

Transport Scotland

Commercial Assurance Review of the Rail Major Projects Portfolio

26 October 2016

Some information contained in the following report has been redacted. Disclosure of this information would, or would likely to prejudice substantially the confidentiality of Network Rail's commercial information and thus cause substantial harm to their commercial interests.



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26 October 2016

Transport Scotland
58 Port Dundas Road
Glasgow
G4 0HF

Dear Mary

In accordance with the terms of our Agreement dated 23 May 2016, this draft report provides a review of the controls and reporting environment of the Rail Major Projects Portfolio (the Portfolio) which includes the Aberdeen to Inverness Improvement Project, Edinburgh Glasgow Improvement Programme, Highland Mainline Improvement Project, Shotts Electrification and Stirling-Dunblane-Alloa Electrification.

Purpose of our review and restrictions on its use

This draft report was prepared solely on your instructions to provide a review of the Portfolio, it should not be relied upon for any other purpose. As others may seek to use it for different purposes this review should not be quoted, referred to or shown to any other parties unless so required by court order or a regulatory authority, without our prior consent in writing. In carrying out our work and preparing our review, we have worked solely on the instructions of Transport Scotland and for their purposes only.

It is important to note that this review has been conducted over a limited period of time and therefore it is likely that further review and analysis will uncover information that will affect our draft findings. The projects are live and developing over time and our review has therefore focused on the current position at Network Rail defined Period 4, 2016. Given time constraints and the volume of data available it has been necessary to adopt an interview and sample review approach.

Our review may not have considered issues relevant to any third parties. As such any use such third parties may choose to make of our review is entirely at their own risk and we shall have no responsibility whatsoever in relation to any such use. This review should not be provided to any third parties without our prior approval and without them recognising in writing that we assume no responsibility or liability whatsoever to them in respect of the contents of our deliverables.

Scope of our work

Our work in connection with this assignment is of a different nature to that of an audit. Our review is based on inquiries of, and discussions with Transport Scotland, Network Rail and the Office of Rail and Road. We have not sought to verify the accuracy of the data or the information and explanations provided by third parties.

If you would like to clarify any aspect of this review or discuss other related matters then please do not hesitate to contact us.

Yours sincerely

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Review of Rail Major Projects Contents

Executive Summary	3
Background and Context	12
Cost Review	14
Project Reviews	18
Aberdeen to Inverness Improvement Project	19
Highland Mainline Improvement Project	24
Shotts Electrification	29
Stirling, Dunblane, Alloa Electrification	36
Edinburgh to Glasgow Improvement Programme	41
Portfolio Governance Review	43
Appendices	46

Review of Rail Major Projects Executive Summary

Background

- ▶ In October 2013, the Office for Rail and Road (ORR) published its Final Determination for Control Period 5, setting the outputs Network Rail (NR) is required to deliver in the five years from April 2014.
 - ▶ The Final Determination identified Rail Major Projects that NR would deliver and their anticipated cost.
 - ▶ In line with the UK rail industry structure, NR is held to account for delivering projects as promised by the ORR, rather than by Transport Scotland (TS).
- ▶ The reclassification of NR as a public sector body on 1 September 2014 brought NR assets and liabilities onto the Government's balance sheet, increasing its exposure to cost overspends.
- ▶ As a result of the reclassification, TS used the quarterly reviews of the Rail Major Projects Portfolio (the Portfolio) with NR and the ORR to provide regular updates and greater detail on project progress.
- ▶ A Memorandum of Understanding and a borrowing limit of £3.3b was agreed between UK and Scottish Governments. This is intended to protect the integrity of the devolution agreement and ensure there is no risk transfer across the separately funded programmes.
- ▶ In response to cost increases reported by NR in March 2016, TS took further action for enhanced reporting across the Portfolio.
- ▶ Following a further cost increase within the Edinburgh to Glasgow Improvement Programme (EGIP) in May 2016, TS commissioned EY to perform a programme commercial assurance review (the EGIP Review).
- ▶ The EGIP Review originally intended to produce an independent view of the cost and schedule to complete for the programme.
- ▶ After an initial assessment it was agreed that, due to an unclear information and execution environment, there was insufficient certainty around the schedule and cost data to build an independent assessment.
- ▶ TS tasked EY to perform a review of the control environment for EGIP. This led to a number of shortcomings being identified in the following functional areas relative to EY's experience of leading practice for projects of a similar size and complexity:
 - ▶ Schedule baseline and forecast
 - ▶ Cost baseline and forecast
 - ▶ Change control, cost contingency and schedule float management
 - ▶ Risk management and performance reporting
 - ▶ Programme assurance
- ▶ Following the EGIP Review, TS requested that EY consolidate its key findings and use this as the basis for a commercial assurance review of the Portfolio, covering:
 - ▶ Aberdeen to Inverness Improvement Project (A2I)
 - ▶ Edinburgh to Glasgow Improvement Programme (EGIP)
 - ▶ Highland Mainline Improvement Project (HML)
 - ▶ Shotts Electrification
 - ▶ Stirling, Dunblane, Alloa Electrification (SDA)
- ▶ This report presents the findings of the Portfolio review.

Review of Rail Major Projects Executive Summary

Purpose

- ▶ This work is a commercial assurance review, focused on assessing the level of control exercised by NR for each project across the Portfolio.
- ▶ It is intended to provide an independent assessment of whether the elements fundamental to successful project delivery are in place and operating effectively.
- ▶ This review is not intended to assure the successful delivery of a project or provide an in-depth performance evaluation of the Portfolio. It is designed to assess the following:
 - ▶ The level of control across the Portfolio
 - ▶ For any major shortcomings in control, what improvement opportunities are available
- ▶ For the avoidance of doubt, our review has not tested whether the scope which NR has decided is necessary to meet the specified programme outputs is in itself appropriate or sufficient.
- ▶ It is important also to note this review has been performed in the context of a number of improvement initiatives within the rail industry, e.g. the Hendy Review, Bowe Review, and Shaw Report. We also understand that NR is implementing an Enhancements Improvement Programme.
- ▶ As noted above, the focus of this review is on the level of controls exercised by NR on each project at the time of the review; however, the recommendations of this report should be considered within the context of these broader UK findings.

Approach

- ▶ We have reviewed the level of control each project has against:
 - ▶ The lessons learned from the EGIP review
 - ▶ The governance expectations set by TS
 - ▶ Selected principles of good practice associated with the Association of Project Management
- ▶ We have categorised our observations and recommendations according to three themes:
 - ▶ Project – within the individual projects and project delivery teams
 - ▶ Portfolio – management of the Rail Major Projects portfolio
 - ▶ Strategic – industry or system wide
- ▶ Unless otherwise stated our review has been of documentation for 2016/17 P4 – the week commencing 18 July 2016.

Review of Rail Major Projects

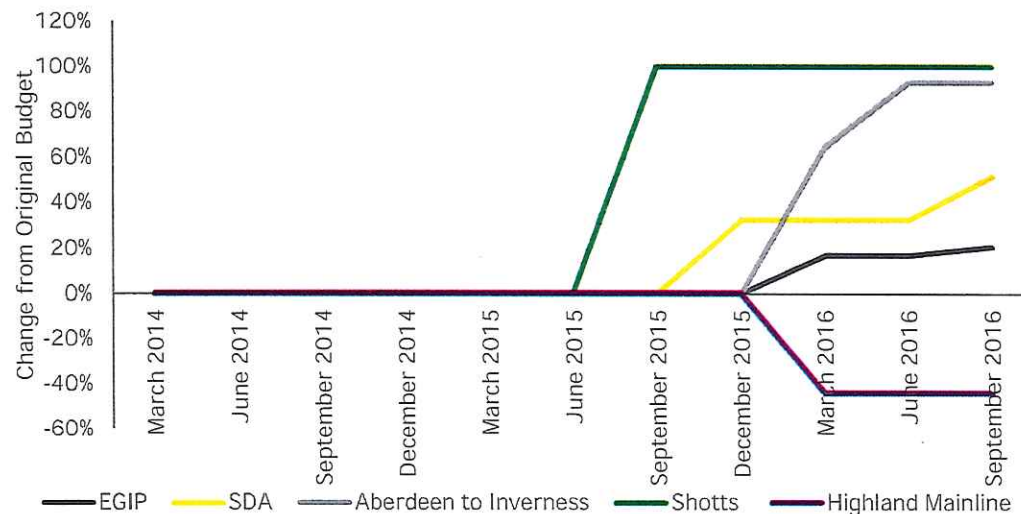
Executive Summary - Project Cost Changes

There has been an increase in the forecast cost of the Portfolio from the original funding of £1,131m to £1,510m, as at P4 2016, an increase of £379m (Note: Current forecast AFCs are stated in outturn prices). The graphs show that:

- ▶ There have been significant forecast cost increases in all projects other than HML, for which the forecast cost decrease was a result of a change to the franchise rolling stock plans, proposed by Abellio in response to TS specifying improved rolling stock and timetable on this line through the ScotRail franchise competition.
- ▶ The other four projects reported forecast cost escalations at a similar time, between Q3 and Q4 2015. This was when, other than for EGIP, the projects were in GRIP stages 1 to 3. We understand that at no stage has TS requested a formal change in scope for these projects, so the changes in costs being considered are based on the same scope.
- ▶ Costs have increased very sharply in short periods of time.

These factors highlight the unreliability of initial cost estimates and the implications this can have for TS as a funder. In addition to the above points, it should be noted that three of the five projects are not yet in the execution phase and therefore a degree of uncertainty exists around the cost estimates on these projects.

Project Forecast Cost Change Over Time



Portfolio Cost Movement



Review of Rail Major Projects

Executive Summary - Key Project & Portfolio Observations

# Theme	Observations	Examples
1 Cost Estimation	<ul style="list-style-type: none"> ▶ NR's cost estimates in the development phase (i.e. prior to GRIP 3 with Approval in Principle) have been unreliable. Whilst each project's individual circumstances have contributed to the cost increases, systemic causes have also been observed. ▶ There is no consistent approach to NR project cost reporting. Costs are presented on a range of cost bases (Quarter 4 2012 prices, outturn prices, etc.) often without an explanation of what has been used. 	<ul style="list-style-type: none"> ▶ SDA/Shotts: Significant underestimate of the cost of electrification (a UK wide issue across all of NR's electrification projects). ▶ EGIP/SDA/Shotts/A2I: Compliance issues - failure to design to meet regulatory requirements. ▶ A2I: NR's initial development and cost estimates based on an incomplete knowledge of its assets, leading to optimistic estimates of civil works required.
2 Governance	<ul style="list-style-type: none"> ▶ There is an inconsistent framework environment governing the relationship between NR, TS and the ORR across the projects. ▶ Under the current UK rail industry model, ORR, rather than TS, holds NR to account for delivering the projects as promised. The reclassification of NR has changed TS's liability and exposure to the projects and EY believes a tighter level of control over change and contingency is now appropriate for TS. 	<ul style="list-style-type: none"> ▶ The current Framework Governance Document is written for the EGIP project, and there is inconsistent governance guidance for other projects (<i>Note: A Portfolio Board has been established to address this issue and TS are currently drafting a Term of Reference between TS and NR</i>).
3 NR Project Controls	<ul style="list-style-type: none"> ▶ EY observed that there is no dedicated project controls system used by NR to control, analyse, forecast and report cost and for integration of progress, schedule and risk information. ▶ Use of uncontrolled spreadsheets has been observed across the Portfolio. 	<ul style="list-style-type: none"> ▶ All projects: Systems such as ARM, @Risk, Primavera P6 and Oracle are used by NR. ▶ A2I: The contingency reported as part of the Highland Enhancements Programme report could not be explained by the project team and differed from that on the cost monitoring spreadsheet supplied to TS.

Review of Rail Major Projects

Executive Summary - Key Project & Portfolio Observations

# Theme	Observations	Examples
4 NR Schedule Integrity	<ul style="list-style-type: none"> ▶ NR project schedules are not robust and lack sufficient detail to give a comprehensive schedule for the Portfolio. 	<ul style="list-style-type: none"> ▶ All projects: Failure of schedule integrity tests across the Portfolio.
5 Performance Reporting	<ul style="list-style-type: none"> ▶ There is a lack of transparency in reporting potential cost increases from NR to TS. EY observed instances where NR had been aware of expected cost increases but had not reported these to TS promptly. ▶ Existing reporting across the projects has not provided TS with sufficient information to give confidence over the projects' status and performance. ▶ Errors and incomplete sentences in reports suggest that they have not been prepared with due care and attention. 	<ul style="list-style-type: none"> ▶ A2I: NR only made TS aware of the increase from £170m to £281m (2012/13 prices) on the regulated milestone date of 31 March 2016. Prior to this, ORR Review Reports had confirmed, based on information reported by NR, that the project remained on target and on budget.

Review of Rail Major Projects

Executive Summary - Key Strategic Observations

#	Theme	Observations	Examples
1	Commercial Leverage	<ul style="list-style-type: none"> ▶ TS lacks effective commercial leverage to penalise or reward NR to drive project performance. 	<ul style="list-style-type: none"> ▶ EGIP: The pain/gain mechanism in place is currently failing to drive positive performance. The upstream pain/gain mechanism between TS and NR is effectively redundant due to the reclassification.
2	Delegation of Authority (DoA)	<ul style="list-style-type: none"> ▶ The current DoA arrangement does not afford TS control beyond instances where the projects exceed the funding headroom or regulated milestone dates. Given the changed liability associated with reclassification, a tighter level of control over change and contingency is appropriate for TS. 	<ul style="list-style-type: none"> ▶ The Framework Governance Document for EGIP does not comprehensively outline a DoA.
3	ORR Regulation	<ul style="list-style-type: none"> ▶ TS recognises its role as the client is reliant on effective regulation given the existing legislation and the direct accountability of NR to the UK rather than Scottish Government. Under the current UK rail industry framework NR is subject to regulation by the ORR. Other than regulatory penalties or other measures imposed by the ORR, NR has scope for underperformance without material or timely consequence given the limitations of the ORR's enforcement powers, particularly post NR reclassification. 	<ul style="list-style-type: none"> ▶ Shotts: The ORR provided an ECAM determination in February 2014 of £80m, however, by June 2015 NR reported internally that the AFC would increase to £160m. ▶ The ORR's determination process primarily reviews NR's costs against benchmarks or similar projects that have been completed to ensure they are reasonable, it does not independently calculate the price of the work required.
4	Control Periods & Cost	<ul style="list-style-type: none"> ▶ EY observed alignment of project planning and delivery of enhancement projects to Control Periods, rather than to the full project lifecycle. Delivery date and funding focus on Control Periods rather than operational needs is a recognised issue in the delivery of projects; however, the investment framework project status does allow for programmes that span multiple Control Periods and was, for example, applied to EGIP. 	<ul style="list-style-type: none"> ▶ A2I: NR has identified the most efficient way of delivering CP5 journey requirements is by accelerating planned CP6 enhancements in the CP5 period. This results in a misalignment between scope and funding across the two Control Periods.
5	TS Enhanced Risk Environment	<ul style="list-style-type: none"> ▶ Given the reclassification of NR, TS is now exposed to more risk – as evidenced in this review. 	<ul style="list-style-type: none"> ▶ Reclassification and our emerging findings across the Portfolio.

