78	1.01
Elasticity Approach	1.26	0.35	-0.22	-0.30	-0.23	-0.11	0.04	0.21	0.37
Control Flow Approach	2.05	-0.20	-0.32	-0.37	-0.36	-0.35	-0.35	-0.35	-0.35

11.7 Reduced Timeline Results

11.7.1 The results presented have focussed on the cumulative revenue impact over the whole period for which data is available. The impact of factors not included in our modelling increases over time, and so we recommend focussing on a shorter period to reduce these impacts. In this test the later years are demonstrating revenue generation of flows where we would not expect it, which we believe is down to factors not included in our modelling. Our recommended period considers the following factors:

- Levels of demand and revenue settling down after services were introduced, noting that generally the lagging of demand impacts suggests it takes up to 4 years for this to happen.
- Service levels have settled down, with major improvements completed and the above settling period having elapsed.

11.7.2 We have selected the period to 2015/16 for the Bradford Service, with the results for the revised test over this period shown in Table 51 to Table 53. These show significant variation in the NPA test results. Although the frequent franchise flow results are now more plausible, there is still significant impact on the affected flow (Leeds to London). We consider that there is a case for not including Leeds to London as an affected flow, as most passengers would have interchanged at Leeds before open access services, and this would significantly increase NPA values.

Table 51. Bradford Service PDFH Modelling Revised Test Results (Cumulative over the period 2010/11 to 2015/16)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.09
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.50
No Franchise Service	[redacted]	[redacted]	[redacted]	4.34
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**0.31**

Table 52. Bradford Service Flow Specific Elasticities Revised Test Results (Cumulative over the period 2010/11 to 2015/16)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.20
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.36
No Franchise Service	[redacted]	[redacted]	[redacted]	3.69
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**-0.11**

Table 53. Bradford Service Control Flow Approach Revised Test Results (Cumulative over the period 2010/11 to 2015/16)

FLOW TYPE	OA REVENUE	GENERATION	ABSTRACTION	NPA
Frequent Franchise Service	[redacted]	[redacted]	[redacted]	0.00
Infrequent Franchise Service	[redacted]	[redacted]	[redacted]	0.35
No Franchise Service	[redacted]	[redacted]	[redacted]	4.22
Affected Flow	[redacted]	[redacted]	[redacted]	-1.00
Total	**[redacted]**	**[redacted]**	**[redacted]**	**-0.35**

12. LUMO RESULTS

12.1 Introduction

12.1.1 The Lumo service was introduced in October 2021, and therefore the revenue on this service is significantly impacted by the Covid pandemic. It is not possible to model the counterfactual situation using PDFH style modelling, as such models will simply not model the impact of lockdowns on rail demand. Also, the data is not readily available for a suitable period to be able to model Lumo in this way.

12.1.2 We have therefore applied the Control Flow approach but using data taken directly from LENNON.

12.1.3 Note that all revenues reported in this section are nominal, and that we have undertaken a comparison based on the revenue prior to the pandemic as the base (2018/19) and the actual revenue in the final full year (2023/24).

12.2 Control Flow Approach Results

12.2.1 The results of the Control Flow approach, showing the estimated revenue impact in 2023/24, are shown in Table 54. As with the other test results presented, "negative abstraction" has been removed at an individual flow level. This applied to the following flows, which therefore show that all Lumo revenue is generated with no abstraction:

- Edinburgh to London
- Edinburgh to Newcastle
- Edinburgh to Stevenage
- Newcastle to Stevenage

12.2.2 On the remaining two flows, the levels of generation and abstraction are similar, further suggesting that the primary impact of the Lumo services has been generation. It is noted that all flows on Lumo are frequent franchise service flows.

Table 54. Lumo Results using Control Flow Approach

FLOW	LUMO REVENUE	GENERATION	ABSTRACTION	NPA
Edinburgh to London	[redacted]	[redacted]	[redacted]	n/a
Edinburgh to Newcastle	[redacted]	[redacted]	[redacted]	n/a
Edinburgh to Stevenage	[redacted]	[redacted]	[redacted]	n/a
Newcastle to London	[redacted]	[redacted]	[redacted]	0.89
Newcastle to Stevenage	[redacted]	[redacted]	[redacted]	n/a
Morpeth to London	[redacted]	[redacted]	[redacted]	0.67
Total	**[redacted]**	**[redacted]**	**[redacted]**	**4.1**

12.2.3 All of our case studies have their own specific features unique to the geographic and temporal boundaries of our analysis. These tendencies are particularly striking in the case of our Lumo case study, where it has only been possible for us to carry out a control flows based analysis. While our results suggest that the Lumo services are largely generative, it must be remembered that this analysis is based on data that spans the Covid pandemic,

whereby demand was initially reduced to extremely low levels, but has since returned at differing levels. Published data suggests that long distance, particularly leisure, journeys have rebounded strongly, and this could provide some explanation for the results being seen. The apparent absence of abstraction on many of the flows in the table above may be largely reflective of this wider move towards leisure travel.

