steer davies gleave

InverSparkie - InverCity Rail Study Update

Report
March 2015

HITRANS

Our ref: P22782201
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Contents

Executive Summary ..... **i**

Overview i

1 The InverCity study of 2011 ..... **1**

The study 1

Demand in 2010 1

Services from 2011 2

Barriers to growth 2

The need for an update 2

2 Recent developments **4**

Demand growth 4

The Pre Ten O'clock Study 5

The January 2015 Highland Main Line timetable 5

3 Future events **7**

Introduction 7

Future events 7

Summary 13

4 Electrification benefits/opportunities **14**

The benefits of the existing service 14

New opportunities 14

The additional opportunities and benefits of electrification 15

5 Conclusions **16**

Introduction 16

2016, the Scotland route study 16

2018, the Strategic Business Plan (SBP) for CP6 16

2023, the Strategic Business Plan (SBP) for CP7 17

Figures

Figure 1.1: Intercity travel to and from Inverness over the HML (year to September 2010) 1

Figure 2.1: Growth in passenger use of Inverness station 4

Tables

Table 2.1: Inverness to Perth day services in January 2015, excluding trains via Aberdeen 5

Table 3.1: Future events 8

Executive Summary

Overview

In 2011, the Highlands and Islands Regional Transport Partnership (HITRANS) commissioned Steer Davies Gleave to undertake a study of intercity rail services connecting Inverness with Perth, the Central Belt including Edinburgh and Glasgow and, through cross-border services, to London. The Final Report, delivered in December 2011, identified a number of issues with the rolling stock, timetable and competitiveness, of these rail services.

HITRANS subsequently commissioned the Pre Ten O'clock Study (PTOC) to investigate rail access in cities in the UK and elsewhere. While more than half the users of Inverness station travel to and from the regional centres of Edinburgh and Glasgow, the PTOC study identified that it was not possible to complete these journeys in either direction before 10am.

Use of Inverness station has been growing and in 2013-2014 reached almost 1.3 million passengers, more than double the number 15 years earlier. Network Rail's route studies now typically take into account forecasts of demand for 30 years ahead, twice the timescale over which demand at Inverness has doubled.

By December 2018 Highland Main Line (HML) connecting Inverness to Perth will benefit from three new fleets of rolling stock:

- From Summer 2018, new trains introduced by Serco on the Caledonian Sleeper franchise
- From December 2018, a Scottish InterCity service of refurbished high Speed Trains (HSTs) introduced by Abellio on the ScotRail franchise
- From December 2018, bimode (electric or diesel) Intercity Express Project (IEP) trains operating services from London, to be operated by Virgin Trains East Coast (VTEC)

These new fleets will address many of existing concerns about the quality of the fleet and may lead to a further growth in demand. However, the exact timetables operated will depend on the emerging performance of the new trains and other operational constraints.

By 2025, when Abellio's ScotRail franchise ends, the refurbished High Speed Trains will be over 45 years old . Even if, by then, new diesel trains were still available and cost-effective, they would not be life-expired in either:

- 2043, when Network Rail's "Route Specification Scotland" envisages that the HML will be electrified and converted to W12 gauge which allows 9' 6" containers to be carried
- 2050, by when the UK is committed to reduce its Greenhouse Gas emissions by 80% relative to the level in 1990

Electrification of the HML by around 2027 may therefore be essential to enable replacement of the HST with electric stock to allow a cost-effective transition to meeting the 2050 emissions targets. It would also provide a number of other opportunities and benefits:

- From December 2018, opportunities to operate the IEP bimodes on electric power, or to convert them to electric sets, and also flexibility for electric stock used in the Central Belt to provide services on the HML
- Benefits from introducing further IEPs or other electric stock, greater flexibility, scope to combine electrification with gauge enhancement for freight trains, and greater use of Scotland's domestically-generated green energy

This suggests that HITRANS can advance strong arguments for the electrification of the HML at any point after 2018 but in any case no later than 2027. Three principal windows of opportunity to do so will arise.

In 2016, HITRANS will have the opportunity to contribute to, and comment on, the Scotland route study, likely to include forecasts of demand to around 2045. It could point out that even a phased approach to electrification from December 2018 would enable bimode IEPs to make greater use of electric power as it became available. Extension of electrification northwards from the central belt and through Perth would also offer greater flexibility in the provision of services in that area.

In 2018, HITRANS will have the opportunity to contribute to, and comment on, Network Rail's Strategic Business Plan (SBP) for Control Period 6 (CP6) from 2019-2024. It could again draw attention to the arguments in favour of electrification, including on a partial or phased basis, as a means of delivering immediate improvements in the energy mix used by IEP bimodes and of adding flexibility to other operations. It could also point out that the end of CP6, in March 2024, is only a year before the end of the Abellio franchise, when a decision may need to be made to replace the HSTs with electric stock and hence to have electrification in place.

In 2023, HITRANS will have the opportunity to contribute to, and comment on, Network Rail's Strategic Business Plan (SBP) for Control Period 7 (CP6) from 2024-2029. By 2023 there will be at least four years' experience of operating Serco's new sleeper fleet, Abellio's HST fleet and VTEC's IEP bimodes. By this stage the performance of the stock, its attractiveness to passengers, and the resulting effect on demand will all be well-understood, and further opportunities to improve the timetable may have been identified.

