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HLOS Performance and Reliability Analysis and Targets

Independent Reporter (Part C) Mandate CN/022

Office of Rail Regulation and Network Rail

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Executive summary

Purpose and scope

This report provides the views of the Independent Reporter (referred to as 'we' in this report) on the Network Rail (NR) Strategic Business Plan (SBP) in respect of Performance Analysis and Targets, responding to ORR Mandate CN022. This report is intended to inform the ORR in producing its Draft Determination for Periodic Review 2013.

Mandate CN022 is in 2 parts and we reported on Part 1 (our proposed methodology) in December 2012. This is the final report produced at the end of Part 2.

The following questions were posed in the mandate:

1. what level of PPM, over 92.5% and CaSL below 2.2%, is value for money and affordable for England & Wales without compromising delivery of other HLOS requirements?

2. to advise if the package of KPIs, developed by NR with the industry, will be effective in achieving the objectives set out by the Scottish Ministers in its HLOS

In order to answer question 1, we agreed that we would first need to answer the following question as a pre-requisite:

3. to what extent does the SBP provide a suitable baseline proposal for addressing the HLOS PPM and CaSL targets (92.5% and 2.2 % respectively) for England and Wales (E&W)?

The scope of the original mandate was extended to include additional questions/tasks defined by ORR and referred to as 'ORR Assessment Criteria', see Appendix A to this report. These additional tasks required us to consider and advise on the appropriateness of NR's forecast ranges and trajectory for PPM and CaSL for E&W. It also required us to consider the suitability of the proposed Freight Delivery Measure and targets for freight service performance. This report also includes the outputs of the additional tasks.

Our approach

Network Rail published its SBP for England and Wales and a SBP for Scotland on 7 January 2013, and made a range of supporting documents available shortly thereafter. We have reviewed these documents, undertaken various targeted interviews with NR staff to understand its proposals, attended relevant NR / ORR SBP challenge meetings, and undertaken analysis of the plans and background information. We chose a sample of three Routes to investigate in detail, (Kent, LNE and LNW), selecting these to be representative of the full complexity of performance issues, and also since they had developed their own local forecasting assumptions and processes.

In addition we also visited the Scotland Route and held discussion with representatives of Transport Scotland and First Scotrail, and considered the SBP for Scotland, and supporting documents as the KPI proposals were developed, in order to fully understand the expectations and approach to performance monitoring and measurement in CP5. We have made reference to the industry responses to ORR's consultation on the CP5 Output Framework as part of our deliberations.

In order to make an assessment of the potential economic value of higher levels of performance, we also undertook some analysis of the likely marginal revenue effects and socio economic benefits of alternative performance levels for both PPM and CaSL on a sample of routes, representing a likely range of values. Lastly, in relation to the Freight Performance Measurement proposals, we held interviews with representatives of the NR national freight management team, and considered SBP supporting documents, freight industry responses to ORR's output measures consultation, Freight Recovery Board minutes and other supporting papers.

Findings

SBP performance planning approach

The process adopted by NR to create the SBP performance plan has been pragmatic, balancing Route ownership and central coordination and guidance. This has however generated varying levels of detail to underpin the forecasts, and we believe a somewhat cautious forecast overall. There may well be useful learning in future through assessing how reliable the various route forecasts prove to be.

The provision by NR of ranged forecasts is helpful, although this needs some care in interpretation and may create a greater perception of precision and deterministic outcome than is the reality. The forecast provides a reasonable level of transparency, although we consider that it would have benefited from improved clarity of which things NR considers itself accountable for, e.g. more clearly separating project mitigation, and other NR improvement action, from ToC led and fleet in its forecast.

Overall we found the planning approach to be reasonable, and to be based upon sound analytical modelling, although we have taken a different view of the likely range of some key inputs, as summarised below.

The principle set out in the SBP, of relying upon the rolling JPIP process to provide a meaningful delivery plan, and to respond to local customer requirements will be essential to provide confidence in delivery, to respond to emerging circumstances, and to deliver value.

PPM (Public Performance Measure) forecast

NR's stated commitment in the SBP to achieving the HLOS targets is encouraging, but we consider that they have been overly cautious in declaring only a 25% confidence level in achieving this, since this level essentially excludes the expected impact of national performance initiatives, and fleet and operator contributions; with these included, the implicit confidence stated by NR improves to 75%.

We consider that some potential risks have been understated in NR's E&W PPM forecast: principally the likely CP4 exit position, where we consider a range of between 91.4% and 92.4% is more likely than NR's 92.5% central assumption and range from 92.2% to 92.8%. We also identify a potential for a greater impact of adverse weather and external factors. This means that the performance trajectory is likely to be worse in the early years of CP5.

In other areas we consider the NR forecast inclines to being overly pessimistic: e.g. insufficient allowance for engineering access productivity and risk mitigation, limited benefits assumed through performance initiatives including CP4 carry-over, no benefits claimed for GSMR, few benefits on enhancement completion, and only a modest expected contribution from fleet and operator actions.

Overall we consider that there is a reasonable likelihood (which we have assessed as a 45% confidence) of achieving the HLOS target of 92.5% by the end of CP5, albeit with a wider range of potential outcomes.

CaSL (Cancellations & Significant Lateness) forecast

The forecast for E&W CaSL is subject to most of the same factors as for PPM, albeit with differing degrees of impact. We consider it is likely that the CP4 exit position will be worse than the HLOS target of 2.2%, and the impact of weather and externals in CP5 also places a greater downside risk, since these are a major contributor to CaSL. Targeted asset management, engineering access mitigation, fleet and operator contributions all have the potential to provide a more beneficial impact than assessed in the SBP.

Again it is encouraging that NR is committed to meeting the CP5 HLOS target, and overall we consider that there is a balanced likelihood of achieving the HLOS target by the end of CP5, but with the trajectory in the early part of the control period likely to be a little below target.

There is a much greater range of variability in CaSL performance by operator and by service group. Given that this is the case, there is a lack of targeted action evident in the SBP seeking to address the poorer performing operators. NR has stated that they would expect that this will be addressed as appropriate through the JPIPs, and ORR will need to monitor to confirm that this is the case.

Poor performing service groups

We have seen limited evidence in the SBP of targeted action directed at poor performing services, as required by the HLOS. We accept NR's contention that these will be addressed in part through enhancement works in CP5, as well as through developing timetables for improved performance, and actions at JPIP level. NR has also highlighted however that enhancement works are primarily geared to addressing future service growth, so will not necessarily address current poor performance, and it will be important to monitor that JPIPs are indeed targeting poor performing services effectively.

Bad days

ORR asked us to assess to what extent NR's plans would address days when performance is impacted severely. We have seen evidence in the Route plans that the underlying causes of severe delays are being tackled to some extent, e.g. through planned targeted action on the most vulnerable assets, and addressing the likelihood and consequences of major external impacts such as result from cable theft, suicides and severe adverse weather. The focus on this is variable by Route however, and the broad national assumption that the delay trend for these causes will be neutral across CP5 suggests that there is not a coordinated national focus to reduce these. NR may benefit from further effort to monitor and transfer best practices in this area during CP5, as well as considering how the development of performance indicators may allow a distinction between right time performance on good days, and service recovery following major incidents, which are blurred in the current metrics.

Value of setting higher output targets

Network Rail has not explicitly considered whether there would be improved value provided by seeking to deliver a higher level of performance output than the HLOS targets in CP5. Instead they have concentrated on how best to deliver the competing outputs of safety, capacity, journey time, and performance at an affordable price. This approach has clearly been consulted and agreed to a large extent through the NTF in advance, and was as anticipated from our discussions with NR during part 1 of our work, ahead of the SBP publication.

The selection of options to include in the SBP, as well as the consideration by NR of trade-offs between capacity, journey time and performance, has implicitly involved some judgement of the relative value of pursuing a higher level of performance. NR led a series of studies in the lead up to the SBP which demonstrated that operating more intensive services, especially on longer and more complex routes, as

well as increasing line speeds, would all be likely to adversely impact performance. This is all logical, and has clearly had some influence on the CP5 strategy. We have not sought to investigate these trade-offs further in our work. For the SBP, NR has assessed value largely in the context of whether additional inputs are required and affordable to increase the confidence of achieving the HLOS targets, rather than whether they would allow the targets to be raised.

We have sought to compare the marginal costs for optional investments with the marginal benefits for alternative levels of performance, drawing upon sampled NR data to understand costs, and modelling revenue impacts on selected service groups. This analysis has demonstrated that there is a wide variation in the potential benefit value by service group, such that further targeted action to improve performance is likely to offer value on some but not all routes. The range of appropriate actions could clearly be extended if a longer pay-back period was applied than NR normally adopts in its appraisals, and if socio-economic benefits were included. Both of these might be deemed appropriate from a passenger perspective, but are not necessarily affordable.

Our very high level assessment of the likely value of setting a higher output target on a national basis appears to indicate this would not be worthwhile. However, very considerable caution needs to be applied to this conclusion, since we are adapting analysis conducted by NR for a different purpose (sensitivity testing its cost forecast), and this data does not necessarily reflect a sustainable assessment of cost and output impact.

Although this analysis provides insufficient justification for setting a higher E&W target for either PPM or CaSL, there may well be value in driving for a higher performance level than NR has indicated in the SBP for some Operators, especially for long distance and intensively used L&SE services, where the marginal value is inherently higher. The case for this is likely to be best explored at local level as part of the JPIP process, and in considering the business case for specific optional investments.

Affordability

Determining the likely affordability of setting a higher level target for performance in CP5 introduces further uncertainty to the assessment of value described in the previous section. We have extrapolated the potential marginal costs per nominal train as derived in the value assessment, to determine a potential range of annual cost increase associated with establishing a higher level of performance. This indicates that a lower bound of around £70m per annum and an upper bound of £900m per annum might increase performance by around 0.5% PPM and CaSL by around 0.1%. However these extrapolations presume at the lower end an effectively inexhaustible supply of improvement opportunities, which is clearly not the case.

We have not been able to make an assessment of what further improvement actions might also be available beyond those already envisaged in the SBP, since NR appears to have generated relatively limited

information in this regard in the SBP process. There may well be some lower cost activities than those identified in our analysis. NR are developing a range of potential further initiatives, but are likely to take these forward only when there is reasonable management capacity available to progress and implement them, and NR expect this in part to mitigate potential emerging adverse impacts on performance.

Scotland KPIs

The Independent Reporter considers that the proposals for Scotland KPIs are clearly based on sound thinking, which has taken into account that these must be practicable, measurable, comprehendible, and manageable. Although there is still more work to do to determine a reporting format, and detail management arrangements for CP5, we have no doubt that this will be achieved The package of KPIs is, with one or two minor exceptions, also consistent with the common themes which emerged from the ORR consultation on 'NR's Output Framework for 2014-19'.

The effectiveness of this approach is likely to be of great interest to the Regulator and User Groups (and NR and TOC management teams) in E&W. Transport Scotland (TS) has taken the view that the experience gained over the next few years will benefit not only the passengers, but also those responsible for setting the regulatory outputs for CP6 in 5 years' time. In this respect, we consider that TS has demonstrated commendable forward thinking with this HLOS requirement.

Freight

The Independent Reporter considers that a reasonable case has been presented to adopt the new Freight Delivery Metric (FDM) as a Regulatory performance measure for CP5 as an alternate to the Freight Delay Minute indicator used in CP4. This appears to have good industry support, since FDM is considered to be a more direct measure, reflective of customer value, and one which focuses solely on NR performance, making it more suitable as a regulatory measure. NR propose to continue to operate Freight Delay Minutes as a national indicator, and we also consider this sensible to allow targeted management of delay causes and continuity with historic data.

Network Rail has set out its preliminary proposals for a target FDM performance level of 95% for CP5, as part of the on-going dialogue with the Freight Joint Board in developing this measure. Whilst this is likely to be broadly appropriate we do not consider that there is yet sufficient track record of operational use for this measure as a basis for finalising a Regulatory target. Furthermore, we do not consider that there has been sufficient evidence presented by NR to substantiate the need for a performance floor significantly below the target level, and specifically to justify the level of the various impairments proposed in reaching its proposed 91.35% figure. We consider that a variable trajectory should be established, since the various risks and opportunities will clearly vary across CP5.

Governance and change control

We acknowledge and support NR's proposals that the rolling JPIP process should continue to be the primary delivery planning mechanism for performance in CP5. As noted above, given the uncertainties inherent in long term planning, it will be important that these are used to mitigate emerging risks, and to target poorly performing services and appropriate value for money. We also consider that it would be helpful to establish clear expectations as to how the outline plans for year 2 become firm plans for year 1 in the rolling JPIP process; such that the medium term planning activity is effective and does not lose credibility in the industry.

We do not see any great merit in NR's proposals for setting a performance floor for CP5 at 90% PPM. There might easily be circumstances when performance remains above this level, but is deemed unacceptable, and it is not inconceivable that performance might fall below this level and still be deemed acceptable. We consider it likely to be more effective to consider such circumstances at the time in judging whether Regulatory intervention is necessary.

We support NR's proposals for an explicit change control mechanism relating to performance outputs, the types of changes to which this should apply, and the governance arrangements envisaged. In practice however, it is likely that very few individual changes would constitute a material change at national level. Network Rail's Delivery Plan for CP5 is likely to provide the effective baseline for change control. Consideration of the requirements for a performance baseline should therefore form part of the specification for the Delivery Plan.

Key conclusions

In relation to the three primary questions posed by the mandate, the Independent Reporter considers that:

1. We have not seen evidence that an alternative (higher) level of output target beyond that specified in the HLOS for E&W PPM and CaSL would represent value for money, or be affordable in the context of the other outputs and affordability constraints which NR is required to deliver. However, this is a very complex area, and whilst there is not in our view a case for a higher national target, the evidence suggests that there may well be value in pursuing higher levels of output on some routes and poorly performing services, potentially at the expense of those where performance is already strong.

2. The proposals developed for a package of performance KPIs in Scotland are suitable and are likely to be effective in achieving the objectives set out by the Scottish Ministers in its HLOS. We commend this approach, and consider that it is likely to provide valuable learning for the rest of the network.

3. The approach adopted by NR to developing the performance plan for the SBP is reasonable, although there remains a high degree of uncertainty in the forecast performance. It will therefore depend upon

an effective JPIP process and continued national programme management to ensure that this is translated into a deliverable plan. We have differed from NR's view on the likely trajectory and confidence limits for both E&W PPM and CaSL, notably in recognising a likely lower starting position countered by a greater upside potential for improvement during CP5, resulting in a wider range of outcomes. Nonetheless, we believe that provided sufficient effort is put by Network Rail into progressing performance management initiatives, and that the industry aligns with NR in progressing ToC led improvements, there is a reasonable likelihood of achieving the HLOS targets for PPM and CaSL. The wide range of potential outcomes is not surprising at this stage, but demonstrates that continued viligance will be needed by all parties to achieve the desired outcome.

Recommendations

We have made a number of recommendations for consideration by NR and ORR.

We recommend that Network Rail should:

1. Undertake further work to substantiate the key assumptions and relationships underpinning the development of the Freight Delivery Metric (FDM) and communicate these to stakeholders, prior to finalising the proposed FDM target. This should include reasonable expectations for improvement action upon freight performance in CP5, as well as identified risks.

2. Operate FDM in parallel with the existing delay minutes metric for the remainder of CP4 as a 'dummy run', in order to provide confidence to the ORR that the target and measure is appropriate, and to give NR the opportunity to better refine the FDM target for CP5, prior to its endorsement by the Freight Joint Board and ORR.

3. Utilise current analysis of CP4 performance, and in particular the benefit monitoring of Base + and Base ++ initiatives, to understand ore fully the expected performance trajectory, and hence whether and where it should undertake further improvement activity in support of achieving the CP5 targets, and JPIPs. We consider that the confidence in relation to this element of the plan is not as high as it could be, and more rigorous benefit management should improve this.

4. Undertake a lessons learnt exercise on the different approaches adopted by its Routes and national team in preparing the SBP, and establish a plan to monitor the reliability of the forecasts generated and to share best practice.

We recommend that ORR should:

1. Give consideration in setting Regulatory targets for CP5 performance, to the revised profile and ranges for England & Wales PPM and CaSL which the Reporter has set out as reasonable ranges for performance in CP5, taking into account NR's plans, risks and opportunities.

2. Not set a higher level of target for either E&W PPM or CaSL for CP5 than proposed in the HLOS on the basis of the value analysis and affordability assessment conducted by the Reporter, since we do not consider that our assessment has provided evidence that this would be value for money at national level.

3. Consider whether it would be desirable to set some expectations as to the content for JPIPs, and also the means by which the targets for year 2 of rolling JPIPs should be amended to become Customer Reasonable Requirements for year 1.

4. Provide a mechanism by which, after the CP5 determination, Transport for Scotland (and possibly NR and FSR (First Scotrail) retain the right to modify within reason (and with ORR approval), the package of KPIs. We consider it likely that through use, and with the benefit of experience and hindsight, opportunities to modify and improve the package will inevitably come to light.

5. Engage with NR and the National Task Force in the further development of the proposed change control mechanism, and in particular, that consideration of the requirements for a performance baseline should form part of the specification for the Delivery Plan.

1. Scope of report

This report provides the views of the Independent Reporter on the NR Strategic Business Plan in respect of Performance Analysis and Targets in response to Mandate CN022. Mandate CN022 required us to respond in 2 parts. We reported on Part 1 (our proposed methodology) in December 2012. This is the final report produced at the end of Phase 2 of our mandate.

The key questions which the mandate required us to address are as follows:

"We require the reporter to assess the SBP and advise the ORR:

1. what level of PPM, over 92.5% and CaSL below 2.2%, is value for money and affordable for England & Wales without compromising delivery of other HLOS requirements; and

2. to advise if the package of KPIs, developed by NR with the industry, will be effective in achieving the objectives set out by the Scottish Ministers in its HLOS."

In addition, in order to answer question 1 above, we agreed that we would first need to assess the extent to which the SBP provided a suitable baseline proposal for addressing the HLOS PPM and CaSL targets for England and Wales (E&W).

In addition to the scope of the original mandate, this report also encompasses the summary output from various additional tasks as varied into the mandate. The full mandate, as amended is included at Appendix A. These additional tasks required us in particular to consider and advise on the appropriateness of NR's forecast ranges and trajectory for PPM and CaSL for E&W. It also required us to consider the suitability of the proposed target for the proposed Freight Delivery Measure for monitoring freight service performance.

This report is intended to inform the ORR in producing its Draft Determination for Periodic Review 2013.

Note that we refer in many places in this report to the term "performance"; this is a short-hand for operational train service performance, rather than any wider consideration of NR or industry performance.

2. Background

As part of the Periodic Review process, NR has produced its Strategic Business Plans (SBP) for England and Wales and separately for Scotland. These, together with an extensive volume of supporting documents, set out its intended approach to meeting the HLOS. This was published on 7 January 2013.

In respect of train service performance, the HLOS for England and Wales set out the requirements as below. In conducting our assessment of suitability we have given close consideration to each of the expectations set out in the HLOS[1] below.

E&W HLOS

19. Reliability has continued to improve in CP4. The high amount of recent investment in the rail network means it is not yet clear how much further performance improvement can be delivered in CP5 without incurring investment which is not value for money or which compromises the delivery of other HLOS outputs.

20.Bearing in mind the need to balance different objectives, the Secretary of State is setting a Metric specifying that reliability, as measured by the 'public performance measure' (PPM), should achieve an overall level of at least 92.5% moving annual average by the end of CP5. She wishes to have a higher level if the ORR determines this is value for money and can be affordably achieved without compromising delivery of other HLOS requirements.

21.The Secretary of State also wishes to see a reduction to no more than 2.2% by the end of CP5 in the overall percentage of trains which are cancelled or arrive at their final destination significantly late ('Cancellations and Significant Lateness' - CASL). Again, she wishes to have a better level if the ORR determines this is value for money and can be affordably achieved without compromising delivery of other HLOS requirements.

22. In respect both of PPM and CASL, the Secretary of State requires that the industry focuses on improving the worst-performing routes and those on which lower levels of reliability have the greatest economic effect and would wish to see a plan is produced to this effect.

1 High Level Output Statement for England and Wales, SBP Guidance

23.In framing the Reliability Metrics and Requirements in this way, the Secretary of State wishes to secure an outcome where the industry is empowered to secure an overall level of reliability in CP5 at least as high as that which is likely to be achieved in CP4, but which is more consistently delivered, improving the passenger experience.

Scotland HLOS

3.7 The Scottish Ministers expect a consistently high level of performance from rail services in Scotland for the benefit of passengers and freight users in Control Period 5 which builds and improves upon what is expected to be achieved by the end of Control Period.

3.8 The Scottish Ministers therefore require that the outputs of the network will be maintained in such a manner as to enable the operators of each franchise let by the Scottish Ministers to achieve a Public Performance Measure (PPM) of 92.5% by the end of Control Period 5, with a minimum PPM of 92% achieved across each year of that Control Period. The Scottish Ministers also require that the outputs of the network will be maintained in such a way as to recognise the position of other operators on the network.

3.9 In support of the delivery of the PPM, the Scottish Ministers will also require NR to work with its industry partners to develop key performance indicators which as a package:

- encourages and facilitates outperformance of PPM, as outlined above
- measures and improves performance on 'right time' measures over the lifetime of the Control Period
- are not to the detriment, and where possible improve, the level of service provided to other operators
- reflects the impact of performance on passenger experience
- reflects the economic value of services, disaggregated by Scottish service group, or line, or time period or a combination of those things
- are sufficiently flexible to take account of periods of severe disruption, with a focus on working with all affected operators in those circumstances to provide the best service possible for rail users
- do not add additional expenditure to the baseline costs of the Scottish operating route.

3. Review approach

The Independent Reporter was requested to deliver mandate CN022 in October 2012. Our review team, as set out in our response to the mandate, is listed in Appendix B1.

Having considered NR's preparatory work on performance analysis and planning, we reported on Part 1 of the mandate, setting out our methodology in December 2012.

Network Rail subsequently published its SBP for England and Wales and SBP for Scotland on 7 January 2013, and made a range of supporting documents available shortly thereafter. In accordance with our proposal, we have reviewed these documents, undertaken various targeted interviews with NR staff to understand its proposals (as listed in Appendix B2), attended selected NR / ORR SBP challenge meetings, and undertaken analysis of the plans and background information.

In reviewing the effectiveness of the performance planning process, and the validity and confidence in the performance metric trajectories proposed by NR, we undertook interviews both with NR's national team who were responsible for coordinating the performance planning process, and also sampled three Routes in some detail. The Routes selected for this sampling (Kent, LNE and LNW) were intended both to be representative of the full complexity of performance issues, and also those (as advised to us by the national team) who had more significantly developed their own local forecasting assumptions and processes.

In addition we also visited the Scotland Route and held discussion with representatives of Transport Scotland and First Scotrail, and considered the SBP for Scotland and supporting documents, in order to fully understand the expectations and approach to performance monitoring and measurement in CP5. We were also provided with draft documents setting out the intended measurement approach as these developed during February 2013.

In order to make an assessment of the potential economic value of higher levels of performance, we also undertook some analysis of the likely marginal revenue effects and socio economic benefits of alternative performance levels for both PPM and CaSL on a sample of routes. In order to understand how this value was likely to vary across the network, we selected five service groups for this analysis, which were intended to be broadly representative of a range from higher to lower expected value. Since the revenue data is deemed commercially sensitive, we have redacted the operator specific details:

- Long distance operator 1
- Long distance operator 2
- LS&E operator
- Regional operator 1
- Regional operator 2

Further detail on our value assessment methodology is provided in Appendix C.

Lastly, in relation to the Freight Performance Measurement proposals, we held interviews with representatives of the NR national freight management team, and considered SBP supporting documents, Freight industry consultee responses to ORR's output measures consultation, Freight Recovery Board minutes and other supporting papers.

4. Assessment of SBP plan for passenger performance

In this section we comment firstly on the overall approach adopted by NR to producing the SBP forecasts, secondly on likely accuracy and reliability of the supporting models, and subsequently on the confidence in the various key input assumptions. We then present a summary of the Independent Reporters views on the performance forecasts for PPM and CaSL, and the output from various sensitivity tests on the input assumptions, before finally presenting an IR view on the likely CP5 performance range.

Methodology adopted by NR at Route and national levels for SBP performance planning and forecasting

The methodology adopted by NR in deriving the forecast PPM performance trajectory for CP5 is contained in NR documents entitled CP5 Performance Estimating Methodology (undated) and CP5 Performance Estimates & Analysis (Rev 01 dated Dec 2012).

The methodology is succinctly illustrated in a process map, which appears in the above documents, and is reproduced in figure 1 below.

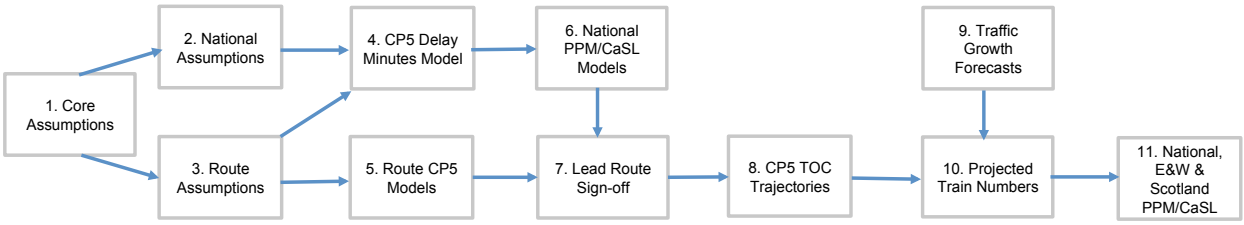


Figure 1: NR CP5 Performance Estimating Methodology process map

The process adopted by NR was reviewed at high level as part of the CN/022 Phase 1 assessment and described in the Phase 1 report as incremental and sound in principle. That conclusion is unchanged as a result of the deeper assessment carried out as part of Phase 2 work.

The 8 main stages in the process (with references to the 11 steps in the process map above) were as follows;

1. National guidance

   The Route teams were given initial guidance by the national team about the PPM trajectories which each of the TOCs would need to achieve over the 5 years of CP5 if the overall HLOS target of 92.5% was to be achieved. The guidance from the national performance team included a statement of the traffic growth forecast (provided by the national planning team) as well as an assessment, in the form of congestion factors, of the increased reactionary delay which would result from the traffic growth forecast (steps 1 & 2).

2. Route modifications

   The Route teams then applied a number of local modifications for a number of factors to the initially proposed trajectories, based on either their own judgements and calculations or using assumptions offered by the national team (3, 4, 5 & 6).

3. Route submissions

   The Route teams then agreed the final TOC trajectories, and the forecast range of possible outcomes between a 'best case' and 'worst case' scenario, with the relevant TOCs, before submitting them to the national team along with any qualifications or caveats (7 & 8).

4. National modifications

   The national team then applied a final small adjustment to the TOC trajectories submitted by the Routes to reflect the changes to relative train numbers operated by each TOC as a result of increased train kms, thus deriving a set of TOC trajectories with 'best case' and 'worst case' outcomes, which could be aggregated into a single national trajectory (9 & 10).

5. Aggregation of Route submissions

   The 'best case' and 'worst case' outcomes were attributed confidence levels of 25% and 75% respectively and then aggregated using a Monte Carlo methodology during which 10,000 iterations were carried out in order to derive a single national trajectory for the Route submissions (11).

6. National overlays

   The national team then derived 2 separate overlays to be applied to the single national trajectory. These were known as National Performance Improvement and Industry Improvement & Project Risk Reduction overlays. These overlays took the form of additional trajectories, with 'best case' and 'worst case' scenarios, to reflect the performance improvements which are expected to occur as a result of initiatives not yet visible to the Route teams (11).

7. Aggregation of national overlays

   The 2 overlays were then aggregated, along with the trajectories submitted by the Routes, using the same Monte Carlo methodology. This created a single final forecast trajectory for the overall effect of all NR and non-NR driven foreseeable and anticipated performance improvement effects over the whole of CP5 (11).