Review of Rail Major Projects

Executive Summary - Key Strategic Observations

#	Theme	Observations	Examples
6	Control Periods & Operations	<ul style="list-style-type: none"> ▶ Control Periods are not aligned to the passenger franchising process and this can lead to abortive spend. ▶ Enhancements delivery dates are aligned to Control Periods rather than operational milestones. 	▶ A2I/HML/Shotts/SDA: March 2019 is a consistent delivery date across all projects, however, this date has no operational importance, rather it is simply the end of a Control Period.
7	Role of ECAM	<ul style="list-style-type: none"> ▶ The ECAM process is used to review early project estimates. This means that NR is protected against poor early cost estimates. ▶ EY observes that the ECAM determination is treated as the first recognised project baseline. 	<ul style="list-style-type: none"> ▶ SDA: A revised ECAM submission is possible for SDA, however, ORR recognises that this would remove an incentivisation target for NR. ▶ A2I: The NR team made their ECAM submission on 17 August 2016 and appear to be treating the ECAM process as the start of their baseline.
8	Portfolio Approach	<ul style="list-style-type: none"> ▶ Under the current portfolio funding approach, TS does not have a high level of visibility and oversight on how funding and portfolio savings are managed by NR. 	▶ TS has no control over movements of budget between Rail Major Projects by NR. It is anticipated this will be considered within the remit of the newly established Portfolio Board.
9	Industry-wide Holistic Approach	<ul style="list-style-type: none"> ▶ A more holistic approach between TS, NR and Train Operating Companies (TOCs) could reap benefits and value for money solutions across the network. Better coordinated, industry-wide planning has the potential to deliver the same outputs more efficiently. 	<ul style="list-style-type: none"> ▶ HML anticipated cost saving has been delivered through a saving resulting from Abellio ScotRail's operational decision, driven by TS's franchise specification, to use High Speed Trains on the route, thereby significantly reducing the infrastructure interventions required to deliver the project's output specification. ▶ The ScotRail Alliance was set up to encourage better alignment between Abellio ScotRail and NR. It was proposed in response to TS's franchise competition which indicated that TS was supportive of alliancing as a vehicle for greater industry collaboration and gave credit for committed cost savings accruing from alliancing.

Review of Rail Major Projects

Executive Summary - Recommendations

#	Theme	Recommendation	Rec. Leader	Enabling Parties	Suggested Timeframe
1	Project	Implement a project controls improvement initiative focused on cost, risk and schedule. This should encompass controls, analysis, forecasting and reporting. <i>(Note: This recommendation has already been directed to NR by TS. We understand that NR is seeking to address these issues on a company-wide basis through its Enhancements Improvement Programme (EIP). TS should require time-defined commitments from NR in respect of the implementation of EIP in Scotland and how it will be applied to each of the projects.)</i>	NR	NR / Alliance	0-3 Months
2	Project	Elevate project team focus on visible, dynamic forecasting, with emphasis on early identification, substantiation and visible challenge of cost and schedule to complete.	NR	NR / Alliance	0-3 Months
3	Portfolio	Update the Rail Major Projects governance framework to be Portfolio-wide, and include review and definition of: <ul style="list-style-type: none"> ▶ TS expectations for the design, development and delivery of the Rail Major Projects Portfolio+ ▶ Roles, responsibilities and accountabilities through each GRIP phase ▶ Delegations of authority ▶ Protocols <i>(Note: This recommendation has already been actioned by TS with the introduction of the Portfolio Board)</i>	TS	NR / ORR	0-3 Months
4	Portfolio	Create a separate performance management framework, including consideration of: <ul style="list-style-type: none"> ▶ Information requirements / consistent performance reporting ▶ Potential incentives & penalties 	TS	ORR	3-6 Months
5	Portfolio	Review the process for defining and approving commercial strategy for future projects and scopes of work.	TS	NR	3-6 Months
6	Portfolio	Engage ongoing independent integrated assurance to support improvement initiatives and maintain quality standards.	TS	TS	3-6 Months

Review of Rail Major Projects

Executive Summary - Recommendations

#	Theme	Recommendation	Rec. Leader	Enabling Parties	Suggested Timeframe
7	Strategic	Update TS's approach to delivering Rail Major Projects to align with new financial and operational responsibilities following NR reclassification (<i>Note: This recommendation has already been actioned by TS through the development of Terms of Reference between TS and NR for the next Control Period</i>).	TS	NR, ORR	6-12 Months
8	Strategic	Review the early development process and project estimation and its appropriateness for TS.	TS	NR, ORR	6-12 Months
9	Strategic	Review the process for funding for major projects to take account of TS's role following NR reclassification.	TS	ORR, SFT	6-12 Months
10	Strategic	Review the benefits and risk of aligning project delivery timescales to operational outputs within the Control Period planning framework for Scotland.	All*	All*	6-12 Months
11	Strategic	Investigate options for improving industry-wide coordination to scope, design, develop and deliver projects more efficiently.	All*	All*	6-12 Months

* Including Transport Scotland, Network Rail, Office of Rail and Road, Train Operating Companies, Scottish Futures Trust and the Scottish Government.

Review of Rail Major Projects

Background and Context

Overview of the Rail Industry in Scotland

This overview highlights how changes in the industry have impacted TS's role, its relationship with NR and how it has intervened to address these challenges

The Regulatory Model

- ▶ NR's required CP5 outputs including those linked to major enhancement projects, were determined by the ORR in line with legislation.
- ▶ The Scottish Government's (SG) strategic requirements that informed this determination were set out in its 2012 High Level Output Specification (HLOS) which was published alongside a Statement of Funds Available (SoFA).
- ▶ This model, ensuring Government focused only on high level strategic outcomes and outputs and leaving NR to determine the appropriate means of delivery with accountability to the ORR, was advanced by the industry at that time as being the most efficient and in the best interests of funders.
- ▶ NR accepted the Final Determination in February 2014 and issued its Delivery Plan in March 2014 (subsequently updated). The Delivery Plan set out what NR would deliver over CP5. The culmination of Periodic Review 13 (PR13) was then ORR's Delivery Plan Notice of 31 March 2014 accepting NR's Delivery Plan as a baseline for CP5 and against which NR performance would be measured. CP5 began on 1 April 2014.
- ▶ Project governance arrangements in Scotland remained relatively strong compared to England & Wales, with greater ORR involvement and assurance on individual schemes. These have been further strengthened in response to reclassification and the erosion of the financial risk buffer by the creation of a new Portfolio Board for all major projects. This Board oversees progress and also acts as a vehicle for agreeing large programme changes within the separate borrowing limit for Scotland.

Control Period 5

- ▶ The scale of enhancements committed for delivery in CP5, backed by SG investment, was significantly higher than the equivalent investment over preceding control periods. NR was confident of its capability to deliver and in 2013, the ORR concluded that on balance, NR had a good track record of delivering enhancements in CP4.
- ▶ A difference between CP4 and CP5 was the lower level of maturity of scheme development across the Scotland portfolio (the same applied in England & Wales) despite the significant development funding that had been made available by TS during CP4 and an open and transparent approach to HLOS development.
- ▶ The desire for Government to include commitments to capacity enhancements, whether as an identified scheme or metric based, was supported by NR over the alternative Investment Framework option. This was due to an expectation of portfolio efficiencies and the removal of additional regulatory approval requirements with respect to securing access to RAB borrowing.
- ▶ In part this uncertainty for projects was reflected in the ORR Determination for CP5. Indeed the ORR introduced a new process - the Enhancements Cost Adjustment Mechanism (ECAM, see page 54 for more details) aimed at managing and regulating this uncertainty. Building on the suggestion of the industry, this mechanism postponed the setting of efficient costs for individual projects, and thus the total cost of the whole enhancements Portfolio, until the point when each project reached GRIP3.

Review of Rail Major Projects

Background and Context

Overview of the Rail Industry in Scotland (cont'd)

Reclassification

- ▶ NR's reclassification as a central government body was confirmed by the Office of National Statistics in December 2013, prior to the formal commencement of CP5, but took effect from 1 September 2014.
- ▶ A Framework Agreement, agreed between the UK Government and NR, was published in September 2014 and set out how the Department for Transport and NR would interact in terms of corporate governance and financial management. This reflected the role of the Secretary of State for Transport as the owner and sole shareholder of NR.
- ▶ A separate Memorandum of Understanding between the UK and Scottish Governments was published alongside the Framework Agreement. This outlines the role of the Scottish Ministers in NR's governance following reclassification, in particular those areas of governance, reporting and financial management which may have a direct or indirect impact on the running of the Scottish network.
- ▶ SG also insisted on a separate limit on borrowing for NR activities in Scotland as a means of protecting the integrity of the devolution agreement and ensuring no risk transfer across the separately funded programmes. This limit was agreed at £3.3 billion – providing a significant risk buffer for NR to manage its Scotland programme. At this time, and reflecting the risk to public finances, TS intensified governance arrangements, with enhanced quarterly reporting arrangements reinforced with additional ORR involvement.
- ▶ At that time, reclassification was noted by the UK Government as a statistical change, brought about by a change in European requirements on public accounting (ESA10) and that the strategy would be to maintain sufficient operational flexibility to NR, to avoid major changes to the structure of the organisation, and to avoid Government taking a more active involvement in day-to-day matters.

Changes to NR Governance and role of the ORR

- ▶ In June 2015 the UK Government confirmed significant changes to NR's corporate governance, including appointment of a new chair and the removal of public members. This was not in response to reclassification, but rather the impact of significant project delays and cost increases within the England and Wales enhancements programme.
- ▶ This also triggered a series of industry reviews – the Hendy, Bove and Shaw reviews – covering various aspects of the England & Wales programme and seeking recommendations on NR's future structure and governance.
- ▶ Reclassification was not a cause of programme delays or cost increases but it clearly exposed weaknesses in the prevailing regulatory model for the early part of CP5, particularly in the way enhancement projects were managed. Capital cost increases could no longer be agreed between NR and the ORR and managed off the Government balance sheet through private borrowing.
- ▶ As identified by the Bove Review, cost escalation of schemes could be absorbed, as only the financing cost had to be considered in an ORR assessment of affordability, not the overall capital expenditure. Further, this ability to make changes to scheme funding at a relatively late stage in the development of each project meant that there was a limited incentive on NR to accurately forecast the initial cost estimates.
- ▶ This was not reflected in the role of the ORR at the time of reclassification and therefore requires further consideration in a Scottish context for the planning of future enhancement projects, properly reflecting the potential imbalance in levels of accountability of NR to the SG compared to the Secretary of State.

Review of Rail Major Projects

Cost Review - Current Status (2016/17 P4)

In this section we provide an overview of the cost position for each project. These are shown in the waterfall diagrams in the following slides which break down the components of the changing cost forecasts. It should be noted that there is no single source for this data and as highlighted in the individual project reviews there is uncertainty over the accuracy of some figures. Key observations from the waterfall diagrams are:

- ▶ The NR revised baseline shows a significant increase from the opening NR baseline position, this is in excess of £350m.
 - ▶ This is likely to put significant pressure on the funding position for CP5 and the affordability of these projects will need to be assessed by TS and NR.
 - ▶ The majority of changes that are shown in the NR revised baseline are currently unapproved by TS as can be seen in the cost table in the Appendix (page 55). This casts further doubt on the funding position of these projects and whether TS will accept the increased costs to allow these projects to be completed.
- ▶ There are cost increases shown within the waterfalls that are currently "Unknown" (these are highlighted green). A brief description of each of these is given below:
 - ▶ EGIP, the 16/17 P4 PRG Report showed an increase of £25.7m on the 16/17 P3 PRG reported costs, however there was no narrative explanation of this within the report. It is expected that as part of NR's response to the EY EGIP review a more detailed AFC will be produced that will give a breakdown of the full cost increase.
 - ▶ SDA, the 16/17 P4 PRG Report showed an increase of £20m on the 16/17 P3 PRG reported costs, however there was no narrative explanation of this within the report. This was queried with the SDA team and it was explained that this was not due to a defined cost increase, but an expectation that the project would not be deliverable for £139m.
 - ▶ A2I, one of the cost increases is labelled "Indirect Costs", however, no further data has been given as to the nature of these costs. A more detailed breakdown of these costs is expected within the ECAM submission. There is also a cost difference between the 16/17 P4 PRG report, and the AFC of £330m that NR has included in the ECAM submission. We understand that this is due to a difference in cost base (ie, it is priced in outturn prices). A more detailed breakdown of these costs is expected to be set out in the ECAM submission.
- ▶ Where possible we have attempted to use NR's classification of the type of change within the waterfalls, however, it should be noted that we have not performed a review of the components of the cost increases as a part of this review and they have been split into broad categories to allow for easier presentation.

Review of Rail Major Projects

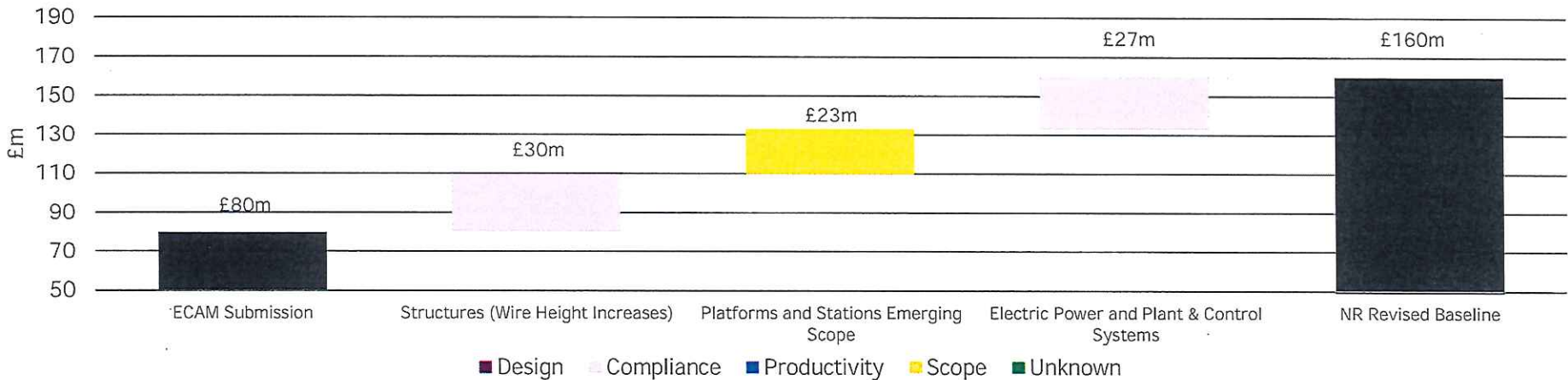
Cost Review - Project Waterfalls

Combined Portfolio



Note: This is the combined position of the waterfall charts for the five project, see each for the source of the cost data.