By then, with the end of Abellio's ScotRail franchise imminent, and the need to specify the future fleet, both ScotRail and potential bidders will need a clear view on whether the route is to be electrified by the time the fleet might be replaced, probably as early as 2027. If no decision has yet been take to electrify the Highland Main Lane, HITRANS could point out that this may be the last opportunity to do so and to ensure that electric traction is in use before 2050.

1 The InverCity study of 2011

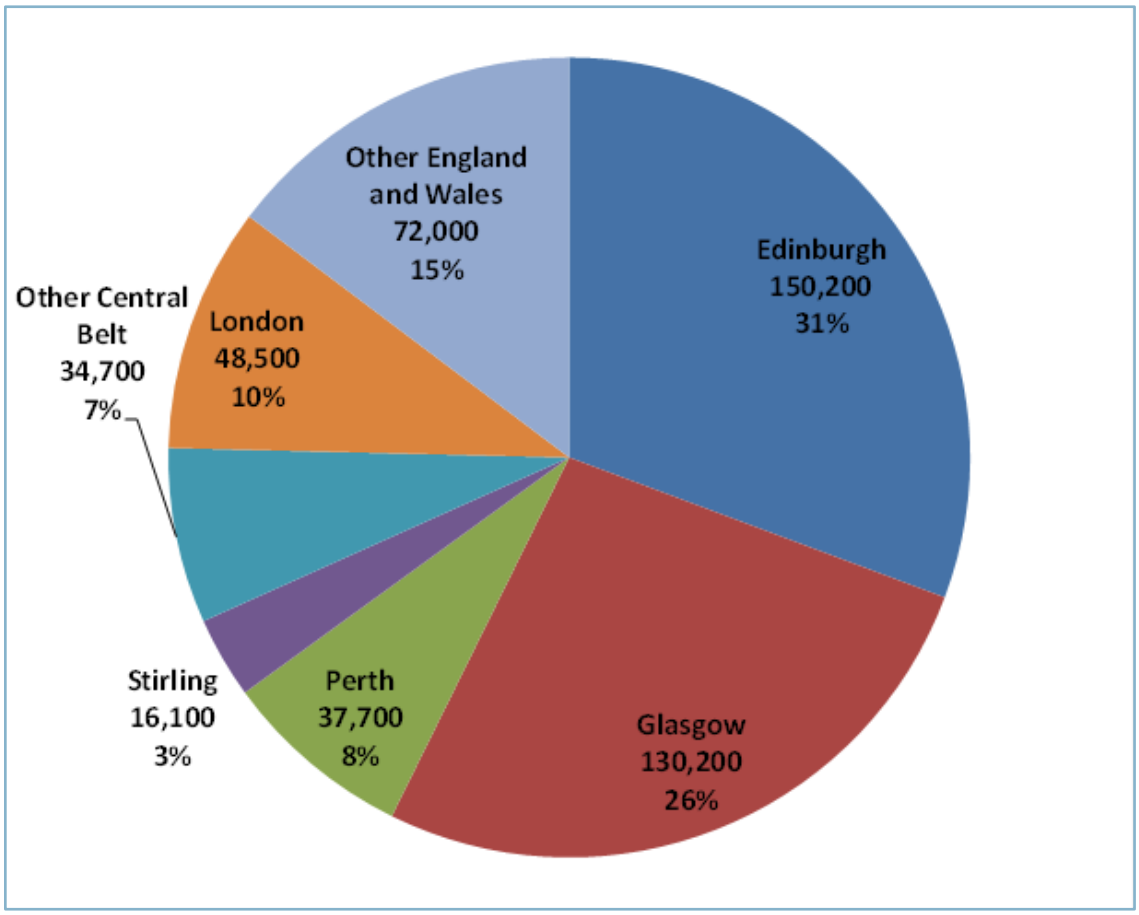
The study

1.1 In 2011, the Highlands and Islands Regional Transport Partnership (HITRANS) commissioned Steer Davies Gleave to undertake a study of intercity rail services connecting Inverness with Perth, the Central Belt including Edinburgh and Glasgow and, through cross-border services, to London. The InverCity study Final Report was delivered in December 2011.

Demand in 2010

1.2 The InverCity study identified 1.1 million rail journeys per year to and from Inverness and estimated that 40% of them were intercity, with more than half to Edinburgh (31%) and Glasgow (26%).

Figure 1.1: Intercity travel to and from Inverness over the HML (year to September 2010)



Source: InverCity rail Study, December 2011

Services from 2011

1.3 The study also noted that, from December 2011, there would be 11 trains per day in each direction between Inverness and the Central Belt.

Barriers to growth

1.4 The study identified a number of barriers to growth in the use of intercity rail for travel to and from Inverness, which we summarise below.

1.5 On services to Glasgow and Edinburgh, the issues identified included:

- The limited capacity and quality of the Class 170 trains, with no WiFi and power points only available in First Class.
- The timing of the first morning trains, and the desirability of being able to reach meetings in Glasgow or Edinburgh by 10am.
- The relatively infrequent service, and associated need to change at Perth, which was particularly disliked by tourists.
- The poor awareness of the value for money of rail compared to other modes.