8. Derivation of E&W and Scotland components

   The above step was repeated for just the E&W components of the national forecast and for just the Scotland components.

The resulting NR forecast trajectories for CP5, and the associated probability and cumulative probability distribution curves, are defined by a suite of relevant charts and graphs in the SBP, some of which are reproduced in Appendix F.

Overall quality of process

The IR's assessment of the overall process adopted by NR is as follows;

- The overall process of deriving the national trajectories was logical and defensible and encouraged devolved Routes to accept accountability for their forecast TOC trajectories.

- The process involved high levels of judgment by informed individuals. These were largely unavoidable. The exercise of performance forecasting is not an exact science (and less exact than the processes of modelling journey time and capacity).

- The approaches taken by NR to the modelling of CP5 funding and train performance were very different. In essence, the Routes were given financial targets and other output targets and asked how good could be the train performance. They were *not* given a train performance target and asked how much it would cost to deliver it.

- There was a great temptation for the Routes to be risk-averse in their judgements and thus set lower targets with lower levels of confidence than they might otherwise have done. There was no incentive on Routes to do otherwise, especially given the uncertainty implicit in making performance forecasts over a 5-year period. Also, NR placed great significance throughout the process on the value and importance of the JPIP process, and the fact that it will encourage subsequent honest and well-informed joint discussion at local level about short-term performance targets in establishing delivery plans.

- When interviewed, the Routes made frequent reference to the largely unpredictable nature of external influences such as weather, fatalities, cable-theft, TOC attitudes and DfT franchising policy. Also, the Routes were sceptical about the performance benefits from nationally driven initiatives, including those currently forecast to begin delivering benefits in CP4, until these had been established as local initiatives included in their JPIPs. These concerns added to the forecast cautiousness of the Routes in making forecasts.

- The use of confidence limits applied to forecast trajectories was helpful, although the maturity of the process as applied to performance modelling and knowledge levels amongst Route performance management teams as applied to performance modelling are clearly lower than those applied in other areas where risk assessment has become common industry practice, (such as for example in cost planning of major projects within the industry). NR has utilised their wider risk management expertise to guide the process, which is fundamentally sound, but many of the inputs are judgement based.

- There was some evidence amongst Route teams of a lack of acknowledgement of the vital importance of getting 'the basics' right as a result of which the potential for 'continuous improvement' was generally not seen as an area for performance improvement through CP5. In the opinion of the Reporter this is a major opportunity area for NR.

The process adopted by NR did little to counter a risk-averse reaction from the Routes. In response to this risk averseness, NR appear to have applied national performance improvement "overlays" which lack substantiation and may therefore carry more risk than that suggested by the confidence limits applied to them. The net effect of this has resulted in a national forecast performance outcome of 92.5% with a reasonably high level of confidence. This is consistent with the general view which now seems to exist in the industry to the effect that a performance plateau will have been reached by the end of CP5. NR has acknowledged that they have developed the nationally applied overlays, largely in order to demonstrate the potential for an acceptable confidence level in achieving the HLOS CP5 exit targets. NR therefore appears to be accepting the challenge that, as industry leader, it must find methods, as yet undefined in detail, to deliver the target set, whilst at the same time delivering unprecedented levels of physical and structural change and without taking the easy options of journey time or capacity worsenment.

We provide a further commentary on the modelling approach, and the rigour of the mathematical modelling in Appendix E. We found no fundamental flaws or weaknesses in this work.

In the view of the Independent Reporter, the forecasting approach adopted by NR appears reasonable and credible in the context of the structural changes to a devolved railway, and the ongoing JPIP delivery planning process.

Assessment of SBP forecasts for PPM and CaSL for E&W

CP4 / JPIP Exit Trajectory

A key assumption in forecasting CP5 performance is the expected exit position at the end of CP4, since the modelling approach takes this as an assumed base for applying subsequent actions. This is in itself subject to uncertainty relative to the Regulatory targets of 92.5% PPM and 2.2% CaSL. Nonetheless for the purposes of SBP modelling, NR has assumed a most likely forecast that they will achieve these targets, with a tolerance range for PPM of +/- 0.3% e.g. 92.2% to 92.8%.

The LDRP and LSEP Quarter 3 Report indicates that PPM is running below the Regulatory target, with Long Distance sector 1.7% worse than target, and L&SE sector 0.5% worse than target. This however is offset by Regional sector performance which is currently 0.5% worse, but predicted to improve to above target. The Q3 results are not necessarily typical as bad weather and external events depressed the PPM and CaSL. This effect will not necessarily be repeated in 2013/14.

The LDRP and LSEP Quarter 3 Report also states an updated forecast for the end of 2013/14 for Long Distance sector at 90% and L&SE sector at 91.9%. Assuming a Regional sector performance of 92.6% and allowing for the relative contributions made by the sectors to the overall E&W outcome, this implies a current NR forecast for the end of CP4 of around 91.9% at 90% confidence levels.

This forecast (of 91.9%) is at variance with the NR interim forecast emerging from the spring 2013 JPIP process. This suggests a forecast 2012/13 year end position for E&W of 91.2% and a projection for end of CP4 of 92.4%. This is still an emerging picture with JPIPs currently under development. It incorporates an assumption that seasonal effects will be an average of the last 5 years. Although slightly below the Regulatory target, this forecast can still be considered uncertain, and challenging to achieve since it is dependent upon significant improvement contributions from many local and national (e.g. Base +) initiatives.

The LDRP and LSEP Quarter 3 Report makes it clear that the forecast of 91.9% is, however, likely to increase as additional improvement plans based on best practice emerging from the recent West Coast South improvement programme led by Chris Gibb, the LSE Asset Plan led by Dave Ward and any new initiatives emerging from the spring 2013 JPIP process.

Taken together with recent performance trajectories, initiative deployment risks, and weather uncertainty, we consider that a range of outcomes between 91.6% and 92.4%, with a most likely position of 92.2% is a more realistic planning assumption than the 92.5% assumed by NR in the SBP.

CP5 forecast trajectory

Network Rail has built up the CP5 performance forecast in four main layers, as presented in the SBP Performance Annex[2], an extract from which is shown in figure 2 below. These build upon the expected CP4 exit position by applying additional trajectories for each of the main expected drivers of change in performance:

1. traffic growth, and Thameslink (shown pink below)
2. route forecasts, including asset performance, local and national operational management initiatives, the carry-over from improvements started in CP4, and potential works access disruption (shown blue); layers 1 and 2 have formed the basis of Operator forecasts in the SBP
3. centrally led performance improvement initiatives, e.g. additional Base + and Base ++ ideas not yet initiated (shown grey)
4. nominal further stretch allowance for reductions in NR, ToC on Self and ToC on ToC caused delays (shown white); layers 1 to 4 aggregated have formed the NR "upside" E&W forecast in the SBP

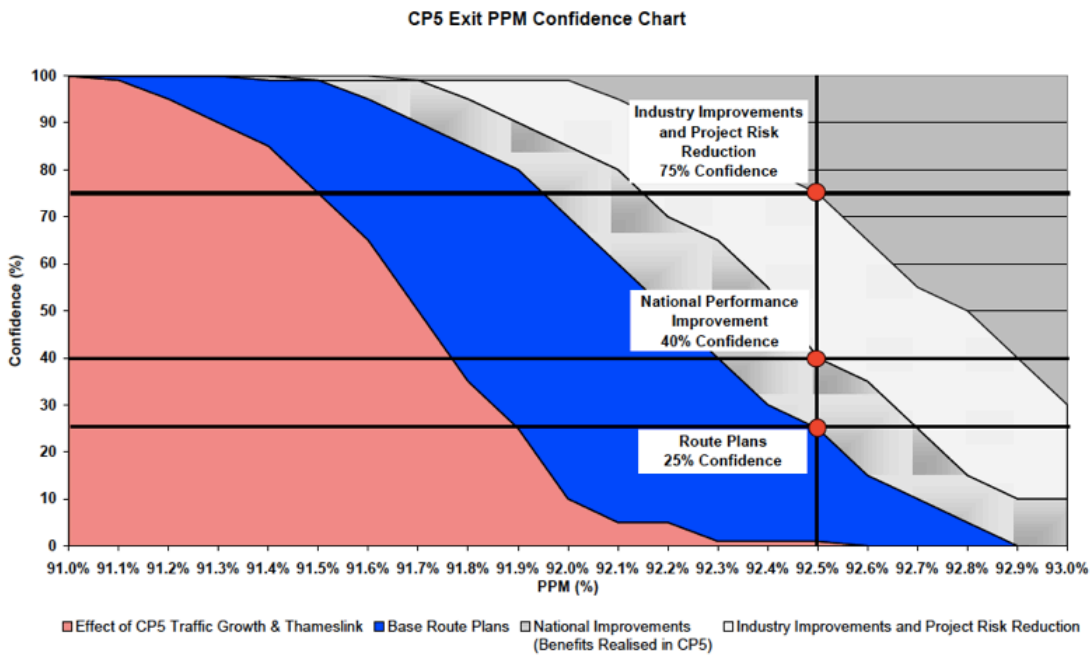
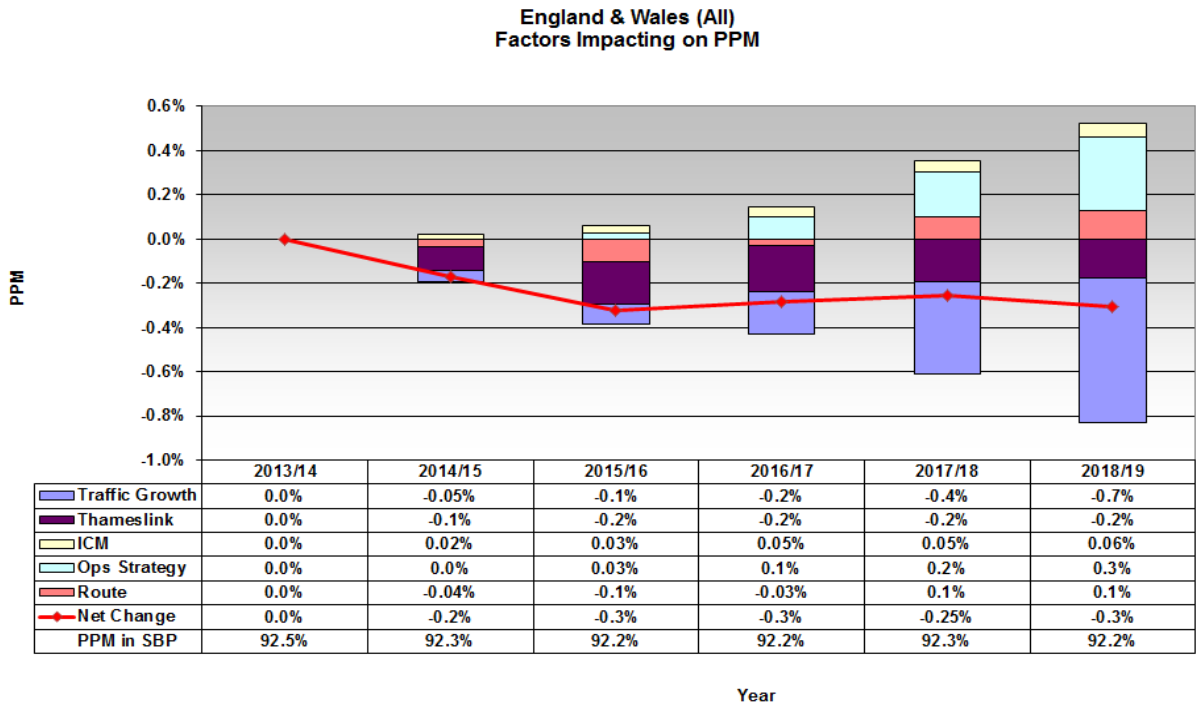


Figure 2: SBP forecast CP5 exit ranges for E&W PPM performance

[2] "Performance Plan for England, Scotland and Wales", version 1.0, 7 January 2013

Build up of PPM Trajectories

Network Rail consider that the core Performance plan is reflected in layers 1 and 2 above. These have had considerably more detailed development and modelling than the forecast in layers 3 and 4. The main contributions to the forecast PPM for E&W in layers 1 and 2 above, are shown in Figure 3 below. This data and graphic is derived from NR's own SBP supporting data file, and has been adjusted by the IR only in so far as we have combined the NR Route contributions reported separately as Route Inputs and Additional Route Inputs in NR's data file. We have combined these since they appear to reflect only different approaches to calculation, rather than different sources of delay.



	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Traffic Growth	0.0%	-0.05%	-0.1%	-0.2%	-0.4%	-0.7%
Thameslink	0.0%	-0.1%	-0.2%	-0.2%	-0.2%	-0.2%
ICM	0.0%	0.02%	0.03%	0.05%	0.05%	0.06%
Ops Strategy	0.0%	0.0%	0.03%	0.1%	0.2%	0.3%
Route	0.0%	-0.04%	-0.1%	-0.03%	0.1%	0.1%
Net Change	0.0%	-0.2%	-0.3%	-0.3%	-0.25%	-0.3%
PPM in SBP	92.5%	92.3%	92.2%	92.2%	92.3%	92.2%

Figure 3: SBP contributions to E&W PPM forecast

The main performance drivers illustrated in Figure 3 are the contributions from Traffic Growth, Operating Strategy (and TMS), Thameslink and "Route Inputs". Route Inputs cover a broad mixture of inputs, such as targeted asset management action where this varies from ICM assumptions, the impacts of expected disruptive engineering access, local improvement initiatives and allowance for seasonal affects. The scale and scope of this varied by route, and assessments are essentially judgemental. Although the individual

Route inputs show varying levels of increase and decrease, in aggregate they are modest and improvement actions are largely assumed to merely neutralise risks.

Commentary on planning assumptions adopted by NR and key sensitivities

The following section considers the main input parameters and assumptions which NR has made in producing its SBP performance forecast. References throughout to "downside" are expected worsenment on performance forecast and "upside" are expected betterment.

Traffic growth

Congestion impacts upon performance have been shown to be very significant in the Trade-Off analysis, which NR has undertaken in the lead up to SBP. NR has assumed underlying passenger train km growth of 7%, and freight train km growth of 16% over CP5, based upon available industry forecasts.

In addition to impacting asset wear and tear, and hence potentially reliability, NR has demonstrated that traffic growth affects the degree of reactionary delay especially on congested route sections, and have established regression relationships for this linkage. NR has allowed for the constraint on growth imposed by capacity constraints, at least until such time as these are addressed through network enhancement, but assumed demand will translate to off-peak growth elsewhere.

We believe NR's approach here is sound, although moderate uncertainty remains regarding the amount of passenger growth and extent to which this translates to additional services in the off-peak. There is a higher degree of uncertainty in freight volumes, especially given the likelihood of increases in freight charges which will suppress demand; we therefore consider that the greater uncertainty is on the upside, e.g. for a lesser impact on performance.

Thameslink

Thameslink is a major component of the E&W forecast, since it represents a major and challenging programme of engineering work throughout CP5. With the delivery of Key Output 2 in the final year, it will also introduce a significant additional volume of services, which are inherently a high performance risk, since they interact with many other flows across the network. NR's trade-off work has demonstrated the relative lower reliability of such services.

Thameslink is a relatively mature project, with a high level of modelling of the expected performance impacts, notably in work undertaken by SDG. NR has in general adopted the SDG modelling conclusions as part of its SBP forecasting, although the affected Routes have made some adjustments where they consider the modelling under-estimates the impact upon the most congested route sections.

We consider that the assumptions made are broadly reasonable, although there is a lesser confidence attaching to the interim years which have been subject to less timetable development, than for the final step post KO2. Overall a relatively high level of confidence applies to this element of the forecast, compared with other components as below.

Asset performance

Asset reliability will vary in response to wear and tear, and the asset management regime which NR adopts. This is modelled through NR's cost models. Resulting delay will also depend upon the extent of reactionary delay, as measured in delays per incident (DPI). NR forecasts an increase in DPI during CP5, especially in year 5, reflecting the expected increase in traffic levels. This seems reasonable, although targeted response action may counter this to some extent.

The asset policies which NR intends to adopt for CP5 are expected to offset the impacts of increasing traffic in order to achieve levels of Delay Minutes which remain broadly stable with those as achieved by the end of CP4, from asset performance. Some routes have assumed a modestly improving trajectory through targeted action to address performance hotspots. Examples are the targeting of earthworks on LNE, and a power supply cable renewals campaign on LNW. There is also extensive upgrading of power supplies planned, which should improve resilience. Overall this type of planned action is assumed by NR to provide modest contributions to improving E&W PPM by end of CP5, of around 0.04% for non-track assets and 0.02% for track assets.

We consider that, given affordability constraints, the planning assumption which NR has adopted is reasonable, although the extent to which asset management is able to offset underlying traffic growth effects is uncertain, and this reflects a greater risk than presented in the SBP forecast. As noted above, we consider that the traffic growth forecasts may represent a worst case, especially for freight, so there is also some potential upside if growth is lower. We have allowed for a modest additional up and down side in our forecast trajectory.

Route deployed operational performance improvement initiatives

This category covers a broad range of local and national initiatives. Examples are:

- Key Route strategies to combat seasonal risks
- focus on Right Time Railway improving the underlying quality of timetables and delivery to these
- additional information controllers at Manchester
- additional PPM controllers to help improve regulation of long distance services

- cable theft prevention initiatives on LNW (and other routes)

In general the routes have stated that their energies have been focussed on the short term, and striving to achieve the CP4 performance targets, rather than detailed planning for CP5. This is understandable, especially since, as noted above, there is still a significant gap to close in CP4.

Although NR has applied a broadly common approach in generating a national forecast for E&W, the nature of Route devolution has meant that alternative assumptions have been developed by each Route within an overall national framework. This has meant that Routes have reflected their own challenges and views of opportunities, and have developed their plans in consultation with their Train Operator customers. NR expects the Routes to continue to develop JPIPs with each operator on a rolling basis throughout CP5 as the mechanism to flesh out deliverable plans. Appendix D2 summarises the Route assumptions and illustrates that the different routes have recognised different challenges, and to some extent applied different priorities.

In responding to the need to deliver a range of other outputs within an affordability constraint, we observe that performance outputs have not generally been given a high priority relative to other outputs. The Routes which we sampled (Kent, LNE and LNW) also stressed the adverse impacts of traffic growth and enhancement work, and the degree of uncertainty in their forecasts of potential improvement. This has resulted in a relatively risk averse performance forecast. The performance benefits which may be expected to carry over from performance improvement initiatives and enhancements delivered at the end of CP4 appear understated compared with the benefits anticipated at their launch. Based upon the latest LDRP and LSE Recovery Plan forecasts, it is expected that a contribution to national PPM of 0.3% will be generated from Base + initiatives in 2013/14, and given the profile of delivery across this year, the full year effect is likely to be an additional 0.3% contribution in the first year and throughout CP5.

We acknowledge that there is considerable uncertainty, which in some cases as noted below we consider may be greater than that reflected in the ranges forecast. In general however, we consider that there is likely to be more upside, as well as some further downside, than allowed for in the route forecasts. We comment on specific points in the following sections.

Operating Strategy, Traffic Management System

A core feature of NR's operational strategy is the consolidation of signalling control into fewer Route Operating Centres. This will also facilitate the deployment of modern Traffic Management System. Once implemented nationally, this is expected to bring substantial performance benefits (business case projects a 4% reduction in delay minutes nationally), especially in recovering from major disruption. NR has adopted a cautious profile of benefits, significantly below those assumed in the TMS business case, and many Routes have assumed no performance benefit at all in CP5. Nonetheless this contributes around 0.3% to E&W PPM by the last year of CP5. We acknowledge that there are uncertainties in the schedule and scale

of benefit, and most of this will be realised in CP6, but consider that there is more CP5 upside than recognised in the SBP.

GSMR

Network Rail acknowledges that there are likely to be performance benefits associated with the implementation of GSMR, particularly on those routes where there is not already some alternative form of in-cab digital radio (e.g. Cab Secure Radio). GSMR is in use across over half of the network now, and it is expected that the remainder of the network will be fitted in 2013/14, bringing further potential benefit early in CP5. However NR has assumed that this will be performance neutral in CP5, since there are uncertainties in the phasing of the bringing into use by remaining Operators, and the associated scale of benefit. We acknowledge that there are some uncertainties, but these are modest, and there is considerable existing experience of the benefits realised, so we consider this to be an over-cautious approach. With benefits still to be realised for around one third of operators in CP5, and on past experience GSMR is likely to result in overall reductions of 3% in delay minutes, a sustainable contribution to reducing E&W PPM by around 0.08% might reasonably be anticipated.

External delay causes

Network Rail expects to continue to focus on those external events that have the highest impact on performance and to address these through the initiatives that they have put in place in CP4 to prevent cable theft and suicide incidents. This is likely to yield a particularly beneficial impact upon CaSL.

Given the relationship between suicides and on-going economic uncertainties, it is difficult to project the likelihood of suicides on the rail network, so NR's assumption that the impact of suicides will be performance neutral in CP5 is reasonable.

NR has adopted a similar approach for cable theft; this assumes that it is performance neutral during CP5. The performance plan states that increased theft due to a forecasted copper price rise will be mitigated by activities undertaken by NR and proposed legislative changes to scrap yards.

Weather effects

Network Rail has committed to identifying and addressing those assets that are most susceptible to extreme weather, as outlined in the SBP and Route plans. We would expect the increased level of investment in these assets, alongside route specific initiatives and the increasing use of localised weather forecasts to result in a reduced level of delay for individual severe weather events, and a subsequent improvement in performance. The underlying assumption in NR's CP5 performance forecast uses an average weather delay of the past five years, and assumes a neutral impact compared with CP4. Given that NR has acknowledged within the SBP that incidents of extreme weather are becoming more common,

we believe however that they should have built some additional estimate of extreme weather frequency into their CP5 performance forecast. Although this would result in a further downside to the forecasted performance range, we believe that this would improve its robustness. We have allowed for this possibility in our assessment, which is explicitly a different assumption from NR's.

Engineering access disruption

We accept that if increased engineering access is required in the early part of CP5 and with the number of major enhancements to be delivered, the potential for over-runs, and reliability issues with new assets is likely to have an adverse impact on performance. Possession associated delays, which have been a major factor in CP4, are therefore likely to increase in the first three years of CP5 and there are further possession related risks later in the control period, (e.g. those associated with Crossrail and Northern Hub). There is however some uncertainty regarding the delivery profile which assumes a peak in years 2 and 3 and a substantial reduction by year 5. We have therefore allowed for the potential reprofiling of some of this work to the later years in CP5 as a downside (for the exit position) in our assumed performance trajectory ranges. However, since there is some uncertainty in the quantum of engineering access that will be required, NR has generally allowed for a pessimistic view on the likely scale of access and associated disruption. We have allowed for some improved productivity in delivery, and improved mitigation of possession risks in our upside assessment.

Enhancement project benefits

A number of enhancements are planned to be completed in the last year of CP4, or during CP5. Many of these address current performance pinch-points, as recognised by NR in the SBP. For a small number of more mature projects, (e.g., Thameslink, Crossrail, Reading) for which timetable modelling has been undertaken, specific assumptions have been included in the SBP forecasts regarding the expected performance impacts, taking account of the adverse impact of running additional services. NR has not otherwise made specific allowance for any performance contribution from the *completion* of these enhancements, e.g. it has been assumed they will be performance neutral. The rationale is that these are insufficiently developed to allow a reliable assessment of potential benefit, and also that additional capacity is generally rapidly consumed by running additional services.

We consider this approach to be somewhat cautious, since the capacity and operational benefits resulting from enhancements are unlikely to be fully used from opening, especially in the off-peak. In addition, the downside impact of additional traffic has been modelled separately, (as discussed under Traffic Growth above). However, many of the enhancements will not deliver benefits until the final year of CP5, and as noted above, there are deliverability risks. By considering a sample of likely enhancements we have made an assessment of potential scale of benefits, using the GRIP reports and appraisal documents provided as a source of evidence. In general these only provide a qualitative view of performance benefits. Most of the enhancements are aimed at capacity or journey time improvement, although some performance

improvement potential is recognised, especially on Long Distance routes. Examples of projects which are likely to offer tangible performance benefit are:

- Filton bank (Bristol) quadrupling
- Stafford remodelling
- Birmingham New Street resignalling
- Watford re-signalling
- Derby station remodelling
- Northern hub

This is a complex area, and whilst we consider there is likely to be more upside than recognised in the SBP, in view of the uncertainty we have not included a specific provision in our assessment of the most likely performance trajectory, although we have included an additional contribution of 0.1% to E&W PPM in year 5 of CP5 in our upside assessment.

Centrally led performance initiatives

NR has initiated a number of major performance improvement initiatives in the last two years of CP4, as part of the Long Distance Recovery and L&SE Plans. Examples are the generation of timetables for improved performance, better incident recovery, a focus on freight performance and alternative regulation policies. NR expects some of these initiatives to continue into, and to deliver additional benefits, in CP5. Given the slow build-up of performance benefits associated with these initiatives it is expected that additional performance benefits to those realised in CP4 (assessed by the IR to be worth 0.3% MAA PPM) will materialise in the first and all subsequent years of CP5. This alone exceeds NR's central forecast for performance improvement over CP5.

In addition NR expects to continue to pursue the approach of establishing fewer more significant nationally-led initiatives in CP5, and the IR understands that NR has very recently identified a large number of new potential candidate schemes under the five headings of Incident Prevention, Performance Enablers, Normal Day Improvements, Incident Response and Significant Event Mitigations. However, these are not yet developed sufficiently well to identify benefits, or to make any meaningful assessment of confidence levels associated with specific schemes. As a result, they have not been reflected in the individual TOC trajectories presented in the SBP. Nonetheless NR recognises that these nationally-led programmes are essential to improve the confidence in achieving its Regulatory targets in both CP4 and CP5. They have assessed this as having the potential to contribute a further 0.2% to E&W PPM by the end of CP5. We have therefore taken account of this additional likely positive contribution in our assessment.

Other Network Rail initiatives

In addition to specific assumptions on the improvement potential available from asset management, operating strategy, and performance initiatives, as noted above, NR has identified the potential for a further reduction of up to 1% year on year in all Delay Minute categories for which NR is responsible in its upside performance trajectory. This is assessed by NR as having an overall contribution of 0.2% to E&W PPM by the end of CP5. Whilst the implicit commitment to achieving the HLOS outputs is welcomed, we consider this to be unsubstantiated and likely to be a double count of the specific opportunities described elsewhere, and so we have discounted this in our assessment.

Operator caused delays

ToC on Self (ToS) and ToC on ToC (ToT) category delays have represented some 45% of the overall cause of train delays in CP4. Route plans have assumed that these are likely to remain static in terms of contribution to PPM and CaSL across CP5. This reflects in part the substantial uncertainty associated with the re-franchising programme, as well as the practical difficulty in engaging with many operators in long-term planning at this time.

Network Rail has made an allowance for the potential for improvement in these areas in their upside forecast, e.g. as necessary to achieve an increased level of confidence in achieving the HLOS targets. This includes a year on year reduction of 1% per annum in each of ToT and ToS. This is assessed by NR as contributing to around 0.2% to E&W PPM by the end of CP5.

In view of the potential scale of impact, the positive steps currently being taken to engage operators in performance improvement, and the potential of strategic alliancing, we consider this to be a cautious assessment. In addition there is expected to be significant improvement in fleet reliability in the latter years of CP5, with Thameslink, IEP and electrification fleets likely to come on stream and bringing a step reduction in casualty frequency. Based upon assumptions for fleet reliability provided by NR, this alone is forecast by NR to have an impact on E&W PPM of between 0.1% and 0.2%. This should also have a particularly beneficial impact upon CaSL. We have included this additional upside in our assessment, assuming a reduction in ToS and ToT delay minutes of up to 2% year on year, per annum.

We summarise in Table 1 below the key features of the assumptions upon which NR has built each element of its forecast, together with the Reporter's view of the likely accuracy of each element.