Shotts Electrification



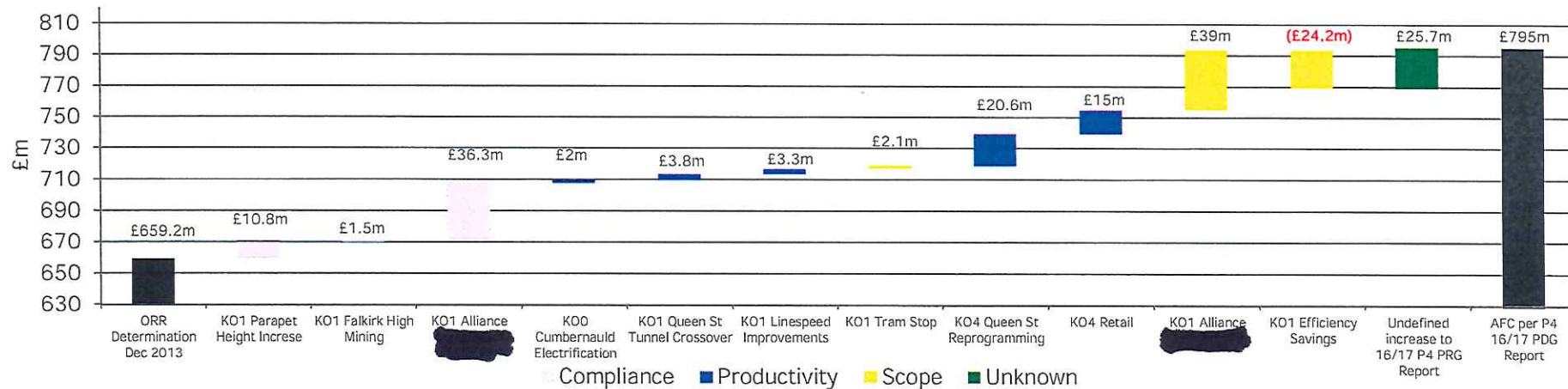
Source: Scotland Rolling Programme of Electrification - Position Presentation October 2015

Note: AFC is in line with 2016/17 P4 PDG

Review of Rail Major Projects

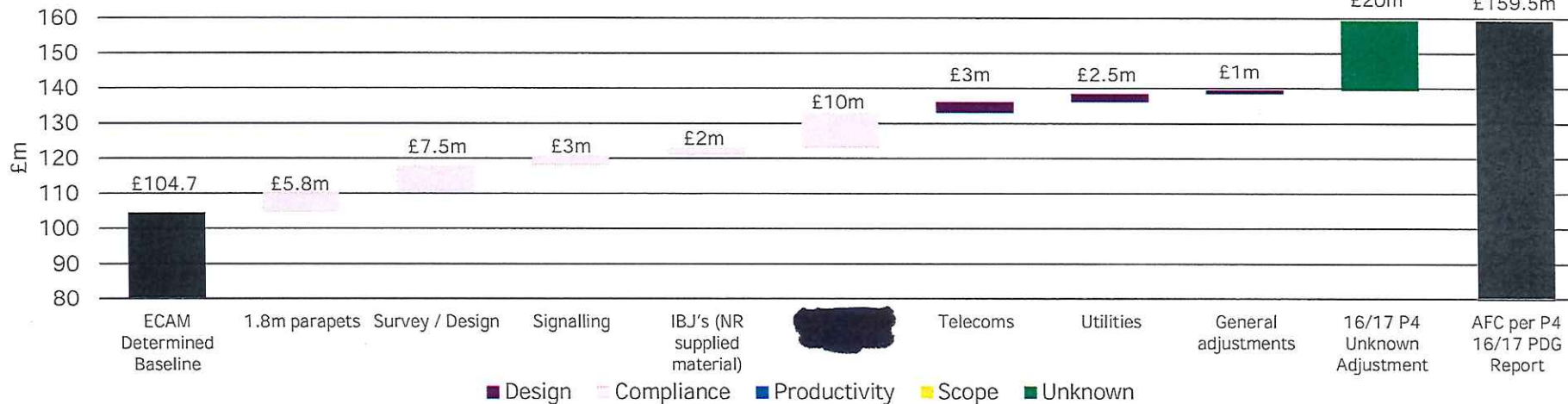
Cost Review - Project Waterfalls

EGIP



Source: EGIP Preliminary review of project cost and schedule (Phase One) and 2016/17 P4 PRG Report

SDA



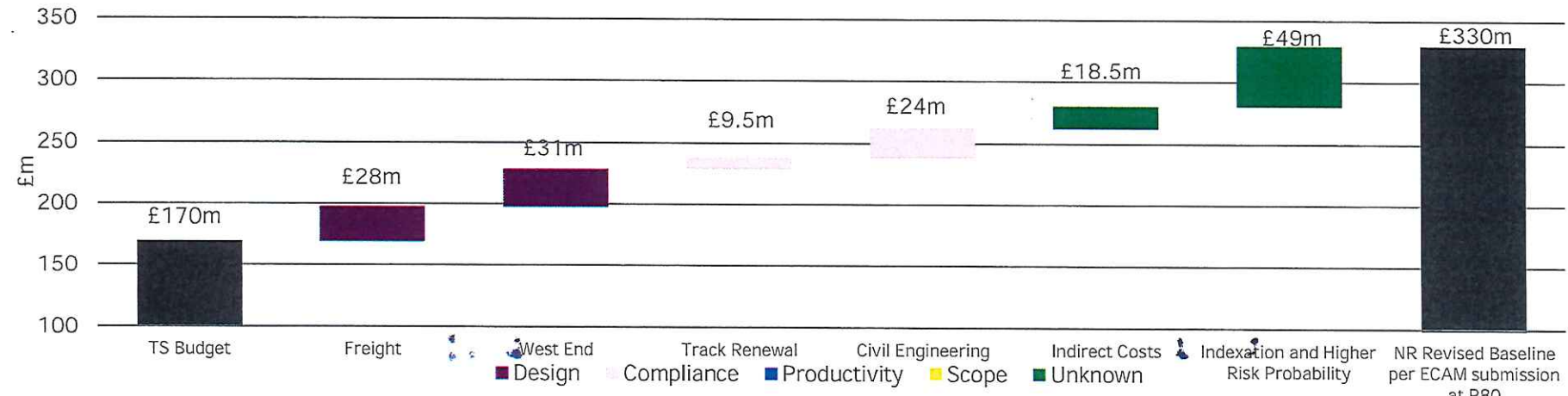
Source: Scotland Rolling Programme of Electrification - Position Presentation October 2015

Note: AFC is in line with 2016/17 P4 PDG

Review of Rail Major Projects

Cost Review - Project Waterfalls

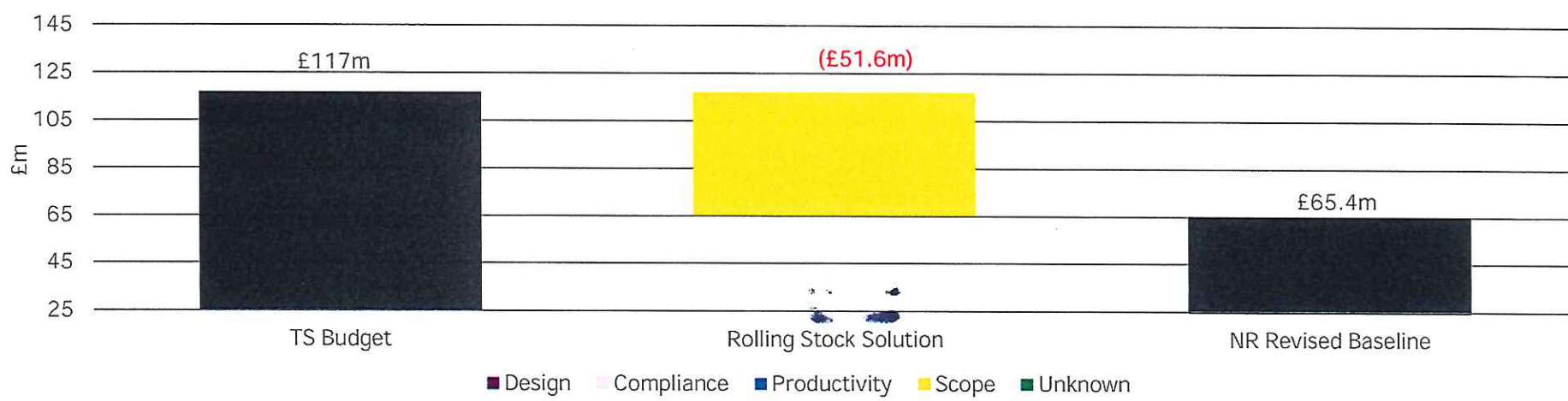
A2I



Source: A-I Options Report v1.0 and P4 HEP Report

Note: AFC is still being reported as the original TS budget

HML



Source: HiML 123278 Updates P3-17 & P4-17

Note: AFC is still being reported as the original TS budget

Review of Rail Major Projects Overview

In this section we present the findings from our controls review of the Portfolio:

- ▶ Aberdeen to Inverness (A2I)
- ▶ Highland Mainline (HML)
- ▶ Stirling-Dunblane-Alloa (SDA)
- ▶ Shotts Electrification
- ▶ Edinburgh Glasgow Improvement Programme (EGIP)

We considered the effectiveness of the management controls in place for each of the projects to develop a view of how “in control” each of the projects are. For the purpose of this, NR have provided us with all the information requested where such information was available. We gathered evidence through:

- ▶ Interviews with the NR team responsible for each project, including the Sponsor, Programme Manager, Commercial Manager, Project Planner and Risk & Value Manager
- ▶ Interviews with TS sponsors and officers
- ▶ Interviews with the ORR
- ▶ Review of a selection of documents and schedules provided to us by NR and TS (this does not represent an exhaustive review or audit but was rather a sample to consider the nature and detail of information available and reported to TS)

The information gained was then compared to good practice controls and reporting examples to provide a benchmark against which the project control environment could be compared. We recommend that TS review where NR’s controls are determined to have been suboptimal and consider the extent to which these controls should be improved.

For each project, we provide a project overview narrative and current status summary, followed by an overview and RAG report (Red/Amber/Green against good practice) for the following key control areas:

- ▶ Cost controls
- ▶ Schedule
- ▶ Risk Management
- ▶ Project Reporting

Further information on each project is included within the appendices.

Review of Rail Major Projects Project: Aberdeen to Inverness

Overview

- ▶ Specification: The specification of the project for CP5 is to deliver infrastructure capacity improvements for new stations at Kintore and Dalcross. This specification is to support future requirements for the route to have a half hourly service between Elgin and Inverness (post-CP5) and a hourly service with two hour journey times between Aberdeen and Inverness (also post-CP5).
- ▶ Scope: To meet the above specification, NR has developed a scope that includes reinstatement of double track between Inverurie and Aberdeen, resignalling, signalling enhancement at Elgin, changes to the railway alignment, extension of the loop and relocation of the station at Forres, line speed improvements between Inch and Aberdeen, deliver infrastructure capacity for new stations at Kintore and Dalcross and platform extensions at Elgin and Inch.
- ▶ Budget & Schedule: The project had a GRIP 2 level estimate of £170m, the CP5 Final Determination cap was set at £191m on the basis of GRIP 3 without AIP; the current project estimate, as included in the ECAM submission provided to us by NR, stands at £330m (GRIP 3 with AIP), which NR confirmed represented the AFC in outturn prices (ie, including indexation) and risk accounted for at P80 (this is equivalent to the £281m in 2012/13 prices and at P50 that NR informed TS of in March 2016). The infrastructure was scheduled to be ready for use in March 2019, however, the P6 schedules show a completion date of September 2019, this is as a result of the delay in making the ECAM submission to the ORR. A key milestone will be set as part of the ECAM determination.
- ▶ Commercial Overview: BAM Nuttall appointed as principal contractor (under contract covering both A2I and HML), currently executing advanced works. For each contract element, BAM Nuttall is invited to provide a tender which NR reviews and can challenge – NR has the option to let the element competitively if it is not content with BAM Nuttall's cost estimate. BAM Nuttall will then be engaged under a NR12 Target Cost contract, which includes a pain/gain share mechanism.
- ▶ Systems & Personnel: NR uses various systems to help manage the project, such as ARM and Primavera P6, but does not appear to use any specialist project controls software. Reflecting the stage of project development, the project team currently consists of 20-25 people. This will increase as it moves towards delivery. No human resourcing issues were noted although NR resources are shared between projects - there is overlap of the A2I team with that delivering HML.

Current Status

- ▶ GRIP Stage: GRIP 3 with Approval In Principle (AIP) has recently been completed.
- ▶ Current focus: Current management focus is the ECAM process, with a submission made to ORR on 17 August 2016, while BAM Nuttall is carrying out advance works.
- ▶ Baseline development: Original requirements were worked to GRIP 3 level by summer 2012. Scottish Ministers' HLOS for CP5 led to a change in project phasing, with the revised December 2013 GRIP 3 report having a cost estimate of £240m. This was in excess of the CP5 Final Determination Cap of £191m, so a revised scope was agreed in March 2014 with an estimated cost of £170m at GRIP 2 and the First Minister made an announcement of that package of improvements.
- ▶ Scope changes: Design changes caused by change in rolling stock assumptions (HSTs rather than 170s) led to regulated Change Control programme delay of six months.
- ▶ Progress: The scope was developed to GRIP 3 with AIP based on outline design, survey, ground and site investigation to the regulated milestone date of March 2016. At this time NR informed TS that the revised cost estimate had risen to £281m in 2012/13 prices (equivalent to the £330m at P80 and at outturn prices that we understand has been reported in the ECAM submission); it would appear that NR gave TS very little notice of this cost increase as prior to March 2016, ORR Review Reports had confirmed the project remained on target and budget. TS does not recognise the increased cost figure; however, NR has made its ECAM submission (delayed from May to August 2016) on that basis as any further delay in ECAM could lead to failure to achieve delivery by the regulated delivery date.
- ▶ Project risks: Major risks to cost and schedule have been identified as: resource availability; adverse weather; NR's ability to service and supply the contractor due to remote location; land; and consents.