1.6 On services to London, the issues identified included:

- The uncompetitive rail journey time compared with air
- The poor awareness of the value for money of rail compared to air

1.7 HITRANS repeated a number of these points in its response to the RAIL 2014 Consultation launched in 2011.

1.8 The studied also identified that:

- Class 170 stock does not provide an ambience which is attractive to tourists.
- It was not possible to operate a northbound service arriving in Inverness before 10:00.
- The stock used on overnight sleeper services between Inverness and London had been refurbished, but was old.
- The planned introduction, on the East Coast Main Line from London, of 5-car InterCity Express Programme (IEP) would include bimode trains using overhead electric power where it is available and diesel power elsewhere. This would, potentially, allow more services between London and Edinburgh to be extended to Inverness.

The need for an update

1.9 HITRANS has now identified a number of recent events which suggest the need for an update to the study. These include in particular that:

- The now-committed introduction of IEP on the East Coast Main Line (ECML) between London, Edinburgh and both Inverness and Aberdeen. Inverness will be served by bimode stock but in the event of future electrification this could make use over overhead electric power.
- The award of the new ScotRail franchise, to use shortened “2+5” diesel High Speed Trains (HSTs) to create a Scottish InterCity linking Scotland’s cities including Inverness. The HSTs date from the 1970s and are therefore likely to require replacement much earlier than would be the case if the franchisee had introduced a new fleet of Diesel Multiple Units (DMUs).

1.10 IEP means that the rolling stock used on the limited services between Inverness and London will be capable of making use of future electrification, and the decision to use relatively old HSTs to provide the InterCity services means that they may need to be replaced at the end of the new franchise at latest in 2025.

1.11 HITRANS has therefore commissioned Steer Davies Gleave to carry out a brief review and update of the InverCity study, focusing on the case for electrification of the Highland Main Line (HML).

1.12 This Report does not repeat the work of the earlier InverCity study and, while intended to be a freestanding document, may best be understood in conjunction with:

- The December 2011 InverCity study for HITRANS by Steer Davies Gleave, described above
- The December 2011 Pre Ten O'clock Study for HITRANS by the Haste Partnership

1.13 In the remainder of this Report we therefore:

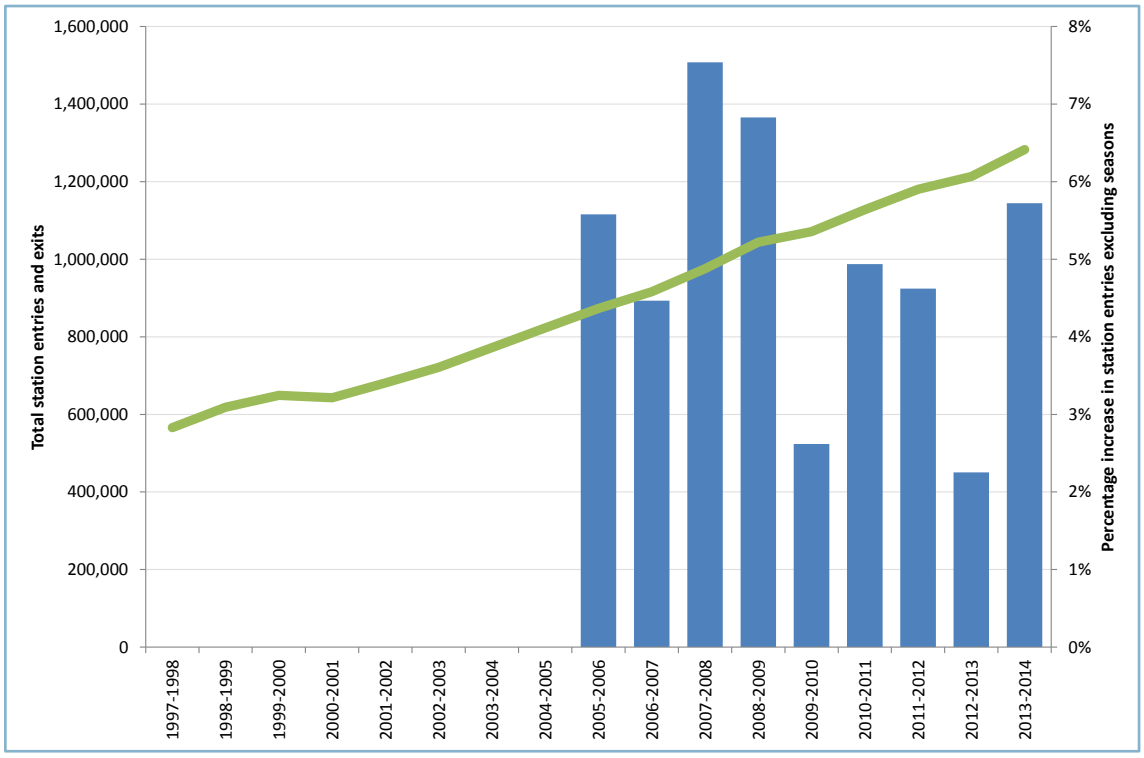
- In Section 2, list the recent developments
- In Section 3, summarise the future events which may be relevant to electrification
- In Section 4, review and summarise the potential benefits and opportunities of electrification
- In Section 5, set out our conclusions and proposals for next steps

2 Recent developments

Demand growth

2.1 As noted above, in this study we have not repeated the detailed market analysis carried out as part of the original InverCity study. We have, however, reviewed trends in the use of Inverness station, based on annual statistics on station usage published by the Office of Rail Regulation (ORR). Figure 2.1 illustrates the trend in passenger numbers since 1997-1998 and the annual percentage growth in passenger numbers.