Layer	Component	NR SBP assumptions	PPM CP5 exit contribution	Accuracy Confidence	Reporter comments
0	CP4 exit	Will achieve CP4 Regulatory target	+1.2% on 12/13	Medium	SBP assumed 92.5%; NR now forecasting CP4 exit of 92.4% for

		Assumed uncertainty of +/- 0.3% about 92.5% target			E&W; IR consider a range of 91.6% - 92.2% (most likely) - 92.4% is plausible, given the current 91.2%
Layer	**Component**	**NR SBP assumptions**	**PPM CP5 exit contribution**	**Accuracy Confidence**	**Reporter comments**
1	Traffic growth	Passenger train km growth of 7% Freight train km growth of 16% Reactionary delays especially congested routes	-0.75%	Medium	Passenger forecast has reasonably high confidence; Freight forecast is out dated, (and subject to current update) and does not allow for anticipated impact of increase in Freight Charges
	Thameslink	Disruption throughout CP5 during build, and congestion on opening, supported by modelling with some Route overlays; at CP5 exit equates to worsenment of 0.25% on E&W PPM	-0.25%	High	Thameslink is a mature project, and has been subject to extensive modelling, especially for KO2 timetable. Although some manual adjustments have been made to the modelled forecasts, these appear sensible.
2	Asset performance	Increased wear and tear and Delays per Incident, broadly offset by improved asset management and response, but with some targeted improvement	+0.06%	Medium	Core NR assumption is challenging to achieve – there is probably both more up and downside than acknowledged in the SBP
	Performance initiatives	Improvement through modest carry-over of CP4 initiative benefits, and some new Route actions	+0.05%	Medium	Insufficient allowance for the potential carry-over of benefits into CP5

	NOS and TMS	Cautious write-down and delay of benefits nationally; most Routes neutral	+0.28%	Medium	Additional upside potential, although with risk of CP5 delay; NR acknowledge much more to come in CP6

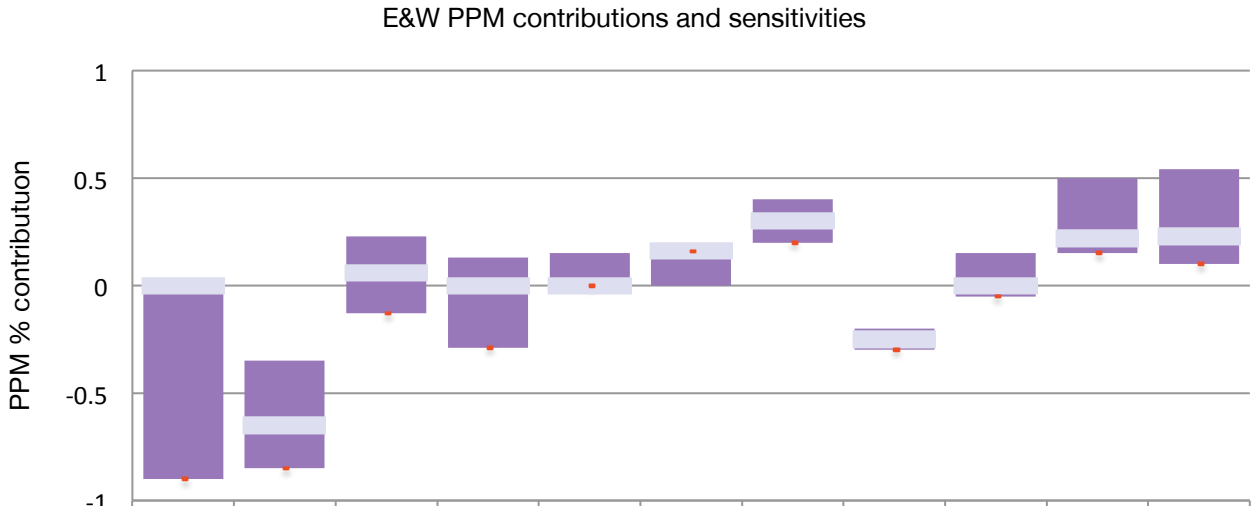
Layer	Component	NR SBP assumptions	PPM CP5 exit contribution	Accuracy Confidence	Reporter comments
2	External and Weather	Increasing incidence of weather & theft, offset by NR campaigns targeting causes & recovery, which will neutralise impact	Neutral	Medium	Challenging to deliver, given likely increasing frequency of environmental factors; probable greater downside than upside, especially for weather
	Works access disruption	Additional quantum of access (up to 25% on CP4), causing linear increased delay minutes during CP5	Yr 3: -0.5% Yr 5: +0.16%	Medium	Apparently overstated by NR in taking worst case from Deliverability assessment as a core assumption; risk to project slippage likely to smooth year 2 and 3 peak back into years 4 and 5, so may worsen CP5 exit position; potential for mitigation of impacts, as nominally included by NR in layer 4 forecast
	Enhancement benefits incl. electrification	Generally taken as neutral on assumption that enhancement benefits will be consumed in use of capacity generated, other than for specific developed and modelled schemes	Broadly neutral	Low	Understates potential benefit, as many projects improve operability and build capacity ahead of full use, especially off-peak; however, most schemes deliver in years 4 and 5, and with risk of slippage, likely contribution is both modest and uncertain

Layer	Component	NR SBP assumptions	PPM CP5 exit contribution	Accuracy Confidence	Reporter comments
3	CP5 performance initiatives	Additional contribution from as yet unspecified national initiatives	+0.2%	Low	Modest assumption, taken across whole of CP5, given that last two years of CP4 on LD and LSE generating 0.5% national PPM, with anticipated carry-over from these worth 0.3%; potential range between 0 and 0.6% more credible
4	NR other	Unspecified source other than intent to mitigate project disruption; effectively a stretch target	+0.2%	Low	This is generated essentially as a stretch to close the gap to HLOS target for PPM, without any substantiation; if national improvement initiatives and project mitigation assumed to be included in layers 2 and 3 above, then this appears high risk
	ToT and ToS, including new fleets	No substantiation since limited ToC appetite to engage in planning for SBP; includes potential benefits of new more reliable fleets	+0.2%	Low	This is not well developed at this stage, for understandable reasons given the degree of refranchising planned; however the work currently being sponsored by NTF indicates there is likely to be more upside especially with the introduction of new fleets, and through strategic alliancing. Downside risks (e.g. from major timetable change / realigned franchise targets) are potentially controlled with the proposal for a change control regime.

IR sensitivity testing of forecast PPM and CaSL ranges

The Reporter has undertaken, with NR's support, various sensitivity tests in order to understand the potential significance to the overall PPM and CaSL forecasts of the various uncertainties which exist in relation to the key input variables. The variables to which this has applied, and the results of these tests are described in Appendix F. A summary of the sensitivity results is presented in figure 4 below. In this figure the solid white line indicates the contribution to the SBP PPM forecast for E&W in year 5 for the indicated variable. The size of the blue bar indicates the Reporter's assessed range of potential impact for the variable, drawn either from the sensitivity results, NR's own assessment or the Reporter's judgement where this differs from NR's forecast.

Whilst the sensitivity tests are potentially less reliable than NR's own forecast, as presented in the SBP, the Reporter nonetheless considers that for the various reasons summarised above, in many cases they may represent a more likely outcome. We have therefore compiled an alternative forecast, based upon a combination of NR's own forecast and these outputs, together with some further judgement in relation to variables not subject to sensitivity assessment, as described in table 2 below.



	CP4 exit	Traffic growth	Asset management	Weather / externals	Eng access effectiveness	Access phasing	NOS / TMS	Thameslink	Enhancement	Performance initiatives	Fleet and Operators
Upper range	-0.1	-0.35	0.23	0.13	0.15	0	0.4	-0.2	0.15	0.5	0.54
SBP	0	-0.65	0.06	0	0	0.16	0.3	-0.25	0	0.22	0.23
Lower range	-0.9	-0.85	-0.13	-0.29	0	0.16	0.2	-0.3	-0.05	0.15	0.1

Figure 4: PPM contribution and sensitivity range for each main input variable

Parameter	SBP downside	SBP most likely	SBP upside	Reporter downside	Reporter most likely	Reporter upside	Reporter view commentary
CP4 exit	92.2%	92.5%	92.8%	91.6%	92.2%	92.4%	Additional albeit asymmetric downside identified based upon current performance and trajectory
Traffic growth	-0.8%	-0.7%	-0.5%	-0.85%	-0.6%	-0.4%	Uncertainty especially in freight forecast likely to reduce impact giving increase in upside and reduce most likely impact
Thameslink	-0.3%	-0.2%	-0.1%	-0.3%	-0.2%	-0.1%	As SDG analysis
Route asset management	0.06%	+0.06%	+0.06%	-0.2%	-0.01%	+0.2%	A range of +/- 2% DM yr on yr applied to asset KPIs
Externals and weather	0%	0%	0%	-0.3%	-0.08%	+0.15%	A range +2 / -4 % yr on yr for external and weather DMs and to reflect a potential outcomes.
Engineering Access	0.16% [1]	0.16% [1]	0.16% [1]	-0.2%	-0.05%	+0.1%	Sensitivity assessment undertaken for Virgin WC only; but assumed similar values could be expected nationally.
NOS and TMS	0.2%	0.28%	0.36%	0.2%	0.28%	0.4%	Greater upside range potential
Performance initiatives	+0.15%	+0.2%	+0.3%	+0.15%	+0.3%	+0.60%	Includes a 0.3% expected carry over from CP4 Base+ and further initiatives in CP5.
Enhancement projects and GSMR	0%	0%	0%	0%	+0.08%	+0.18%	GSMR expected to provide 0.08% contribution, and IR assessment of upside potential for enhancement benefits
Operator and fleet	0%	+0.1%	+0.2%	0%	+0.45%	+0.55%	Doubled TOC on Self and TOC on TOC DM year on year improvement to 2% DM to reflect a broader range of outcomes, including new fleet contributions.
Other NR overlay	0%	+0.10%	+0.2%	0%	0%	0%	NR unspecified 1% yr on yr DM reduction, which we consider double counts above.

Table 2: Reporters view of various inputs to forecast

Notes: [1] this is the year 5 impact; year 3 is 0.5% adverse

Conclusions for E&W PPM forecast

Based upon the aggregate results from the sensitivity tests conducted on PPM variables, as reported in Appendix F, and the other potential range adjustments identified in table 2 above, the Reporter has produced its own assessment of the likely trajectory for PPM across CP5. This result is presented in figure 5 and table 3 below. This is not an entirely modelled result, and has incorporated a certain amount of judgement, as indeed has NR's own forecast. As such this is not necessarily any more reliable than NR's own forecast. However, taking all the evidence which we have seen into account, we consider that this is a credible range for the performance trajectory.

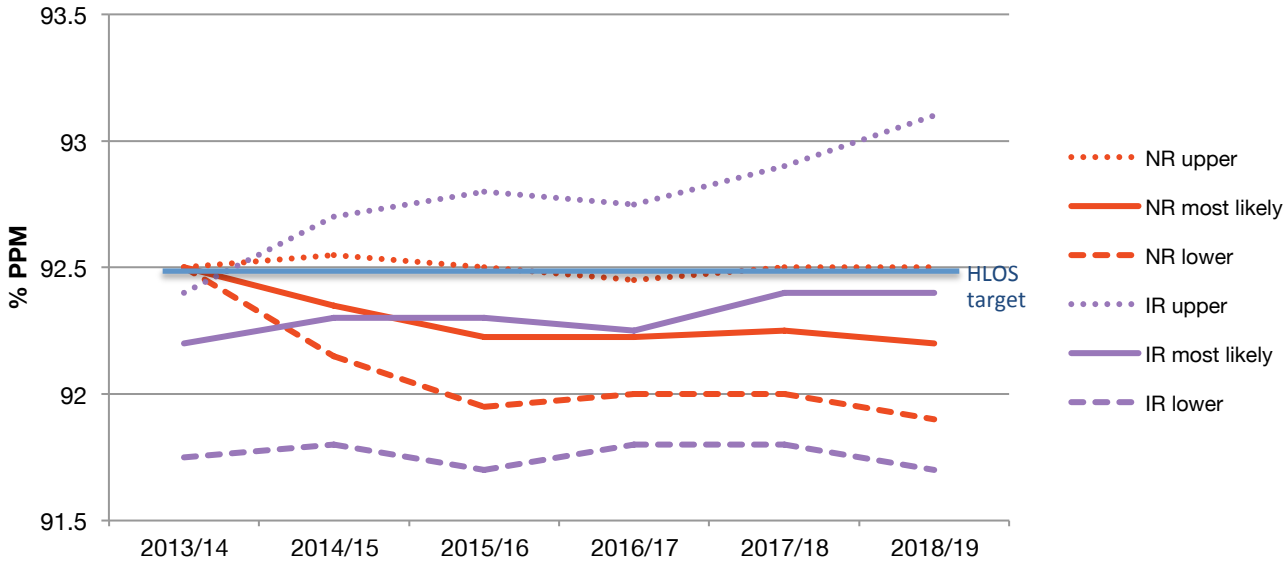


Figure 5: performance trajectory for E&W PPM over CP5

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
NR upper	92.50	92.55	92.50	92.45	92.50	92.50
NR most likely	92.50	92.35	92.23	92.23	92.25	92.20
NR lower	92.50	92.15	91.95	92.00	92.00	91.90
IR upper	92.40	92.70	92.80	92.75	92.90	93.10
IR most likely	92.20	92.30	92.30	92.25	92.40	92.40
IR lower	91.60	91.80	91.70	91.80	91.80	91.70

Table 3: performance trajectory for PPM over CP5

Assessment of SBP forecast for CaSL

Linkage of PPM and CaSL

PPM and CaSL are linked in modelling terms through changes in Delay Minutes (DM). Actions targeted at reducing DM to improve PPM will in many cases also automatically reduce CaSL. PPM is however related to changes in DM across all KPIs, whereas CaSL is dominated by changes in a subset of KPIs, e.g. those associated with Fleet and operators, external and weather incidents, and to a lesser extent signalling, power supply, OLE and track defects. By targeting those KPI areas related to CaSL it would be possible to get a bigger impact on CaSL relative to PPM. We have not however seen any significant evidence that this approach has been followed in a systematic manner nationally in the SBP, although some Routes are clearly addressing the underlying NR causes of CaSL in their plans.

A 1% reduction in delay minutes on average increases PPM by 0.08% and reduces CaSL by 0.012%, although this relationship varies by service group.

Route Plans

The NR National team, and the LNW, Kent and LNE Route teams, were asked to explain their approach to planning specifically for reducing CaSL as opposed to a more general approach to improving PPM.

The response from NR was generally to the effect that very little CaSL specific planning is done primarily because there is a good correlation between delay minutes and CaSL as a result of larger incidents associated with mainly major external events (e.g. extreme weather, complicated fatalities and major cable theft and OLE de-wirements) and that initiatives directed towards reduction of these kind of events are therefore examples of a focus on CaSL.

Another common response from the NR teams was that NR, jointly with the TOCs, can influence CaSL via their contingency plans and approach towards service recovery. For example, an incident may lend itself to swift service recovery as a result of decisive cancellations in the first few minutes which can limit the long run effect on CaSL which would otherwise occur. Another example is that during times of heavy passenger loading in winter weather a joint decision may be taken to limit service recovery cancellations for the sake of passengers already travelling. Assuming delays to individual trains could be kept within 30 minutes, this would also limit the effect on CaSL, but significantly increase PPM failures.

There were a very few examples quoted from CP4 of focused action planning specifically to reduce CaSL. One such plan cited was for the improvement of axle counter reliability in Stansted Tunnel which had been causing excessive terminations short of destination to cross-country Stansted Airport services, but relatively few delay minutes. No such examples were offered for CP5, although similar local initiatives might be expected to flow from the JPIP process.

Finally, NR took the view that TOCs are well placed to directly influence CaSL by managing crew and rolling stock resources to prevent cancellations as a result of incidents, as well resource shortages not associated with incidents on the network.

This is a reasonable response from NR to the management of CaSL, so long as the general approach of reducing incidents which lead to major delay minutes and thus the reduction of CaSL, is complemented by a preparedness during CP5 to address emerging local issues which affect particular Service Groups and threaten to cause CaSL targets to be missed.

Taking the same judgements that we have applied to the forecast of PPM, as detailed in the previous section, we have also derived an alternative forecast for the range of outcomes for E&W CaSL across CP5. This forecast, and the major contributory elements are set out in Figure 6 and Table 4 below.

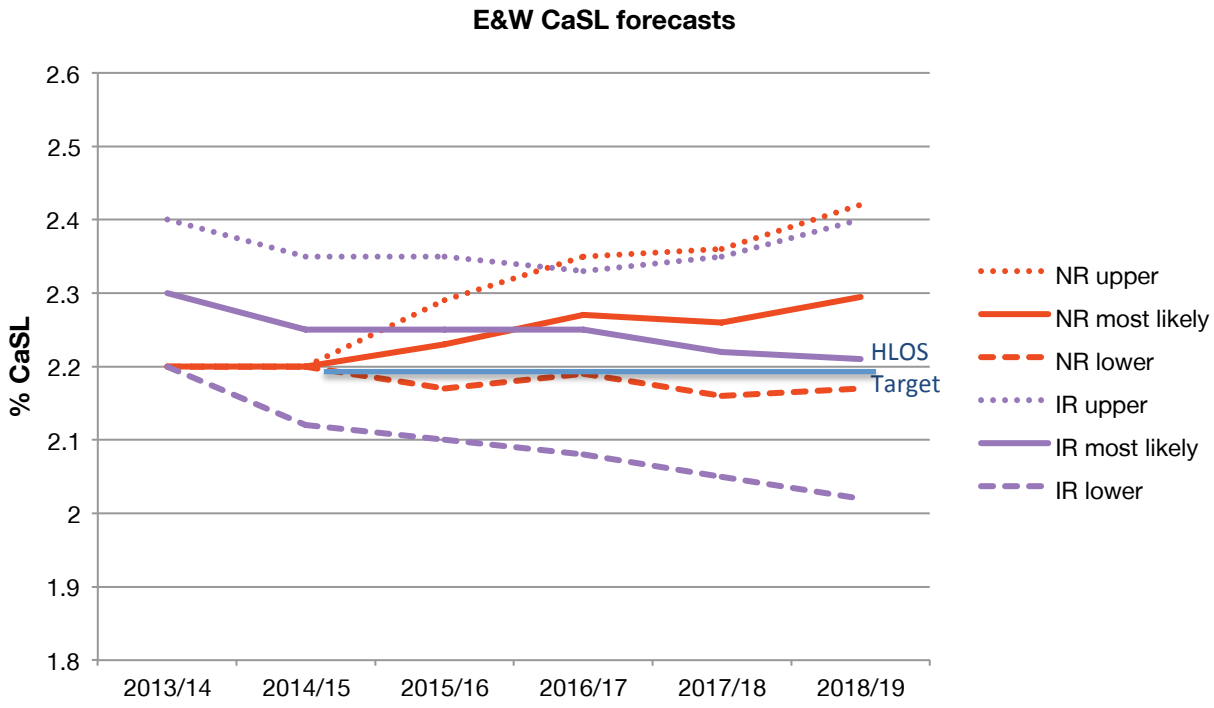


Figure 6: performance trajectory for E&W CaSL over CP5

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
NR upper	2.20	2.20	2.29	2.35	2.36	2.42
NR most likely	2.20	2.20	2.23	2.27	2.26	2.30
NR lower	2.20	2.20	2.17	2.19	2.16	2.17
IR upper	2.40	2.35	2.35	2.33	2.35	2.40
IR most likely	2.30	2.25	2.25	2.25	2.22	2.21
IR lower	2.20	2.12	2.10	2.08	2.05	2.02

Table 4: performance trajectory ranges for E&W CaSL over CP5

Targeting of worst performing routes

HLOS sets an expectation that performance improvement efforts will be focused both on services that are currently the worst performing, as well as those where greatest value may be expected from improvement.

In the SBP there is only limited evidence presented that NR is targeting the worst performing services for particular improvement. NR sets out some analysis of the worst performing service groups in Appendix 2 to the Performance Plan for England Wales and Scotland, in which it shows that those currently performing more poorly are targeted for network enhancement, and likely to be targeted for timetable improvement.

We have undertaken a simple analysis of the forecast improvement plans by Operator to see if this provides any systematic evidence that improvement will be greatest where the CP4 exit position is currently worse. We have also grouped these by service type (Long Distance, L&SE, Regional), since this provides an indication also of relative value. The Long Distance and then L&SE services are likely to have greater value attributed to changes in performance.

Figure 7 below shows the results of this analysis for PPM. There is only very modest evidence that a higher degree of improvement is planned for those operators who currently perform well below HLOS targeted levels. Note that the two poorest performing services are for non-franchised operators. There is also not any significantly greater improvement planned for Long Distance services over Regional for example.

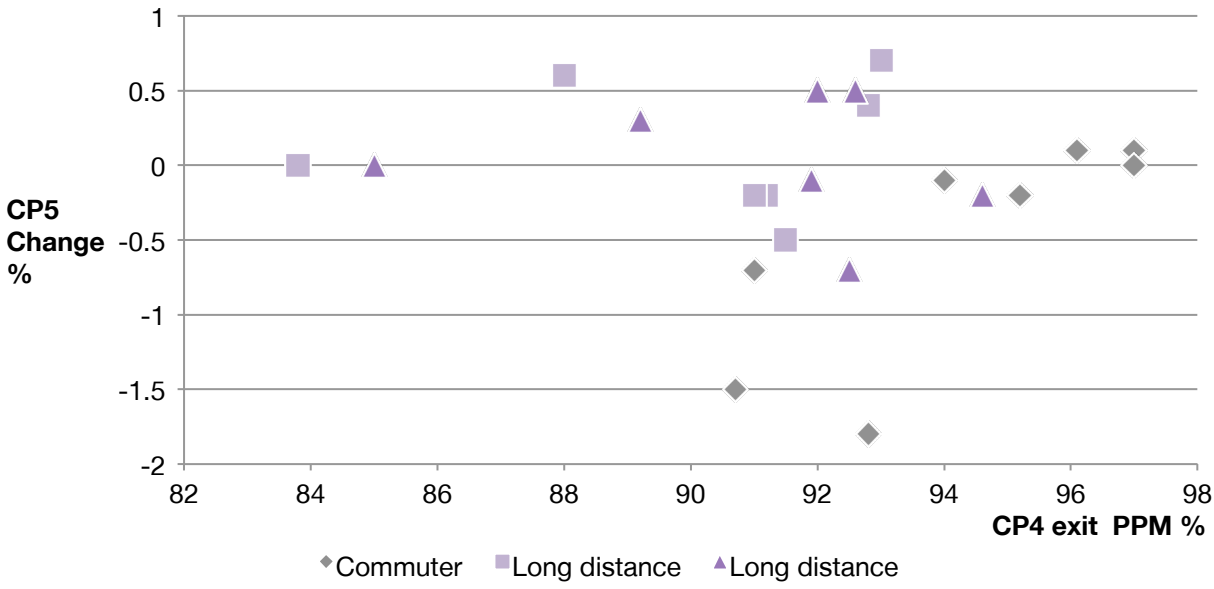


Figure 7: PPM CP4 exit position versus forecast change over CP5, by Operator

We have undertaken a similar assessment for CaSL, as presented in Figure 8 below. Again, there no evidence of any greater targeting of improvement for those operators which currently have a worse level of performance. In fact, if anything, a greater level of improvement is targeted at those operators which are already performing at or above HLOS levels.

Perhaps the most striking feature is that a greater degree of improvement appears to be targeted at L&SE services than at Long Distance services. This is somewhat counter-intuitive, since research by Passenger Focus and others has shown that passengers on long-distance services which are typically less frequent, and who are more likely to have connections to make, tend to place a higher value on cancellation and significant lateness than those on commuter services. CaSL will still be relevant to L&SE services of course, not least because of the potential for over-crowding.

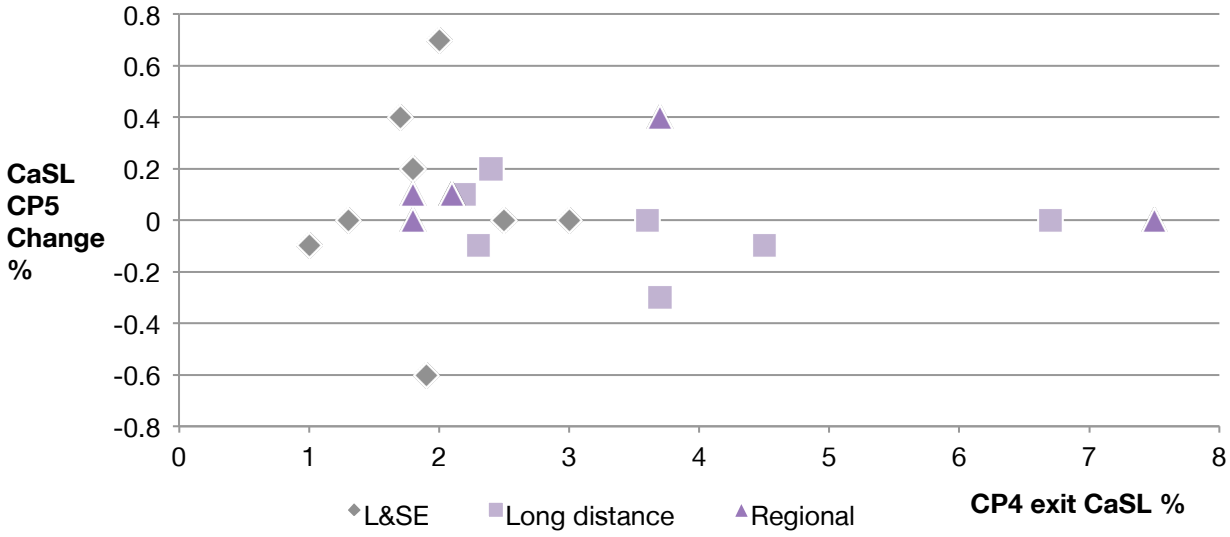


Figure 8: CaSL CP4 exit position versus forecast change over CP5, by Operator

The over-riding impression from this analysis is that the degree of improvement or worsenment being forecast for CP5 in both PPM and CaSL, is more significantly due to the impacts of growth, congestion and engineering access, than a reflection at this stage of targeted action to drive improvement on poorer performing services. NR has stated that they expect this sort of targeted action is more likely to result from local Route and operator JPIP activity, and that the identification of specific improvements and underlying causes will be more effective at local level.

Targeting of Bad Days

As in the case of CaSL, the NR National team, and the LNW, Kent and LNE Route teams, were asked to explain their approach to planning specifically for reducing Bad Days.

A Bad Day is not a formally defined term in the sphere of train performance management. In practice a Bad Day may be regarded as any day where the train service of a TOC is disrupted to such a significant extent that the normal train plan becomes effectively inoperable, the travel plans of passengers are seriously affected and the daily PPM for one or more service groups is dramatically reduced.

The response from the NR teams was similar to that for CaSL. Specifically the teams stated that Bad Days are usually the result of larger incidents associated with mainly major external events (e.g. extreme weather, complicated fatalities and major cable theft and OLE de-wirements) and that initiatives directed towards reduction of these kinds of events are therefore examples of a focus on Bad Days.

The Route teams added that Bad Days can be reduced by the adoption, by NR and TOCs jointly, of contingency plans and service recovery policies which are tailored to the avoidance of Bad Days, and that the adoption of such plans requires a strong commitment to rapid service recovery from both teams. The LNW team particularly stated that they would be seeking such a commitment from TOCs.

Further, the NR national team stated that Bad Days always result in one or more Significant Performance Incident Reviews (SPIRs) being produced by joint TOC and NR Route teams and that the recommendations and lessons leant from such reports are being collated at the centre to create a reference source of initiatives for reducing Bad Days and that these would eventually be loaded into the performance initiative reporting system iPAT. This statement from the national team was checked with the LNW Route team which added that SPIR actions are routinely reviewed at a number of Route-based reliability groups, and that this has resulted in a special focus on vulnerable 'linear assets' (i.e. assets running along the line of route which, when they fail, can lead to a total suspension of service rather than a degraded mode operation). These include OLE, track, signalling power supply cables and signalling control circuits. It is expected that this process will continue in CP5.