12.3 Additional Analysis

12.3.1 Figure 29 presents the franchise operator revenue change from 2019 on LNER flows to London, including Edinburgh to London and Newcastle to London. The graph demonstrates that Edinburgh to London has seen revenue change over the period generally in line with both Aberdeen and Inverness to London. Likewise, Newcastle revenue change is generally in line with that for Leeds to London.

12.3.2 It is difficult to draw any firm conclusions from this graph, but it does provide evidence that our findings of mainly generation from Lumo, even on those flows served by frequent franchise operator services.

Figure 29. Franchise Operator Revenue on LNER Flows (2019 = 1)

[redacted]

13. SUMMARY AND CONCLUSIONS

13.1 Modelling Limitations

13.1.1 An important qualification of the results we discuss below concerns the impact of demand drivers not included in our modelling and the necessary simplification applied in modelling. This factor makes it very difficult to precisely assess the impact of open access operations on franchise operator revenue. This is particularly the case for flows that are served by frequent franchised operator services with high levels of franchise operator revenue; where the level of abstraction is small compared to impacts of these other factors. The level of variability in growth across flows, due to the different impact on individual flows, also makes it difficult to select flows to use in the control flow approach.

13.2 Summary Results

13.2.1 We have compared our estimates of outturn generation to abstraction ratios against:

- ORR's indicative generation to abstraction ratio of 0.3, below which it has publicly stated that it is unlikely to grant access to open access applicants; and
- A further indicative range of 0.3 to 0.45, which during the course of this engagement ORR staff told us would provide a reasonable proxy for the range of NPA estimates which it had placed the most weight on at the time of the initial granting of access to the four key services featured in this study.

13.2.2 We have created an index to apply to each of the modelling results presented in this note that indicates the level of confidence that we have in the model results. This index of confidence reflects three key components:

- The number of years over which a forecast is being considered, as the impact of factors not included in our modelling will increase over time.
- The scale of negative generation indicated in the results for individual flows, as a proxy measure of the potential impact of the factors not included in our modelling.
- The closeness of the modelling approach to industry best practice.

13.2.3 This index has been calculated as follows:

1. A negative generation ratio has been calculated:

$$\frac{Sum\ of\ Negative\ Generation}{Total\ Open\ Access\ Revenue}$$

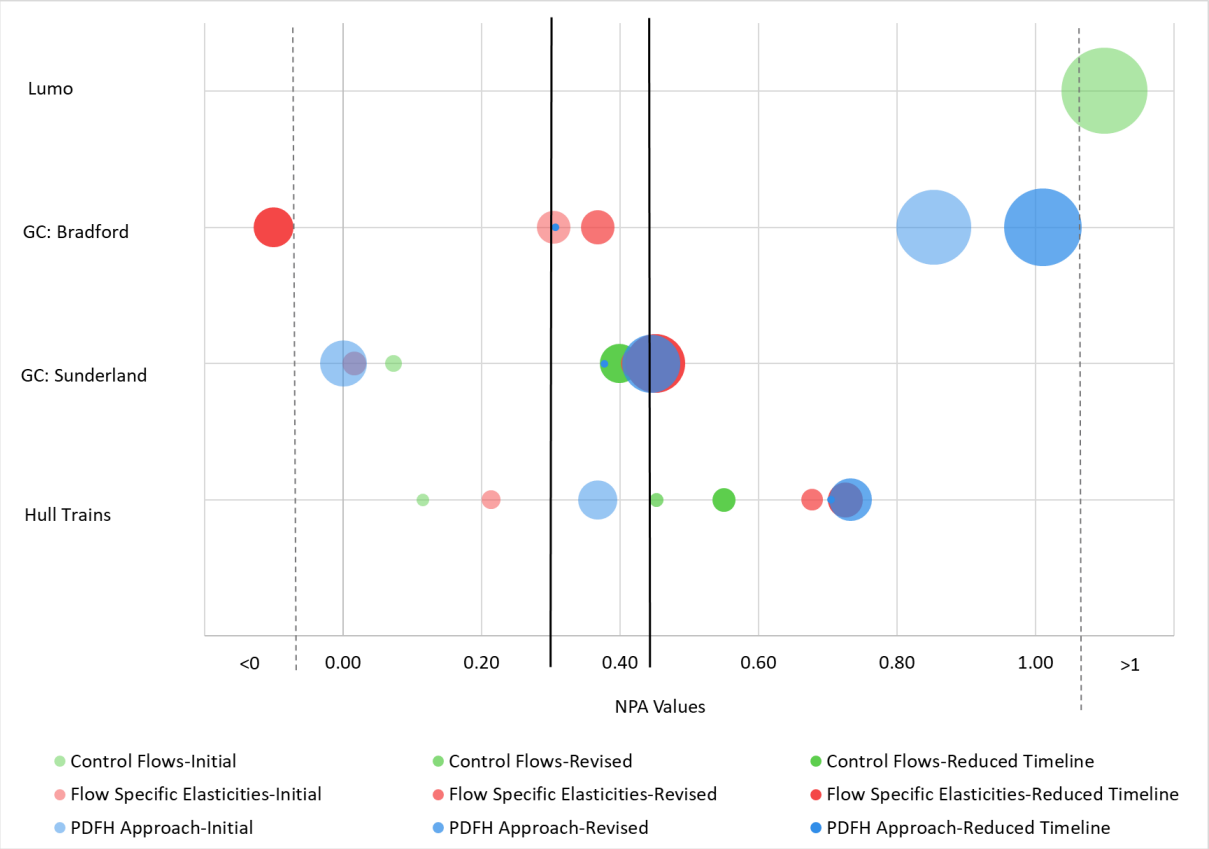
2. The negative generation ratio has been turned into an index value:

$$1 - \frac{Negative\ Generation\ Ratio\ for\ Approach}{Maximum\ Negative\ Generation\ Ration\ across\ all\ approaches}$$

3. The index has then been divided by the number of modelled years (since modelling accuracy decreases over time).
4. The index has then been divided by a value reflecting the level of confidence in the approach (1 for PDFH elasticities, 2 for flow specific elasticities and 3 for control flow.

13.2.4 Figure 30 shows the NPA results using each of the three approaches, with the diameter of the markers representing our confidence in the modelling based on the index detailed above. These results include the initial tests, revised test and reduced timeline results.

Figure 30. Summary of NPA Values and our Confidence Levels



13.2.5 The key observations that can be drawn for each of the open access services are set out below:

- Hull Trains:
  - The initial results (on the basis of both elasticity and control flows methods) are all below an NPA test value of 0.4, but with the PDFH elasticity in the middle of the 0.3 to 0.45 range, the other approaches being below 0.3. The PDFH approach exhibits the lowest levels of negative generation as well as being the closest method to best practice and is therefore the result in which we place the most confidence.
  - The revised test results, where the levels of negative generation have been reduced, are all above the 0.3 to 0.45 range, with the ratio values increasing with the closeness of the modelling to best practice.
  - The reduced timeline results are all clustered around the 0.7 value.
  - The results, apart one in which we have the least confidence due to significant 'negative generation' on the Doncaster to London flow, are all above the 0.3 level. The results in which he have the most confidence are clustered around 0.7.
  - We conclude that the evidence presented suggests that this service has resulted in NPA values above the 0.3 to 0.45 range.
- Grand Central Sunderland service:

- The initial results for this service are all very low, even for the PDFH approach which most reflects industry best practice.
- All other results, both the revised and reduced timeline results, are all clustered around the 0.4 to 0.45 range. May of the individual points are hidden by the last result plotted on the chart which has a reasonably high level of confidence attached to it.
- We conclude that the balance of evidence from these tests is that the NPA values for this service sit within the 0.3 to 0.45 range.

- Grand Central Bradford service:

  - The results for this service are spread across the NPA test values. Many of the results overlap and so are not visible in the chart.
  - The value form the PDFH approach are all above the 0.3 level, with the revised test and reduced timeline results above the 0.3 to 0.45 range.
  - All results that produce a positive NPA value are above a value of 0.3.
  - We conclude that this service produces values within or above the 0.3 to 0.45 range.

- Lumo

  - Only the results from a control flow approach are available.
  - The absence of negative generation in the results means that the result presented is attached a high level of confidence in our weightings despite the reliance on control flows.
  - The robustness of this result is, however, reduced by the limited data that is available (and hence our reliance on a control flow approach) and the fact that the service began during the Covid pandemic. As a result, we are obliged to consider the demand change between the last full year before the pandemic (2018/19) and the most recently available full year (2023/24).
  - The evidence that is available suggests NPA values that are substantially above the 0.3 to 0.45 range.

13.2.6 We have summarised our view of where the NPA results lie against the criteria set out at the beginning of this section in Table 55.

Table 55. Summary of NPA Findings by Service

OPEN ACCESS SERVICE	VS A 0.3 THRESHOLD	VS. AN INDICATIVE 0.3 TO 0.45 RANGE FOR HISTORIC ACCEPTANCE.	NOTES
Hull Trains	Above	Above	Some low values driven by large levels of negative generation
GC – Sunderland	Above	Within	Some low values driven by large levels of negative generation
GC – Bradford	At or above	Within or above	Mixture of low values driven by negative generation and high values likely driven by low forecast demand growth. Overall least confidence in these results.
Lumo	Above	Above	Only control flow approach used, and uncertainty in the post-covid era.

13.3 Conclusions

13.3.1 The key conclusions for this study are:

- It is difficult to draw definitive conclusions on historic generation and abstraction due to the impact of factors not considered in our modelling. This is reflected in the levels of negative generation and negative abstraction that exist in modelling results prior to any adjustments.
- When considering the results in which we have the most confidence, our results demonstrate generation abstraction ratios that are at or above the value of 0.3. While there are results lower than these levels, each of these examples includes levels of negative generation that limit our confidence in the results.
- Our results provide confidence that the generation abstraction ratios are within or above a range of 0.3 to 0.45 which has typically informed past decisions.

IDENTIFICATION TABLE	
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