Figure 2.1: Growth in passenger use of Inverness station



Source: Office of Rail Regulation. Data plotted exclude season ticket travel which is unlikely to be InterCity.

2.2 The Figure shows that total usage of the station has more than doubled since 1997-1998, from fewer than 0.6 million passengers to 1.1 million in 2010-2011 and almost 1.3 million in 2013-2014. There has been consistent growth in every year since 2004-2005 and an average growth rate of over 4% per annum since 2010-2011, the year preceding the InverCity study.

The Pre Ten O'clock Study

2.3 In November 2011 HITRANS commissioned the Pre Ten O'clock Study (PTOC Study) to investigate integrated rail access in cities in the UK and elsewhere. The findings of the PTOC Study, which were too late to incorporate into the InverCity Rail Study, were that:

- From Inverness, it was possible to reach Edinburgh direct by 10:00 and Glasgow, with a change, by 10:14
- From Edinburgh and Glasgow, it was not possible to reach Inverness before 10:28
- In contrast, travel between other cities in the UK and Europe and the local capital could normally be completed before 10:00 in each direction

2.4 The PTOC Study also suggested that timetables have evolved reflecting the historical predominance of London as capital of the United Kingdom rather than of the individual national capitals and regional centres including Edinburgh and Glasgow. As the InverCity study noted, however, the northbound sleeper train, and two following freight trains, acted as a practical constraint to offering earlier services from Edinburgh and Glasgow to Inverness.

The January 2015 Highland Main Line timetable

2.5 Table 2.1 summarises the principal services on the Highland Main Line during January 2015 timetable which was introduced in December 2014.

Table 2.1: Inverness to Perth day services in January 2015, excluding trains via Aberdeen

Inverness	Perth	To		From	Perth	Inverness
06:50	08:49	Edinburgh 10:06 (Glasgow 10:18)		(Edinburgh 06:33) Glasgow 07:10	08:10	10:27
07:55	09:54	Kings Cross 15:51		Edinburgh	09:47	11:57
08:45	10:49	Glasgow		Glasgow	11:16	13:28
09:41	11:55	Edinburgh		Edinburgh	11:54	14:10
10:45	12:57	Edinburgh		Glasgow	13:13	15:23
12:53	15:02	Edinburgh		Edinburgh	14:51	15:23
14:47	16:53	Glasgow		Glasgow	16:17	18:21
15:51	18:05	Edinburgh		Kings Cross 12:00	18:02	20:06
17:30	19:38	Glasgow		Edinburgh	18:58	21:01
18:46	21:00	Edinburgh		Glasgow	19:21	21:26
20:15	22:34	Glasgow 23:43 (Edinburgh 00:11)		(Glasgow 19:41) Edinburgh 19:44	21:01	23:10
Total 11 southbound trains				Total 11 northbound trains		

2.6 There are still a total of 11 day trains in each direction per day that operated in the December 2011 timetable, including one through service each way to and from London Kings Cross. The maximum interval between trains in each direction is around 2 hours.

2.7 Return from full-day meetings is possible in both directions:

- From Inverness, it is possible to stay in Glasgow or Edinburgh until 19:41 or 19:44 respectively and return to Inverness by 23:10
- From Edinburgh and Glasgow, it is possible to stay in Inverness until 20:15, although the connection back to Edinburgh does not arrive until 00:11

2.8 However, the timetable still does not resolve the issues identified in the Pre Ten O'clock Study:

- The earliest departure from Inverness does not reach Edinburgh until 10:06 and Glasgow, with a change, at 10:18, in each case several minutes later than in the PTOC Study
- The earliest arrival in Inverness is at 10:27, one minute earlier than in the PTOC Study

2.9 In the next Section we describe in more detail a number of future events which are likely to be relevant to the potential electrification of the Highland Main Line.

3 Future events

Introduction

3.1 The InverCity study identified a number of "key interventions" then expected on the Highland Main Line, in date order:

- 2012, December: minor timetable and journey time improvements
- 2013, the expected reletting of the East Coast franchise
- 2014, the reletting of the ScotRail franchise
- 2016, Edinburgh Glasgow Improvement Programme (EGIP) and Class 170 refurbishment
- 2017 onwards, the prospect of a Highland Main Line hourly service and electrification
- 2017 onwards, the Intercity Express Programme (IEP) on the East Coast Main Line (ECML)
- 2026 onwards, High Speed rail with the completion of High Speed 2 Phase 1

Future events

3.2 Table 3.1 overleaf, which updates and expands this analysis, summarises the expected timings of a number of future events which may be relevant to the electrification of the Highland Main Line.