5. Value and affordability assessment

NR targeting of routes where reliability will have greatest economic effect

The E&W HLOS included a requirement that the industry focuses on those routes on which lower levels of reliability have the greatest economic effect and that this should be reflected in the SBP.

NR advised us during our part 1 activity that it considered that the development of detailed plans at operator and service group level, which might include the targeting of routes where reliability offered a higher economic value, was more appropriately undertaken as part of the rolling two-year JPIP process. This in part also reflects an understanding reached with the National Task Force in the lead up to the preparation of the SBP regarding the future pivotal role of the JPIP process in performance planning. This was re-affirmed in our discussions with NR following the publication of the SBP.

Although the SBP does not provided an explicit assessment of the value of alternative performance levels on different routes, there has been much implicit analysis of the trade off between the value of higher performance, cost and other outputs in the preparation of the SBP.

Network Rail undertook a number of trade-off studies under the general direction of the National Task Force subgroup: Planning Oversight Group. The output from these studies is reported in the SBP supporting documents[3],[4]. This work was undertaken primarily to better understand the relationship between performance inputs and outputs. It highlighted in particular the very strong link between traffic growth, congestion and performance, and led to a focus on relieving the most congested corridors which may be considered as "hotspots" for performance. The resulting enhancement projects at these hotspots will potentially help to contribute to alleviating poor performance, as well as providing additional capacity. In addition the work highlighted the criticality of developing optimal timetables designed to deliver high levels of right time performance. This has subsequently become one of the national performance initiatives "Timetable for Performance". NR expects to deploy this approach particularly on routes which have a lower level of current performance, but also where Operators believe there is a higher value from improving performance.

[3] Performance Plan for England, Wales and Scotland, version 1.0, 7 January 2013
[4] Trade offs summary document, SBP supporting document, January 2013

As part of route asset management policies and associated planning processes, we have also seen evidence that there is a targeting of routes where there is likely to be a higher value from improving reliability. For example, the Track Asset policy has given priority to undertaking renewal on those route sections where the "value of delay" as indicated by schedule 8 indices, is more than double the national average. Some other asset management M&R proposals are clearly targeted at critical assets on the busiest and therefore highest value long distance and suburban route sections, such as the OLE reliability improvement plans on the West Coast south. Although this is not presented in the SBP as targeting for greatest economic effect, it will nonetheless implicitly achieve this outcome in broad terms, although we comment below on some limitations of this approach.

Lastly, it is also clear that the SBP planning process, at both Route and national levels, gave consideration and priority to those options which were considered most likely to be cost effective in driving improved performance, although clearly this was a balance with the need to also deliver a range of other outputs, notably safety, capacity and journey time, within the overall affordability constraints. We sought and were provided with some explicit examples of operations, maintenance, renewals and enhancement options impacting performance, both which were included in the SBP, and in several cases which had been excluded on the grounds of affordability. Examples of these initiatives are listed below. Although we requested supporting business case data for these items, which would have allowed us to include these in our value analysis, these were generally not forthcoming, other than for the Western suicide prevention and cable theft initiatives listed below.

Included in SBP

- LNW route – auto reconfigurable power supplies for resignalling schemes at Watford, Stafford, Birmingham New Street, part of Wolverhampton and Macclesfield
- Western Route – accelerated renewals in CP5 with the objective of fewer disruptions in CP6
- Sussex Route – additional track expenditure, (£9m) to improve condition and reliability in a particular PPM hot spot

Excluded from SBP

- LNW Route auto reconfigurable power supplies for Water Orton and Walsall removed from workbank as considered not to be affordable
- Sussex Route – reduction in level of signalling cable renewals
- Sussex Route – renewal of lighter weight conductor rail which is considered to have a risk of displacement

- Western Route – cable theft initiatives – not considered to be affordable in CP5, although positive business case apparently shown.
- Western Route – suicide reduction initiatives - not considered to be affordable in CP5, although positive business case apparently shown.

Reporter assessment of economic impact of alternative levels of performance

Cost of changes in PPM and CaSL

The methodology used by NR for valuing potential changes in delays, as part of preparing business cases for projects, converts a projected reduction in Delay Minutes (DM) into an industry value, and compares this with the anticipated costs to assess net value and payback period. The NR PPM model can also be used to convert projected changes in DM into changes in PPM and CaSL, so it is possible to use this data to establish a cost per nominal train brought within PPM (or with a different adjustment, a nominal train brought within CaSL). We have used this approach to determine the marginal cost / nominal train PPM and CaSL, and summarise the results in table 6 below. In this analysis we have allowed for the total number of trains which would be brought within PPM or CaSL within a control period, e.g. assumed a 5 year benefit life, or lesser period as assumed in NR's own business cases; in reality the benefits might continue beyond this, so these may be an over-estimate of cost / nominal train.

The business cases we have considered are derived from several NR sources. Some reflect investments which are being progressed in CP4. We have labelled these as "CP4 delivered". Others are examples of potential investments which NR has identified as part of the SBP compilation process, but which have not been included in the planned expenditure at this stage. We have labelled these as "CP5 rejected".

Project Status	Project description	Cost	Benefits (DM)	No of PPM Trains	Cost / Train
CP4 delivered	Sussex: Class 442 Couplers	£720k	30,033	2,816	£256
CP4 delivered	Anglia: Clay Bank Track Quality	£300k	43,608	2,739	£110
CP4 delivered	Western: Paddington & Hays IECC	£819k	50,125	1,580	£518
CP4 delivered	LNE:4 Hole to 6 Hole IBJ	£99k	14,035	805	£123
CP4 delivered	LNW: Cable Theft Prevention	£886k	58,962	3,611	£245
CP5 rejected	Western: CP5 Suicide Initiatives	£7,831k	141,300	4,454	£1,758
CP5 rejected	Western: CP5 Cable Theft	£8,800k	140,692	4,435	£1,984

Table 6: Costs and benefits for sample of performance improvement investments

We have shown the marginal cost / nominal train brought within PPM for each of the investments in figure 9 below. This shows that there is a spread of marginal cost, as might be expected. This ranges from £100 / train £500 / train for CP4 investments, and up to £2000 / train for CP5 rejected investments. The business cases for investments pursued in CP4 evidently offer a much lower cost / train (better return), than those rejected for CP5, although the latter evidently still presented a positive investment case, and were evidently rejected on affordability grounds. The CP5 rejected investments are line of route investments, and it is therefore not entirely surprising that they represent a lower payback than the more targeted CP4 investments, and not necessarily a reflection of overall increasing cost of worthwhile improvements in CP5.

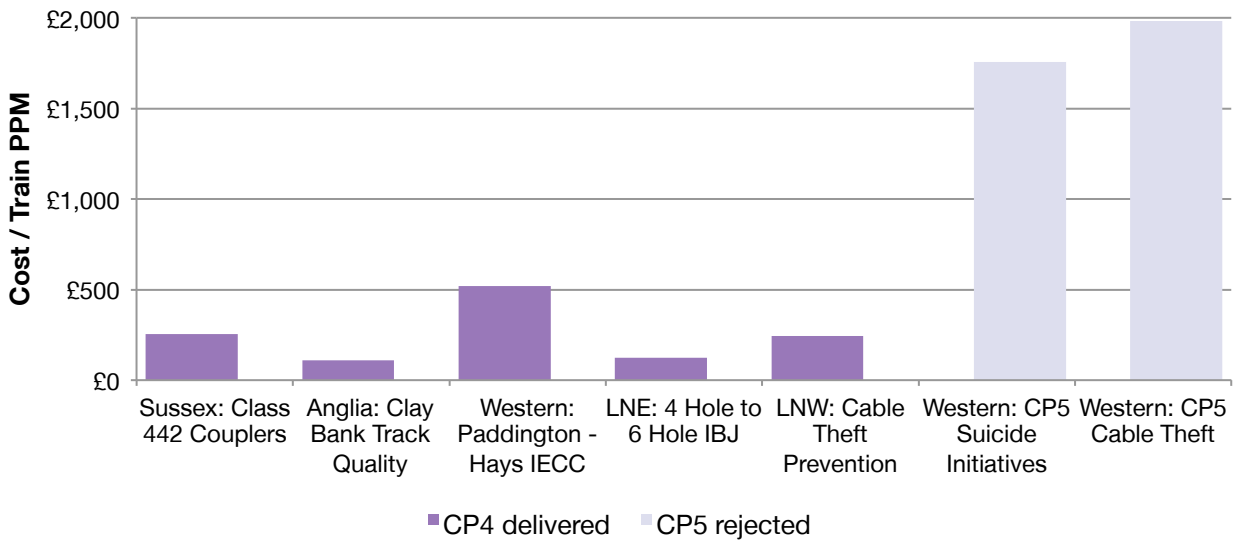


Figure 9: Marginal costs for sample of performance improvement investments

Network Rail has also undertaken some assessment of the marginal cost associated with different levels of performance, as part of the SBP preparation. This work is presented as part of its Uncertainty analysis [5]. This assessment was undertaken primarily for the purpose of understanding the risk exposure which NR may face if its cost and efficiency projections prove inaccurate. It considered firstly what likely level of uncertainty existed within its cost forecasts, and expressed this as a confidence curve for each of the main elements of operating, maintenance, renewals and enhancements expenditure. In a subsequent stage of the analysis, there uncertainty associated with performance delivery was also considered. A model was derived which considered how variations in the level of input activity might impact both cost and performance in terms of delays minutes and national PPM. This considered both the potential impact of a higher, and a lower level of inputs and cost, relative to the SBP planned level.

It is possible to infer from this analysis how differing levels of input activity, and hence expenditure might therefore be applied in order to intentionally adjust the output level of performance. Considerable caution needs to be applied to this interpretation for two key reasons. Firstly, whilst the model assumptions NR has developed are an attempt to understand the immediate consequences of different inputs upon performance, they have not been developed to consider the long-term and sustainable impacts. It is entirely possible for example, that a reduced level of asset maintenance or renewals expenditure would have additional long-term consequences for reliability or investment. Secondly, the analysis has not been developed and validated in a manner intended for the purpose of making decisions on alternative levels of investment. It cannot therefore be considered as likely to be robust for this purpose.

Nonetheless, since there was very limited data available to us of the marginal cost associated with different levels of performance, we have converted the NR output findings (which present cost / national PPM %) into a cost per nominal train within PPM, to allow comparison with the discrete business case data. Two values may be derived from this Uncertainty analysis; the cost / nominal train for reducing performance, and the cost / nominal train for improving performance. The cost saving for reducing PPM is calculated as £9,500 / nominal train, whilst that for improving PPM is calculated as £22,000 / nominal train. It is broadly intuitive that a higher value should apply to driving improved performance, since this becomes progressively more difficult. We have not sought to investigate the detailed NR assumptions which derived these values.

Figure 10 below presents the marginal costs / train within PPM derived from NR's Uncertainty analysis, alongside the values derived previously for discrete investments (note this is a log scale). This shows that the costs derived on a national basis are significantly higher than those generated for local business cases. This is also intuitively logical, since it is likely that a national broad brush approach to driving a higher or lower level of performance would be less cost effective than through targeted investments addressing known key critical assets and vulnerabilities.

[5] "Uncertainty Analysis Stage 2 and 3": SBPT3296, January 2013.

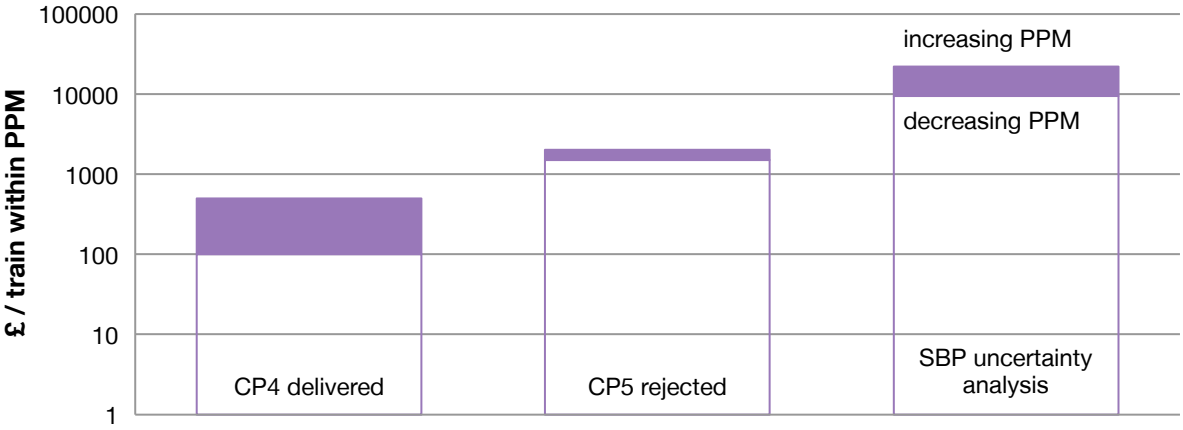


Figure 10: Marginal cost for local versus national performance improvements

We have also investigated the extent to which it becomes progressively more difficult to achieve continuing improvements in performance as the underlying level of performance improves. This is intuitively likely to be the case, since as performance improves, there are fewer delay causing events to target. In addition, even if delay causing events are reduced, it is likely that an aggregation of sub-threshold delays will still limit the extent to which trains may arrive within PPM thresholds.

Figure 11 below demonstrates this significant increase in effort required to achieve a given % PPM or CaSL improvement as performance improves. At 88% PPM, an improvement of 1% in Delay minutes increases PPM by 0.12%, whereas at 96% PPM this is reduced to just 0.04%, e.g. three times as large a percentage saving in delay minutes needed for a given PPM improvement.

Similarly for CaSL, at 5% CaSL, a saving of 1% in delay minutes gives a 0.04% improvement in CaSL, but at 2% CaSL, the same percentage saving in Delay Minutes generates only a 0.01% reduction in CaSL, e.g. four times as large a percentage saving in delay minutes needed for a given CaSL improvement.

This may seem like semantics; ultimately a train arriving within PPM targets is still a PPM saving. But it does become progressively harder to achieve this by targeting above threshold delays. Running a right time railway however is likely to be virtuous in delivering high levels of PPM and this demonstrates the increasing importance of targeting sub-threshold delay.

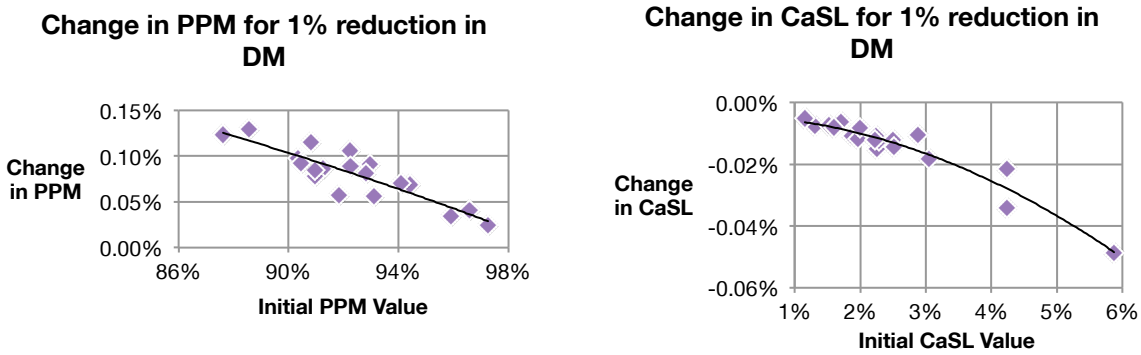


Figure 11: Reducing impact of delay minutes as performance improves

Value of changes in PPM and CaSL

To support an overall assessment of the potential value of seeking a higher level of performance output, we have undertaken further analysis to derive the theoretical benefits attaching to varying performance for a selection of operator service groups. The service groups that we have considered were selected to provide a likely range from high to low value, and are as listed in section 3 above. In each case we have applied a broadly standard methodology as defined in the industry standard "Passenger Demand Forecasting Handbook", which translates lateness into an equivalent change in journey time, and then applies expected elasticity parameters to convert into an expected change in journey volumes. We have calculated both an industry revenue benefit, and also a socio-economic benefit (using standard DfT WebTag guidance), in each case. Further details of our assessment methodology are provided in Appendix C.

The results of this analysis are presented in table 7 below. For each service group we present the calculated change in industry revenue and socio-economic benefit for a 1% change in PPM, and also for a 0.1% change in CaSL.

(all benefits in £m/annum)	Benefits for 1% improvement in PPM			Benefits for 0.1% improvement in CaSL		
Service Group	Revenue	Socio-economic	Total	Revenue	Socio-economic	Total
LD operator 1	£2.16m	£0.30m	£2.46m	£0.54m	£0.07m	£0.61m
LD operator 2	£4.76m	£1.02m	£5.7m	£1.61m	£0.35m	£1.96m
L&SE operator 1	£2.26m	£1.02m	£3.29m	£0.65m	£0.30m	£0.94m
Regional operator 1	£0.89m	£0.39m	£1.28m	£0.29m	£0.13m	£0.42m
Regional operator 2	£0.11m	£0.14m	£0.23m	£0.05m	£0.06m	£0.10m

Table 7: Benefits attaching to changes in performance for sample of service groups

The above results are presented by service group and on an annual basis. In order to afford a direct comparison with the marginal cost data presented above we have divided these values by the total number of trains per annum for each service group, and multiplied by 100 or 1000 respectively. This generates a benefit value / nominal train achieving PPM or CaSL respectively. Whilst this may not be reliable for individual trains, since each will carry different volumes and mixes of passengers, it will provide a value which is representative on average for the service group of moving a single train from outwith to within PPM or CaSL.

Reporter assessment of likely value for money of setting higher level of PPM target

A comparison of the marginal costs associated with higher levels of performance, and the marginal benefits as assessed in the preceding sections, potentially allows conclusions to be inferred regarding the likely value of setting a higher or lower target on a national basis.

Figure 12 below presents both the costs / nominal train within PPM, and the benefits / nominal train on a consistent vertical axis.

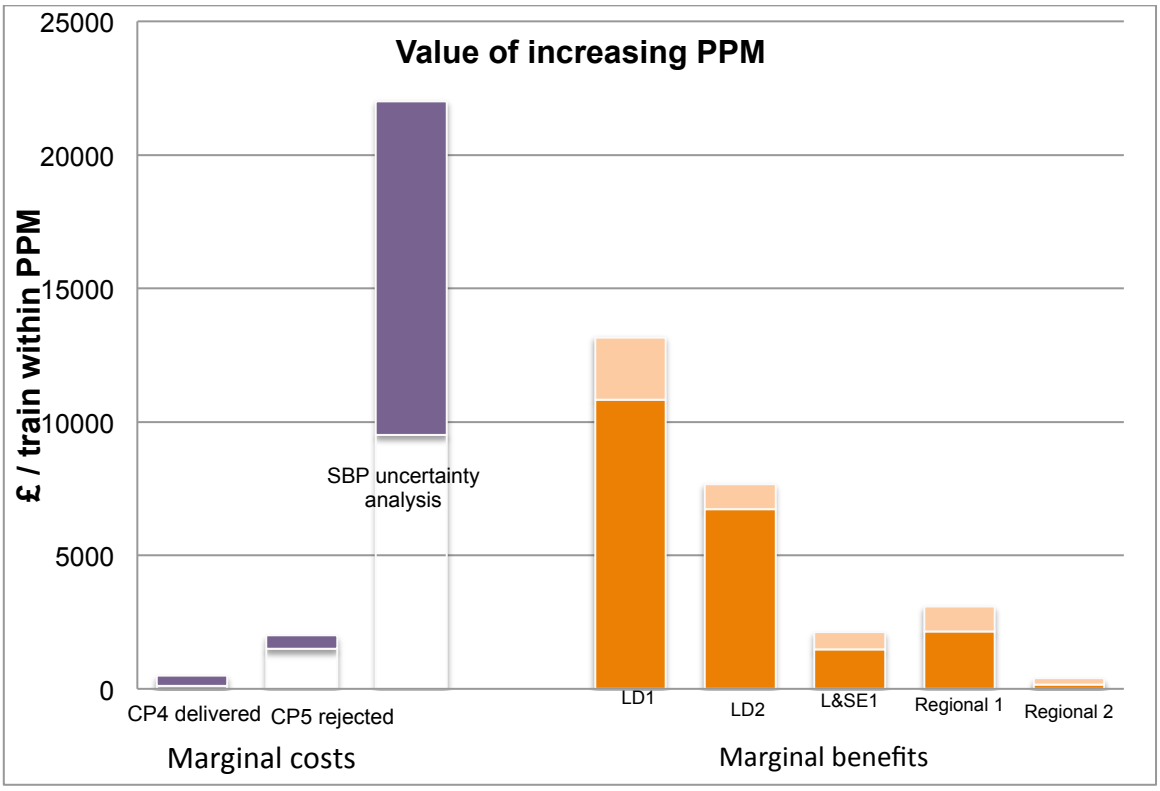


Figure 12: comparison of marginal costs and benefits for range of interventions

This graphic illustrates a number of points.

- The cost range for discrete investments is significantly less than the apparent cost / nominal train for overall national change. This is intuitively logical, since clearly discrete investments are likely to be more targeted and hence cost effective.

- The benefits vary substantially by service group, with far greater values for long distance services and then commuter services than for regional routes. This reflects train size and hence loadings, journey lengths and ticket values.

- The socio economic benefits attaching to services are typically worth around an additional 10-20% of the direct revenue benefit for long distance services, around 40% for commuter services, and up to an additional 100% for regional services.

- The benefits expected exceed the costs for discrete investments on the highest value routes, but not on lower value routes; this result is likely to be reflected across network, demonstrating that worthwhile investments are likely to be limited to higher value service groups.

From the above analysis, it can be inferred that there are likely to be worthwhile targeted investments on higher value service groups, but that there does not generally appear to be value in setting a higher level of output on national basis.

Furthermore, when coupled with the point made previously about the increasing difficulty of driving performance improvement as performance is improved, it is likely that the case for targeted investments will be strongest on those route which are performing least well. This is hardly a surprising conclusion, but demonstrates that we should expect to continue to see improvement initiatives being pursued in CP5, especially where value is greatest and performance weak. Indeed, NR are themselves assuming that this will be the case, although the scale of this will be determined through the JPIP process.

Reporter assessment of likely value for money of setting lower level of CaSL target

We have conducted a similar analysis as described for PPM above in relation to the marginal costs and benefits for trains achieving CaSL. In this instance we have only be able to compare the marginal costs from discrete business cases (the same set as for PPM), with the marginal benefits calculated using the PDFH and WebTag methodologies.

The results for CaSL are presented on a similar basis as for PPM in figure 13 overleaf.

The results for CaSL show a similar picture as for PPM, although the marginal benefits and costs for a nominal train are both somewhat greater than for PPM, since clearly a train failing CaSL has a greater impact on passengers.

The range of benefits / nominal train is between £1,700 and £44,000 depending upon service group.

The range of marginal costs / nominal train is between £500 and £10,000 depending upon initiative. In practice, many initiatives will have a material impact both upon PPM and CaSL at no additional cost, and therefore the business case may be improved by considering both, although care needs to be taken here in double counting actual revenue effects.

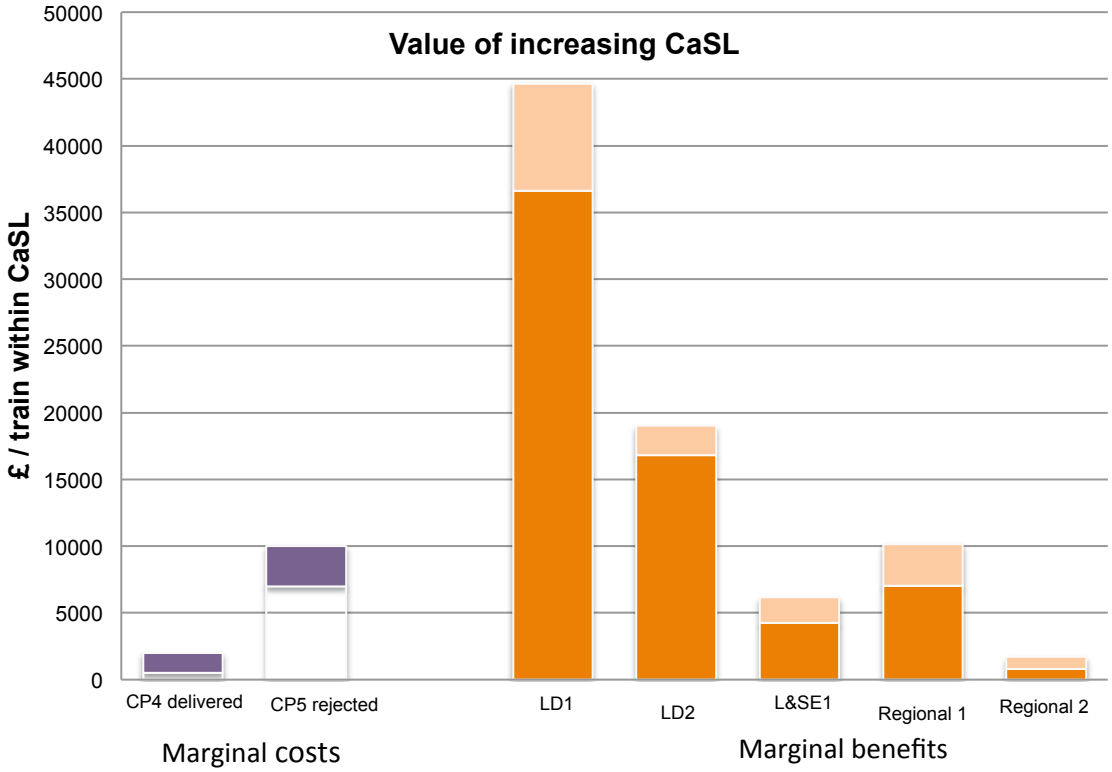


Figure 13: Marginal costs and benefits / nominal train achieving CaSL

Reporter assessment of affordability

The ranges of marginal cost associated with performance improvement per train (as presented above) may be grossed up to provide an indication of the likely overall cost of achieving an alternative performance level on a network wide basis. From this it is possible to infer a range of potential cost for achieving a given level of network wide performance improvement.

On this basis, the marginal cost to increase E&W PPM by 0.5% would range from £90m to £700m; on average, the same marginal cost would also be expected to reduce E&W CaSL by 0.1%.

The very broad ranges quoted reflect alternative approaches to interventions; the lower end applies to specific optional initiatives which may only be applicable to particular routes / locations. There is clearly not an inexhaustible supply of such opportunities. In addition, it is likely to become increasingly difficult to drive improved performance. So the lower ranges are almost certainly an underestimate. The cost based upon optional investments pursued in CP4 and those excluded from the SBP plans, may therefore be considered as a very lower bound estimate. Conversely, the NR uncertainty analysis assumes a set of alternative actions to those assumed in the SBP are applied uniformly across the network. In practice it is unlikely that any such alternative approaches might be applied on a more targeted basis. The NR national cost / PPM trade-off analysis may therefore be considered as a possible upper bound estimate.

A further limitation of this analysis is that these interventions may not produce sustainable changes. Many of the initiatives considered would not produce an indefinite benefit, for example where the creation of additional assets such as CCTV will have a limited life, and would require replacement at the end of this period.

The above assessment is a very high level analysis, and clearly much more work would be required to consider and address the uncertainties inherent, and to provide a more robust analysis. This is beyond the scope of the current mandate.

Nonetheless, we conclude that whilst there may well be value for money and affordable opportunities to improve performance on a targeted basis, a material increase in the overall E&W performance target is not likely to be affordable in CP5 given other constraints.

Observations on NR approach to developing business cases for performance improvement investment

In order to rely upon the industry approaches which NR has proposed to realise VfM, it is important that the appraisal mechanisms adopted for considering optional investment and management actions are fully representative of industry and user interests. We consider that the existing NR processes for assessing options for performance improvement, both routinely and as part of compiling the SBP have some limitations, which may mean that the industry cannot be confident that these will necessarily ensure VfM. These are:

- NR has typically sought a short–term payback within 5 years in considering performance investments.
- In CP4 NR has adopted an averaged value / minute by service type, rather than applying a location specific valuation in its performance investment appraisals; whilst this may be appropriate for national or Route-wide initiatives, it may under, or over-value localised improvements.
- Business cases have typically been evaluated on an industry rather than socio-economic basis, which may substantially undervalue benefits.