Review of Rail Major Projects Project: Aberdeen to Inverness

Cost Control Observations

- ▶ The project is at GRIP 3 with AIP, and a new baseline will be set through the ECAM submission. Advanced works are underway and BAM Nuttall report on Cost of Work Done (COWD) and period-by-period forecasts through a consistent process of reports, progress meetings and commercial meetings each period. BAM Nuttall's reports are interrogated and challenged by NR's Commercial Manager.
- ▶ For each contract element, BAM Nuttall will be invited to submit a tender which will then be reviewed by NR and is expected to be challenged.
- ▶ A cost control process will be put in place for the main contract to monitor contractor progress and variation on a weekly (meeting) and period (report) basis. It will be based on that successfully employed on Borders Railway and will include a change control procedure to which a time limit KPI will be attached.
- ▶ Contingency will be informed by the Risk Register. The project will hold the Risk Register PMean value as its contingency as part of its AFC. At each period's risk meeting the contingency value will be compared to the project's residual exposure: if it is greater than residual value then there will be no change; if it is less than residual value then this will be reported internally and to TS. In addition, the difference between P80 and PMean is held as extra contingency at Sponsor level.
- ▶ We note that a Framework Governance Document is under development, but has not yet been agreed by TS/NR.

Outcome of Key Cost Control Tests

Control Test	Rating	Summary Observation
Clear audit trail from original funding to current AFC		No changes to original Determination budget prior to ECAM submission
WBS captures entire scope & used throughout reporting		This is captured internally by NR for the contracts awarded to date but has not been supplied to TS. It is noted that this has been requested by TS and NR will supply it going forward.
Progress is clearly communicated by WBS and package		This data is captured by Primavera for NR and NR has outlined how this will be monitored and audited to ensure accuracy for the Main Works Contract. TS should ensure that this process and the oversight required is communicated through the Framework Governance Document
Scope deviations auditable	N/A	No scope deviations to audit to date (this will be a post-ECAM baseline action)
Cost over-runs auditable	N/A	No cost overruns to audit to date (this will be a post-ECAM baseline action)
Effective Contingency Management		The proposed process appears reasonable, but issues were observed with the current position. A very small contingency of £5k is currently reported for the advanced works; however, discrepancies were noted between the contingency figure in the internal Highland Enhancements Programme (HEP) report and that in the cost schedule for the advance works
Estimate to Complete Process is Rigorous & Auditable	N/A	The Estimate to Complete process will be fully implemented when the Main Works Contract is awarded. NR interviewees outlined how they expect this process to operate and described a rigorous and auditable process. Current estimate to complete for the advance works contract is monitored by NR through reports supplied by contractor and reported to TS on a periodic basis
Change Register Check		Change Register only exists for period Risk Register updates
Cost Process Check		There does not appear to be a standard NR approach to project cost controls, The A2I cost process is under development, to be based on that employed on the Borders Railway project, and is not yet in place
Evidence of baseline Deviation review	N/A	No baseline until ECAM process concluded

Review of Rail Major Projects

Project: Aberdeen to Inverness

Schedule Observations

- ▶ The A2I Programme Schedule contains a lack of the basic structure and content necessary to allow for a deeper dive review of the project schedule which includes the following:
 - ▶ A hypothetical performance scenario to test the result of programme.
 - ▶ A hypothetical delay analysis to test the project related cost and how it will impact the structure.
 - ▶ A critical path and near critical path analysis to evaluate which activities would be impacted if there is an issue.
 - ▶ A schedule network analysis to view the total time it takes to complete the project.
- ▶ The Work Breakdown Structure (WBS) throughout the schedule is incomplete.
 - ▶ The schedule is missing many level 2 and level 3 activities.
 - ▶ Many activities that are listed within each milestone seem to be a placeholder and not the true activity.

Schedule Integrity Assessment

P6 Schedule Reviewed: (116647 Pend 1617 - 04.xer)

Schedule Test Performed	Results	Summary Observations	Legend
1. Logic Check	Red	65% of the scheduled activities are missing either a predecessor or successor	Schedule Check Passes
2. Leads Check	Red	Two of the scheduled activities had negative lag	
3. Lags Check	Green		Schedule Check Fails
4. FS Relationship Check	Red	86% of the scheduled activities were associated with Finish to Start Logic	
5. Hard Constraint Check	Green		
6. High Float Check	Red	16% of the scheduled activities had a float greater than 44 days	
7. Negative Float Check	Red	51 of the scheduled activities had a negative float	
8. High Duration Check	Green		
9. Invalid Dates Check	Green		

Review of Rail Major Projects

Project: Aberdeen to Inverness

Risk Management Observations

- ▶ Standard NR risk process has been put in place using Active Risk Manager (ARM), an industry accepted risk management tool, with some overlay from the risk management process developed for EGIP (eg, project risk dashboard). Regular Risk Meetings (at least periodic, at some times more frequent) are held at which the project risks are reviewed and updated.
- ▶ The Risk & Value Manager for A2I is responsible for a number of projects, including Queen Street Redevelopment, Edinburgh Gateway, Waverley Station and signalling projects. An analyst is being recruited to the team to provide support.
- ▶ Risk Meetings appear to be well attended by relevant Programme, Project and Commercial managers and engineers and have buy-in from the senior project team. The updated Risk Register and change report is circulated after each Risk Meeting.
- ▶ All risks are weighted and costed in the Risk Register. Mitigation actions and owners are identified and action due dates recorded. Progress against actions is reviewed at each Risk Meeting.

Risk Management Tests

Risk Management Test	Rating	Summary Observation
Process Consistency to ISO		No issues identified
Process adherence check		The risk management process is adhered to
Organisational Engagement		Risk Register reviewed and updated on a four-weekly period basis, updated Risk Register and Change Register is circulated to attendees after each review. R&V Manager did not note any issues with project team buy-in to the risk management process
Risk Mitigations Review Rigour		Mitigation owners, actions and due dates are identified for all the major risks and are reviewed at each Risk Meeting. Risk values and probability are also reviewed at each Risk Meeting
Connectedness to Cost Forecast		Risk value is compared to project contingency after each Risk Meeting
QSRA Activity		QSRA has recently been finalised, which is reasonable for the project's stage of development
QCRA Activity		QCRA has recently been finalised, which is reasonable for the project's stage of development
Frequency of Risk Universe Value Update		Risk Universe is reviewed on a regular, four-weekly basis

Review of Rail Major Projects

Project: Aberdeen to Inverness

Project Reporting Summary Observations

- ▶ The project reporting suite provided to TS by NR does not appear to contain all the information that we would expect to see reported.
- ▶ The reporting suite provided does not appear to focus on the key areas that we would expect TS to be interested in. Its emphasis is primarily on short term project status and appears to be more suitable for a project manager rather than a client/funder.
- ▶ The data required to satisfy a proportion of the good practice reporting tests is held by NR and, where relevant, provided to NR by the contractor on a regular basis. Despite this it has not then been communicated to TS.
- ▶ NR interviewees noted that it is their intention to implement the majority of the below within their project reporting when the Main Works Contract is awarded.
- ▶ We would expect to see a more standardised, concise reporting suite which is formally agreed in advance with TS. This could take the form of a dashboard or a template reporting format.

Project Reporting Tests

Project Wide View / Executive Summary	Rating	Schedule	Rating	Other	Rating
Activities for the Period	Green	Critical & Near Critical Activities	Yellow	Key Quantities	Yellow
Performance KPIs	Red	Resource Analysis	Red	Hours	Yellow
Key Milestones	Green	Key Dates Discussion	Green	Quality management	Yellow
Overall Project Progress	Green	Cost	Rating	Risk management	Green
Project Concerns & Remediation	Yellow	Budget - Original, Approved, Unapproved	Green	Engineering	Yellow
Key Activities Next Period	Green	Expenditures	Green	Procurement	Yellow
Project Cost Summary Table	Yellow	Estimate to Complete	Green	Contracts	Yellow
Schedule	N/A	Variances	Yellow	Offsite Fabrication & Manufacturing	Yellow
Scope Changes	Green	Change Management	Yellow	Construction & Installation	Yellow
Progress & Performance Detail	Rating	Contingency Drawdown	Red	Regulatory Approvals	Green
Engineering Progress Curves	Red			Commissioning	Yellow
Procurement Progress Curves	Red			Operational Readiness	Yellow
Fabrication / Manuf. Progress Curves	N/A				
Construction Progress Curves	Red				
Commissioning Progress	N/A				
Recovery / Response Plan Progress	N/A				

Review of Rail Major Projects

Project: Highland Mainline

Overview

- ▶ Specification: Output requirements are: to deliver an hourly service between Inverness and Perth extended to either Glasgow or Edinburgh, provision of journey time reductions of around ten minutes; and more efficient freight operations by 2019.
- ▶ Scope: To meet the above specification, NR has developed a scope that includes interventions at Aviemore and Pitlochry.
- ▶ Budget & Schedule: The project had a £117m cost estimate at July 2014. Franchisee rolling stock changes have led to a smaller scale infrastructure intervention and a lower current cost estimate of £65m. The infrastructure is scheduled to be ready for use in March 2019, but this may change when the ECAM determination is made, this is expected in Summer 2017.
- ▶ Commercial Overview: BAM Nuttall has been appointed as principal contractor (under a contract covering both A2I and HML).
- ▶ Systems & Personnel: NR uses various systems to help manage the project, such as ARM and Primavera P6, but does not appear to use any specialist project controls software. Reflecting the stage of project development, the project team is substantially the same as that for A2I. This will increase in size as it moves towards delivery. No human resourcing issues were noted, although NR resources are shared between projects, with particular overlap of the A2I team with that delivering HML.

Current Status

- ▶ GRIP stage: The project is currently at GRIP 2, although the change of project scope has caused a redesign exercise meaning the current working cost estimate is at GRIP 0.
- ▶ Current focus: Current project team focus is design and cost development. ECAM submission is expected to be made in Summer 2017.
- ▶ Cost development & scope change: The project had a £117m cost estimate at July 2014 based on a scope assumption that Class 170s would be used. The project was then paused until the ScotRail franchise let process was completed, as part of this TS challenged and incentivised the TOC bidders to deliver commitments which would reduce journey times without the need for major capital investment. As part of its winning bid submission, Abellio included new timetabling work that identified that the outputs could be met through a different rolling stock plan allowing more limited interventions at Aviemore and Pitlochry. This has reduced the current cost estimate to £65m.
- ▶ Major risks: Major risks to forecast cost and schedule have been identified as:

Review of Rail Major Projects

Project: Highland Mainline

Cost Control Observations

- ▶ The project is at an early stage of design development (GRIP2), with the cost estimate currently at GRIP 0. Cost controls are limited at this stage.
- ▶ A cost control process will be put in place for the Main Works Contract, based on that successfully employed on Borders Railway, to monitor contractor progress and variation on a weekly (meeting) and period (report) basis. This will include a change control procedure to which a time limit KPI will be attached.
- ▶ We note that a Framework Governance Document is under development, but has not yet been agreed by TS/NR.

Outcome of Key Cost Control Tests

Control Test	Rating	Summary Observation
Clear audit trail from original funding to current budget		No changes will be made to the original agreed funding level until ECAM submission
WBS captures entire scope & used throughout reporting		This is captured internally by NR for the contracts awarded to date but has not been supplied to TS. It is noted that this has been requested by TS and will be supplied going forward
Progress is clearly communicated by WBS and package		Primavera captures this data internally for NR and it has been outlined how this will be monitored and audited to ensure accuracy for the Main Works Contract. TS should ensure that this process and the oversight of it they require is communicated to them in line with the Framework Governance Document
Scope deviations auditable	N/A	No scope deviations to audit to date (this will be a post-ECAM baseline action)
Cost over-runs auditable	N/A	No cost overruns to audit to date (this will be a post-ECAM baseline action)
Effective Contingency Management	N/A	There is no contingency in the current authorised spend at this stage of development
Estimate to Complete process is rigorous & auditable	N/A	The Estimate to Complete process will be implemented when the Main Works Contract is awarded
Change Register Check		Change register only exists for period Risk Register updates
Cost Process Check		There does not appear to be a standard NR approach to project cost controls, The HML cost process will be based on that employed on the Borders Railway project, and is not yet in place
Evidence of baseline deviation review	N/A	No baseline until post-ECAM

Review of Rail Major Projects Project: Highland Mainline

Schedule Observations

- ▶ The Highland Mainline Programme Schedule contains a lack of the basic structure and content necessary to allow for a deeper dive review of the project schedule which includes the following:
 - ▶ A hypothetical performance scenario to test the result of programme.
 - ▶ A hypothetical delay analysis to test the project related cost and how it will impact the structure.
 - ▶ A critical path and near critical path analysis to evaluate which activities would be impacted if there is an issue.
 - ▶ A schedule network analysis to view the total time it takes to complete the project.
- ▶ The Work Breakdown Structure (WBS) throughout the schedule is incomplete.
 - ▶ The schedule is missing many level 2 and level 3 activities.
 - ▶ Many activities that are listed within each milestone seem to be a placeholder and not the true activity.

Schedule Integrity Assessment

P6 Schedule Reviewed: (123278 Pend 1617 - 04.xer)

Schedule Test Performed	Results	Summary Observations	Legend
1. Logic Check	Red	52% of the scheduled activities are missing either a predecessor or successor	Schedule Check Passes
2. Leads Check	Red	4 of the scheduled activities had negative lag	
3. Lags Check	Green		Schedule Check Fails
4. FS Relationship Check	Red	79% of the scheduled activities were associated with Finish to Start Logic	
5. Hard Constraint Check	Green		
6. High Float Check	Red	42% of the scheduled activities had a float greater than 44 days	
7. Negative Float Check	Red	23 of the schedule activities had a negative float	
8. High Duration Check	Green		
9. Invalid Dates Check	Green		

Review of Rail Major Projects Project: Highland Mainline

Risk Management Observations

- ▶ Standard NR risk process has been put in place using Active Risk Manager (ARM), an industry accepted risk management tool, with some overlay from the risk management process developed for EGIP (eg, project risk dashboard). Regular Risk Meetings (at least periodic, at some times more frequent) are held at which the project risks are reviewed and updated.
- ▶ HML is being delivered by the same NR team as A2I, and the same processes are being followed.
- ▶ The project Risk Register currently assesses risks qualitatively rather than quantitatively. This appears to be reasonable given the early development stage of the project.
- ▶ All risks are weighted in the Risk Register. Mitigation actions and owners are identified and action due dates recorded. Progress against actions is reviewed at each Risk Meeting.

Risk Management Tests

Risk Management Test	Rating	Summary Observation
Process Consistency to ISO		No issues identified.
Process Adherence Check		The risk management process is adhered to.
Organisational Engagement		Risk Register reviewed and updated on a four-weekly period basis.
Risk Mitigations Review Rigour		Mitigation owners, actions and due dates are identified for all the major risks and are reviewed at each Risk Meeting. Risk values and probability are also reviewed at each Risk Meeting.
Connectedness to Cost Forecast		Risk value is compared to project contingency after each Risk Meeting.
QSRA Activity	N/A	No QSRA has been performed – this is reasonable given the early stage of the project development.
QCRA Activity	N/A	No QCRA has been performed – this is reasonable given the early stage of the project development.
Frequency of Risk Universe Value Update		Risk Universe is reviewed on a regular, four-weekly basis.