3.3 We discuss each of these dates below in turn.

2015, March: start of East Coast franchise day services

3.4 The Department of Transport has awarded a new East Coast franchise to Virgin Trains East Coast (VTEC), which will oversee the introduction of Intercity Express Project (IEP) trains on the East Coast Main Line from December 2018. The East Coast IEP fleet will include four types of train set:

- 5-car and 9-car electric sets
- 5-car and 9-car bimode sets, which also have underfloor diesel power packs

3.5 Of particular relevance to the Highland Main Line are:

- The scope to couple and uncouple 5-car sets to allow splitting and joining of services to make efficient use of limited paths on one part of the network while providing through services to another
- The scope for bimode sets not only to operate on electrified and non-electrified lines but also, as electrification is extended, to convert to all-electric operation and, if no longer needed, to remove the underfloor diesel power packs and convert them to electric sets

3.6 We discuss the opportunities arising from this flexibility in further detail below.

Table 3.1: Future events

Date	Event
2015, March	Virgin Trains East Coast (VTEC) begins operation of East Coast franchise day services
2015, April	Abellio begins operation of ScotRail franchise including day services
2015, April	Serco begins new Caledonian Sleeper franchise
2016, July	Scotland Route Study is due to report, potentially including demand forecasts to 2045 for the Highland Main Line
2018, January	Network Rail issues Strategic Business Plans for CP6 from April 2019 to March 2024
2018, Summer	Serco introduces new stock on the Caledonian Sleeper franchise
2018, December	Abellio begins to operate 2+5 high speed trains (HSTs)
2018, December	VTEC begins to introduced electric and bimode IEPs on the East Coast Main Line
2019, April	CP6 begins
2020, March	Break option, after 5 years, for Abellio ScotRail franchise
2023, January	Network Rail issues Strategic Business Plans for CP7 from April 2024 to March 2029
2023, March	VTEC franchise ends, use and deployment of IEPs may be reviewed
2024, April	CP7 begins
2025, March	Abellio ScotRail franchise ends, and existing HSTs will be approaching 50 years old
2025	A9 Perth to Inverness dualling is completed, enhancing scope for coach competition to rail
2027	Earliest introduction date of HST replacements ordered by the new ScotRail franchisee
2030	Serco Caledonian Sleeper franchise ends, with sleeper stock up to 15 years old
2033	High Speed 2 complete to beyond Manchester and Leeds, with potential half hour saving on Edinburgh to London times and comprehensive recast of the ECML services and timetable
2043	Electrification of Highland Main Line envisaged in “Route Specification Scotland 2014”
2045	Potential end year for demand forecasts in 2016 Scotland Route Study
2050	Date by which the UK intends to reduce Greenhouse Gas emissions by 80% relative to 1990
2057	Indicative end of a 30-year life of trains replacing HSTs from 2027

Source: Steer Davies Gleave research and analysis of published documents and statements

2015, April: start of ScotRail franchise including day services

3.7 Transport Scotland has awarded the new ScotRail franchise to Abellio, which will take over the operation from April 2015 and operate it until March 2025, with a 5-year break option in March 2010. Among the proposals for the franchise are:

- From 2018, introduction of High Speed Trains (HSTs) to link seven Scottish cities
- From 2019, an hourly service between Perth and Inverness

3.8 Details of the 2019 hourly timetable or the times of the first and last trains are not yet available, but these proposals clearly represent a major uplift in the quality and frequency of service to and from Inverness and are, prima facie, likely to stimulate further growth in passenger numbers. In particular, the introduction of refurbished units of the popular HST stock will address the deficiencies of the Class 170 stock identified in the InverCity study (see paragraphs 1.5 and 1.7 above).

2015, April: start of Caledonian Sleeper franchise sleeper services

3.9 Transport Scotland has awarded the new Caledonian Sleeper franchise to Serco, which will take over the operation from April 2015 and operate it until 2030. The new trains will offer a radical upgrade to the existing stock and offer four accommodation types:

- Cradle seats with reclining seating
- Pod flatbeds with lie-flat seating, similar to airline Business Class
- Berths with wash basin
- Ensuite berths with toilet and shower

3.10 This stock will remove the issues of ageing sleeper trains identified in the InverCity study (see paragraph 1.7 above) and provide a step change in the quality of the sleeper services.

2016, July: Scotland Route Study, with demand forecasts to 2045

3.11 In November 2014, Network Rail began work on the Scotland Route Study, which is programmed for completion in July 2016.

3.12 The Route Study is likely to consider demand forecasts for a thirty-year period, which will probably mean to 2045, much longer than the period in which demand has doubled shown in Figure 2.1. This suggests that it will also need to take into account a number of other developments over the period to at least 2045, which we list below.

2018, January: Network Rail issues Strategic Business Plans for CP6

3.13 The exact arrangements for each 5-yearly Periodic Review vary between Control Periods (CPs), but we would expect that Network Rail will issue its Strategic Business Plans for CP6, from April 2019 to March 2024, around January 2018. These plans will need to set out its proposals for investment and development of the Highland Main Line during CP6, and HITRANS will no doubt wish to explore opportunities to influence them and in particular to ensure that they are consistent with the longer term forecasts and vision emerging from the Route Study.

2018, Summer: Caledonian Sleeper franchise introduces new trains

3.14 As noted above, Serco plans to introduce new sleeper trains, which are expected to come into service in Summer 2018. There may be initial teething problems with the stock, but a critical issue may be their performance in meeting journey times, and the ultimate flexibility this provides to accelerate or modify the timetable.

2018, December: start of 2+5 high speed trains (HSTs) on HML

3.15 Only a few months after Serco's sleeper trains, Abellio is expected to introduce the new 2+5 HSTs onto the HML. As with the new sleeper trains, there may be some teething troubles, but there may be flexibility to accelerate or modify the timetable.