Network Rail and DfT may wish to consider how they may ensure that in future such investments may be considered on a broader socio-economic business case where appropriate.

6. Scotland KPI proposals

The package of KPIs as proposed by NR Scotland team was originally discussed in Nov 2012 at a 'CP5 Working Group' in Scotland chaired by the Head of Strategic Planning and involving all cross-border TOCs, freight operators and ATOC representatives. After the initial discussions it was agreed by those present that the package of additional KPIs should apply only to FSR (including sleeper services) for the time being. There was no support for application of the additional KPIs to cross-border TOCs when operating in Scotland for fear of causing perverse management actions.

Since the initial discussions, these proposals have been developed by the NR team working very closely with FSR using, as guidance, the 7 key objectives set by TS and stated in the HLOS. The package has now reached an advanced stage of development and, although it is not yet finalised, it has been used to produce a first trial report of the new KPIs, albeit using some dummy data, for p10 2012-13.

The package of KPIs falls into two groups; Group 1 being those which will apply to all operators (these are KPIs which are currently periodically reported) and Group 2 being those which will apply to FSR only (being a mixture of existing and new KPIs).

The Group 2 KPIs fall into a number of distinct tabulations and sub-tabulations. Each tabulation seeks to address a different aspect of train performance as experienced by the passenger and to address one or more of the 7 HLOS objectives (see Appendix F1 which shows all of the proposed Group 1 and Group 2 KPIs).

The package of KPIs is 'work in progress' at present, and although substantially complete, will not be ready to use 'in anger' until the start of 2013-14. At present the KPIs are being trialled to establish that the data exists and can be extracted, and that results from the NR Business Objects system (which allows extraction of data from TRUST) are consistent with data extracted by FSR from the BUGLE system. There is currently a high degree of consistency between the two, though not yet complete consistency.

The proposals have been shared informally by NR with other industry stakeholders, although not yet formally with TS, NTF or Passenger Focus.

Given the novel nature of some of the KPIs, problems are likely to be encountered in creation of trends based on historic data. However, trends will emerge during 2013-14 as a track record is established.

NR is keen not to introduce formal targets and (especially not) additional Regulation where none is sought by the HLOS. It is understood by the NR and FSR teams that public scrutiny of emerging trends will represent a very effective form of informal Regulation during CP5.

In order to finish the work, NR is planning to:

- complete the formal definition of a small number of outstanding KPIs (e.g. the definitions of 'consistently late', 'most heavily loaded', 'severe disruption' etc need finalising, also the process of selecting which peak time commuter services will be monitored at which heavily used intermediate stations needs confirming)
- produce a formal paper setting out the proposals in sufficient detail to satisfy all stakeholders
- repeat the trial exercise every period between now and year end
- begin publishing the KPIs internally and without dummy data from p1 in 2013-14

IR view on likely meeting of HLOS objectives

The proposed package of KPIs reads well and feels intuitively correct in that it covers the most important aspects of the passenger experience. It does not dilute the importance attached to general punctuality and reliability, yet it encourages a focus on heavily used trains and stations and it acknowledges the importance of right-time operation, reliable connections and delivery of amended services in times of disruption.

The table in Appendix F2 includes an assessment of which passenger experiences and management behaviours are influenced by each KPI and the extent to which the TS objectives have been addressed.

Note that these tables include one KPI, namely CaSL, which has been very recently added by NR, in agreement with FSR, at the suggestion of the IR. CaSL has now been included because (1) this is a Regulated Output in E&W and must be at least worthy of being a monitored indicator in Scotland, (2) the data is already collected and the KPI routinely extracted from the data, hence the value of being able to monitor the KPI comes at zero marginal cost and (3) cancellations are a significant driver of customer satisfaction on long distance routes with infrequent services such as exist in Scotland.

Other possible KPIs which were considered by NR for inclusion but rejected in consultation with the IR (at least for the time being) were 'average lateness' (because there are other KPIs in the package which more accurately reflect the loadings on popular trains and at popular interchanges), 'worst performing right-time starts' (because this is an important diagnostic measure rather than a significant primary driver of

passenger satisfaction) and 'train performance after the exclusion of bad days' (because of the significant difficulty of defining a 'bad day' and the risk of introducing perverse management behaviours).

Whilst the NR and FSR team seem confident in their work and have successfully produced a dummy report, there is more work to do before the proposal can be considered complete. It is not yet ready for formal presentation.

The proposal is clearly based on sound thinking which has taken into consideration the practicalities of producing and using the KPIs. Crucially there are no system changes nor major new data collection processes required in order to produce the KPIs; although some new management processes will be necessary to abstract and process the data and to calculate and present the new KPIs.

IR views on extent to which KPIs considered exclusive, comprehensive, comprehendible, available, and manageable

The dummy report containing the proposed package of KPIs for p10 was only 10 pages in length and easily comprehendible (given the benefit of a short briefing note).

The package of KPIs is comprehensive and the measures are reasonably, although not perfectly, mutually exclusive (i.e. the same 'measure' is not directly reflected in too many KPIs thus over-emphasising its influence on the overall package). The KPIs are all manageable (i.e. the NR and FSR teams have it within their gift to influence and improve, by their management actions, every one of the KPIs). Finally, the package of KPIs is, with one or two minor exceptions, consistent with the common themes which emerged from the ORR consultation on 'NR's Output Framework for 2014-19' (see Appendix H).

It would be helpful if, after the CP5 determination, TS (and possibly NR and FSR) retains the right to modify (with ORR approval), within reason, the package of KPIs. Through use, and with the benefit of experience and hindsight, opportunities to modify and improve the package will invariably come to light.

The effectiveness of this approach is likely to be of great interest to the Regulator and User Groups (and NR and TOC management teams) in E&W. TS has taken the view that the experience gained over the next few years will benefit not only the passengers, but also those responsible for setting the regulatory outputs for CP6 in 5 years time. In this respect, TS has demonstrated commendable forward thinking with this HLOS requirement.

7. Freight measure and targets

Context of CP4 freight performance and current measure

During CP4, as in previous control periods, Freight performance has been measured using the industry Freight Delay Minutes measure. This takes the sum of delay minutes to Freight services (as allocated under the PfPI process), and divides by the freight train mileage run, to give a Delay Minute per 100 km metric. A moving annual average metric is adopted to smooth the adverse impacts of exceptional poor months triggered by seasonal effects. This is a very well established metric, and has the virtue of being readily disaggregated across NR's Route geography. However, it is less relevant to Freight end users, is sometimes complex to understand in terms of cause and effect, and groups together causes of delay from different parties.

In CP4, a Regulatory Target was set for Delay Minutes, requiring a steadily improving trajectory year on year, to an exit position of 2.94 minutes/100 km. Following a period of gradual worsenment in performance in CP4, and steadily increasing gap to the Regulatory Target, ORR imposed an Enforcement Order on NR, requiring it to work with the industry to establish a Freight Recovery Plan (FRP). This was duly established, and progress in establishing this plan, together with a turn-around in driving improved performance over the first 9 periods of 2012/13, led to the Enforcement Order being withdrawn in November 2012.

Proposed Freight Delivery Measure metric for CP5

One of the requirements of the Freight Recovery Plan was the intent to establish an alternative metric for freight service performance which was more representative of freight customer interests and performance on key flows, as well as being more readily understandable by those on the ground responsible for operational delivery. As a result NR, in concert with the Freight Operating Companies (FOCs), has developed the Freight Delivery Measure (FDM). This measure tracks the punctuality of freight services at destination as well as taking into account cancellation of booked (not planned) services as a result of NR performance. It is defined as:

$$\frac{\text{All confirmed and booked services - (Punctuality Failures + Non FOC Service Cancelations)}}{\text{All confirmed and booked services}} \times 100 = \text{FDM}$$

Punctuality failures are defined as those not arriving at destination within 15 minutes of plan, AND where NR has caused at least 15 minutes of delay en route.

Non-FOC Service Cancellations are defined as those where a party other than a FOC has requested cancellation of a service booked to run.

In addition to being a more direct measure, and reflective of customer value, another key advantage of this metric over the previous Delay Minutes measure is that it focuses solely on NR performance, making it more suitable as a regulatory measure. NR has proposed in the SBP that this metric at national level should become the sole freight performance regulated measure for CP5. They will however continue to utilise Delay Minutes as an internal indicator, both for continuity, in order to help identify causality, and since it lends itself to Route disaggregation and targeting.

FDM will be a useful measure for FOC and front line staff as it is more tangible and in line with the industry norm than the current delay/100km. FDM will not however be the key to improving behaviours or performance within NR - this will be achieved through the focus on delay minutes by corridor. The benefit of FDM at frontline level will be the ability to issue a simple instruction of 'help the freight train get to destination within 15 minutes of it planned arrival time' rather than the current 'please help the freight train traverse the network whilst incurring no more that 2.94 delay minutes per 100km'.

NR set out its preliminary proposals for use of the FDM, for a target performance level of 95% for CP5, and for the establishment of a performance **floor** of 91.35%, for the purposes of Regulatory intervention, in an SBP supporting document[6]. This was intended to be considered by the Freight Joint Board in February 2013 (successor to the Freight Recovery Board created to oversee the Freight Recovery Plan). Once the target has been agreed, a course of action to achieve it will then be developed.

It was noted by NR[7] that the FOCs would like the target to be as close as possible to 100%, so NR believe this it is 'unlikely that the floor will be agreed at 91.35%'. Nonetheless, NR believes that the target and floor proposals would provide a good result to customers, incentivise NR to manage performance, and give customers a level of protection over and above that which they get under the current measure.

Industry support

The ORR consultation on the NR Output Measure framework in Autumn 2012 drew a number of responses from Freight Operators and other interested parties (see Appendix H), which demonstrate that the concept of the FDM is broadly supported by stakeholders, provided that appropriate targets are set. For example:

[6] "Freight Performance Measurement and Targeting in CP5", NR supporting document SBPT3330, 4 January 2013.
[7] Freight Performance Meeting Minutes, 13 February 2013

- DB Schenker stated that it was pleased that ORR intends to adopt this new measure, subject to a satisfactory starting point and trajectory for CP5 being agreed with NR, which would incentivise a continued focus on and improvement in freight performance;
- Freightliner also supported the proposed measure but believes that it is important that NR is set a more ambitious, rising target (than that set for CP4), which will motivate them to continue to drive improvement in freight performance.

Maturity of measure

It is important to note that the proposed FDM is an entirely new measure for the industry, and whilst it has been discussed for some time, and reported to the Freight Joint Board throughout 2012/13, it has not yet been used operationally. NR has retrospectively constructed the time sequence for this measure from available data, back to the beginning of 2010/11. This time series for the FDM measure is illustrated in figure 14 below.

In addition, NR has undertaken a comparison of the national level Freight Delay Minute measure and the new FDM. This shows a strong correlation between the two metrics, as illustrated in Figure 15. This gives some confidence that by driving future performance on the FDM, this would be likely to continue to also drive improvement in Delay Minutes. This is important, since Delay Minutes will continue to have an impact upon overall network-wide system performance.

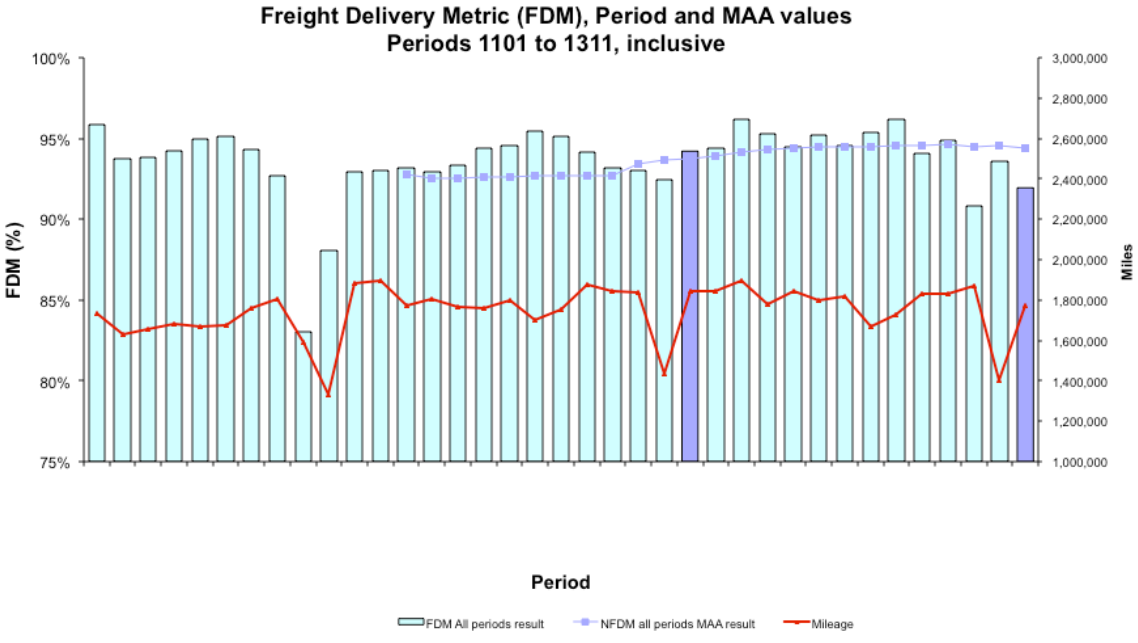


Figure 14: Freight Delivery Measure time series

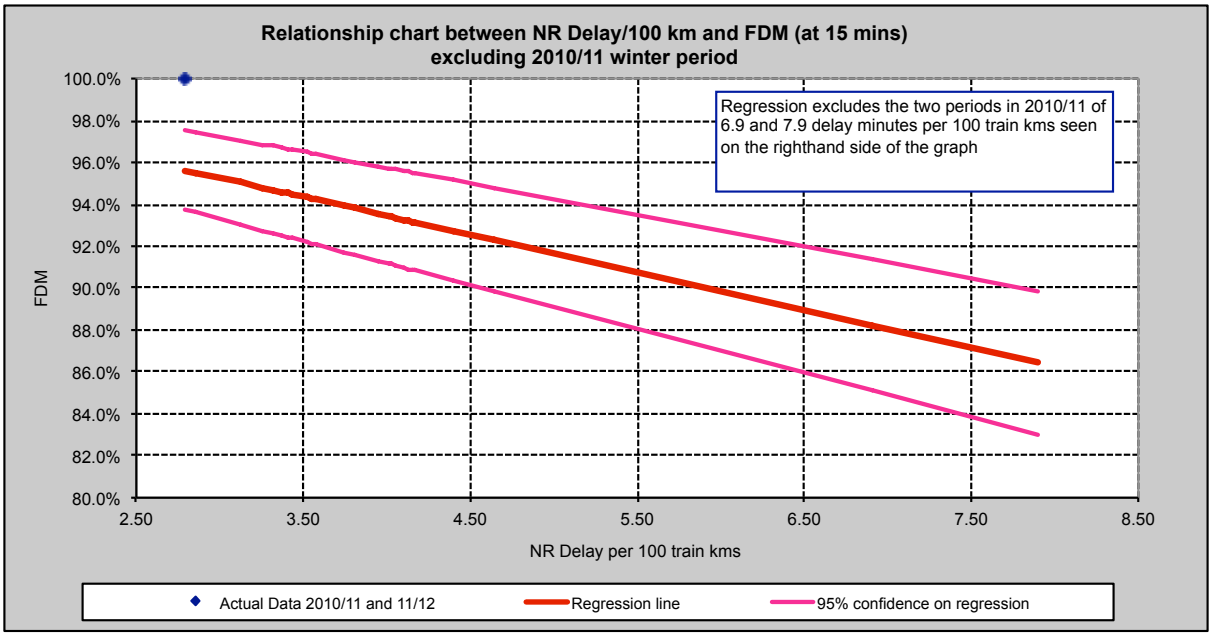


Figure 15: Correlation between FDM and Delay Minutes

As a new measure, there is likely to be a bedding-in period when FDM is brought into use, before we can be entirely confident about the stability of the measure and its future performance. It is highly likely that positive behaviours will be exhibited simply by focusing on this new measure, such as for example for signallers and controllers to regulate freight services suffering modest delay en route to ensure that they arrive at destination within 15 minutes of plan. This is likely to result in significant improvement in the metric without great attention to other underlying causes of delay.

In addition it is entirely possible that the new metric may cause some unintended, and even perverse behaviours to be exhibited. This might include for example, an additional challenge on the attribution of delay and cancellation between the parties, and a loss of interest in recovering delays when these significantly exceed 15 minutes. However, these risks are probably mitigated to a greater extent by the fact that such behaviour would have a direct bearing on Schedule 8 payments. NR also intend that Freight Delay Minutes will remain a published indicator at national level, but not a Regulatory target, which will continue to provide assurance that there is not any perverse behaviour, as well as providing continuity with historic data.

In the following sections we provide a commentary on NR's preliminary proposals in relation to the target and floor levels for FDM, and the supporting analysis. However it should be noted that NR has advised us that these were developed to inform the on-going dialogue with the Freight Joint Board, and as such were at a less mature state than the development of the PPM and CaSL forecasts for passenger. As noted above, they are not yet supported by a NR freight performance plan, although we understand that it is NR's

intention to develop this in due course. We offer our analysis to help inform the further development of these forecasts.

CP4 exit forecast

Periods 10 and 11 in 2012/13 have shown a significant downturn in performance in terms of both Delay Minutes (DM) and FDM, reflecting the wet-weather related difficulties, both to earthworks, and directly as a result of flooding. However, the underlying performance, excluding these factors, continues to show a positive trend. This together with improvement action being taken as a result of the FRP gives NR some confidence that they will be able to achieve the Regulatory DM target at the end of CP4. NR's starting position for proposing a target, and performance floor for CP5 is therefore that the CP4 DM target will be achieved, and that an equivalent level of performance should also be achieved for the FDM.

Network Rail has not established a direct trajectory for the FDM for the remainder of CP4. However, based upon the relationship between DM and FDM, as presented in figure 2, if the DM target of 2.94 minutes/100 km is achieved, this will equate to an FDM performance of 95.4%. However, there is some uncertainty to this, based upon the imprecise relationship between the two measures.

Direct projection forward of the current trend in FDM performance to the end of CP4 would suggest a likely position of between 95% and 96%, depending upon the severity of seasonal affects in 2013/14.

Risks and Opportunities to performance in CP5

To calculate an appropriate target for Freight performance in CP5, NR has performed a regression analysis to compare FDM against Delay per 100km (as shown in Figure 2). A confidence level was then applied to this analysis to derive an equivalent FDM to the delay/100km target for the exit of CP4 of 2.94 delay minutes/100km. This resulted in a CP5 FDM performance target of 95.4%.

Given the level of confidence around the regression, the variability in the relationship between FDM and Delay/100km, as well as the acknowledged weaknesses of FDM as a measure, NR identified a number of potential risks to Freight performance and FDM in CP5. NR assessed these risks based on a combination of data analysis and past experience to derive a likely percentage impact that each of the risks could have on FDM in CP5. The risks identified by NR, the likely impairment that each of these risks presents, and the rationale for this level of impairment are included in table 8 below.

Based on the consultation undertaken and the evidence received from NR, we have outlined our view, against each identified impairment in Appendix J, as to whether the forecast is 'reliable and based upon credible and sufficient input actions, and whether the NR proposed target/floor is reasonable in the context of HLOS'. We have also provided an indication of where a different level of impairment may be appropriate.

The impairments identified by NR, as described in Appendix J, seem generally reasonable in principle, based on the anecdotal and data evidence provided[8] [9]. However, the NR analysis of the impact of these impairments has only been undertaken at a high level, meaning that there is insufficient confidence in the scale of impact identified. In our interviews with NR they suggested that there derivation of the FDM floor was in effect a 'negotiation' with the freight operators, and that 'the final figure is not expected to be 91.35%'. It was also explained that these impairments are intended to highlight the risks to FDM performance, rather than being a definitive assessment on the likely risk and impacts of these impairments.

We consider that in most cases the evidence provided to demonstrate the basis for the relationship between these impairments and FDM was incomplete. In some cases the basis for the assumption of a change in operating characteristics (e.g. increase in average velocity and distance travelled) has not been adequately isolated in the evidence presented, from other variables.

Table 8: NR proposed basis for calculating FDM measure floor level

Performance Risk	FDM Impact	NR Rationale
CP5 Starting Position	95%	NR has committed to aim for delivery of 2.94 delay minutes per 100km, and has developed a Freight Recovery Programme in order to develop schemes and initiatives that would assist NR in closing the gap between current JPIP forecast (poorer exit position) and actual exit. There is no precise correlation between FDM and delay/100km, however based on the regression analysis performed an equivalent FDM of 95.4% has been derived for the exit from CP4. This analysis excludes two 'severe' periods in winter 2010/11 as these were considered atypical.
Confidence Level	-1.6%	NR has applied a confidence level of 95% to allow for initiatives only delivering 95% of their perceived potential as well allowing for mathematical error and natural variability within the relationship between delay/100k and FDM, and accuracy of data capture for each metric.
Increase in Velocity	-0.90%	There is a risk that increasing velocity will have a negative impact on FDM as removing slack within schedule will mean that the same level of delay will result in a train arriving later at destination (a 10kmh increase in velocity would lead to a 1.8% fall in FDM).
Increase in longer distance services	-0.20%	There is a risk that increasing longer distance services will have a negative impact on FDM – the further a train runs, the more likely it will experience a 15 minute delay, even if underlying robustness is the same. NR advises an increase in average distance by 10km

[8] "Freight for ORR CP5 review 2", 4 March 2013
[9] "FDM Target Setting 4", 12 March 2013

Performance Risk	FDM Impact	NR Rationale
		would cause a 0.2% fall in FDM)
Growth in freight traffic	-0.25%	The SBP is assuming 20% growth in freight trains using the network. This increases the risk of reactionary delay due to congestion at yards, on the freight network and available resources. Traditionally NR uses a factor that assumes for each 1% growth in traffic reactionary delay per mile will increase by 0.5%. A 20% growth in traffic therefore suggests a 10% growth in NR reactionary delay this would result in a 5% increase in delay per mile – up to 3.08 delay minutes per 100km.
Engineering Work	-0.10%	The quantum of overnight engineering enhancement work on the core freight network is expected to increase during CP5. The access impact on the CP5 trajectory is based on the relative quantum of possessions planned on the key corridors, and anticipates greater delay risk on services running on the shoulder of possessions.
External Risks	-0.10%	NR expects in CP5 that mitigation keeps pace with the risk level for suicides and cable theft. 16% of trains failing FDM have been delayed due to these two external causes. VfM would focus spend on mitigation on to high density passenger network so increased risk may show through in an increase of occurrences on lightly used freight network.
Weather	-0.50%	NR considers that the 2.94 figure relies on a benign winter. Freight performance is reported to be particularly effected by poor weather which makes a target reliant on assumed weather. NR has assumed one poor winter period (using the second worst period in 2011/12) which would lead FDM MAA to drop by 0.5% and delay per 100km would increase by 0.28 minutes.
Revised Target	91.35%	

Despite the significant level of planned network enhancement works in CP5, NR has made no provision for a reduction in FDM due to the positive impact of network enhancements, such as the provision of grade separated junctions and freight diversionary routes. NR also noted that there are a significant number of other elements that could have been factored into the development of the FDM target however it has been necessary to 'draw the line somewhere'. It was stated that 'NR has not factored in the forecast 22% increase in freight traffic in CP5', although this appears to go against the evidence presented. NR noted that it was expecting to achieve significant further improvement in performance by working with the freight operators and their customers on operating practices, especially within terminals to ensure right time departures, and to increase the availability and use of more robust pre-planned paths.

These factors lead to an assessment that the analysis has been carried out at a very high level and is at this stage indicative and broad brush, designed to set out a negotiating position which provides NR with a floor

level above which it can be confident of remaining and the FOCs with a minimum expected position across the control period, rather than a rigorously derived target which balances opportunities and risks to drive either sustainable performance or significant improvements in Freight performance. From this review, it has not been demonstrated that the FDM target has been developed based on credible and sufficient input actions, such that it would provide a stretching target. Nonetheless, we consider that with a further period in which FDM is brought into dummy use, and undertaking further analysis, this should be possible with the data available to the industry.

From the discussions held, it would appear that this approach has been adopted for a number of reasons. These include the fact that Freight performance is not included in the HLOS, and the fact that FOCs do not make additional contributions based on NR performance, so NR has to strike a balance between level of investment and level of performance.

Independent Reporter view on likely FDM trajectory

In broad terms, NR has proposed a flat line target and floor for each year of CP5. Whilst NR has achieved a great deal to date in recovering CP4 performance, the fact that the CP5 target makes no provision for further improvement in performance represents a missed opportunity. NR advises that opportunities to improve performance are broadly considered to offset as yet unquantified risks.

We understand that NR is in the process of constructing a forward-looking trajectory for FDM which will reflect the phasing of risks and potentially opportunities. However, this has not been available within the timescale for our report. Accordingly, and without further evidence of the phasing of the effects cited above, it is not possible to comment here on the proposed trajectory.

Implementation and Future Development

The proposed CP5 FDM target and floor proposal has been presented to the Freight Joint Board (FJB) in February 2013. NR advises that once the FDM has been agreed with the FOCs, they will implement a roll-out plan which will include adjustments to policies and procedures to reflect the new metric, briefings to NR and key stakeholders, target setting by strategic freight corridor, and development of new management policies to take advantage of the positives represented by this metric.

The Reporter requested a copy of this roll-out plan however was advised that it is still in draft and has not been worked through the FPISG. It was noted that this roll-out plan will be on the agenda for the March FJB meeting. Accordingly it is not possible to conclude whether the steps planned to implement this new metric are reasonable.

Network Rail is not currently expecting to introduce FDM in parallel with delay/100km for the remainder of CP4 in a ‘dummy run’ capacity as they remain focused on achieving the delay/100km target and believe

that running FDM in parallel, albeit in a 'dry-run' capacity, could distract from achieving this target. This is reported to be for further discussion with the FJB.

It would not therefore be a surprise if there were something of a step change in the metric observed in the initial period of its operation. Since the FDM target has been developed using broad, high-level analysis and a limited range of parameters, it would seem sensible to test the applicability and suitability of FDM in practice before committing to a firm target for CP5.

NR will continue to work with the customer supply chain and with the FOCs to improve processes and turnaround time. This is important to NR as it carries the burden of supply chain delays that are brought onto the network.

All measurement of freight performance is currently focused on NR performance related delays (which accounts for c.20% of the overall freight delays). There is no current measure of FOC performance. The FOCs are not regulated and they do not want a measure that gives the ORR a need to review their performance as FOC delays are often caused by other elements in the supply chain, e.g. waiting at ports, so the FOCs need a flexible system. Going forward however it is likely that NR will start to look at FOC on FOC, or FOC on NR delays in order to identify potential joint performance initiatives. From an industry performance / network capacity utilisation perspective it would be desirable to have metrics which reflect both NR and operator / supply chain performance.

Freight Delivery Measure conclusions

The Reporter considers that a reasonable case has been presented to adopt the FDM as a Regulatory performance measure for CP5. This appears to have good industry support, since FDM is considered to be a more direct measure, and reflective of customer value, which focuses solely on NR performance, making it more suitable as a regulatory measure.

Network Rail has set out its proposals for a target FDM performance level of 95% for CP5, and for the establishment of a performance floor of 91.35%, and these are being considered by the Freight Joint Board. However, whilst a level around 95% is likely to be broadly appropriate we do not consider that there is sufficient track record of operational use for this measure as a basis for setting a Regulatory target. Furthermore, there has not been sufficient evidence presented by NR to substantiate the need for a performance floor significantly below the target level, and specifically to justify the level of the various impairments proposed in reaching the 91.35% figure.