Review of Rail Major Projects

Project: Highland Mainline

Project Reporting Summary Observations

- ▶ The project reporting suite provided to TS contains some gaps in information.
- ▶ It is noted that for many of the below reporting tests there will have been no request from TS for the accompanying data. However, these tests reflect good practice.
- ▶ The reporting suite provided does not emphasise the key areas that TS would be interested in. It focuses primarily on short term project status and is more suitable for a project manager rather than a client.
- ▶ The data required to satisfy a proportion of the good practice reporting tests is held by NR and, where relevant, provided to NR by the contractor on a regular basis. Despite this it has not then been communicated to TS.
- ▶ NR interviewees noted that it is their intention to implement the majority of the below within their project reporting when the Main Works Contract is awarded.
- ▶ We would expect to see a more standardised, concise reporting suite which is formally agreed in advance with TS. This could take the form of a dashboard or a template reporting format.

Project Reporting Tests

Project Wide View / Executive Summary	Rating	Schedule	Rating	Other	Rating
Activities for the Period	Green	Critical & Near Critical Activities	Yellow	Key Quantities	Yellow
Performance KPIS	Red	Resource Analysis	Red	Hours	Yellow
Key Milestones	Green	Key Dates Discussion	Green	Quality management	Yellow
Overall Project Progress	Green	Cost	Rating	Risk management	Green
Project Concerns & Remediation	Yellow	Budget - Original, Approved, Unapproved	Green	Engineering	Yellow
Key Activities Next Period	Green	Expenditures	Green	Procurement	Yellow
Project Cost Summary Table	Green	Estimate to Complete	Green	Contracts	Yellow
Schedule	Yellow	Variances	Yellow	Offsite Fabrication & Manufacturing	Yellow
Scope Changes	Green	Change Management	Yellow	Construction & Installation	Yellow
Progress & Performance Detail	Rating	Contingency Drawdown	Red	Regulatory Approvals	Yellow
Engineering Progress Curves	Red			Commissioning	Yellow
Procurement Progress Curves	Red			Operational Readiness	Yellow
Fabrication / Manuf. Progress Curves	N/A				
Construction Progress Curves	Red				
Commissioning Progress	N/A				
Recovery / Response Plan Progress	N/A				

Review of Rail Major Projects Project: Shotts Electrification

Overview

- ▶ Specification – The Scottish Ministers High Level Output Specification identified specific interventions within the rail industry, one of which was a rolling programme of electrification which was expected to include the electrification of the Shotts line. Electrification will allow for new rolling stock to be operated on the line which should reduce journey times, costs and carbon emissions.
- ▶ Scope – Installation of 74 single track kilometres of electrification between Holytown Junction and Midcalder Junction. In addition to electrifying the line the scope of the project includes demolition of three structures, civil engineering works to 31 structures, two station rebuilds, five station platform extensions and two platform resurfaces.
- ▶ Budget & Schedule – The project went through the ECAM process in February 2014 with an estimated cost of £79.9m. This cost was based on desktop reviews and did not include site visits. As a result, the ECAM estimate included wide ranging assumptions on the quantity and complexity of work required to deliver the project. When works commenced and site visits took place it became apparent the required works were more substantial than assumed. This combined with an updated scope to deliver two station rebuilds and an upgraded Overhead Line Electrification (OLE) system the project costs were later revised in November 2015 to £160m. The project has a regulatory milestone to deliver the electrified route by March 2019.
- ▶ Commercial Overview – The project is to be delivered in two stages – Route Clearance Works and installation of Overhead Line Equipment (OLE). The Route Clearance Works are being delivered by BAM Nuttall and the OLE is to be delivered by CarillionPowerlines. Project delivery has been split up into 11 contracts with six contracts for route clearance and five for the OLE installation. All contracts with the exception of OLE GRIP 6 to 8 Implementation have been or are to be awarded on a fixed cost basis. OLE Grip 6 to 8 Implementation is expected to be awarded on a target cost basis.
- ▶ Systems & Personnel – The project team utilises ARM for risk management, Oracle Projects for cost information and Primavera for schedule programming. Various excel spreadsheets are also used which record change, cash flow forecasts and project reporting.

Review of Rail Major Projects Project: Shotts Electrification

Current Status

- ▶ GRIP Stage – The route clearance works are at GRIP 6 and OLE works at GRIP 4.
- ▶ Progress (Route Clearance) – £40m of contracts have been awarded for route clearance and £22.5m worth of work has been completed to the end of Period 4 2016. The final 'Tranche' of work is deemed the most complex of the route clearance phase and work commenced in July 2016. The final contract awarded has a value of £15.3m with £2.2m still to be spent on design and other civils works.
- ▶ Progress (OLE) – Of the five electrification works contracts, three have been awarded to cover Early Contractor Involvement (ECI), advance works and design. ECI and advance works are completed and the design phase commenced in May 2016 and is expected to conclude in April 2017. The bulk of the electrification works are still to be awarded with £12m reserved for station works expected to commence in January 2017 and £50.8m for the OLE implementation with foundation construction expected to commence in September 2017.
- ▶ NR Costs – NR costs and project incidentals are budgeted to be £41.7m, which includes [REDACTED] £5.2m of NR costs have been spent to P4 2016.
- ▶ Risk Overview (Route Clearance) – The mean risk exposure of the route clearance works is [REDACTED]. The main risk to route clearance works is that upgrades at three bridges which were estimated just to be parapet modifications may need to be re-decked. NR engineers have worked up options and the NR commercial team priced these options. NR is tendering for a Notified Body (NOBO) to review the options before it approaches the ORR for approval of works. The mean risk exposure of this is estimated at [REDACTED].
- ▶ Risk Overview (OLE) – The mean risk exposure for the OLE works is [REDACTED] with contingency currently at [REDACTED]. The Shotts line runs through one of the most densely mined areas in Scotland. Mine remediation works may be required and it is unclear what additional costs they will add to the project. This encompasses the biggest risk to the electrification works with a mean risk exposure of [REDACTED].
- ▶ Change Position – The total approved change for the project to Period 4 2016 is £1.3m. EY noted a report highlighting there is currently £0.6m currently as unapproved change however our review found this amount to be higher. EY has not been able to establish a clear unapproved change position for the project.

Review of Rail Major Projects Project: Shotts Electrification

Cost Control Observations

- ▶ There is an authorised budget of £160m to deliver the project. As is normal in the rail industry structure there is no contractual relationship between TS and NR which incentivises cost savings and efficiencies.
- ▶ The cost increases of the project from £79.9m to £160m have received no external review by ORR or another source to justify whether these cost increases are reasonable and reflect true VfM.
- ▶ The project does not have an integrated project management system which will assist with change management, contingency management and cost reporting. Various internal cost reports/registers are held in spreadsheets which exposes project reports to uncontrolled use. Spreadsheets do not provide natural checks and balances between reports nor do they provide a clear audit trail or assist with robust project reporting.
- ▶ Contingency was set at an appropriate level to cover the project's mean risk exposure at initiation. Draws from contingency require review and sign-off from persons with appropriate level of authority. EY has not had sight of any formal documentation which highlights the contingency compared to the mean risk exposure on a periodic basis. The level of project contingency should be regularly reviewed and compared to the risk exposure of the project. The periodic risk meetings would be an appropriate forum for this.
- ▶ Change requests are submitted by the contractor in a standardised format with supporting documentation. These are reviewed/challenged by the project team and require sign-off before the change request is accepted.
- ▶ The review of change requests is informal and takes place by 'marking up' the change request submission to evidence the checks done. For material change requests it would be appropriate to complete a change request review form which details the checks performed on the validity of the request and what work was performed to ensure VfM is achieved on the request.
- ▶ From documentation reviewed, EY could not obtain a clear picture of the overall change position of the project, what has been approved, what is unapproved and the general status of each individual change request. The project's overall change position included in a WIP spreadsheet does not reconcile with the NR change register and we could not reconcile the NR change register to information contained in contractor reports. This presents a risk that unapproved change requests have not been factored into the project reporting which may result in delayed recognition of costs for the project.
- ▶ For contracted work, TS does not have any oversight over the current contract value and change position. This does not allow for review and challenge to the forecast to complete estimates in the project.
- ▶ Percentage of physical progress complete cannot be reported for the project at a contract level. This therefore does not allow for review of costs progressing in the project versus the physical progress.

Review of Rail Major Projects Project: Shotts Electrification

Outcome of Key Cost Control Tests

Control Test	Rating	Summary Observation
Clear audit trail from original funding to current budget	Green	The overall funding of £160m to the current budget has not changed. All changes to WBS budgets are auditable from Oracle Projects
WBS captures entire scope & used throughout reporting	Green	WBS used in reporting is consistent throughout the reporting framework and covers the full scope of the project
Progress is clearly communicated by WBS and package	Yellow	Reporting is on a WBS basis and provides detail of COWD. No information is provided on the current contract costs, change position and forecasts to complete
Scope deviations auditable	Green	Scope deviations are supported by auditable change requests. Review of these change requests and decisions can be improved by formalising the review process
Cost over-runs auditable	Green	All changes to the costs of the project are input into Oracle and are supported by supporting documentation such as contractor request for payments, purchase orders and timesheets
Effective Contingency Management	Yellow	Draws from contingency are subject to sign-off by persons of appropriate authority before they are input into Oracle Projects. Formal reviews of contingency levels versus the mean risk exposure of the project can enhance the process
Estimate to Complete Process is Rigorous & Auditable	Yellow	EY has not noted any formalised process on estimating forecast to complete with supporting back-up. Forecast to complete is not subject to formal or rigorous challenge
Change Register Check	Yellow	The status of change requests is not clear from the change register. EY could not reconcile the change register to project reports or to underlying contractor reports
Cost Process Check	Yellow	Cost control can be improved with the implementation of a project control system. No procedures noted that provide sufficient detail on how costs will be managed throughout a project lifecycle
Evidence of baseline deviation review & interventions	Red	Unable to identify any documents which compare the original baseline and physical progress with current project position and supporting material giving guidance on the deviations and what mitigating actions are being taken to support this












Review of Rail Major Projects Project: Shotts Electrification

Schedule Observations

- ▶ The Shotts Programme Schedule contains a lack of the basic structure and content necessary to allow for a deeper dive review of the project schedule which includes the following:
 - ▶ A hypothetical performance scenario to test the result of programme.
 - ▶ A hypothetical delay analysis, to test the project related cost and how it will impact the programme.
 - ▶ A critical path and near critical path analysis to evaluate which activities would be impacted if there is an issue.
 - ▶ A schedule network analysis to view the total time it takes to complete the total project.
- ▶ The Work Breakdown Structure (WBS) throughout the schedule is incomplete.
 - ▶ The schedule is missing many level 2 and level 3 activities.
 - ▶ Many activities that are listed within each milestone seem to be a generic activity or a placeholder for future detailed activities.
 - ▶ NR Project Management Team is aware of the scheduling issues and are working with the contractor to develop a more detailed schedule.
 - ▶ NR has biweekly meetings with the project team to understand the update on the development the schedule into a more useable schedule.

Schedule Integrity Assessment

P6 Schedule Reviewed: (Shotts Programme.xer)

Schedule Test Performed	Results	Summary Observations	Legend
1. Logic Check			 Schedule Check Passes
2. Leads Check		92 of the scheduled activities had negative lag	
3. Lags Check		7.21% of the scheduled activities had a lag associated with them	 Schedule Check Fails
4. FS Relationship Check			
5. Hard Constraint Check			
6. High Float Check		23% of the scheduled activities had a float greater than 44 days	
7. Negative Float Check		14 of the schedule activities had a negative float	
8. High Duration Check			
9. Invalid Dates Check			

Review of Rail Major Projects Project: Shotts Electrification

Risk Management Observations

- ▶ The risk management system used on Shotts is Active Risk Manager (ARM) which is an industry accepted risk management tool. Risks are added to the risk register in ARM either following periodic risk meetings or ad-hoc with guidance from the project team. When a risk is added to ARM ad-hoc it is not given a quantified value as this is collectively agreed upon at the periodic risk meetings.
- ▶ The Risk and Value (R&V) team consists of two managers and an analyst who report to the R&V Director based in York with a remit of North of England and Scotland. At the time of writing the team is advertising for an analyst who will be able to assist the managers. EY noted from its review that this appeared to be sufficient resource to allow the risk team to appropriately perform their duties.
- ▶ Interviews with R&V Team did not note any breakdowns or issues in communication between the project delivery team and risk. Risk meetings are undertaken each period to cover the route clearance and electrification works. These meetings are attended by risk, the senior engineer, the commercial manager, project manager and other team members. We consider this appropriate given a project of its size.
- ▶ Risk do not regularly attend project team meetings. This may restrict their understanding of the project and its risks.
- ▶ Contractor risk registers are not reviewed as part of the NR risk process. Thus, it is possible that risks to the project are not identified and therefore not considered at periodic risk meetings. There is potential that early indications of possible cost overruns are not managed and the mean risk exposure for the project may be understated.
- ▶ Mitigation plans are reviewed every month at periodic risk meetings. These are documented within the risk register.
- ▶ In the past, TS has not attended the NR periodic risk meetings. It is important that TS attend meetings going forward as these are critical discussions on potential cost increases which will ultimately be borne by TS. TS should also be in a position at these meetings to challenge mitigation actions and the appropriateness of risk estimations.

Risk Management Tests

Risk Management Test	Rating	Summary Observation
Process Consistency to ISO	Green	Risk process is in line with good practice
Process adherence check	Green	The risk management process is adhered to
Organisational Engagement	Yellow	There are risk meetings every four weeks with appropriate levels of involvement. This could be enhanced by including risk more as part of a project team
Risk Mitigations Review Rigour	Green	All open risks assigned an owner with details of mitigating actions agreed and reviewed at risk meetings
Connectedness to Cost Forecast	Yellow	No evidence of a formal review of risk values against the project contingency
QSRA Activity	Green	QSRA completed for each GRIP stage which is in line with procedure
QCRA Activity	Green	QSRA completed for each GRIP stage which is in line with procedure
Frequency of Risk Universe Value Update	Red	The contractor risk register is not reviewed and considered for NR risk register update

Review of Rail Major Projects

Project: Shotts Electrification

Project Reporting Summary Observations

- ▶ Reporting of project progress occurs every four weeks at the Project Delivery Group meetings which is attended by TS, NR and a representative from the ORR.
- ▶ EY noted from interviews with NR and TS that there was no formalised agreement on structure for reports. TS receive a PDG report which includes narrative on project progress and an accompanying commercial report. The current reporting structure has been agreed based on informal agreements between NR and TS.
- ▶ EY noted from the June 2016 report that there was incomplete sentences and that sections in the July 2016 report were word for word the same as the June 2016 report. These aspects suggest the reporting is not being completed with due care and attention.
- ▶ Cost reporting does not highlight difference between periods to give an indication of spending levels in a month. We noted that the costs of two contracts to be awarded changed by offsetting c£7m amounts without an explanation given as to why this was the case.
- ▶ Cost reporting does not provide TS with oversight of current contract costs, change status and estimates to complete.
- ▶ There is no communication on change requests and control included in the report. This fails to provide TS with oversight that changing costs are being appropriately reviewed and challenged.
- ▶ While the reports give bullet points of activities in the period there is little information about the progress of the project against its intended scope and schedule.
- ▶ Our RAG report on the PDG and Commercial report below shows that the reporting currently in place does not include sufficient detail for a project of this size and complexity. The metrics applied below are those which EY view as being included in industry good practice project performance reports.