2018, December: start of electric and bimode IEPs on ECML

3.16 Also in December 2018, VTEC is expected to introduce electric and bimode IEPs on the ECML. We have not identified when the first bimode services will operate on the HML to Inverness but, combined with the new sleeper trains and 2+5 HSTs, there may be further opportunities to accelerate or modify the timetable. HITRANS supports cross-border services and in particular the ambience and quality they offer relative to the current ScotRail DMU fleet.

2018, December: summary

3.17 In summary, by the end of 2018, the rolling stock of all three franchises serving the Highland Main Line will have been replaced, removing the issues of ambience and quality identified by the InverCity study. However the exact details of the timetable, and in particular the overall journey times of each service, will almost certainly be refined as the performance characteristics of each of the new fleets is established.

2019, April: start of CP6 begins

3.18 Control Period 6 will begin in April 2019 and the industry will implement, over the following five year period to March 2024, the High Level Output Specifications (HLOSs) developed by Scottish Ministers and the Department of Transport, including upgrades to infrastructure capacity and capability provided by Network Rail under the supervision of the Office of Rail Regulation (ORR).

2020, March: break option, after 5 years, for Abellio ScotRail franchise

3.19 The ScotRail franchise includes a break option after five years. We have not examined the details of the option but note that it might be possible for Scottish Ministers to terminate the franchise at that point, potentially in the event of a policy decision that the ScotRail services should revert to operation in the public sector. This would not, however, affect the fundamental issues that the HST fleet would be then by over 40 years old, as we discuss further below.

2023, January: Network Rail issues Strategic Business Plans for CP7

3.20 Part way through CP6, Network Rail will initiate the planning process for CP7, which begins in 2024, a year before the end of the Abellio ScotRail franchise. This will provide a second opportunity for HITRANS to influence the plans and in particular to ensure that they are consistent with the longer term forecasts and vision emerging from the Route Study.

2023, March: East Coast franchise ends

3.21 The VTEC franchise for the East Coast will end in March 2023, and in the preceding months the Department for Transport will need to devise, in consultation with stakeholders, the specification for the new franchise. By this stage, after several years of IEP operation on the Highland Main Line, HITRANS will be well-placed to identify opportunities and proposals for service improvements including, potentially, different patterns of IEP operation.

2024, April: CP7 begins

3.22 Control Period 6 will begin in April 2024 and the industry will implement, over the following five year period to March 2029, the High Level Output Specifications (HLOSs) developed by Scottish Ministers and the Department of Transport.

2025, March: ScotRail franchise ends, HSTs approaching 50 years old

3.23 Assuming that the option to break the ScotRail franchise in 2020 has not been exercised, the franchise will come to an end in March 2025. Scottish Minister will have consulted on a specification for a replacement franchise, but by that stage a key issue is likely to be the future of the HST fleet which will be over 45 years old and which it may be technically difficult and/or commercially unattractive to refurbish for further life extension.

3.24 2025 appears to represent a key break point by which time Scottish Ministers will need to decide whether:

- To continue with a further extension of the lives of the HST fleet, if this is possible at acceptable cost and risk.
- To invite bidders to replace the stock.

3.25 If Ministers decide that the rolling stock should be replaced, they will have two options:

- On the basis that the HML has been or will be electrified shortly after 2025, and that the HSTs should be replaced with electric InterCity stock equivalent to, or better than, the IEP fleets to which passengers will have become accustomed.
- On the basis that the HML will not be electrified and will require a diesel fleet.

3.26 If Ministers decide to continue with diesel operation, they will have two options:

- To use existing stock cascaded from elsewhere on the British network. While it might be possible for bidders to offer existing diesel stock, any fleet then in existence is, like the current Class 170 fleet, likely to be seen by passengers as a retrograde step relative to the ambience provided by HST and particularly IEP.
- To procure new stock specifically tailored to these services and with appropriate ambience and onboard facilities. It may, however, become increasingly difficult to persuade manufacturers to build new diesel stock at acceptable prices, and a new fleet introduced after 2025 would have an expected life to well beyond 2050, when the UK is committed to reduce its Greenhouse Gas emissions by 80% relative to the level in 1990.

3.27 If a replacement franchise were let on the basis that the franchisee should specify, procure and commission rolling stock, as has been practice in the past, then the earliest date at which a new fleet could be brought into use would be around 2027, as we set out below. This means that electrification of the HML, if not completed during CP6, would still be timely if completed during the first 2-3 years of CP7.

2025: A9 Perth to Inverness dualling is completed

3.28 On current proposals, the dualling of the A9 between Perth and Inverness will be complete. While a welcome improvement in accessibility to Inverness and Highland Region as a whole, this will improve the attractiveness of car and coach travel relative to rail and, at the margin, reinforce the case for ensuring that the rail offer, including not only rolling stock but also journey time, service frequency and through services, is fit for purpose in this competitive environment.

2027: Earliest date in service of HST replacements

3.29 As noted above, unless replacement stock was procured by Transport Scotland, in the same way that the Department of Transport has led the procurement of IEP, 2027 is the earliest date at which a replacement franchisee offering ScotRail services from 2025 could introduce a new fleet of either electric or diesel stock for InterCity services in Scotland.