If FDM is to be used as a regulatory target in CP5, it is desirable that it is brought into use, at least on a 'dummy' basis alongside the Delay Minute measure, during the last year of CP4. This is not without risk, since there is a possibility that having two measures may confuse on the ground, or even create some minor erosion in Delay Minute performance, and will therefore require careful communication by NR.

NR has proposed a flat line target for each year of CP5 in the SBP, although we understand that they are now doing more work to develop a potential trajectory, as noted above. We consider that this would be more appropriate, since the various risks and opportunities will clearly vary across CP5. We note also the Freight operator views, as expressed in the Output Measures consultation (see Appendix H), for a challenging and rising target in CP5.

Freight Delivery Measure recommendations

The Reporter recommends that as part of its further development of the FDM on behalf of the Freight Joint Board, NR:

1. Undertakes further work to substantiate the key assumptions and relationships underpinning the development of the FDM and communicates these to stakeholders, prior to finalising the proposed FDM target. This should include reasonable expectations for improvement action upon freight performance in CP5, as well as identified risks.

2. Considers operating FDM in parallel with the existing metric from the remainder of CP4 as a 'dummy run', in order to provide confidence to the ORR that the target and measure is appropriate, and to give NR the opportunity to better refine the FDM target for CP5, prior to its endorsement by the Freight Joint Board and ORR.

8. Proposed governance arrangements and change control

NR has set out in the SBP Performance Plan a number of proposals in relation to the envisaged governance arrangements for managing performance in CP5. We comment on the main proposals which will affect the performance targets and trajectory below.

Performance Oversight

It is envisaged that National Task Force (NTF) will continue to agree the passenger industry PPM target on a year by year basis, this figure being the aggregation of targets from individual JPIPs together with an assessment of cross-industry risks and opportunities. NTF and sub-groups appear to have provided an effective mechanism for overseeing performance planning in CP4, so it appears sensible that this should continue, although ORR will need to take a view on an annual basis as to whether the aggregation of JPIPs, risks and opportunities continues to provide sufficient confidence in the achievement of the Regulatory targets as CP5 progresses.

Rolling JPIPs

NTF-OG re-stated in July 2012 that the expectation of the industry is that two-year rolling JPIPs will continue into CP5. It is proposed that this will remain the key cross-industry planning approach going forward as endorsed by NTF on 26th September 2012. This is already underway, with the current 2013/14 JPIP process providing outline plans for the first year of CP5, which are due to be signed off in April 2013. Again, this appears to have been an effective mechanism in CP4, and it is helpful to take a longer term perspective, especially since many actions will take at least a year to demonstrate benefit. However, for the second year plan to be effective as a medium term planning mechanism, some ground rules should be established regarding the rolling mechanism for translating year two into year one. It would be sensible that the trajectory set as year two is only varied where there have been clear unexpected external factors at play, or where the industry agrees that an alternative performance level represents a better trade-off between outputs, as opposed for example to underperformance in year one.

Performance Floor

NR has proposed that an absolute performance floor of 90.0% PPM for E&W should be established, below which performance would not be expected to deteriorate, even allowing for exceptional external circumstances. Above this level, it considers that the industry should be able to monitor and self-regulate, taking corrective action as appropriate. We do not see any great merit in setting such a floor. There might easily be circumstances when performance remains above this level, but is deemed unacceptable, such as for instance a sudden material dip after a period of performance at or above the Regulatory target. Equally it is not inconceivable that performance might fall below this level and still be deemed acceptable, e.g. if exceptional external factors, or changes in franchise circumstances were drivers. We consider it likely to be more effective to consider such circumstances at the time.

Change control

Network Rail has proposed that a change control mechanism should operate during CP5 for performance outputs. This was briefly described in the SBP and has since been the subject of a paper to NTF POG in February 2013 which set out the envisaged process and criteria for application in greater detail. This mechanism would allow the industry to potentially agree to vary from the Regulated level of output, should it be considered that this would lead to an improved industry value. Change control would potentially facilitate such agreement, and would therefore be limited to trade-offs that:

- are deliberate decisions, initiated by funders and/or operators;
- are unforeseen in the periodic review; and
- would have a material impact on NR's ability to deliver its regulated outputs (taking into account "positive" as well as "negative" changes in this respect).

We consider that these are all sensible criteria, and can see merit in establishing such a mechanism, although there are some practical considerations:

- clarifying what is to be considered material change;
- establishing supporting models to allow the performance impacts of change to be agreed;
- ensuring that there is an appropriate definition of baseline.

The types of change which are likely to qualify for consideration as changes include:

- overall change in traffic growth compared with SBP assumption

- material change in enhancement projects, including new or cancelled projects
- material change in service specification and performance target at franchise change
- material change in timetable allowances (difference between working timetable and public timetable)

In practice it is likely that very few individual changes would constitute a material change at national level. NR has also proposed that a series of smaller changes might be rolled up to constitute a material change. This is potentially more difficult to administer, although it would appear to be relatively straightforward for example in respect of traffic growth, by monitoring annual volumes relative to SBP assumption at strategic route section level. Changes in franchise specification should also be relatively straightforward to monitor and evaluate. NR has proposed that Event Steering Groups should oversee trade-off decisions in respect of performance impacting changes, and these might therefore also provide a first point of test for applicable change and to assess scale of impact, and hence materiality.

Network Rail believe that the current range of available performance models can be used to support trade-off decisions, and hence in principle to assess the change impacts on PPM in support of change control, although these are likely to continue to be refined in response to emerging needs.

The required granularity of baseline assumptions will derive from the definition of materiality and applicable change. Depending upon the intent to roll-up smaller changes as qualifying change, this baseline definition may be more onerous. NR's Delivery Plan for CP5 is likely to provide the effective baseline for change control. Consideration of the requirements for a performance baseline should therefore form part of the specification for the Delivery Plan.

Freight governance

It is envisaged that the Freight Joint Board will continue in CP5 as an industry oversight body for Freight Performance. This appears to have been very helpful and effective in CP4 in overseeing performance recovery. NR has proposed that they should be responsible for setting the floor level for the FDM. We have commented above that the current proposals for a performance floor are likely to require significant further work to provide a robust trajectory. An early task for the Freight Joint Board is therefore likely to be monitoring a period of shadow operation of the FDM in 2013/14, and to propose an appropriate trajectory / target for CP5 once there is sufficient track record of operation.

9. Conclusions

Key conclusions

In relation to the three primary questions posed by the mandate, the Independent Reporter considers that:

1. We have not seen evidence that an alternative (higher) level of output target beyond that specified in the HLOS for E&W PPM and CaSL would represent value for money, or be affordable in the context of the other outputs and affordability constraints which NR is required to deliver. However, this is a very complex area, and whilst there is not in our view a case for a higher national target, the evidence suggests that there may well be value in pursuing higher levels of output on some routes and poorly performing services, potentially at the expense of those where performance is already strong.

2. The proposals developed for a package of performance KPIs in Scotland are suitable and are likely to be effective in achieving the objectives set out by the Scottish Ministers in its HLOS. We commend this approach, and consider that it is likely to provide valuable learning for the rest of the network.

3. The approach adopted by NR to developing the performance plan for the SBP is reasonable, although there remains a high degree of uncertainty in the forecast performance. It will therefore depend upon an effective JPIP process and continued national programme management to ensure that this is translated into a deliverable plan. We have differed from NR's view on the likely trajectory and confidence limits for both E&W PPM and CaSL, notably in recognising a likely lower starting position countered by a greater upside potential for improvement during CP5, resulting in a wider range of outcomes. Nonetheless, we believe that provided sufficient effort is put by NR into progressing performance management initiatives, and that the industry aligns with NR in progressing ToC led improvements, there is a reasonable likelihood of achieving the HLOS targets for PPM and CaSL. The wide range of potential outcomes is not surprising at this stage, but demonstrates that continued viligance will be needed by all parties to achieve the desired outcome.

Additional conclusions

SBP performance planning approach

The process adopted by NR to create the SBP performance plan has been pragmatic, balancing Route ownership and central coordination and guidance. This has however generated varying levels of detail to underpin the forecasts, and we believe a somewhat cautious forecast overall. There may well be useful learning in future through assessing how reliable the various route forecasts prove to be.

The provision by NR of ranged forecasts is helpful, although this needs some care in interpretation and may create a greater perception of precision and deterministic outcome than is the reality. The forecast provides a reasonable level of transparency, although we consider that it would have benefited from improved clarity of which things NR considers itself accountable for, e.g. more clearly separating project mitigation, and other NR improvement action, from ToC led and fleet in its forecast.

Overall we found the planning approach to be reasonable, and to be based upon sound analytical modelling, although we have taken a different view of the likely range of some key inputs, as summarised below.

The principle set out in the SBP, of relying upon the rolling JPIP process to provide a meaningful delivery plan, and to respond to local customer requirements will be essential to provide confidence in delivery, to respond to emerging circumstances, and to deliver value.

PPM (Public Performance Measure) forecast

NR's stated commitment in the SBP to achieving the HLOS targets is encouraging, but we consider that they have been overly cautious in declaring only a 25% confidence level in achieving this, since this level essentially excludes the expected impact of national performance initiatives, and fleet and operator contributions; with these included, their implicit confidence improves to 75%.

We consider that some potential risks have been understated in NR's E&W PPM forecast: principally the likely CP4 exit position, where we consider a range of between 91.4% and 92.4% is more likely than NR's 92.5% central assumption and range of 92.2% to 92.8%. We also identify a potential for a greater downside impact of adverse weather and external factors in CP5, which is explicitly a different from NR's neutral assumption. This means that the performance trajectory is likely to be worse in the early years of CP5.

In other areas we consider the NR forecast inclines to being overly pessimistic: e.g. insufficient allowance for engineering access productivity and risk mitigation; limited benefits assumed through performance initiatives including CP4 carry-over; no benefits claimed for GSMR; few benefits on enhancement completion; and only a modest expected contribution from fleet and operator actions.

Overall we consider that there is a reasonable likelihood (which we have assessed as a 45% confidence) of achieving the HLOS target of 92.5% by the end of CP5, albeit with a wider range of potential outcomes than NR has forecast.

CaSL (Cancellations & Significant Lateness) forecast

The forecast for E&W CaSL is subject to most of the same factors as for PPM, albeit with differing degrees of impact. We consider it is likely that the CP4 exit position will be worse than the HLOS target of 2.2%, and the impact of weather and externals in CP5 also places a greater downside risk, since these are a major contributor to CaSL. Targeted asset management, engineering access mitigation, fleet and operator contributions all have the potential to provide a more beneficial impact than assessed in the SBP.

Again it is encouraging that NR is committed to meeting the CP5 HLOS target, and overall we consider that there is a broadly balanced likelihood of achieving the HLOS target by the end of CP5, but with the trajectory in the early part of the control period likely to be a little below target.

There is a much greater range of variability in CaSL performance by operator and by service group. Given that this is the case, there is a lack of targeted action evident in the SBP seeking to address the poorer performing operators. NR has stated that they would expect that this will be addressed as appropriate through the JPIPs, and ORR will need to monitor to confirm that this is the case.

Poor performing service groups

We have seen limited evidence in the SBP of targeted action directed at poor performing services, as required by the HLOS. We accept NR's contention that these will be addressed in part through enhancement works in CP5, as well as through developing timetables for improved performance, and actions at JPIP level. NR has also highlighted however that enhancement works are primarily geared to addressing future service growth, so will not necessarily address current poor performance, and it will be important to monitor that JPIPs are indeed targeting poor performing services effectively.

Bad days

ORR asked us to assess to what extent NR's plans would address days when performance is impacted severely. We have seen evidence in the Route plans that the underlying causes of severe delays are being tackled to some extent, e.g. through planned targeted action on the most vulnerable assets, and addressing the likelihood and consequences of major external impacts such as result from cable theft, suicides and severe adverse weather. The focus on this is variable by Route however, and the broad national assumption that the delay trend for these causes will be neutral across CP5 suggests that there is not a coordinated national focus to reduce these. NR may benefit from further effort to monitor and transfer best practices in this area during CP5, as well as considering how the development of performance

indicators may allow a distinction between right time performance on good days, and service recovery following major incidents, which are blurred in the current metrics.

Value of setting higher output targets

NR has not explicitly considered whether there would be improved value provided by seeking to deliver a higher level of performance output than the HLOS targets in CP5. Instead they have concentrated on how best to deliver the competing outputs of safety, capacity, journey time, and performance at an affordable price. This approach has clearly been consulted and agreed to a large extent through the NTF in advance, and was as anticipated from our discussions with NR during part 1 of our work, ahead of the SBP publication.

The selection of options to include in the SBP, as well as the consideration by NR of trade-offs between capacity, journey time and performance, has implicitly involved some judgement of the relative value of pursuing a higher level of performance. NR led a series of studies in the lead up to the SBP which demonstrated that operating more intensive services, especially on longer and more complex routes, as well as increasing line speeds, would all be likely to adversely impact performance. This is all logical, and has clearly had some influence on the CP5 strategy. We have not sought to investigate these trade-offs further in our work. For the SBP, NR has assessed value largely in the context of whether additional inputs are required and affordable to increase the confidence of achieving the HLOS targets, rather than whether they would allow the targets to be raised.

We have sought to compare the marginal costs for optional investments with the marginal benefits for alternative levels of performance, drawing upon sampled NR data to understand costs, and modelling revenue impacts on selected service groups. This analysis has demonstrated that there is a wide variation in the potential benefit value by service group, such that further targeted action to improve performance is likely to offer value on some but not all routes. The range of appropriate actions could clearly be extended if a longer pay-back period was applied than NR normally adopts in its appraisals, and if socio-economic benefits were included. Both of these might be deemed appropriate from a passenger perspective, but are not necessarily affordable.

Our very high level assessment of the likely value of setting a higher output target on a national basis appears to indicate this would not be worthwhile. However, very considerable caution needs to be applied to this conclusion, since we are adapting analysis conducted by NR for a different purpose (sensitivity testing its cost forecast), and this data does not necessarily reflect a sustainable assessment of cost and output impact.

Although this analysis provides insufficient justification for setting a higher E&W target for either PPM or CaSL, there may well be value in driving for a higher performance level than NR has indicated in the SBP for some Operators, especially for long distance and intensively used L&SE services, where the marginal value

is inherently higher. The case for this is likely to be best explored at local level as part of the JPIP process, and in considering the business case for specific optional investments.

Affordability

Determining the likely affordability of setting a higher level target for performance in CP5 introduces further uncertainty to the assessment of value described in the previous section. We have extrapolated the potential marginal costs per nominal train as derived in the value assessment, to determine a potential range of annual cost increase associated with establishing a higher level of performance. This indicates that a lower bound of around [£70m per annum] and an upper bound of £900m per annum might increase performance by around 0.5% PPM and CaSL by around 0.1%. However these extrapolations presume at the lower end an effectively inexhaustible supply of improvement opportunities, which is clearly not the case.

We have not been able to make an assessment of what further improvement actions might also be available beyond those already envisaged in the SBP, since NR appears to have generated relatively limited information in this regard in the SBP process. There may well be some lower cost activities than those identified in our analysis. NR are developing a range of potential further initiatives, but are likely to take these forward only when there is reasonable management capacity available to progress and implement them, and NR expect this in part to mitigate potential emerging adverse impacts on performance.

Scotland KPIs

The Independent Reporter considers that the proposals for Scotland KPIs are clearly based on sound thinking, which has taken into account that these must be practicable, measurable, comprehendible, and manageable. Although there is still more work to do to determine a reporting format, and detail management arrangements for CP5, we have no doubt that this will be achieved The package of KPIs is, with one or two minor exceptions, also consistent with the common themes which emerged from the ORR consultation on 'NR's Output Framework for 2014-19' (see Appendix H).

The effectiveness of this approach is likely to be of great interest to the Regulator and User Groups (and NR and TOC management teams) in E&W. Transport Scotland (TS) has taken the view that the experience gained over the next few years will benefit not only the passengers, but also those responsible for setting the regulatory outputs for CP6 in 5 years time. In this respect, we consider that TS has demonstrated commendable forward thinking with this HLOS requirement.

Freight

The Independent Reporter considers that a reasonable case has been presented to adopt the new Freight Delivery Metric (FDM) as a Regulatory performance measure for CP5 as an alternate to the Freight Delay

Minute indicator used in CP4. This appears to have good industry support, since FDM is considered to be a more direct measure, reflective of customer value, and one which focuses solely on NR performance, making it more suitable as a regulatory measure. NR also intend that Freight Delay Minutes will remain a published indicator at national level, but not a Regulatory target, and we consider this sensible to continue to manage performance at working level and continuity with historic data.

Network Rail has set out its preliminary proposals for a target FDM performance level of 95% for CP5. Whilst this is likely to be broadly appropriate we do not consider that there is yet sufficient track record of operational use for this measure as a basis for setting a Regulatory target. Furthermore, we do not consider that there has not been sufficient evidence presented by NR to substantiate the need for a performance floor significantly below the target level, and specifically to justify the level of the various impairments proposed in reaching its proposed 91.35% figure. We consider that a variable trajectory should be established, since the various risks and opportunities will clearly vary across CP5.

Governance and change control

We acknowledge and support NR's proposals that the rolling JPIP process should continue to be the primary delivery planning mechanism for performance in CP5. As noted above, given the uncertainties inherent in long term planning, it will be important that these are used to mitigate emerging risks, and to target poorly performing services and appropriate value for money. We also consider that it would be helpful to establish clear expectations as to how the outline plans for year 2 become firm plans for year 1 in the rolling JPIP process; such that the medium term planning activity is effective and does not lose credibility in the industry.

We do not see any great merit in NR's proposals for setting a performance floor for CP5 at 90% PPM. There might easily be circumstances when performance remains above this level, but is deemed unacceptable, and it is not inconceivable that performance might fall below this level and still be deemed acceptable. We consider it likely to be more effective to consider such circumstances at the time in judging whether Regulatory intervention is necessary.

We support NR's proposals for an explicit change control mechanism relating to performance outputs, the types of changes to which this should apply, and the governance arrangements envisaged. In practice however, it is likely that very few individual changes would constitute a material change at national level. NR's Delivery Plan for CP5 is likely to provide the effective baseline for change control. Consideration of the requirements for a performance baseline should therefore form part of the specification for the Delivery Plan.

10. Recommendations

We make below various recommendations based upon the conclusions stated above. This includes some repeated from within the main body of the report, which we have restated here for ease of reference.

We have separated these into recommendations for NR and for ORR.

The Reporter recommends that NR should:

1. Undertake further work under the oversight of the Freight Joint Board to substantiate the key assumptions and relationships underpinning the development of the FDM and communicate these to stakeholders, prior to finalising the proposed FDM target. This should include reasonable expectations for improvement action upon freight performance in CP5, as well as identified risks.

2. Consider operating FDM in parallel with the existing delay minutes metric for the remainder of CP4 as a 'dummy run', in order to provide confidence to the ORR that the target and measure is appropriate, and to give NR the opportunity to better refine the FDM target for CP5, prior to its endorsement by the Freight Joint Board and ORR.

3. Consider how it can utilise its current analysis of CP4 performance, and in particular the benefit monitoring of Base + and Base ++ initiatives, to understand more fully the expected performance trajectory, and hence whether and where it should undertake further improvement activity in support of achieving the CP5 targets, and JPIPs. We consider that the confidence in relation to this element of the plan is not as high as it could be, and more rigorous benefit management should improve this.

4. Undertake a lessons learnt exercise on the different approaches adopted by its Routes and national team in preparing the SBP, and establish a plan to monitor the reliability of the forecasts generated and to share best practice.

The Reporter recommends that ORR should:

1. Give consideration in setting Regulatory targets for CP5 performance, to the revised profile and ranges for E&W PPM and CaSL which the Reporter has set out as being in its view credible ranges for performance in CP5, taking into account NR's plans, risks and opportunities.

2. Not set a higher level of target for either E&W PPM or CaSL for CP5 than proposed in the HLOS on the basis of the value analysis and affordability assessment conducted by the Reporter, since we do not consider that our assessment has provided evidence that this would be value for money at national level.

3. Consider whether it would be desirable to set some expectations as to the content for JPIPs, and also the means by which the targets for year 2 of rolling JPIPs should be amended to become Customer Reasonable Requirements for year 1.

4. Provide a mechanism by which, after the CP5 determination, TS (and possibly NR and FSR) retain the right to modify within reason (and with ORR approval), the package of KPIs. We consider it likely that through use, and with the benefit of experience and hindsight, opportunities to modify and improve the package will inevitably come to light.

5. Engage with NR and the NTF in the further development of the proposed change control mechanism, and in particular, that consideration of the requirements for a *performance baseline* should form part of the specification for the Delivery Plan.

Appendices

Appendix A: CN022 Mandate

Independent Reporter (Part A) Mandate

CP5 HLOS performance and reliability target - analysis

Version 1, Issued on 19-09-2012
Ref CN/022

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1. Purpose of Mandate

The periodic review has started. The High Level Output Statements were published in June 2012 (Scotland) and July 2012 (England & Wales). These set performance targets that the funders wish to buy in Control Period 5.

England & Wales HLOS:
The England & Wales HLOS specifies a minimum overall PPM level of at least 92.5% moving annual average by the end of CP5. For CaSL it specifies a single target for England and Wales by end of CP5 (2.2%). For both it also requires a higher level if the ORR determines this is value for money and can be affordably achieved without compromising delivery of other HLOS requirements.

Network Rail will present the levels of performance that it expects to deliver in its Strategic Business Plan on 7th January 2013. The ORR will then decide what outputs NR must deliver and present this in its final determination (October 2013).

Scotland HLOS:
The Scotland HLOS require that the outputs of the network will be maintained in such a manner as to enable the operators of each franchise let by the Scottish Ministers to achieve a PPM of 92.5% by the end of CP5, with a minimum PPM of 92% achieved across each year of the Control Period.
In support of the delivery of the PPM, the Scotland HLOS also requires Network Rail to work with its industry partners to develop key performance indicators which as a package:

- encourages and facilitates outperformance of PPM, as outlined above
- measures and improves performance on 'right time' measures over the lifetime of the Control Period
- are not to the detriment, and where possible improve, the level of service provided to other operators
- reflects the impact of performance on passenger experience
- reflects the economic value of services, disaggregated by Scottish service group, or line, or time period or a combination of those things

- are sufficiently flexible to take account of periods of severe disruption, with a focus on working with all affected operators in those circumstances to provide the best service possible for rail users
- do not add additional expenditure to the baseline costs of the Scottish operating route

We expect Network Rail to present the package of KPIs in its Scotland Strategic Business Plan. The ORR will then assess if these KPIs meet the requirements set in the Scotland HLOS (set out above) and present its views in the final determination (October 2013).

We require the reporter to assess the SBP and advise the ORR:

1. what level of PPM, over 92.5% and CaSL below 2.2%, is value for money and affordable for England & Wales without compromising delivery of other HLOS requirements; and
2. to advise if the package of KPIs, developed by Network Rail with the industry, will be effective in achieving the objectives set out by the Scottish Ministers in its HLOS.

2. Scope

England & Wales:
Assessment of performance outputs that represent value for money and affordability, over the minimum specified in the HLOS. The outputs in scope are PPM and CaSL. Consideration given to operating routes where appropriate.
Scotland:
Assessment of the package of KPIs proposed by Network Rail will be effective in meeting the objectives outlined in the Scotland HLOS (see paragraphs 3.9 of the HLOS or in Appendix A of this mandate).
General approach:
This is not an area of work that has done before and therefore requires thought on how it should be done. Therefore, we would like the work to be done in two phases. The first phase will review relevant documentation and interview relevant stakeholders to define a methodology. The reporter should note that the first phase should require limited input from the Network Rail performance teams so as not to draw focus from the planning process. This may require flexibility with interview timescales, which should be co-ordinated via Tolu Coker. We will need the reporter to agree with Network Rail the information it will give us in support of the SBP. We anticipate that this will be done in close co-operation with ORR, NR, DfT and TS. It will also define the information requirements to enable an assessment to be carried out. The second phase will be to carry out the work and provide conclusions in advance of the ORR's determination.
Contingency
In addition the analysis and assessment of the performance section of the SPB may require additional, as yet unspecified, support from the independent reporter. In preparation for this, ORR identified 31 potential assessment criteria for the plan. These are listed at appendix A.

A series of "challenge meetings" have been set up. The performance challenge meeting is scheduled for 28 January. Work is likely to be required from the reporter in preparation for these meetings and in the subsequent analysis and assessment. In addition 10 route challenge meetings are scheduled to take place between 1 and 19 February. Support may be required in preparation for, or to assess issues arising from these meetings, and it is not intended to divert Route attention other than these route challenge meetings..

3. Deliverables

We require:

- Phase 1 draft report – by 23 November 2012
- Phase 1 final reports – by 14 December 2012
- Phase 2 draft report – by 17 April 2013

- Phase 2 final report – by 22 May 2013

ORR and Network Rail will provide comments within 5 working days of the draft reports and the reporter will provide final reports 10 working days later, taking into account the comments. The reporter will provide one or two page executive summaries, suitable for publication.

In terms of the contingency requirement, we may require:

- Draft analysis in support of the performance, punctuality and reliability challenge meeting draft report – by 23 January 2013
- Final analysis in support of the performance, punctuality and reliability challenge meeting draft report – by 8 February 2013
- Draft analysis in support of the route challenge meetings – by 31 January 2013
- Final analysis in support of the route challenge meetings – by 22 February 2013
- Draft analysis in support of the SBP assessment for the March ORR Board meeting – by 28 February 2013
- Final analysis in support of the SBP assessment for the March ORR Board meeting – by 15 March 2013

ORR and Network Rail will provide comments within 5 working days of the draft reports and the reporter will provide final reports 10 working days later, taking into account the comments. If required, the reporter will provide one or two page executive summaries, suitable for publication.

4. Resources

The breadth and depth of Phase 1 is to be commensurate with a resource cap of 30 days. Phase 1 should provide a resource estimate for Phase 2, which we will assess to ensure it is reasonable.

The contingency requirement is estimated as a maximum of 40 days.

5. Response from reporter

The reporter should respond to this mandate within 2 weeks detailing your approach, staff, proposed fee and milestones.
The response should also confirm whether there are any conflicts of interest and if so how they will be handled.
If the response is accepted the reporter will be expected to start work as soon as possible.

Mandate Appendix A: ORR's assessment criteria

1. Can NR hit a national PPM MAA of 92.5% by end CP5?
2. Can the end CP5 92.5% PPM MAA target be set higher in a VfM way, that's affordable and doesn't compromise delivery of other HLOS requirements?
3. Can NR hit the national CaSL target of 2.2% by end CP5?
4. Can the end CP5 2.2% CaSL target by set higher in a VfM way, that's affordable and doesn't compromise delivery of other HLOS requirements?
5. Has the industry delivered robust plans to improve worse performing routes and those on which levels of reliability have greatest economic effect
6. What further targets should be set for CaSL and PPM, e.g. national annual, sector, TOC?
7. How will we decide what outputs are set and how will we assess them; NR's proposal, safeguards to customers, can we monitor?
8. What is the regulatory status of all measures?
9. Are we content with the definition of freight (PPM / CaSL) measure and targets?
10. Do the performance plans align with other plans, e.g. AM
11. Is the delay minute trajectory consistent with XXX?

12. How can NR ensure that performance planning is robust and joined up with the TOCs?
13. How will benefits from operational schemes be realised and measured?
14. How do we ensure that the component targets deliver the regulated outputs?
15. Is the phasing realistic?
16. Is it explicit about the assumptions e.g. DPI, DM/PPM relationship?
17. Is there clear evidence that best practise is being shared?
18. Are benefits consistently calculated across all routes/schemes?
19. Is there evidence of peer challenge?
20. Is there strong evidence of TOC engagement?
21. How will TOCs be engaged in delivery of the plan?
22. How will risks from franchise change be managed?
23. Is there clear evidence that the individual TOC PPM and CaSL targets are deliverable?
24. How are NR going to reduce cancellations?
25. Is there enough priority being given to achievement of the CaSL target?
26. Does the plan demonstrate a clear linkage between the indicators and outputs?
27. Is the relationship between RT and PPM clearly understood?
28. Is there a clear plan to deal with sub-threshold and unexplained delay?
29. Is the relationship between the Freight CaSL measure and FPM clearly understood and articulated?
30. Is there evidence that they can effectively process and integrate all the available data?
31. What other sources of data do they intend to utilise?