Project Reporting Tests

Project Wide View / Executive Summary	Rating	Schedule	Rating	Other	Rating
Activities for the Period	Green	Critical & Near Critical Activities	Yellow	Key Quantities	Yellow
Performance KPIS	Red	Resource Analysis	Yellow	Hours	Yellow
Key Milestones	Green	Key Dates Discussion	Yellow	Quality management	Yellow
Overall Project Progress	Red	Cost	Rating	Risk management	Yellow
Project Concerns & Remediation	Yellow	Budget - Original, Approved, Unapproved	Yellow	Engineering	Yellow
Key Activities Next Period	Yellow	Expenditures	Yellow	Procurement	Yellow
Project Cost Summary Table	Yellow	Estimate to Complete	Yellow	Contracts	Yellow
Schedule	Yellow	Variances	Yellow	Offsite Fabrication & Manufacturing	Yellow
Scope Changes	Yellow	Change Management	Yellow	Construction & Installation	Yellow
Progress & Performance Detail	Rating	Contingency Drawdown	Yellow	Regulatory Approvals	Yellow
Engineering Progress Curves	Red			Commissioning	Yellow
Procurement Progress Curves	Red			Operational Readiness	Yellow
Fabrication / Manuf. Progress Curves	Red				
Construction Progress Curves	Red				
Commissioning Progress	N/A				
Recovery / Response Plan Progress	N/A				

Review of Rail Major Projects

Project: Stirling, Dunblane, Alloa (SDA) Electrification

Overview

- ▶ **Specification:** The SDA project is designed to increase capacity on the line, improving journey times by up to 10 minutes. The project is also a key interdependency of EGIP's Key Output 3, which will reduce Glasgow-Edinburgh journey times to 42 minutes. Without successful completion of the SDA works, this EGIP benefit cannot be realised.
- ▶ **Scope:** The SDA project consists of overhead line electrification of 93 kilometres of track between SDA. In addition NR will undertake parapet protection works in line with updated safety standards. Enabling works will consist of de-vegetation, route clearance and site access improvement.
- ▶ **Governance:** The project was originally part of the EGIP programme, however it was removed from EGIP's scope in 2012. The project is currently reported on at the EGIP Board, but is planned to be delivered under NR's Rolling Programme of Electrification.
- ▶ **Budget & Schedule:** The original ECAM determination in late 2012 was for £104.7m, while the latest cost estimate is £159.6m. It is not yet clear whether a wholly new ECAM determination will be made or whether the old one will be revised in light of project specification changes. The stated completion date is September 2018 with operation into service by December 2018.
- ▶ **Commercial Overview:** Enabling works packages are currently being procured with [REDACTED] for signalling works, with the [REDACTED] for route access and ground investigations works, and there is also a tender out for de-vegetation works. The Main Works contract will be procured on a sole-source basis with the [REDACTED] with contract award likely to occur by late September. The contracting mechanism is not yet agreed, but indications from NR suggest the contract will be Target Price.
- ▶ **Systems & Personnel:** The NR team uses various systems to help manage the project, such as ARM, Primavera Risk Analysis and Primavera P6, but does not appear to use any specialist project controls software. NR resources are often shared between projects.

Current Status

- ▶ **GRIP phase:** The project is currently conducting work allocated to GRIP Stages 3 and 4 (Option Selection and Single Option Development). The EGIP Alliance is currently developing a single option for SDA but Approval In Principle has not yet been gained.
- ▶ **Procurement:**
 - ▶ A GI/SI early works package has been awarded to the EGIP Alliance.
 - ▶ Enabling works packages are currently being procured with [REDACTED] for signalling works and for de-vegetation works. The tender submissions were received [REDACTED] for review by NR.
 - ▶ The Main Works contract will be procured on a sole-source basis with the [REDACTED] with contract award likely to occur by [REDACTED]. The contracting mechanism is not yet agreed, but indications from NR suggest the contract will be Target Price. The NR team is undertaking a detailed review of the Alliance's proposed schedule, as the expected format was not specified.
- ▶ **Actual Progress vs Plan:** No integrated and baselined project schedule exists as yet to track performance, and construction contracts have not yet been let.
- ▶ **Cost Performance:** The NR team does not yet have a baseline cost of the project. The outline costs rose from £104.7m to £139m (including Grangemouth works, which will not be funded by TS) and the latest cost estimate from the Alliance is £159.6m (of which £151.4m would be funded by TS). This is currently under review. The cost of work done was £19.8m at Period 4 in FY16-17.

Review of Rail Major Projects

Project: Stirling, Dunblane, Alloa (SDA) Electrification

Commercial & Cost Control Observations

- ▶ Given the early stage of the SDA project with cost and schedule baselines yet to be agreed, full testing of cost control measures is not applicable. However, we have conducted a review of the increased budget estimates.
- ▶ The original ECAM determination of £104.7m was made in 2012. Since then, project specifications have changed due to updates to nationwide standards around rail electrification. The latest cost estimate from the Alliance is £159.6m (as at P4 16/17).
- ▶ It is not clear whether the ORR will conduct another full ECAM or if they will revise the original ECAM having assessed the specification changes.
- ▶ The process for agreeing the final budget, capital allocation, contingency and risk allocation is still to be determined.
- ▶ The Alliance has significant commercial leverage, as NR believes there to be insufficient capacity in the UK supply chain to deliver the SDA project by December 2018. This assumption about supply chain capacity has not however been confirmed through issuing an Expression of Interest, Pre-Qualification Questionnaire, or similar vetting procedure as part of the procurement exercise. This lack of rigour is a significant concern, given that estimated costs have already increased by over 50%, and there are few options for NR to reduce cost through adding competitive tension into the commercial environment.

Outcome of Key Cost Control Tests

Control Test	Rating	Summary Observation
Clear audit trail from original funding to current AFC		Breakdown of increased cost estimate exists however £20m increase between P3 and P4 reports could not be substantiated. Cost not baselined yet
WBS captures entire scope & used throughout reporting		Current draft Alliance schedule does not include sufficient detail of the scope breakdown
Progress is clearly communicated by WBS and package	N/A	Progress reporting is largely qualitative as baselines and a WBS have not yet been set
Scope deviations auditable		There is a high level breakdown of the revised scope, which was caused by updated national standards for electric railways
Cost over-runs auditable	N/A	Cost is not yet baselined, but indicative budgets have far exceeded the original ECAM determination
Effective Contingency Management		QCRA amount does not align with the budget figure, however a cost baseline has not yet been set
Estimate to Complete Process is Rigorous & Auditable	N/A	Construction has not yet begun
Change Register Check		There only exists a change register in reference to Risk Register updates
Cost Process Check	N/A	Costs are yet to be confirmed and baselined, although tracking of COWD does not appear to be rigorous

Review of Rail Major Projects

Project: Stirling, Dunblane, Alloa (SDA) Electrification

Schedule Observations

- ▶ The SDA Programme Schedule contains a lack of the basic structure and content necessary to allow for a deeper dive review of the project schedule which includes the following:
 - ▶ A hypothetical performance scenario to test the result of programme.
 - ▶ A hypothetical delay analysis, to test the project related cost and how it will impact the programme.
 - ▶ A critical path and near critical path analysis to evaluate which activities would be impacted if there is an issue.
 - ▶ A Schedule Network analysis to view the total time it takes to complete the total project.
- ▶ The Work Breakdown Structure (WBS) throughout the schedule is incomplete.
 - ▶ The schedule is missing many level 2 and level 3 activities.
 - ▶ Many activities that are listed within each milestone seem to be a generic activity or a placeholder for future detailed activities.
- ▶ NR Project Management Team is aware of the scheduling issues and are working with the contractor to develop a more detailed schedule.
 - ▶ NR has biweekly meetings with the project team to understand the update on the development the schedule into a more useable schedule.
 - ▶ NR Project Management Team is aware of the SDA scheduling issues and are working with the contractor to develop a more detailed updated schedule by the end of August.

Schedule Integrity Assessment

P6 Schedule Reviewed: Version 1: (SDA 5-8 Programme with elaborated Advanced works 1 (PIN Proposal) v.1.xer) and Version 2: (Cost loaded (W.I.P) - SDA 5-8 Advance Enabling Works Programme - Draft 2.xer)

Schedule Test Performed	Results (v1)	Results (v2)	Summary Observations	Legend
1. Logic Check	Green	Green		Schedule Check Passes
2. Leads Check	Red	Red	13 scheduled activities had negative lag	
3. Lags Check	Red	Red	8.33% of the scheduled activities had a lag associated with them	Schedule Check Fails
4. FS Relationship Check	Red	Red	86% of the scheduled activities were associated with Finish to Start Logic	
5. Hard Constraint Check	Green	Green		
6. High Float Check	Red	Red	77% of the scheduled activities within the schedule had a float greater than 44 days	
7. Negative Float Check	Green	Green		
8. High Duration Check	Red	Red	20% of the scheduled activities within the schedule had a duration longer than 2 months	
9. Invalid Dates Check	Green	Green		

Review of Rail Major Projects

Project: Stirling, Dunblane, Alloa (SDA) Electrification

Risk Management Observations

- ▶ ARM is used to track risks as and when they are identified. However, risks are only costed once a month at Risk Review Meetings. Primavera Risk Analysis Tool is used for QSRA and @Risk has been used for conducting the only QCRA to date in May 2016.
- ▶ The Risk & Value Management activities are undertaken by a single resource, who also has responsibilities for the Shotts project. As activity on the SDA project ramps up through procurement and into construction, this shared resource could become over-burdened. It is noted that there are plans to propose a Risk & Value Management Analyst role to help manage the workload across the RPE.
- ▶ NR's periodic SDA risk review meetings include the SDA Project Sponsor, Project Management, Engineering and Commercial. In addition, the Project Manager for SDA from TS is invited to attend for information and to provide oversight guidance.
- ▶ The risk management process employed to date on the SDA project captures risks within the generally understood boundaries of the project itself. For example, it was not clear whether SDA procurement delay risk would sit at the EGIP programme level, given that the impact would be most visible upon delivery of Key Output 3 (achieving a 42 minute journey time between Edinburgh and Glasgow).
- ▶ The SDA risk process does not account for risks to TS, given that NR own the risk management process and is chiefly concerned with delivery of the project against time, budget and quality measures. TS is represented at risk review meetings.
- ▶ All risk mitigation plans are discussed and, if necessary, updated at each periodic risk review meeting. There has been little movement on SDA's key risks at this early stage, and hence there is little evidence to make a judgment on mitigation plan follow-ups.

Risk Management Tests

Risk Management Test	Rating	Summary Observation
Process Consistency to ISO	Green	Risk management process appears to be developed in line with leading practice
Process adherence check	Green	Risk Registers and Risk Change Registers appear to show robust application of the process, although SDA's governance prevents holistic capture of strategic risks
Organisational Engagement	Green	There are monthly updates to the Risk Register, including costing, with attendance from TS, Engineering, PM, Commercial and the NR Sponsor
Risk Mitigations Review Rigour	Green	Risks appear to have well thought through mitigations, including action owners
Connectedness to Cost Forecast	Green	The cost forecast is being analysed and risk values are part of the discussion. It is too early to assess whether risk values are accurately reflected in baselined budget
QSRA Activity	Green	QSRA's are conducted at each GRIP phase and appear to be rigorous
QCRA Activity	Green	QCRA's are conducted at each GRIP phase and appear to be rigorous
Frequency of Risk Universe Value Update	Yellow	SDA-related risks that impact EGIP are covered in the EGIP Risk Register, which may cause confusion, given the interdependency between the two projects

Review of Rail Major Projects

Project: Stirling, Dunblane, Alloa (SDA) Electrification

Project Reporting Summary Observations

- ▶ Reporting on SDA has undergone a significant overhaul and a new reporting format has been adopted from P4 2016/17. The new NR Sponsor has committed to providing sufficient detail to keep TS informed of progress, high level cost data, key risks and activities planned for the period ahead. We have reviewed the new reporting format and there are still some gaps in the content, particularly around schedule and cost performance, but this is a result of the quality of the underlying data rather than reporting process itself. In addition, more detail could be made available via Appendices to allow for TS scrutiny, as required.
- ▶ It is noted that as there are no agreed baselines for cost and schedule, detailed reporting would be of minimal use, other than to provide a snapshot of costs to date and progress against indicative milestones.
- ▶ Although construction has not yet begun, there is too little detail over NR's project management costs to date for TS to be able to comment on NR's performance.

Project Reporting Tests

Project Wide View / Executive Summary	Rating	Schedule	Rating	Other	Rating
Activities for the Period		Critical & Near Critical Activities		Key Quantities	N/A
Performance KPIs		Resource Analysis		Hours	
Key Milestones		Key Dates Discussion		Quality management	
Overall Project Progress		Cost	Rating	Risk management	
Project Concerns & Remediation		Budget - Original, Approved, Unapproved		Engineering	
Key Activities Next Period		Expenditures		Procurement	
Project Cost Summary Table		Estimate to Complete	N/A	Contracts	N/A
Schedule	N/A	Variances		Offsite Fabrication & Manufacturing	N/A
Scope Changes		Change Management		Construction & Installation	N/A
Progress & Performance Detail	Rating	Contingency Drawdown	N/A	Regulatory Approvals	
Engineering Progress Curves				Commissioning	N/A
Procurement Progress Curves				Operational Readiness	N/A
Fabrication / Manuf. Progress Curves	N/A				
Construction Progress Curves	N/A				
Commissioning Progress	N/A				
Recovery / Response Plan Progress	N/A				

Review of Rail Major Projects

Project: Edinburgh to Glasgow Improvement Programme

In July 2016, TS instructed EY to performed a commercial assurance review of EGIP. This built upon our preliminary review from May 2016. There were five key areas of focus for this review:

- ▶ An assessment of the current NR declared forecast cost and programme position;
- ▶ A review of the risk process and outputs;
- ▶ An action plan to assist in the monitoring and control of the remainder of the workscope;
- ▶ Any strategic findings in its enquiries that can be read across the Enhancement Portfolio; and
- ▶ A review of the EGIP governance arrangements and identification of areas for improvement.