2030: Caledonian Sleeper franchise ends

3.30 The newly-awarded Caledonian Sleeper franchise ends in 2030. If, at that point, the HML had been electrified, a replacement franchise would, in principle, be able to move to all-electric traction over the entire route between Inverness and London.

2033: High Speed 2, saving half an hour between Edinburgh and London

3.31 Current proposals are that Phase 2 of High Speed 2 will be completed by 2033, with an expectation that this will allow a reduction of half an hour on current journey times between Edinburgh and London by using HS2 between London and north of Leeds. This will provide a further stimulus to rail travel even on relatively long journeys from Inverness, and may also provide Inverness and stations on the HML with new connections to stations on HS2.

2043: "Route Specification Scotland 2014" envisages that electrification is in place

3.32 In April 2014, Network Rail published its document "Delivering a better railway for a better Britain – Route Specification Scotland 2014". This document acknowledged that electrification of the HML would not be carried out by 2019, the end of CP5. However, it envisaged conversion of the signalling to European Rail Traffic Management System (ERTMS) in 2021-2023 and, by 2043, conversion to W12 gauge which allows 9'6" high containers to be carried, and electrification. The Route Specification does not state when electrification would be completed, but does not preclude it being completed considerably before 2043.

3.33 Electrification and gauge clearance both typically involve work to overhead structures to provide additional headroom for the overhead catenary and higher rail vehicles respectively. We would also expect that there would be synergies from carrying out electrification and gauge clearance work as part of a combined programme.

2045: End year for demand forecasts in 2016 Scotland Route Study

3.34 We noted above that the Scotland Route Study is due to report in July 2016. Precedents suggests that it will need to include demand forecasts to at least 2045, which will therefore identify the growth expected over the period to 2043. We note, however, that the consideration of the impacts of HS2 Phases 1 and 2 for Scotland in general and the HML in particular may be rudimentary, given the limited detail yet available about even the services which will be "captive" to HS2.

2050: UK to reduce Greenhouse Gas emissions by 80% relative to 1990

3.35 By 2050, the UK is committed to reduce its Greenhouse Gas emissions by 80% relative to the level in 1990. This will involve cumulative and wide-ranging change to energy efficiency and generation mix which cannot yet be foreseen in detail, but is likely to mean a much-reduced reliance on fossil fuels in any application, such as electricity generation, for which alternatives are or will be available.

3.36 Scotland has hydroelectric and wind generation and is well-placed to make increased use of domestically-generated green electricity.

2057: Indicative end of a 30-year life of trains replacing HSTs from 2027

3.37 Finally, 2057 is the indicative end of life of any potential replacement for the Scottish InterCity HST fleet introduced, as part of the next ScotRail franchise, in around 2027. This suggests that diesel-powered replacements for the HST fleet would need either:

- To remain in operation after the 2050 Greenhouse Gas targets have been met
- To be replaced after a relatively short life to allow the targets to be met

3.38 Neither appears likely to be an economically and environmentally efficient outcome.

Summary

3.39 Summarising the above points:

- By 2050, the UK is committed to reduce its greenhouse gas emissions by 80%.
- By 2043, Network Rail already envisages that the HML will be both electrified and be upgraded to W12 gauge.
- By 2025, Scottish Ministers are likely to need to decide on a replacement fleet for Abellio's 2+5 HSTs, which by then will be over 45 years old.

3.40 By the time that this decision needs to be made:

- New diesel stock, with an InterCity ambience, might be difficult to procure at acceptable prices and, once procured, would have a working life extending beyond 2050.
- Existing diesel stock, if available, would have a shorter remaining life but might not have the ambience, comparable with HST and IEP, appropriate to an InterCity service.
- New electric stock with an InterCity ambience, whether similar to IEP or of an improved design, could maintain and enhance onboard quality, have better performance and lower maintenance costs, and operate on power generated from green energy sources.

3.41 It therefore appears increasingly likely that, by 2025, the most effective response will be to replace HSTs with electric stock. However, to make use of new electric stock, it would be necessary to electrify the HML, indicatively by 2027, 2-3 years into CP7. Electrification of the HML would also allow bimode IEPs to operate on electric power after December 2018 or, depending on electrification elsewhere, to be converted to electric-only operation.

3.42 This suggests that electrification of the Highland Main Line:

- May be beneficial from December 2018, when even partial electrification would allow increased use of the IEP bimodes' electrical capability
- May be necessary by around 2027, so as to enable the Scottish InterCity HST fleet to be replaced with electric stock

4 Electrification benefits/opportunities

The benefits of the existing service

4.1 The InverCity study identified a number of benefits of the existing intercity services to and from Inverness subdivided as:

- Economy
- Tourism
- Environment
- Resilience

4.2 This document does not repeated the detailed analysis and argument of the InverCity study, but notes that these benefits remain at least as valid now as they did at the time of the study.

New opportunities

4.3 The introduction of IEP, and Abellio's proposed 2+5 HST fleet, bring a number of further opportunities over and above the improvements relative to existing East Coast HST and ScotRail Class 170 stock respectively.

4.4 IEPs should provide a step change in ambience relative to the existing HST services provided by East Coast trains. They will have 5-car sets which may be better suited to extension from Edinburgh to Inverness than HSTs. They also provide an opportunity for splitting and joining, for example to allow trains between Inverness and the Central Belt to split and combine at Perth, with Edinburgh and Glasgow portions. This could be particularly useful early morning or late evening to provide earlier arrivals and later returns.