Mandate Appendix B: edited extracts from advice to ministers, SBP requirements and the HLOSs

Advice to Minsters

8.13 We have discussed the possible contents of the Secretary of State's HLOS with DfT and we are currently working with DfT and Network Rail to clarify certain issues, such as the split between CP4 and CP5 costs for committed enhancement projects. We have also reviewed the experience of working with the funds that were specified in the 2007 HLOS e.g. for the strategic freight network, so that lessons can be learnt in terms of specification and governance (see paragraphs 5.70-5.72).

8.14 DfT has indicated that their HLOS is likely to contain requirements on performance, capacity and make allowances for certain funds and we are in discussion on this.

8.15 We are reviewing whether the further outputs (beyond the HLOS requirements) specified in PR08 should also be specified again and if so whether the measure should be changed in any way. We are also reviewing whether any new outputs should be added or existing outputs dropped and the cost implications of any changes (which must be affordable given the SoFA). In doing this we are drawing on the helpful material in the Initial Industry Plan.

8.16 In our August 2012 consultation we will set out what the options are – given the content of the HLOS – for the overall framework of outputs, enablers and monitoring KPIs for PR13.

SBP guidance

We expect your plan to be well evidenced and robust. Specifically we expect your SBP to:

• Clearly describe the **outputs** you will deliver in CP5. You will need to explain how these meet customer reasonable requirements and link to the wider **outcomes** you expect them to achieve;

• Clearly set out the **expenditure levels and overall revenue** you believe you need to deliver these outputs;

• Identify the **key enablers**, such as improvements in asset management processes, which your plan relies on to deliver the CP5 settlement and improvements beyond;

Outputs

1.14. At this stage we do not know what outputs the HLOSs will specify. The DfT has indicated that it is likely to continue to specify a PPM requirement. It will specify a set of enhancement schemes many of which are already committed and is likely to specify capacity metrics as it did in the 2007 HLOS. The Scottish Government Infrastructure Investment Plan 2011 sets out plans for rail infrastructure investment over the next 10 to 20 years, including the major projects of EGIP, Borders, Aberdeen-Inverness, Highland main line, Aberdeen to central belt improvements and wider electrification of the network. The SBP will need to include forecasts of required outputs supported by an analysis of how they will be delivered. Whatever the precise specifications you need to be clear what Network Rail will do in order to deliver the HLOSs and what you are assuming others (e.g. train operators, funders) will do to deliver those outputs.

1.15. You should also set out how you are meeting any reasonable requirements of your customers which go beyond HLOS requirements for which you can secure funding.

1.16. We expect you to demonstrate how the outputs link to outcomes for rail users and the wider economy and environment, where it will be important to distinguish Network Rail's contribution from the wider industry one. The best way of demonstrating this is likely to vary depending on the outcome; we want to agree these with you shortly. In our incentives consultation we suggested that the following outcomes are relevant: passenger satisfaction, freight customer satisfaction, economic growth, connectivity (for example, inter urban journey times) and environmental sustainability.

1.17. You will need to set out how you will monitor and manage delivery – specifically you will need to forecast monitoring KPIs (such as asset condition measures). You will need to set out how you plan to develop the current asset management and safety enablers.

1.18. You should explain how you sought input from train operators, passengers, freight customers, suppliers and other stakeholders in the development of your plan, what input you received, and how you have taken it into account.

E&W HLOS

19. Reliability has continued to improve in CP4. The high amount of recent investment in the rail network means it is not yet clear how much further performance improvement can be delivered in CP5 without incurring investment which is not value for money or which compromises the delivery of other HLOS outputs.

20.Bearing in mind the need to balance different objectives, the Secretary of State is setting a Metric specifying that reliability, as measured by the 'public performance measure' (PPM)[5], should achieve an overall level of at least 92.5% moving annual average by the end of CP5. She wishes to have a higher level if the ORR determines this is value for money and can be affordably achieved without compromising delivery of other HLOS requirements.

21.The Secretary of State also wishes to see a reduction to no more than 2.2% by the end of CP5 in the overall percentage of trains which are cancelled or arrive at their final destination significantly late[6] ('Cancellations and Significant Lateness' - CASL). Again, she wishes to have a better level if the ORR determines this is value for money and can be affordably achieved without compromising delivery of other HLOS requirements.

22. In respect both of PPM and CASL, the Secretary of State requires that the industry focuses on improving the worst-performing routes and those on which lower levels of reliability have the greatest economic effect and would wish to see a plan is produced to this effect.

23.In framing the Reliability Metrics and Requirements in this way, the Secretary of State wishes to secure an outcome where the industry is empowered to secure an overall level of reliability in CP5 at least as high as that which is likely to be achieved in CP4, but which is more consistently delivered, improving the passenger experience.

Scotland HLOS

3.7 The Scottish Ministers expect a consistently high level of performance from rail services in Scotland for the benefit of passengers and freight users in Control Period 5 which builds and improves upon what is expected to be achieved by the end of Control Period 4.

3.8 The Scottish Ministers therefore require that the outputs of the network will be maintained in such a manner as to enable the operators of each franchise let by the Scottish Ministers to achieve a Public Performance Measure (PPM) of 92.5% by the end of Control Period 5, with a minimum PPM of 92% achieved across each year of that Control Period. The Scottish Ministers also require that the outputs of the network will be maintained in such a way as to recognise the position of other operators on the network.

3.9 In support of the delivery of the PPM, the Scottish Ministers will also require Network Rail to work with its industry partners to develop key performance indicators which as a package:

- encourages and facilitates outperformance of PPM, as outlined above
- measures and improves performance on 'right time' measures over the lifetime of the Control Period
- are not to the detriment, and where possible improve, the level of service provided to other operators
- reflects the impact of performance on passenger experience
- reflects the economic value of services, disaggregated by Scottish service group, or line, or time period or a combination of those things
- are sufficiently flexible to take account of periods of severe disruption, with a focus on working with all affected operators in those circumstances to provide the best service possible for rail users
- do not add additional expenditure to the baseline costs of the Scottish operating route

Appendix B: Reporter team and interviewees

Reporter Team

Name	Role
Paul Wiseman	Named Reporter and assignment lead
Jon Wiseman	Lead Reporter
David Hicks	Senior Reporter
Simon Shapiro	Reporter
Dafydd Wyn Owen	Senior Reporter
Stephen Jones	Assignment oversight

Phase 2 interviewees

(Network Rail unless stated otherwise)

Name	Role
Nick Beadle	CP5 Performance Planning Manager (at time of review)
Robert Freeman	Operational Performance and Analysis Manager
Stephen Draper	Performance Analysis Manager
Gordon Stewart	Performance Analyst
Richard Eccles	Director Network Strategy and Planning
Eliane Algaard	Head of Strategic Planning, Group Strategy
Tim Robinson	Freight Director
Duncan Green	Freight, General Manager
Anne Marie Harmon	Programme Manager Change, Scotland
Nigel Wunsch	Head of Strategy & Planning, Scotland
Rene Tym	Route Performance Manager, Kent
Chris Gee	Route Performance Manager, LNE
Lee Armson	Route Performance Manager, LNW
John Kerr	Head of Timetable Compliance and Resilience, First Scotrail

Appendix C: Value assessment methodology

This appendix sets out the methodology which has been applied to derive an assessment of the expected benefits associated with increasing levels of operational performance as measured by PPM and CaSL.

The impact of performance on demand, and hence revenue, has been based on the approach recommended in Section B.5 of the Passenger Demand Forecasting Handbook (PDFH).

Essentially, the index for changes in volume (I_j) between a given origin and destination arising from the change in lateness is given by the formula:

$$I_j = [\ 1 + (w_r(L_{new} - L_{base}))/GJT_{base}\ ]^g$$

Where:

- L_{new} is the average lateness of trains in the modified scenario;
- L_{base} is the average lateness of trains in the existing scenario;
- w_r is a weighting associated with the perception of lateness compared to true journey time;
- GJT is the generalised journey time between the origin and destination in the existing scenario; and
- g is the elasticity of volume to GJT recommended by PDFH for the particular type of journey

In order to apply the generalised formulae above to changes in PPM, we needed to convert PPM to average changes in lateness.

We did this by applying a conversion factor from PPM change to average lateness change, using regression analysis from previous NR studies.

For selected routes / sub-operator groups, we also utilized data sourced from Halcrow, as currently being used for re-calibration of Schedule 8, covering:

- the annual journeys and revenues (by ticket type) for the origin and destination flows constituting 90% of the total revenue for the sub-operator group
- the generalised journey times for each flow sourced from MOIRA

PDFH recommends that a value of 3.0 should be used for w_r. Thus 1.0 minutes of lateness is perceived as 3.0 minutes of true journey time. However, the re-calibration of Schedule 8 has adopted a range of values for w_r between 2.3 and 6.0, depending on the flow type (indicated by the origin-destination combination) and journey purpose (commuting or non-commuting). In order to maintain consistency, we have also used these w_r values developed by Halcrow. Similarly, values of the elasticity g for each origin-destination pair and ticket type were provided by Halcrow.

We thus applied the above formula to the average change in lateness implied by the PPM change for each flow, and calculated an expected revenue impact.

The expected revenue impacts were then summed to give an expected aggregate impact across the flows, and factored to represent the whole sub-operator group. Since commuting and non-commuting values of w_r were provided for each flow, we initially calculated the impact separately based on the minimum and maximum value of w_r for each flow, then took the average of the resulting totals.

We also calculated the expected socio-economic benefits by multiplying the time savings and number of journeys associated with each flow and ticket type (both for existing users and for new users forecast using the above procedure), then applying the appropriate values of time set out in the Department for Transport's WebTAG guidance.

The methodology for calculating the impact of incrementally reducing Cancellations and Significant Lateness (CaSL), was similar to that for PPM as above.

However, instead of applying an estimate of the average lateness reduction required in a particular period to reduce the PPM by 1%, we applied a regression analysis by route for the estimate of the lateness reduction required in a particular period to reduce CaSL by 0.1%.

We then applied the PDFH formula based on these revised changes in lateness.

Each of the above analyses was assessed for a range of service / sub-operator groups, in order to give an indication of how the value of performance improvement varies across the network, and compared with the costs of driving performance improvement. The train service groups analysed include 2 long distance services, one LS&E and 2 regional services, which are not disclosed further here for reasons of commercial sensitivity.

Appendix D: NR model methodology and forecasting assumptions

Appendix D1: Modelling process

This section explains the sources of data and model structure adopted by NR for SBP forecasting.

Data sources

NR has a suite of models for analysing historical data and projecting forward Delay Minutes, PPM and CaSL. The historical data used extends back to 2009/10 and includes:-

- DM data by TOC –Sector-Area-KPI (or Category)
- PPM data by TOC and TOC-Sector
- CaSL data by TOC-Sector (Note: CaSL percentage is sub divided by Full Cancellations, Partial Cancellations & Significant Lateness)
- Train Numbers data by TOC-Sector
- Train Km data by TOC-Sector-Area or FOC-Area

NR has also made some key assumptions on future traffic growth. Key inputs to the modelling are:

- Growth in Train Km by TOC-Sector-Area
- Growth in Train Numbers by TOC-Sector

This data together with modelled JPIP forecasts for the CP4 exit position, are used to produce modelled forecasts of the following outputs:

- DM by TOC-Sector-Area-KPI incorporating changes resulting from proposed initiatives, downsides etc.
- PPM forecasts, derived from projected DM using regression analysis

- CaSL forecasts, derived from projected DM (for applicable KPIs only) by extrapolation

The DM model incorporates changes in DM from the JPIP forecast CP4 exit (end 2013/14) due to:

- Changes in Train km including congestion (reactionary) delay
- ICM – Non Track
- ICM - Track
- National Operations Strategy
- Thameslink

Route identified changes for modelling

The following Routes had specific changes modelled: Western (upside & downside), Wales (upside & downside), East Midlands, Anglia (upsides & downsides), and LNW. Each of the five above DM changes were applied separately to the base JPIP DM to give a PPM by TOC for e.g. EMT & ICM – Non Track for each year and the increments on JPIP base calculated. This was repeated for all TOCs for all six increments for each of the five years of CP5. For each TOC, the six increments were added to the JPIP base to produce a modelled base output PPM by TOC by year.

The routes have provided an upper and lower PPM trajectory for each of their TOCs which were different to the modelled base. An additional PPM factor (termed "Additional Route Input") was created as the difference between the modelled base and the submitted PPM Trajectory thus providing a full reconciliation trail between the current JPIP PMM out turn for CP4 and the PMM Trajectories used for the SBP.

The PPM model allowed the desired PPM values to be input to calculate revised DM totals which could then be fed into the CaSL model to produce the CaSL trajectories corresponding to the PMM Trajectories used for the SBP.

Robustness of the modelling process

The DM and Train KM models use percentage increments to adjust future years DM by TOC-Sector-Area-KPI and to adjust Train KM by TOC-Sector-Area. These are mathematical models and the outputs are only as good as the input data and adjustment percentages.

The model for calculating PPM from DM uses three and a half years of historical data for the regression analysis to calculate future year PPMs for each TOC Sector. Interviews with NR indicate that this relationship has been stable over recent years and that forecasts have been reasonably accurate compared with the eventual actual values and the regression analysis has been stable.

The model for calculation of CaSL from DM uses the latest 26 periods of data (DM by TOC-Sector-KPI) for the regression analysis which is then used for period forecasts through to end of 2013/14 (for JPIPs). The actual / forecast period CaSL for 2012/13 is then used to provide ratios of full cancellations, partial cancellations and significant lateness for each TOC-Sector-KPI for year 2012/13. These ratios are then applied to the forecast DM for TOC-Sector-KPI for each year of CP5.

Interviews with NR indicate that the CaSL / DM relationship is not as stable as the PPM / DM relationship, even when it is applied at a disaggregated TOC-Sector-KPI level as opposed to the TOC-Sector level. The forecasts have not been as reliably accurate and the ratios have changed over time. CaSL is more dependent on events which cause significant reactionary delay. The TOC's planned and unplanned resource availability also influences their ability to recover and return to scheduled service; this clearly varies by operator.

The regression analysis used for CaSL only uses 26 periods of data compared with PPM which uses approximately 45 periods; this inevitably reduces the accuracy of the regression for CaSL.

In addition, the process for incorporating the PPM trajectories produced by the Routes has made the final calculation of CaSL at arm's length from the regression analysis. The values of PPM in the TOC trajectories have been put through the model (in reverse) to provide an adjusted DM that would have produced the required PPM and this adjusted value of DM is then fed into the CaSL model to produce the CaSL trajectories to match the PPM trajectories for each year of CP5.

IR observations on modelling

The forecasts for PPM and CaSL rely significantly on the robustness of the forecast changes in Train km and DM by TOC-Sector-KPI.

The modelled forecasts for PPM, based on historical experience, are as accurate as can be achieved and should prove to be reasonably reliable.

The modelled forecasts for CaSL, based on historical experience, are less accurate since they draw upon a shorter period of data, but, at this time, there appears to be no more suitable method available.

The PPMs and CaSL forecasts presented in the SBP rely heavily on the final PPM "adjustment" made by each Route in producing the PPM Trajectory. For some Routes this is the largest component of the change from JPIP out turn forecast. We have had little visibility of the calculations / estimating which went into producing the PPM trajectories and this reduces our confidence in their reliability.

Appendix D2: Route and national input assumptions

	Assumptions for SBP	Assumptions for Route Plans - Sheet 1			
Item	**Base used for SBP (most Routes)**	Anglia Route	East Midlands Route	Kent Route	LNE Route
CP4 Exit	As JPIP Forecast Exits	Meet CP4 JPIP Exit	Meet CP4 JPIP Exit	Use CP5 exit target, but probably cannot be met in practice	Assumed JPIP exit - expecting some shortfall
Traffic Growth (train KM) and Congestion effect	Base Forecast (National) with congestion effect	(nil)	(nil)	National growth plus "Extra" factor for "Inner"	National growth plus judgement for congestion on PPM
Passenger Growth	none	(nil)	(nil)	Assumed neutral	Assumed neutral
Freight Growth	aggregate 16% increase in train km over CP5	as national	as national	as national	as national
Thameslink	AS SDG	N/A	N/A	As SDG (congestion adjusted)	Neutral
Asset Reliability	Neutral	RCM on 60% points & 30% track circuits Point Heaters extended through CP4	1% Y on Y improvement	Neutral	Continuing reduction in incidents
External	Neutral	Assumed neutral; increased bridge strike monitoring	Neutral	Neutral	Neutral
Possession / Access Impacts	Neutral	RDG schemes delivered as expected	If not met, impact on efficiency	Improved efficiency on NKR Ph2	Identified risks / neutral
Major New Works	Neutral	(nil)	Full timetable run through works	NKR PH2 based on NKR PH1 experience Train lengthening - risk of insufficient power supply	Effects included via judgement
Electrification	Neutral	N/A	Delay to MML with impact performance	Neutral	Construction included; ops benefit = nil
New Trains	Neutral	(nil)	Convert LDHS to electric to improve performance	Neutral	Neutral
Capacity Enhancements	Fully used at next Timetable change	For Crossrail	Schemes to match or greater than demand growth	Nil - negative from TL and train lengthening	Neutral / Nil
Project Risk Reduction	Part of National Initiatives	(nil)	(no comment)	Not much opportunity left after TL & NKRPh2	No knowledge
TOT & TOS	1% Y on Y for each	Further Alliances will have positive impact	Proactively manage service recovery; EMT 125 reduction over CP5	(nil / neutral)	Neutral
National Initiatives	1% Y on Y	Assumed delivered as planned	Dependent on delivery on National plans	Nil	Nil
Aligned Franchising **Base+ & Base++ into CP5**	"Base Assumption" Nil	nil (no comment)	(nil)	No Knowledge Nil - assumed help CP4 shortfall	No knowledge Nil - except where in progress - TTfP, Red Bridge and Red Routes in
NOS Programme / Traffic Management	Nil other than part of National Initiatives	Benefits from colocation n with Crossrail	90% of control moved to Derby	Limited influence & adverse from ECRO	Nil
Continuous Improvement	Nil other than part of National Initiatives	Continuation of CP4 management processes - no specific benefits identified	Apply incident prevention, whole life asset management approach and risk based approach to asset standards	Nil assumed - translated into efficiencies	DM & PPM improvements except for ECT where negate traffic growth in Y5
Refranchising	Neutral	Neutral	Neutral	Neutral	Neutral

	Assumptions for Route Plans - Sheet 2					
Item	LNW Route	Sussex Route	Wales Route	Wessex Route	Western Route	Scotland Route
CP4 Exit	0.5% shortfall	CP4 exit as JPIP Exit - down at 91% (91.9%) & 2.5% (2.1%) CP4 outputs not rolled over into CP5	Delivered 94.6%	Meet CP4 JPIP Targets - 93% & 1.79% - although currently behind	Meet JPIP CP4 exit	Meet 92% PPM
Traffic Growth (train KM) and Congestion effect	National	As National; reductions in reactionary delay expected	Flat except for CASR and electrification changes	(nil)	As National Impact of increase KM following electrification included	
Passenger Growth	Assumed neutral	CP4 schemes expected to meet increased demand for CP5	20% increase	Risk of significant volume growth	Potential performance risk from growth	
Freight Growth	as national	as national	as national	as national	as national	as national
Thameslink	Nil impact	"will need to be factored into the detailed CP5 performance planning and contingency planning"	N/A	N/A	N/A	N/A
Asset Reliability	Neutral	Renewals to improve signalling wiring resilience and reduce track defects	CP4 maintained; continuous in CP5	Steady as 2011/12	Track asset from cost model; non track neutral	
External	Neutral	Expenditure included to mitigate effects.	Neutral	Neutral at CP4 exit Smarter reactions to severe weather	National assumptions / neutral	As CP4
Possession / Access Impacts	Detailed analysis of impact based on judgement / experience	Risks from Thameslink; better use of access for renewals and maintenance	Benefits & access assumed	National initiatives to improve efficiency	Volume of projects and renewals challenge existing levels of performance	
Major New Works	Detailed analysis of impacts	(nil)	Minimal Impact & on time; impacts of NASL resignalling included	Full timetable run	CP4 delivered as planned; Extra TSRs included	
Electrification	(nil)	Enhancement to DC 3rd rail to avoid impacts on timetabled services	Minimal Impact & on time Faster recovery	To improve resilience	Modelled using comparable current schemes; risk to performance on introduction	
New Trains	Assumed Nil	(nil)	Faster recovery	(nil)	Neutral / unreliable on introduction	
Capacity Enhancements	Northern hub included	Some additional to Thameslink	CASR impacts minimal and included	Delivered as planned except Waterloo capacity and DC to AC not included	CP4 delivered as planned	Enhancements not fully reflected in performance
Project Risk Reduction	50% reduction through continuous improvement	(nil)	Integrated access planning delivers expected benefits	Minimise risks	based on current projects	
TOT & TOS	Neutral including passenger growth	Fleet performance currently ahead of target	TOS at CP4 exit levels; fleet reliability neutral	SSWT Alliance efficiencies not included	Neutral except unreliability on new class 395 trains and ERTMS on class 158	Contributes 0.2% PPM plus part of 0.2% for joint actions
National Initiatives	Assumed Nil		(nil)	Assumed delivered as planned	Generally benefits not included	
Aligned Franchising	No Knowledge					
Base+ & Base++ into CP5	Assumed Nil	(nil)	National initiatives delivered	(nil)	Benefits from RCM (Base+) in CP5	
NOS Programme / Traffic Management	As SDG	(nil)	Business Case savings attributable to NOS	Migration of ROC to Basingstoke	National assumptions	NOS effects included - contributes part of 0.3% PPM
Continuous Improvement	Fault teams reinstated	Increased efficiency I n asset management;	Incremental Y on Y	Cost efficiencies may impact performance Investigations into "right time" & "sub threshold"	Implied implementation of lessons from CP4	
Refranchising	Neutral	Build on existing alliancing in new Franchise	Neutral	Neutral	Changes to Franchise map potential further viability in performance	Neutral

Appendix E: IR observations on NR planning approach

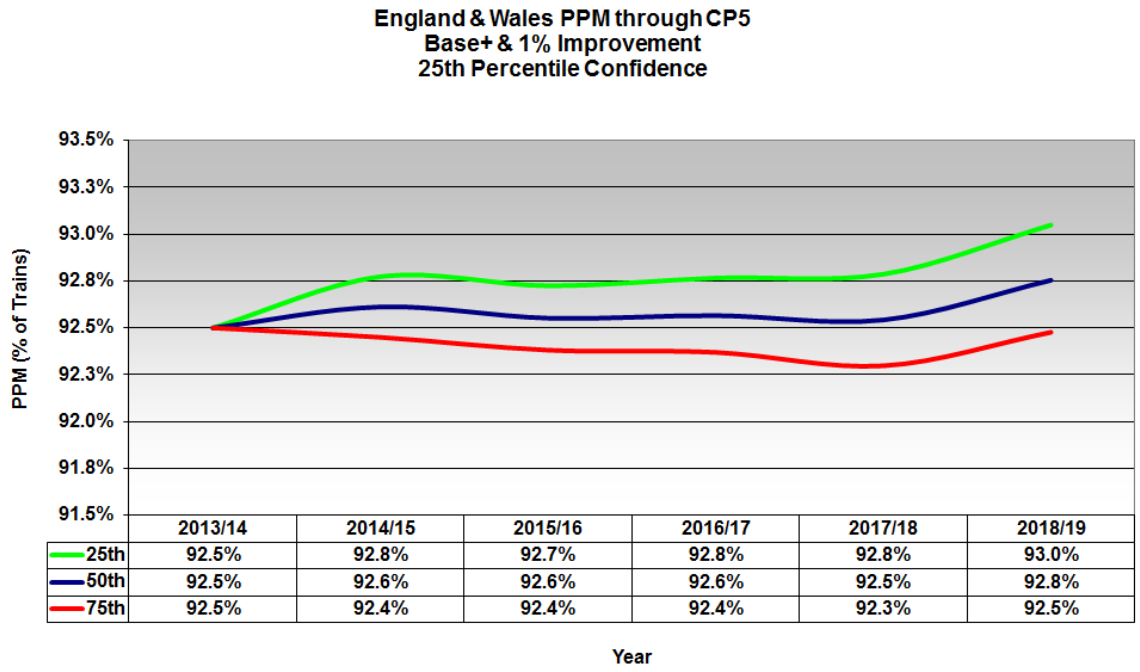
The following bullets summarise the main observations noted by the IR team during the interviews carried out with the NR Route and central teams engaged in producing the SBP performance plan.

- no formal directions sent out to Routes apparently; many key instructions were given verbally
- national traffic growth forecasts accepted with confidence by Routes
- some routes applied local adjustments for the impact of traffic growth on congestion hotspots without a common methodology
- devolved Routes were given freedom to apply own assumptions or adopt national
- very high level of ownership amongst Route teams
- route teams stated that there was too little time to deliver process rigorously
- tendency for Routes to adopt neutral assumptions where confidence low
- routes not inclined to accept that benefits will flow from CP5 national initiatives until proven
- reluctance to accept flow through from CP4 initiatives into CP5 until proven
- one Route applied extra congestion factors for traffic growth effects
- difficult to get TOC involvement where refranchising imminent
- different methods applied to quantify effects new works programmes (e.g. LNW s/sheet v Kent use of previous schemes v LNE judgement by informed individuals)
- large amount of judgement applied to assessing magnitude of various effects and placing confidence ranges around judgements

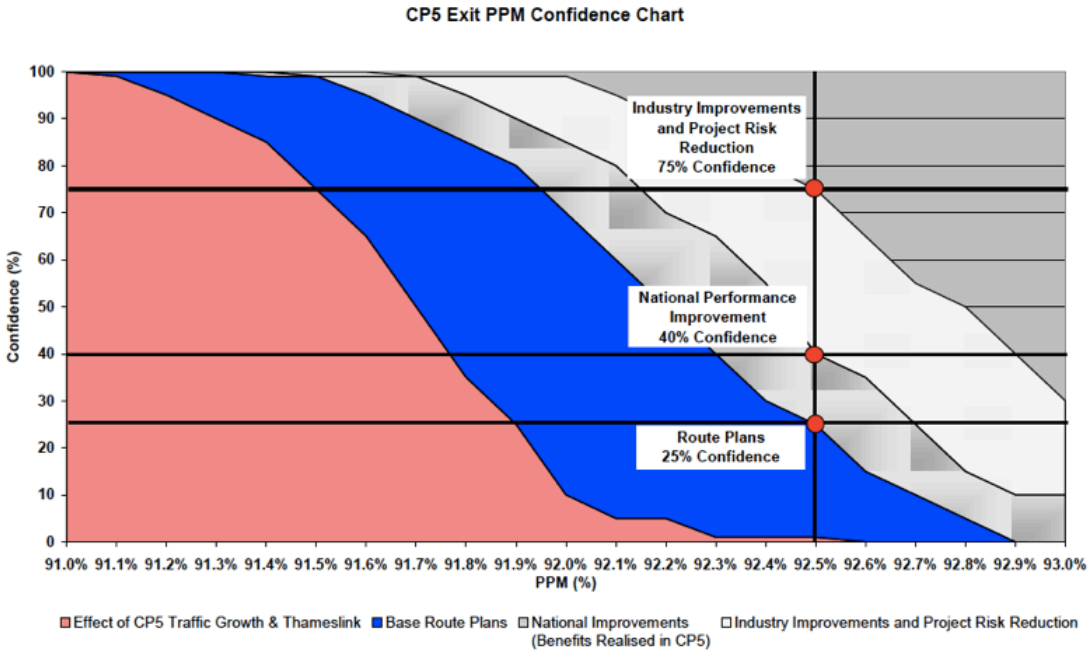
- some Routes prepared to place 25% and 75% confidence limits on forecasts, other prepared to state ‘upside’ and ‘downside’ others prepared to submit ‘most likely’ trajectory only
- some Routes used national model to convert forecast DM effects into PPM trajectories, others used locally derived models and judgements
- some Routes nervous about breakdown of PPM/DM relationship at high PPMs
- CaSL forecasts largely based on known DM/CaSL relationships, with little CaSL specific action planning
- lead Route sign-offs generally included Route MD and Exec
- TOC MDs involved in sign-off process
- routes very sceptical about ability to forecast with confidence in such a changing environment and particularly beyond year 2
- routes nervous about possibility of funding being denied although Routes intent on preserving frontline performance resources
- apparently very little manipulation of TOC trajectories by Route MDs before submission and by the national team after submission
- good evidence of national ‘quality assurance’ by dint of Draper interviews and spreadsheet
- some trajectories based on ‘artificially applied’ confidence limits (e.g. national +0.1%/-0.2% to LNE TOCs)
- national overlays largely unsubstantiated yet they take confidence levels in achieving 92.5% from 25% to 75%
- possibility of double-count in areas of project risk reduction, ToC on Self effects with other layers
- national assumption that CP4 exit would match current JPIP targets seen by Routes as highly unlikely (and increasingly proven to be false assumption)

Appendix F: Route and national forecasts and sensitivity results

Key elements from the SBP forecasts are presented below as a baseline for comparison with the Reporter sensitivity test results.