Findings from Commercial Assurance Review

- ▶ Integrity testing of Alliance schedules concluded a low level of schedule integrity and significant potential for inaccuracy. No confidence over the accuracy of schedule to complete forecasts.
- ▶ Cost baseline is not readily auditable or communicated to a level of detail expected. No confidence over the accuracy of costs to complete forecasts.
- ▶ Change position is not clear between upstream and downstream change registers and lacks sufficient evidence allowing for an audit.
- ▶ Risk management was subject to resourcing issues and limited engagement from some team members.
- ▶ Performance reporting suite does not clearly communicate programme status, performance, change or estimates to complete to a level expected of a programme of this size and complexity.

Response to the Commercial Assurance Review Findings

- ▶ EY asked for eight separate outputs that would address the issues noted above by 12 August.
- ▶ A draft report was provided to TS/EY on 12 August which was deemed unclear and omitted a revised cost baseline.
- ▶ Schedules submitted on 12 August have been revised and re-submitted to EY on 26 August.
- ▶ NR expected to supply a full revised baseline on 1 September for review.
- ▶ EY has advised on a positive intervention plan (see over page) to deliver ongoing assurance for TS going forward which will be applied to EGIP and can be extended to other projects.

Review of Rail Major Projects

Project: Edinburgh to Glasgow Improvement Programme

Positive Intervention Plan

As part of EY's commercial assurance, EY and TS have set out a positive intervention plan in order to bring EGIP back into a state of control and to allow NR to provide reliable and accurate outputs for TS to monitor progress. A summary of this plan is set out below:

- ▶ NR to engage additional specialist resource to help facilitate a full programme controls transformation initiative for EGIP.
- ▶ Programme controls transformation initiative should cover a step change for integrated project controls covering cost, schedule, progress, risk and change which will deliver improved control, forecasting and reporting.
- ▶ The Clienting Unit between TS and NR will jointly set the remit and the specialist resource will report directly to the Clienting Unit.
- ▶ Expected to be a significant undertaking, likely 5 or 6 people, for approximately a three month change period then operational handover afterwards. This should start urgently.
- ▶ TS does not intend to fund this intervention, primarily as these integrated programme controls are expected to be self-financing on the basis of the benefit they will bring the project.
- ▶ Intervention plan will drive change in behaviours and improve processes within the Alliance.
- ▶ Output from the intervention plan is to be designed so it can be rolled out to other projects.

Review of Rail Major Projects Portfolio Governance

Introduction

- ▶ Whilst each project is at a different stage of development, consistent observations were made across the projects which indicate that there are significant opportunities for improvement in the way NR controls and reports on the Scottish rail enhancement projects portfolio.
- ▶ Within the following slides, we describe the governance relationship between NR and TS at a portfolio and at a project level.
- ▶ We then summarise a series of governance, reporting, cost and systems issues that were observed across the portfolio.

Review of Rail Major Projects Portfolio Governance

Overarching portfolio governance – NR’s instructions for CP5

- ▶ The ORR’s Final Determination for Control Period 5 (CP5) set the outputs NR is required to deliver in the five years from April 2014 and the financial framework under which it will operate.
 - ▶ This included the enhancements projects that NR is to deliver within CP5.
 - ▶ This portfolio of projects was agreed with consideration of the estimated cost of the enhancements within the context of TS’s Statement of Funds Available (its affordability envelope).
- ▶ Although TS defines the enhancements it requires and the funds available for them, NR’s responsibility for delivery is to the ORR.
- ▶ As an independent company, NR effectively operates with delegated authority to deliver the enhancements required to the delivery date specified.
 - ▶ Acting within its powers, NR decides on the procurement models and commercial terms reached with contractors to deliver the required outputs. This has been primarily through the EGIP Alliance for the EGIP projects, whereas for A2I and HML, NR has appointed BAM Nuttall as principal contractor and is procuring each contract element under NR12 Target Cost contracts.

Issues identified

- ▶ The selection of enhancement projects deemed to be affordable in CP5 was made on the basis of the pre-GRIP 3 with AIP cost estimates developed by NR. NR’s estimates have since been shown to be unreliable to the extent that they were not fit for that purpose.
- ▶ The regulatory approach to a monopoly supplier such as NR relies on clear reporting, transparency and effective incentivisation. However, these elements appear to be suboptimal within NR.
- ▶ Similarly, NR’s delegated authority model is reliant on NR being adequately incentivised and able to manage the procurements effectively and efficiently. However, with reclassification Government has become exposed to much of the procurement risk related to enhancements. As a consequence, greater visibility and, potentially, control over project delivery and procurement decisions that directly impact Government may now be appropriate for TS.

Review of Rail Major Projects Portfolio Governance

Project level governance

- ▶ Interviewees indicated that, whilst a similar approach to governance is adopted across the projects, there is no uniform approach for the Rail Major Projects:
 - ▶ The requirements for each enhancement project are set in high level output terms, and it is NR's responsibility to design the enhancements to achieve those outputs.
 - ▶ There are no Framework Governance Documents (FGD) in place for the Rail Major Projects. Interviewees indicated that SDA will be added to the EGIP FGD and that a FGD for A2I (and subsequently HML) would be developed based on that used for the Borders Railway. No FGD was noted for Shotts.
 - ▶ Each project observes a reporting cycle within each four-week rail period. Reporting of project progress occurs every four weeks at the Project Delivery Group (PDG) meetings attended by TS, NR and the ORR.
- ▶ Interviewees indicated that there is no formalised agreement on structure for reports for enhancement projects. PDG reports include narrative on project progress and an accompanying commercial report. The report contents are agreed on informal agreements between NR and TS, and based on previous examples (eg, the Borders Railway PDG report):
 - ▶ The contents of these reports are inconsistent. Incomplete sentences and sections not updated period on period suggest that they are not diligently prepared.
 - ▶ TS interviewees indicated that NR displayed a lack of transparency to TS. On several occasions, NR had failed to provide TS with schedules it had requested (eg, A2I risk registers).
- ▶ The standard of information flow is suboptimal following the reclassification of NR in 2014. Now NR is on the Government's balance sheet, cost increases are the Government's risk and TS should have greater visibility of NR's project delivery progress and cost.
- ▶ It has been noted that NR is implementing an Enhancements Improvement Plan to review the controls in place for enhancement projects. At present this has not been directed towards NR in Scotland. It is important when this is implemented in Scotland it aligns with the improvements requested by TS.

Review of Rail Major Projects Glossary & Key

Term	Explanation
A2I	Aberdeen to Inverness Improvement Project
AFC	Anticipated Forecast to Complete
AIP	Approval in Principle
ALT	Alliance Leadership Team
COWD	Cost of Work Done
CPI	Cost Performance Index
DOA	Delegation of Authority
ECAM	Enhancement Cost Adjustment Mechanism
EGIP	Edinburgh Glasgow Improvement Programme
EY	Ernst & Young LLP
E&G Electrification	Edinburgh and Glasgow Electrification
Ext. ROR	Extension to Rules Of Route
FBC	Full Business Case
GRIP	Governance for Rail Investment Projects
HEP	Highland Enhancements Programme
HML	Highland Mainline Improvement Project

Term	Explanation
KO0, KO1, KO2, KO3, KO4	Key Outputs 0, 1, 2, 3, 4
NR	Network Rail
NR-IP	Network Rail Infrastructure Projects
NRS	Network Rail Scotland
OLE	Overhead Line Electrification
ORR	Office of Rail and Road
PAA	Project Alliance Agreement
PAB	Programme Alliance Board
PMG	Programme Management Group
PMO	Project Management Office
PRG	Programme Review Group
QCRA	Quantitative Cost Risk Assessment
QSRA	Quantitative Schedule Risk Assessment
SDA	Stirling Dunblane Alloa Electrification
SPI	Schedule Performance Index
TOC	Train Operating Company
TS	Transport Scotland
TSI	Technical Specifications for Interoperability

Review of Rail Major Projects

RAG Assessment Key

In reviewing the project controls and reporting we have made a comparison to good practice examples and analysed each aspect on the basis of a Red-Amber-Green (RAG) scoring system as follows:

Key	Description
Red	<ul style="list-style-type: none"> ▶ Processes / documentation not presented, or materially lacking in comparison to that expected for a project of this size and complexity ▶ Critical gaps in effective processes or compensating skills within the project team. Project team may have recognised the issues and developed ad hoc responses to cover gaps. ▶ Limited confidence in the ability of the process or function to support stated business objectives
Amber	<ul style="list-style-type: none"> ▶ Processes / documentation only partially in-line with that expected for a project of this size and complexity ▶ Material concerns or shortcomings exist regarding the adequacy of processes / documentation or their application to project performance ▶ High degree of reliance on the knowledge of individuals
Green	<ul style="list-style-type: none"> ▶ Processes / documentation all or mostly in-line with that expected for a project of this size and complexity ▶ Management is proactive in ensuring processes / documentation is fit for purpose and producing outputs that support effective business decision-making and assurance oversight ▶ Management monitors & measures process compliance ▶ Processes contain / demonstrate continual improvement feedback loops

Descriptions relate to the project at the time of assessment and the processes & documentation that were in place. The above definitions are based on categorisation by the Association of Project Management.

Review of Rail Major Projects

Portfolio Summary: Current Scope

Aberdeen to Inverness	EGIP	Highland Mainline	Shotts Electrification	Stirling-Dunblane-Alloa
<p>Project Outputs</p> <ul style="list-style-type: none"> Infrastructure capacity improvements to support new stations at Dalross and Kintore Supporting future (post-CP5) outputs of reduced journey times and more frequent trains along the route <p>Planned Improvements</p> <ul style="list-style-type: none"> The redoubling of the track between Aberdeen and Inverurie Signalling enhancements between Nairn and Elgin Platform extensions at Insh and Elgin to improve reliability The relocation of Forres station Loop extension of the track at Forres, and Infrastructure to allow new stations at Dalcross and Kintore 	<p>Project Outputs</p> <ul style="list-style-type: none"> 42 minute fastest journey time 30% increase in capacity by 2019 <p>Planned Improvements</p> <ul style="list-style-type: none"> Electrification of 150 Single Track Kilometres One new station. Edinburgh Gateway Three completely redeveloped stations, Cumbernauld, Haymarket and Queen Street Eastfield stabling depot Edinburgh Waverley infrastructure capacity improvements One new electric depot, Millerhill Platform extensions at four stations, Linlithgow, Polmont, Falkirk High and Croy 	<p>Project Outputs</p> <ul style="list-style-type: none"> Providing infrastructure to deliver an hourly train service in both directions between Inverness and Perth extended to either Glasgow or Edinburgh Deliver an average end-to-end journey time reduction of around 10 minutes in both directions (measured against the timetable in place on the date of the publication of the HLOS or any improvements introduced between then and 31 March 2014) Provide more efficient freight operations that better respond to the demand from freight customers <p>Planned Improvements</p> <ul style="list-style-type: none"> Aviemore track doubling Pitlochery platform lengthening HSTs 	<p>Project Outputs</p> <ul style="list-style-type: none"> The Scottish Government is committed to a substantial rolling programme of electrification that will bring significant economic, social and environmental benefits <p>Planned Improvements</p> <ul style="list-style-type: none"> Electrification of 74 Single Track Kilometres of the Shotts Line between Holytown and Midcalder junctions to at least W10 freight gauge 	<p>Project Outputs</p> <ul style="list-style-type: none"> The Scottish Government is committed to a substantial rolling programme of electrification that will bring significant economic, social and environmental benefits. Interface with EGIP to allow it to meet its project aspirations <p>Planned Improvements</p> <ul style="list-style-type: none"> Electrification of 93 Single Track Kilometres

Review of Rail Major Projects

Portfolio Summary: Procurement Strategy

Name	Delivery Model	Delivery Partner(s)	Execution Model	Contract Comp. Model	Incentivisation
Aberdeen to Inverness	Pre-Main Works Contract Awarded to BAM Nuttall as an NR standard contract awarded under the NR framework agreement Main Works N/A - Currently going through the ECAM process	Pre-Main Works Contract BAM Nuttall Main Works Contract N/A - Currently going through the ECAM process	Pre-Main Works Contract BAM Nuttall are responsible for completing the enabling works and this is managed by NR Main Works Contract N/A - Currently going through the ECAM process	Pre-Main Works Contract Target Price contract with BAM Nuttall managed by NR Main Works N/A - Currently going through the ECAM process	Pre-Main Works Contract BAM Nuttall are preferred supplier for Scotland and N.England, incentivised as position Main Works N/A - Currently going through the ECAM process
EGIP	KO1 EGIP Alliance managed by NRS. KO2&3 The rolling stock required is being delivered by Abellio ScotRail in consultation with Transport Scotland KO4 N/A - Currently undergoing procurement process	KO1 EGIP Alliance: Costain, Morgan Sindall and NR-IP KO2&3 Abellio ScotRail KO4 N/A - Currently undergoing procurement process	KO1 EGIP Alliance managed by NRS KO2&3 N/A - Abellio ScotRail are responsible for the execution of the rolling stock solution KO4 N/A - Currently undergoing procurement process	KO1 TS-NR: Fixed Price set by ORR Determination NR-Contractors: Target Price contract managed by NR KO2&3 N/A - Abellio ScotRail are responsible for the execution of the rolling stock solution KO4 N/A - Currently undergoing procurement process	KO1 Painshare/ Gainshare between Alliance and NR KO2&3 N/A - Abellio ScotRail are responsible for the execution of the rolling stock solution KO4 N/A - Currently undergoing procurement process
Highland Mainline	Pre-Main Works Contract Awarded to BAM Nuttall as an NR standard contract awarded under the NR framework agreement Main Works N/A - Currently awaiting submission under the ECAM process	Pre-Main Works Contract BAM Nuttall Main Works Contract N/A - Currently awaiting submission under the ECAM process	Pre-Main Works Contract BAM Nuttall are responsible for completing the enabling works and this is managed by NR Main Works Contract N/A - Currently awaiting submission under the ECAM process	Pre-Main Works Contract Target Price contract with BAM Nuttall managed by NR Main Works N/A - Currently awaiting submission under the ECAM process	Pre-Main Works Contract BAM Nuttall are preferred supplier for Scotland and N.England, incentivised as position Main Works N/A - Currently awaiting submission under the ECAM process
Shotts	Route Clearance Single Tender Action with BAM Nuttall OLE Delivered under a framework agreement for all electrification projects in Scotland and the North of England	Route Clearance Works being delivered by BAM Nuttall OLE Installation & Commissioning being delivered by Carillion Powerlines	Route Clearance & OLE Managed by NR-IP	Route Clearance & OLE Separate fixed price contracts for separate portions of work	None other than financial and reputational risks suffered by the contractor
SDA	N/A - Currently undergoing procurement process	N/A - Currently undergoing procurement process	N/A - Currently undergoing procurement process	N/A - Currently undergoing procurement process	N/A - Currently undergoing procurement process

Review of Rail Major Projects Schedule Summary: Overview

Key:
 ■ Original Baseline Forecast Schedule
 ■ Current Revised Forecast Schedule Communicated to TS
 ■ Current GRIP 6 Finish Date from P6 Files



Aberdeen to Inverness



- ▶ Milestone of GRIP 6 completion March 2019 has slipped to September 2019 as a result of the delay in submitting the ECAM.
- ▶ There are no key interdependencies with other projects.