4.5 The 2+5 HSTs should also provide a step change in ambience relative to the ScotRail Class 170 fleet and, with an hourly service from 2019, further stimulate InterCity demand from Inverness.

4.6 The 2+5 HSTs, however, are likely to have limited further working life and, as has been argued in the previous section of this report, may not be technically, operationally, financially or commercially viable much beyond the end of the Abellio franchise in 2025. This means that Scottish Ministers specifying services to be provided after the end of the franchise will need to make three key decisions, as set out in paragraphs 3.24 to 3.26:

- Whether to continue with the HST fleet or to replace it
- If replacing it, whether to continue with diesel trains or move to electric operation
- If continuing with diesel trains, whether to use existing stock or to procure a new fleet, potentially "locking in" diesel operation until beyond 2050

The additional opportunities and benefits of electrification

4.7 Electrification of the HML completed any time after around 2018 would provide a number of opportunities related to the provision of through services from London to Inverness:

- For IEP, the opportunity for bimodes to operate on electric power. Additionally, even if electrification was extended to Inverness in stages, IEP bimodes could gradually make increasing use of electrification as the scheme progressed.
- For IEP, the potential to remove diesel power packs and convert some of the bimode fleet to electric operation. The practical details would depend on whether any other branches served by IEP remained unelectrified.
- Potentially, the use for any electric-power stock to provide through services between the HML and England.

4.8 Electrification of the HML by the time of replacement of the 2+5 HST fleet, which we have provisionally assumed would be around 2027, would allow a number of further benefits:

- For the Scottish InterCity fleet, conversion to electric operation with IEP, similar or newer stock, providing a better ambience and environmental performance.
- For the whole timetable, potential scope to accelerate timings and provide shorter journey times for all journeys using the HML, in whole or in part, benefitting not only Inverness but also travellers to and from further north. This might contribute either to meeting the PTOC objectives of allowing arrival before 10am in Inverness from Edinburgh and Glasgow and vice versa (see Table 2.1) or allowing even earlier journeys between the cities.
- Greater flexibility to deploy electric stock across the ScotRail network.
- Scope to combine electrification works with gauge enhancements for freight trains to Inverness and points further north.
- Greater use of Scotland's domestically-generated green electricity.

4.9 This suggests that there is a strong case for reviewing the indicative date of electrification by 2043 and bring it forward to no later than 2027, and also investigating the potential synergies for combining the work with enhancement of the line to W12 gauge.

5 Conclusions

Introduction

5.1 The analysis is this report suggests that electrification of the Highland Main Line:

- May be beneficial from December 2018, when even partial electrification would allow increased use of the IEP bimodes' electrical capability
- May be necessary by around 2027, so as to enable the Scottish InterCity HST fleet to be replaced with electric stock

5.2 Referring to the timeline set out in Table 3.1, this suggests that there are three principal opportunities to take a decision to move towards electrification:

- By 2016, through the Scotland route study
- By 2018, in influencing the Strategic Business Plan (SBP) for CP6
- By 2023, in influencing the Strategic Business Plan (SBP) for CP7

5.3 We discuss each of these briefly below.

2016, the Scotland route study

5.4 HITRANS has the opportunity to contribute to, and comment on, the Scotland route study due in July and likely to include forecasts of demand to around 2045.

5.5 It could draw attention to the arguments set out in this document and, in particular, that even a phased approach to electrification from December 2018 would enable bimode IEPs to make greater use of electric power as it became available. Extension of electrification northwards from the central belt and through Perth would also offer greater flexibility in the provision of services in that area.

2018, the Strategic Business Plan (SBP) for CP6

5.6 The SBP for CP6 is likely to be issued early in 2018 and in particular before the introduction of Serco's new sleeper fleet ("summer") and Abellio's HST fleet and VTEC's IEP bimodes (December).

5.7 Nonetheless, HITRANS could again draw attention to the arguments in favour of electrification, including on a partial or phased basis, as a means of delivering immediate improvements in the energy mix used by IEP bimodes and of adding flexibility to other operations. It could also point out that the end of CP6, in March 2024, is only a year before the end of the Abellio franchise, when a decision may need to be made to replace the HSTs with electric stock and hence to have electrification in place.

2023, the Strategic Business Plan (SBP) for CP7

5.8 The SBP for CP7 is likely to be issued early in 2023 by which time there will be at least four years' experience of operating Serco's new sleeper fleet, Abellio's HST fleet and VTEC's IEP bimodes. By this stage the performance of the stock, its attractiveness to passengers, and the resulting effect on demand will all be well-understood, and further opportunities to improve the timetable may have been identified.

5.9 With the end of Abellio's ScotRail franchise imminent, and the need to specify the future fleet, both ScotRail and potential bidders will need a clear view on whether the route is to be electrified by the time the fleet might be replaced, probably as early as 2027.

5.10 Even if a new diesel fleet can still be procured in the mid-2020s on commercially and operationally attractive terms, doing so might effectively defer electric operation until beyond 2050, by when the UK is committed to reduce Greenhouse Gas emissions by 80% relative to 1990. If no decision has yet been take to electrify the Highland Main Lane, HITRANS could point out that this may be the last opportunity to do so and to ensure that electric traction is in use before 2050.

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