	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
25th	92.5%	92.8%	92.7%	92.8%	92.8%	93.0%
50th	92.5%	92.6%	92.6%	92.6%	92.5%	92.8%
75th	92.5%	92.4%	92.4%	92.4%	92.3%	92.5%



The following sensitivity tests have been applied in order to assess the potential impact of uncertainty in variables upon the PPM and CaSL trajectory in CP5.

Sensitivity reference	Layer	Inputs varied	Rationale	Downside assumption	Upside assumption
A	0	CP4 exit position	More downside than upside likely around NR E&W 92.4% PPM forecast; CaSL of 2.2 % appears possible but still uncertain, given forecast for 12/13 of 2.5%	PPM = 91.6% CaSL = 2.4%	PPM = 92.4% CaSL = 2.2%
B	1	Traffic growth	Passenger growth is fairly reliable but still with tolerance Freight growth subject to reduction as a result of latest forecasts and proposed increased freight access charges	As A plus: Passenger: SBP x 1.1 = 7.7% growth train km by year 5 Freight as SBP = 16% tkm growth	As A plus: Passenger SBP x 0.9 = 6.3% growth train km by year 5 Freight 0.5 x 16% = 8% tkm growth

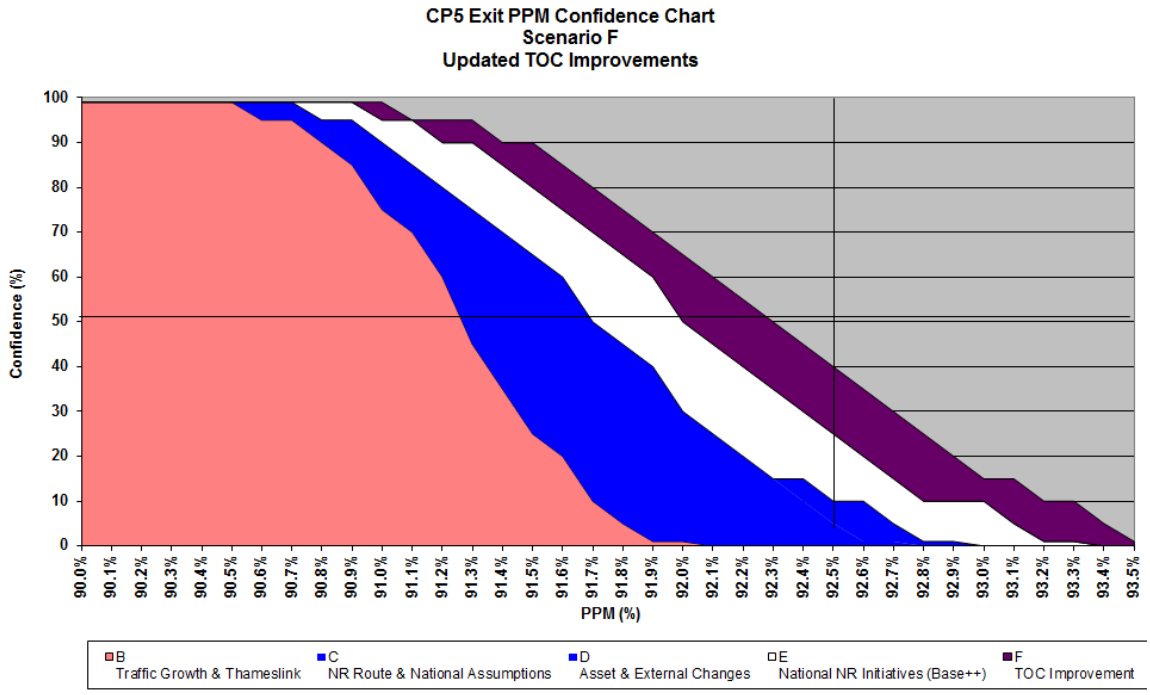
Sensitivity reference	Layer	Inputs varied	Rationale	Downside assumption	Upside assumption
C	2	Access / disruption	NR SBP base assumption equates to the higher case in Deliverability report – treat this as downside, with NR mid-case plus extra project mitigation activity as upside Risk of slippage in project delivery may suppress year 3 peak but increase impact in year 5 – this is an additional downside for year 5	As A and B above, plus: Worst case SBP quantum forecast, but re-profile to make quantum of access more level across years 2 to 5, broadly per 12/13 level	As A and B, plus: "Mid case" SBP access quantum, (20% less than SBP) with profile as SBP, allowing for productivity and risk mitigation
D1 D2	2	Asset reliability and externals	Sensitivity test of up to +/- 10% on asset KPI DMs for uncertainty More downside than upside potential on External KPIs	As A & B above, plus: Extra 2% YoY on asset KPI DMs Extra 4% YoY external KPI DMs	As A & B plus: Less 2% YoY on asset KPI DMs Less 2% YoY external KPI DMs
E	3	National NR initiatives (Base ++)	Additional upside potential given expected 0.5% PPM contribution from Base + initiatives in last 2 years of CP4	As A to D above, plus: As SBP	As A, B, D plus: Ramp to 0.5% PPM by year 5
F	4	ToT and ToS	More upside (reflecting new fleets) than recognised in SBP; also downside from franchise / timetable change, but this protected through change control	As A to E above, plus: As SBP for ToS and ToT, but *exclude* NR DM - 1% Yr on Yr	As A, B, D & E above, plus: Double SBP ToS and ToT, but exclude NR DM reduction

Note: These scenarios all subjected to Monte Carlo modelling, hence options combined above are subject to range of upside and downside assumption

The results of these sensitivity tests in terms of the impact in year 5 of CP5 are presented below.

	Scenario	A	B	D		E	F		
	Input Assumptions / Confidence Levels	CP4 Exit Position	Traffic Growth Congestion	Asset Changes	External Changes	National NR Initiatives	TOS (1% YOY)	TOT (1% YOY)	NR (1% YOY)
SBP	Upside (25th Percentile)	92.80%	-0.52%	N/A	N/A	0.27%	0.21%	0.05%	0.27%
	Most Likely (50th Percentile)	92.50%	-0.65%	N/A	N/A	0.22%	0.18%	0.05%	0.22%
	Downside (75th Percentile)	92.20%	-0.79%	N/A	N/A	0.15%	0.00%	0.00%	0.00%
Sensitivity Changes	Upside (25th Percentile)	92.40%	-0.38%	0.17%	0.13%	0.50%	0.43%	0.11%	0.00%
	Most Likely (50th Percentile)	92.20%	-0.61%	-0.01%	-0.08%	0.33%	0.36%	0.09%	0.00%
	Downside (75th Percentile)	91.60%	-0.85%	-0.19%	-0.29%	0.15%	0.00%	0.00%	0.00%
Difference	Upside (25th Percentile)	-0.40%	0.15%	0.17%	0.13%	0.23%	0.21%	0.05%	-0.27%
	Most Likely (50th Percentile)	-0.30%	0.04%	-0.01%	-0.08%	0.11%	0.18%	0.05%	-0.22%
	Downside (75th Percentile)	-0.60%	-0.06%	-0.19%	-0.29%	0.00%	0.00%	0.00%	0.00%

The impact of each sensitivity test, in terms of cumulative effect on each layer, also in terms of the range of outcomes for year 5 of CP5, is presented below, for comparison with the SBP forecast.



Appendix G: Scotland KPI proposals

Appendix G1: NR proposals for Scotland KPIs

CN/022 - NR Proposals for a Package of KPIs to Apply During CP5 in Response to Scotland HLOS						
KPI Group	KPI Table	*Table (Sub-table/Chart) Title*	*Row Titles/Plotlines in Table (Sub-table/Chart)*	*Measures*	*Regulated / Targeted / Monitored*	Measure To Be Published?
All Operator Group of KPIs						
1	A	First ScotRail Performance	FSR Franchise (x1)	RT (Period, MAA, MAA v Last Year) & PPM (Period, MAA, MAA v Last Year) & CaSL (Period, MAA, MAA v Last Year)	RT (Target), PPM (Reg), CaSL (Mon)	Yes
1	B	Long Distance TOC Performance	TOCs (x 5)	RT (Period, MAA, MAA v Last Year) & PPM (Period, MAA, MAA v Last Year)	RT (Target), PPM (Reg)	Yes
1	C	Freight Operator Performance	Freight Operators (x4)	RT (Period, MAA, MAA v Last Year) & PPM (Period, MAA, MAA v Last Year)	RT (Target), PPM (Reg)	Yes
First ScotRail Only KPIs						
2	A	Service Group Summary	Service Groups (x 6)	RT (Period, MAA, MAA v Last Year) & PPM (Period, MAA, MAA v Last Year) & CaSL (Period, MAA, MAA v Last Year)	Monitored	Yes
		1. HA01 Express	Service Codes (x4)			
		2. HA02 East Coast Suburban	Service Codes (x5)			
		3. HA03 South West Rural	Service Codes (x1)			
		4. HA04 Highland Rural	Service Codes (x4)			
		5. HA06 Strathclyde Electric	Service Codes (x6)			
		6. HA07 Strathclyde Pte Diesel	Service Codes (x13)			
2	B	Peak Time Commuter Services	Summary of Heavily used and intermediate stations (x10)	RT (Period, MAA, MAA v Last Year) & PPM (Period, MAA, MAA v Last Year)	Monitored	Yes
		1. All Day	Heavily used and intermediate stations (x10)			
		2. AM Peak	Heavily used and intermediate stations (x10)			
		3. PM Peak	Heavily used and intermediate stations (x10)			
		4. Off Peak	Heavily used and intermediate stations (x10)			
2	C	Heavily Loaded Trains	Summary of Top 100 Heavily Loaded Trains (x1)	RT (Period, MAA, MAA v Last Year) & PPM (Period, MAA, MAA v Last Year)	Monitored	Yes
		1. Top 100 Heavily Loaded Trains	Train head code, departure time, origin station (x 100 rows)			
2	D	Weekday Trains Late at Destination	Summary of Weekday Services Late at Destination (x1)	RT (Period, MAA, MAA v Last Year) & PPM (Period, MAA, MAA v Last Year)	Monitored	Yes
		1. Weekday Services Late at Destination	Train head code, departure time, origin – destination station (xN rows)			
2	E	Severe Disruption Events	Summary of Events (xN severe events)	Trains Run (Normal Plan, Amended Plan, Actually Run) & % Trains Run	Monitored	Yes
		1. Severe Disruption Events	Events (xN)			
2	F	Passenger Experience	Summary table n/a	Not Applicable?		Yes
		1. National Passenger Survey Spring Scores	Single chart (x 6 plotlines)	Overall Sat (Nat, ScotRail, Reg) & Delay Sat (Nat, ScotRail, Reg)	Monitored	
		2. National Passenger Survey Autumn Scores	Single chart (x 6 plotlines)	Ditto		
		3. First Scot rail Passenger Complaints	Single chart (x 3 plotlines)	Total Comp, Performance Comp, Perf Comp MAA, FSR TOC PPM)		
		4. Possible inclusion of social media measures	TBA	TBA		
2	G	Advance Boarding Availability	TBA	Minutes of train availability before departure	Targeted (in SLC)	Yes

Appendix G2: Independent Reporter assessment of proposed KPIs

CN/022 - Justification for Inclusion of Measures in a Package of KPIs to Apply During CP5 in Response to Scotland HLOS								
KPI Group	KPI Table	*Table (Sub-table/Chart) Title*	*Data Already Collected?*	*KPI already routinely Extracted From Data?*	Measures which Aspects of Passenger Experience?	Drives Which Management Actions?	Consistent with which TS Objectives?	Notes
All Operator Group of KPIs								
1	A	First ScotRail Performance	Yes	Yes	Inconvenience of general lateness, Irritation at general failure to deliver TT RT commitment	General JPIP action plans (in RTR action plans and plans to close gap between PPM and RT)	1,2,3,4,7	For passenger TOCs RT = t-59s, PPM = t-4m59s
1	B	Long Distance TOC Performance	Yes	Yes				
1	C	Freight Operator Performance	Yes	Yes				
First ScotRail Only KPIs								
2	A	Service Group Summary	Yes	Yes	Inconvenience of general lateness, Irritation at general failure to deliver TT RT commitment	General JPIP action plans (in RTR action plans and plans to close gap between PPM and RT)	1,2,4,5,7	No target proposed as no target sought in HLOS
		1. HA01 Express						
		2. HA02 East Coast Suburban						
		3. HA03 South West Rural						
		4. HA04 Highland Rural						
		5. HA06 Strathclyde Electric						
		6. HA07 Strathclyde Pte Diesel						
2	B	Peak Time Commuter Services	Yes	No	Inconvenience of lateness to/from work via heavily used stations, Irritation at missed connections	Focus on TT and station operation affecting heavily used stations, Focus on robustness of booked connections	1,2,4,5,7	Particularly aimed at measuring passenger experience at stations such as Glasgow Queen St Low-Level and Glasgow Central Low-Level. 10 stations account for 20% of passengers
		1. All Day						
		2. AM Peak						
		3. PM Peak						
		4. Off Peak						
2	C	Heavily Loaded Trains	Yes	No	Particular irritation of crowded trains which suffer regular lateness in excess of that implied by SG PPM/RT measures	Focus on trains running in train paths which are not robust	1,2,4,5,7	19% of passengers travel on 5% of trains (i.e. approx. 100 of the 2,200 FSR weekday services). Prioritisation of corrective action driven by combined function of rank, RT and PPM
		1. Top 100 Heavily Loaded Trains						
2	D	Weekday Trains Late at Destination	Yes	No	Particular irritation of trains which suffer regular lateness in excess of that implied by SG PPM/RT measures	Focussed attention on trains running in paths which are not robust	1,2,4	Weekday only measure. Regular (or Consistent) lateness defined as missing PPM on 16 out of 20 days in the period.
		1. Weekday Services Late at Destination						
2	E	Severe Disruption Events	Yes	No	Confidence in short notice changes to TT, Certainty of getting to destination during perturbations	Assured delivery of contingency plans and amended TT, Maximisation of services run with certainty during perturbation	6,7	Severe disruption event defined as 'any event precipitating the uploading of an Amended TT to TSDB' (needs modifying for minor amendments to TT)
		1. Severe Disruption Events						
2	F	Passenger Experience	Yes	Yes	General satisfaction with general service provided and specifically with performance	General customer service action plans and JPIP plans in particular	1,2,4,7	Possible inclusion of measures based on social media currently undefined due to difficulty of ensuring uniqueness of references. Method of collection of complaints submitted to TS, Pass Focus, NR and FSR TBA
		1. National Passenger Survey Spring Scores						
		2. National Passenger Survey Autumn Scores						
		3. First Scot rail Passenger Complaints						
		4. Possible inclusion of social media measures	No	No				
2	G	Advance Boarding Availability	Yes	Yes	Irritation at having to wait to board sleeper services	Efficiency of train preparation	3,4,7	Currently defined as part of franchise SLC

Appendix H: Output measures consultation response summary

ORR undertook an industry consultation on the proposals for the output measurement framework for NR in CP5 in autumn 2012. We have considered the industry responses in undertaking our review, since we consider that it is appropriate that these should be reflected in the final framework.

Key points which were made (although not unanimously by all respondees) in relation to the passenger performance output measures were:

- no need to retain sector-level outputs; too broad and meaningless to passengers
- measure performance at TOC, service group and even individual train level
- passengers need to see measures that reflect their *individua*l experiences
- PPM, CaSL and delay minutes are here to stay; but need supplementing
- right-time performance, and average lateness along the route must be measured
- poor performing routes must not be masked by good ones
- strong belief in the power of 'regulation by public transparency'
- need to acknowledge that most passengers 'feel' lateness at sub-threshold levels
- need to avoid too much new data gathering and meddling for the sake of it
- need to regulate parties according to measures that they control
- performance measures must not be at cost of safety, JT, resilience
- support for aligned objectives; but not many suggestions on how to do that!
- support for 'change control' process to give DfT freedom to let the right franchises

- concern that NR should retain overall accountability for performance
- performance management should reflect emerging industry structures
- belief that NR could focus better on business-critical assets

Consultee responses in relation to the proposed passenger performance measures were:

Output measures supported by consultees

- PPM & CaSL (but not Scotland)
- PPM & CaSL (but not Scotland) by operator

Indicators supported by consultees

- NR caused delay minutes
- right-time performance by operator/service group/service code/train
- average lateness per train, by operator/service group/service code
- average lateness per passenger journey, by operator/service group/service code
- range of PPM, CaSL, RT, average lateness by operator/service group

Freight industry consultees also made a number of observations specific to freight performance measurement; key points are summarised below:

- RFG supported the move in principle, but subject to more detailed information being available as the work progresses;
- DB Schenker noted they had been heavily involved in the development work aimed at devising a new measure of freight performance based on cancellations and significant lateness and were therefore pleased that ORR intends to adopt this new measure subject to a satisfactory starting point and trajectory for CPS being agreed with NR. They considered that the new measure should be set to commence at an equivalent position to that achieved by NR at the end of CP4 with a forecast trajectory of improvement across CP5 as this will incentivise NR to continue to focus on and improve freight performance;

- Freightliner noted that whilst the RFOA had agreed in principle to move to a new performance measure, the target trajectory for CP5 is yet to be agreed with NR. They believe it is important that NR are set a more ambitious, rising target (than that set for CP4) which will motivate them to continue to drive improvement.

Appendix J: Freight Delivery Metric Performance Floor Assessment

Network Rail View			Independent Reporter View	
Performance risk	**% FDM Impact**	**NR Rationale**	**Comment**	**Conclusion**
General				
CP5 Starting Position	95%	NR has committed to aim for delivery of 2.94 delay minutes per 100km, and has developed a Freight Recovery Programme in order to develop schemes and initiatives that would assist NR in closing the gap between current JPIP forecast (poorer exit position) and actual exit. There is no precise correlation between FDM and delay/100km, however based on the regression analysis performed an equivalent FDM of 95.4% has been derived for the exit from CP4. This analysis excludes two 'severe' periods in winter 2010/11 as these were considered atypical.	NR has not established a direct trajectory for the FDM for the remainder of CP4. Based upon the relationship between DM and FDM, as presented in figure 2, if the DM target of 2.94minutes/100 km is achieved, this will equate to an FDM performance of 95.4%. However, there is some uncertainty to this, based upon the imprecise relationship between the two measures. The JPIPs are currently forecasting a poorer exit position than target; however the Freight Recovery Programme is being implemented in an effort to eliminate the gaps between JPIP forecast and actual exit. Based on the advice received, in theory this is a reasonable starting point however without evidence of a performance trajectory for the remainder of CP4 it is not possible to place a level of confidence in NR achieving the CP4 exit figure. It is not clear why NR has chosen to use a starting position of 95% as opposed to	The logic appears sound, however further evidence of the expected CP4 exit figure for FDM is required, which we believe would be best provided through a period of operational shadow running.

Network Rail View			Independent Reporter View	
Performance risk	**% FDM Impact**	**NR Rationale**	**Comment**	**Conclusion**
			95.4% inferred from the delay minute trajectory	
Confidence Level	-1.6%	NR has applied a confidence level of 95%, which it says is to allow for initiatives only delivering 95% of their perceived potential as well allowing for mathematical error and natural variability within the relationship between delay/100k and FDM, and accuracy of data capture for each metric.	It is appropriate to apply a confidence level to analysis of this nature, especially given the acknowledged limited track record of FDM as a measure. However no evidence was identified which indicated whether 95% is an appropriate level of confidence based on the volume and type of data analysed and historic performance in this regard, and this would be an extremely high confidence level, compared for example with 75% applied more typically in passenger performance forecasting. The confidence limit derived appears to include the severe winter periods in 2011, although NR indicated that these had been excluded. We also consider the argument that only 95% of improvement action benefits may be achieved to be unrelated to this confidence level. NR acknowledges that this level has been determined on 'gut feel' based on the experience of freight subject experts. On this basis we do not consider that a reasonable case has been applying this confidence level, and therefore it would be equally realistic to apply a lower level of confidence.	Not accepted: It is appropriate to apply a confidence level, however no evidence presented to support the figure of 95% confidence.

Network Rail View			Independent Reporter View	
Performance Risk	**% FDM Impact**	**NR Rationale**	**Comment**	**Conclusion**
Changes which impact FDM but not underlying performance				
Increase in Velocity	-0.90%	NR state that there is a risk that increasing velocity will have a negative impact on FDM as removing slack within schedule will mean that the same level of delay will result in a train arriving later at destination (a 10kmh increase in velocity would lead to a 1.8% fall in FDM). NR noted that they have reviewed FDM success rate and failures in relation to average velocity and calculated that the higher the velocity, the higher the propensity for failure as a train scheduled to run fast between locations has less ability to recover delays.	The evidence presented to support this (*refer XLS*) contains over 50,000 observations. For simplicity the analysis was undertaken in bands to understand the relationship between velocity and FDM. Although at this banded, high level the relationship between FDM and velocity can be demonstrated, given the coarseness of the analysis presented it is not possible to definitively prove the relationship between increase in velocity and increase in FDM without looking at other contributing factors in each of the cases, e.g. FDM may appear to be affected by velocity, when actually it is service type. No evidence has been presented that demonstrates where the assumption of a 5kph increase in average speed for all freight services in CP5 comes from, other than the expected increase in intermodal traffic. Without this, the evidence presented does not allow one to conclude that the level of impairment calculated is reasonable. Lastly, we would expect any increase to occur gradually over CP5, not to be fixed throughout.	Not accepted: Relationship between FDM and velocity only demonstrated at a high level. Insufficient evidence for 5kph overall increase in velocity.

Network Rail View			Independent Reporter View	
Performance Risk	**% FDM Impact**	**NR Rationale**	**Comment**	**Conclusion**
Increase in longer distance services	-0.20%	NR has identified a risk that an increasing proportion of longer distance freight services will have a negative impact on FDM – the further a train runs, the more likely it will experience a 15 minute delay, even if underlying delay causes are the same. NR advises that an increase in average distance of a freight train by 10km would cause a 0.2% fall in FDM)	Using the same data set as noted above, NR analysed the performance of trains at increasing transit lengths and noted that the longer the journey, the more risk of failure. As with the analysis of velocity, this analysis was carried out using banded data, which confirmed that the shorter the journey, the better results in FDM. The high level nature of the analysis means that, whilst at a banded level the relationship is proven, the detailed relationship between distance and FDM is not clearly demonstrated in that the analysis does not isolate a large number of other contributing factors such as origin and destination, type of freight etc. Therefore, whilst the analysis undertaken appears to support the broad relationship and leads to the level of impairment stated, it is not clear whether this is in fact a true relationship for all freight services. No evidence or substantiation of the assumption that there will be an average increase of 10km across Freight services in CP5 was presented, therefore it is not possible to conclude definitively that this is a reasonable or justifiable level of impairment.	Not accepted: Relationship between FDM and increase in distance only demonstrated at a high level. No evidence for 10km overall increase in average journey length in CP5. Any change likely to be gradual over CP5.

Network Rail View			Independent Reporter View	
Performance Risk	**% FDM Impact**	**NR Rationale**	**Comment**	**Conclusion**
CP5 Risks (which will also impact on Delay/100km)				
Growth in freight traffic	-0.25%	The SBP assumes a 20% growth in freight trains using the network. This increases the risk of reactionary delay due to congestion at yards, on the freight network and available resources. Traditionally NR uses a factor that assumes for each 1% growth in traffic, reactionary delay per mile will increase by 0.5%. A 20% growth in traffic therefore suggests a 10% growth in NR reactionary delay and this would result in a 5% increase in delay per mile – up to 3.08 extra delay minutes per 100km.	The evidence presented in SBP supporting document Performance Plan for England, Wales and Scotland states that there will be a 16% increase in freight trains using the network in CP5. In finalising the FDM for CP5, NR needs to be clear which growth figure it is working to. Evidence was presented by NR to support the relationship between primary and reactionary delay. [*Ref FDM xls.*], however no evidence was presented to demonstrate the relationship between growth and reactionary delay. The level of impairment would need to be recalculated if NR works to the 16% growth figure.	Accepted in principle, although no evidence presented to demonstrate relationship between growth and primary delay. Inconsistent growth figure assumed. The delay impact would be expected to increase gradually across CP5 as freight traffic grows.
Engineering Work	-0.10%	The quantum of overnight engineering enhancement work on the core freight network is expected to increase during CP5. The access impact on the CP5 trajectory is based on the relative quantum of possessions planned on the key corridors, and anticipates greater delay risk on services running on the shoulder of possessions.	NR provided a presentation as evidence, which states that possessions currently have a 0.1% negative impact on FDM, however no details or evidence were presented to substantiate this figure. NR has made an assumption that delays due to possessions on Freight core routes will double through CP5 which will double FDM impact to 0.2% leading to a change of -0.1%. No evidence to substantiate this has been provided. Across the network, engineering access in CP5 is expected to increase by a maximum of 20-30% in years 2 and 3, rather than 100%, and to	Overall logic supported, but not the scale, since no evidence supplied to substantiate the quantum impact on freight services. We would also expect the impact to vary across CP5, in line with forecasts for passenger services.

Network Rail View			Independent Reporter View	
Performance Risk	**% FDM Impact**	**NR Rationale**	**Comment**	**Conclusion**
			reduce by year 5, so the relationship between FDM and engineering access remains unsubstantiated.	
External Risks	-0.10%	NR expects in CP5 that mitigation keeps pace with the risk level for suicides and cable theft. 16% of trains failing FDM have been delayed due to these two external causes. VfM is likely to focus spend on mitigation on to high density passenger network so increased risk may show through in an increase of occurrences on lightly used freight network.	NR cites the relationship between freight delay per suicide incident versus that of TOCs on the non-core passenger network, however NR has not provided any evidence to substantiate this relationship. NR might also expect to give some priority to mitigation activity on freight core routes. It is therefore not possible to conclude that this is a reasonable level of impairment.	Not accepted: no evidence submitted to substantiate relationship.
Weather	-0.50%	NR considers that the 2.94 figure relies on a benign winter. Freight performance is reported to be particularly affected by poor weather which makes a target reliant on assumed weather. NR has assumed one poor winter period (using the second worst period in 2011/12) which would lead FDM MAA to drop by 0.5% and delay per 100km would increase by 0.28 minutes.	In this instance, NR has taken a different approach to that of passenger PPM, in that they have considered an average of the past 2 rather than 5 years and only included 1 rather than 2 bad winters. This is partially due to a lack of FDM data beyond the 2-year horizon. However this also leads to a slightly less prudent target for freight than that proposed for passenger services. If, as suggested, freight is particularly impacted by poor weather it would seem prudent to at least mirror the passenger position.	Accepted in principle, given the limited time period of data, but noted that position inconsistent with passenger services. Likely to be desirable to review this after a further period including at least one years data.
Revised Target	91.35%			