EGIP



- ▶ There are ten regulatory milestones within EGIP, nine of these are currently on schedule and one is delayed. The Key Output 1 "Infrastructure Ready for Use" was forecast for March 2017, but is now forecast for July 2017. This doesn't affect the completion of the overall programme.
- ▶ There is a key interdependency with SDA and any delay to SDA will result negatively on EGIP.

Highland Mainline



- ▶ Milestone of GRIP 6 completion March 2019. This will be dependent on the ECAM submission date.
- ▶ There are no key interdependencies with other projects.

Shotts



- ▶ There is one regulatory milestone which is currently on schedule, the "Infrastructure Ready for Use" milestone by March 2019.
- ▶ The P6 schedule shows a completion date of May 2022, this is because there remains uncertainty over how the line will be powered with National Grid advising they cannot supply power to the Curriehill Feeder station until 2022.

SDA



- ▶ There is one regulatory milestone which is currently on schedule, the "Infrastructure Ready for Use" by March 2019.
- ▶ The current completion date communicated to TS is September 2018 with entry into service in December 2018.
- ▶ There is a key interdependency with EGIP in that the "Infrastructure Ready for Use" milestone is required by December 2018.

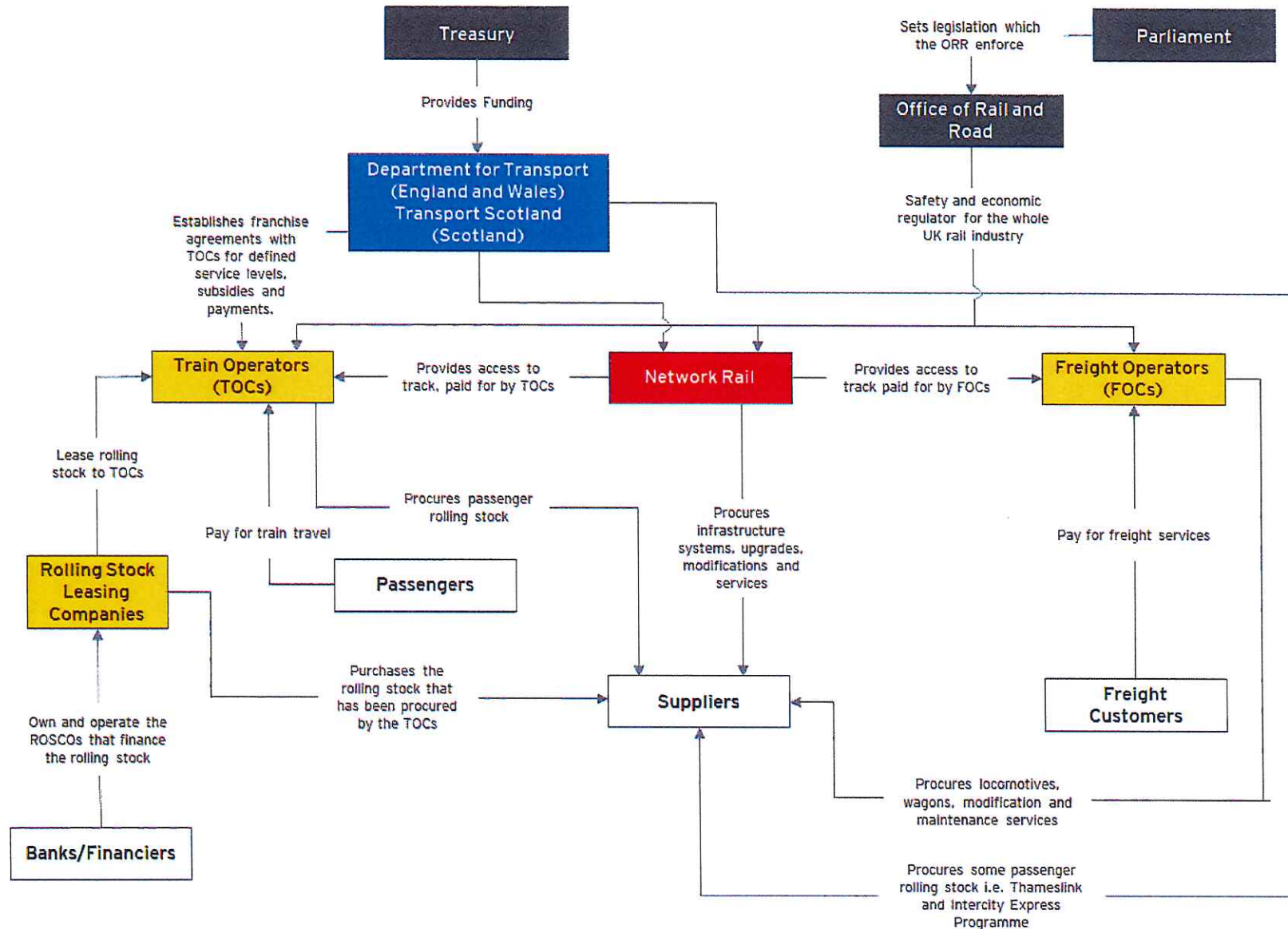
Review of Rail Major Projects Timeline

We have set out below a timeline for the Rail Major Projects, this has been advised to EY by TS:

- ▶ 17 May 2016 - EGIP commission starts
- ▶ 12 August 2016 - Initial EGIP review findings reported to NR 30th June 2016 – requires NR to respond to 8 point improvement plan on 12 August 2016
- ▶ 5 July 2016 - Minister updates on current status of Rail Major Projects Portfolio and initiates review of all projects noting EGIP already underway with SFT having a watching brief
- ▶ 25 July 2016 - Major projects review commences for SDA, Shotts, HML and A2I with completion date scheduled for 2 September 2016
- ▶ 12 August 2016 - NR supplies response to improvement plan which lacks any financial information therefore rendering any re-baseline analysis incomplete
- ▶ 19 August 2016 - note to Minister on current status of the review
- ▶ 23 August 2016 - NR shares latest EGIP AFC with TS
- ▶ 30 August 2016 - EGIP review meeting to go through NR improvement plan submission and reach agreed position
- ▶ 2 September 2016 - NR latest financial assessment published with OM&R costs as well as latest Enhancement assumptions included to form headroom position
- ▶ 5 September 2016 - Draft Final report submitted to TS for review
- ▶ 8 September 2016 - NR meeting with TS to update on current status regarding developing a revised AFC
- ▶ 20 September 2016 - Regular meeting with Minister
- ▶ Late October 2016 - Option for Ministerial statement to Parliament on the outcome of the Rail Major Projects review
- ▶ Early November 2016 - Rural Economy and Connectivity Committee with attendance from NR and Minister to update on outcome of the review

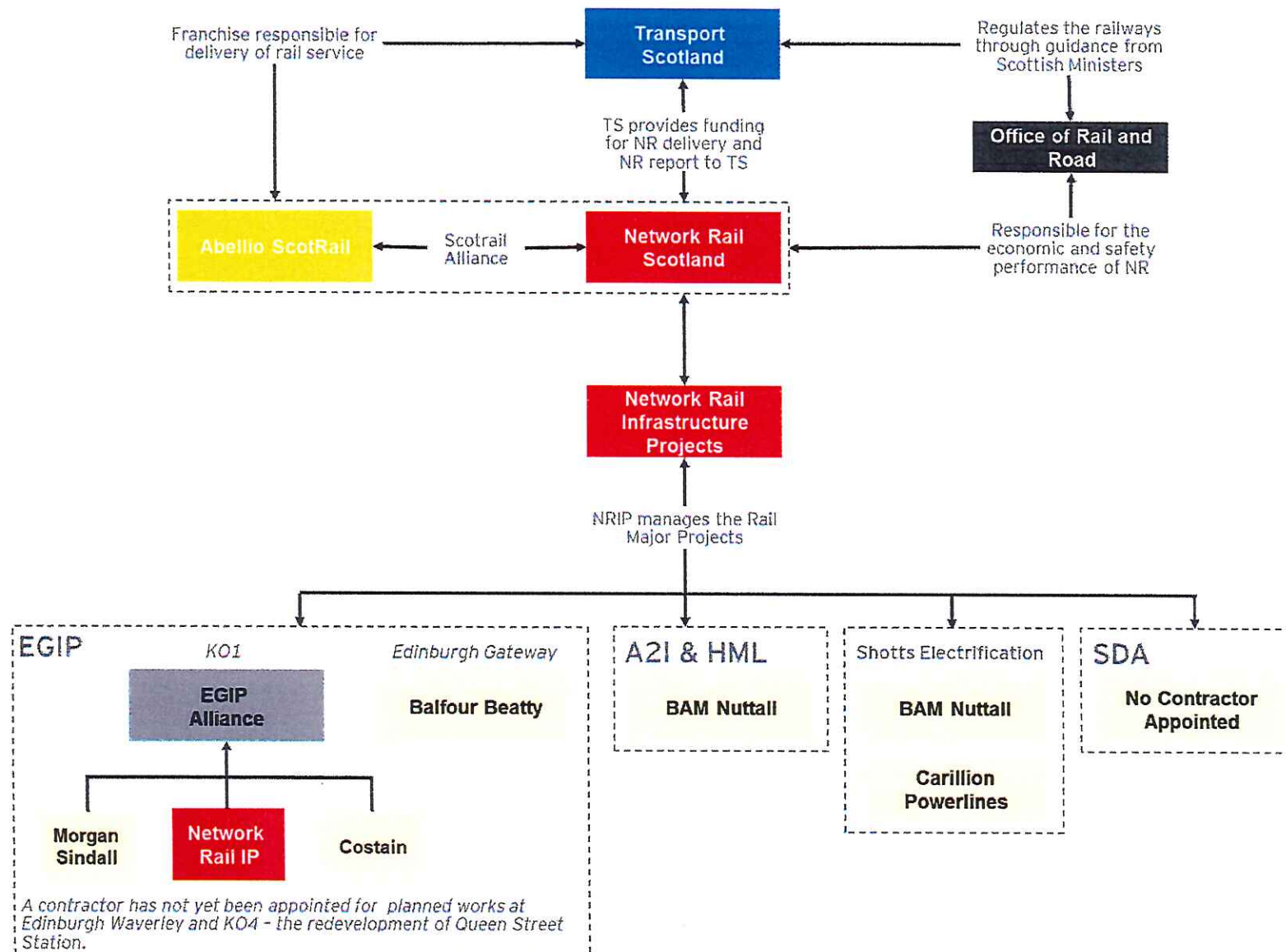
Review of Rail Major Projects

Rail Industry Overview



Review of Rail Major Projects

Scottish Major Projects Overview



Review of Rail Major Projects

ECAM - Development of Enhancements Projects

The process by which enhancement projects are developed and costed is outlined below:

- ▶ In June 2012, the Scottish Government published its vision for Scotland's railway, the High Level Output Specification (HLOS) - this detailed what it wanted the rail industry to deliver in Control Period 5, 2014-2019. In addition, it published the Statement of Funds Available, which detailed the funding envelope available to deliver the HLOS. NR consulted with its industry partners to consider how it could best deliver against these requirements and the Government's wider economic objectives. It issued its Strategic Business Plan 2014-19 which set out its strategy and detailed the schemes it thought should be taken forward in that period.
- ▶ The ORR then provided a determination on the Strategic Business Plans and how much it thought NR needed to deliver Control Period 5. NR published its final delivery plan in response to this in March 2014.
- ▶ However, to determine the efficient cost of enhancement schemes the ORR introduced a new step in the determination process. Building on the suggestion of the industry, it agreed to delay the setting of efficient cost envelope for the enhancements portfolio until after the CP5 Determination. The intention was to give both TS and NR the opportunity to agree what was needed and how it would be delivered. It included a mechanism to allow ScotRail to challenge and contribute to the specification of projects in an effort to improve whole-system operational efficiency. The process introduced was named the Enhancements Cost Adjustment Mechanism (ECAM). The determined cost forms the baseline for which NR have to deliver the enhancement project.
- ▶ The projects within our review were subject to different development and costing processes:
 - ▶ EGIP: EGIP was subject to an individual determination process by the ORR outside of the ECAM process.
 - ▶ SDA & Shotts Electrification: The cost of these projects was determined under the ECAM process at GRIP 3 stage, but before the projects had Approval In Principle (AIP). The costs for both projects has since significantly increased and as a result for future projects it was agreed that submission would not be made to ECAM until AIP have been obtained.
 - ▶ A2I: Submission to ECAM was made in August 2016 after AIP had been obtained. A determination is expected in September 2016.
 - ▶ HML: Submission to ECAM is expected to be made in Summer 2017 once AIP has been obtained.

Review of Rail Major Projects Cost Summary - Current Status (2016/17 P4)

Review of Rail Major Projects Cost Summary - Current Status Definitions

Review of Rail Major Projects

Three Lines of Defence Assurance Concept

- ▶ Project assurance provides an independent assessment of whether the elements fundamental to successful project delivery are in place and operating effectively. It is designed to provide information to those that sponsor, govern and manage a project to help them make better informed decisions which reduce the causes of project failure, promote the conditions for success and increase the chance of delivering the required outcome cost effectively.
- ▶ The 3 Lines of Defence ('3 LoD') is a leading practice concept of assurance used by many large projects and programmes, including for example the Olympic Delivery Authority

Line	Typical Role
1 st Line – direct accountability for delivery, working directly with supplier and delivery partners	<ul style="list-style-type: none"> ▶ Acts as the client to the delivery partner and/or Tier 1 contractors ▶ Accountable for day to day delivery of the project and business case, working directly with suppliers and delivery partners ▶ Works within the project (not independent) but is accountable for ensuring the project team is delivering in line with objectives ▶ Supported by the 2nd LoD
2 nd Line – co-ordinate, facilitate, challenge and oversee the effectiveness and integrity of the first line. Works with the 1 st line and suppliers to make improvements	<ul style="list-style-type: none"> ▶ Primarily undertaken by a programme assurance office, or within / coordinated via a project delivery PMO ▶ Operates as a 'support and challenge' role within the project organisation ▶ Incorporates functions such as commercial, legal, cost control, planning & schedule control, legal, technical support ▶ Also reports to the project management
3 rd Line – Independent Audit	<ul style="list-style-type: none"> ▶ Independent of the delivery organisation, acts on behalf and at the request of the ultimate project sponsors ▶ Provides independent perspective and challenge on areas such as processes, controls or outputs ▶ Produces audit reports and provides advice on the design and implementation of project risk frameworks

Review of Rail Major Projects

Disclaimer

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