Contents

1. Executive Summary

A range of improvements are underway on the Midland Main Line (MML) that will generate benefits to passengers and increase the financial and operating efficiency of the railway. The MML programme Key Output 1 (KO1) includes capacity works to enable a 6 trains per hour timetable as well as lines peed enhancements, journey time reductions and full electrification of the London to Corby route. KO1 is expected to deliver over £1.6bn of passenger benefits over a 60-year appraisal period and offer value for money.

Following the decision not to progress with MML Key Output 2 (full electrification to Sheffield / Nottingham), the Secretary of State (SoS) requested that new build bi-mode 125mph rolling stock is specified for the East Midlands franchise. The purpose of MML Key Output 1a (KO1a) is to enable the use of these bi-mode trains on electrified sections of the Midland Mainline, and optimise the benefits of their use. Delivering this outcome will require power infrastructure work to be undertaken by Network Rail. This document sets out the Business Case for investment in these infrastructure enhancements, based upon a set of defined assumptions as to the capability, specification, and costs of the new bi-mode trains.

The business case supports proposed specification of new bi-mode trains for the East Midlands franchise, although it should be noted that no such trains with the required capability exist, and (given the bespoke requirements) the costs of such vehicles are not known and subject to high level of risk and uncertainty. This risk will be mitigated to some extent through the manufacturer and financier competition.

In enabling the operation of bi-mode trains on the Midland Main Line, KO1a will improve passenger experience and reduce crowding on intercity services, and reduce the environmental impact of these services by allowing them to utilise existing (or planned) electrification infrastructure. It will also encourage greater competition and innovation in the market for high speed bi-mode rolling stock, potentially offering benefits across the industry.

Key Output 1a will include power connection and reinforcement works near Bedford and Kettering, and Overhead Line Equipment (OLE) improvements on existing infrastructure between Bedford and St Pancras.

Background

The Full Business Case for the Key Output 1 (KO1) elements of the MML Enhancements Programme was approved by BICC and Secretary of State in August and September 2017 respectively. The delivery of KO1 by Network Rail is now underway.

In July 2017, the Secretary of State announced the cancellation of Key Output 2, electrification to Nottingham and Sheffield. The consultation for the next East Midlands franchise was launched at the same time and included a proposal to introduce new bi-mode trains on services between Nottingham, Sheffield and London from 2022. The infrastructure required to enable these new trains is defined as Key Output 1a, and is the subject of this business case.

The new bi-mode rolling stock will be procured as part of the East Midlands franchise, the Invitation To Tender (ITT) for which is scheduled for April 2018. The new franchise is due to be awarded in April 2019, and begin in August 2019.

Costs, Benefits, & Programme Delivery

The current full programme cost estimate for KO1a infrastructure is within the REDACTED assumed in the CP6 enhancements funding envelope, as contained within the Statement of Funds Available (SoFA).This business case is seeking funding authority of REDACTED to progress the programme from Outline Business Case (OBC) to Full Business Case (FBC). This is to enable completion of the design stage, and any remaining development work, ahead of seeking a commit to deliver decision with an FBC, anticipated in January 2019. One element (the South of Bedford power scheme) is further developed than other areas of the programme; as such a commit to deliver decision for this element is being sought with this OBC.

This programme is affordable against the CP5 Portfolio defined by the Hendy Review in 2015. Based upon the level of committed funding in CP6, the CP6 element of the programme is also currently affordable.

Investing in Key Output 1a has been assessed as offering poor to medium value for money, with a benefit to cost ratio between 0.4 and 1.96. The wide range is a product of uncertainty over the specification of the bi-mode train, together with the associated uncertainty regarding potential (additional, not currently scoped) infrastructure adjustments required to accommodate this new train. The lower range is based on either the introduction of a homogenous fleet for the East Midlands franchise (i.e. if bi-mode rolling stock were used for all services on the franchise, rather than a mix of Electric Multiple Units (EMUs) and bi-modes), or if a fixed formation 8 car train were procured. The upper range assumes a ‘flexible’ 5 car formation (i.e. where two 5 car trains can be joined or separated as demand requires), and the use of EMUs for commuter services to Corby / Kettering.

Details of how the franchise competition plans to ensure the higher VfM scenarios detailed here are realised through technically deliverable, affordable, and value for money bids are contained in the East Midland Franchise Competition OBC, provided alongside this submission. However, the BCR range displayed here recognises that the type of bi-mode rolling stock required for the MML does not currently exist, and as such there remains significant uncertainty around the specification and capability of these new trains.

The delivery of KO1a infrastructure will be delivered by Network Rail, under the governance and management procedures and process established for the wider MML programme. The procurement of new bi-mode rolling stock will be achieved through the new East Midlands franchise, the Invitation To Tender for which is due to be published in April 2018. The ambition is to introduce the first new bi-mode train into service in 2022; however the new rolling stock will not be able operate in electric mode before the completion of KO1a infrastructure enhancements in December 2023.

The winning bidder of the next East Midlands franchise will have a critical role in realising the benefits of this investment through the procurement of new bi-mode rolling stock. Given this key interface, the approval schedule for both the MML Programme and the East Midlands franchise competition have been aligned, such that the franchise ITT will be published using an infrastructure baseline for KO1a that has been approved at OBC stage and, as for KO1, agreed with NR under contractual-type arrangements. This will provide an agreed baseline for the franchise and introduce a change control process to ensure infrastructure and franchise remain aligned.

Risks, Issues, & Opportunities

Bi-mode rolling stock with the required operational characteristics for the MML does not currently exist; as such manufacturers will have to develop new proposals for the new franchise. The investment case for KO1a is extremely sensitive to the cost, specification, and capability of the bi-mode train; if the train procured diverges to any great extent from that assumed in our central assessment case then the benefits of this investment are significantly reduced.

2. Strategic Case

2.1 Business Strategy

The Midland Main Line (MML) is part of the strategic rail network and plays a key role in enabling economic, environmental and community benefits at national, regional and local level. It serves a diverse set of markets for rail services including inter-regional, commuter, long distance and freight. (See Figure 1: Midland Main Line).

The Government has committed to a continued programme of investment in rail to meet projected increases in demand from passengers and freight[1]. The Government's Transport Investment Strategy commits to maintaining and upgrading our transport infrastructure, to connect communities and businesses and help deliver balanced growth across the country[2]. The key priorities of this strategy are to:

- create a more reliable, less congested, and better connected transport network that works for the users who rely on it;
- build a stronger, more balanced economy by enhancing productivity and responding to local growth priorities
- enhance our global competitiveness by making Britain a more attractive place to trade and invest
- support the creation of new housing

The Government has also committed to carbon emission, greenhouse gas and air quality targets.[3] In his speech of 12 Feb 2018, the Rail Minister reiterated the government's intent to lower the environmental impact of rail transport, while continuing to improve services for passengers. Further, he announced an ambition to see all diesel only trains taken out of service by 2040.

These commitments are reflected in the DfT's strategic objectives, namely to:

- *Boost economic growth and opportunity;*
- *Build a One Nation Britain;*
- *Improve journeys;*
- *Deliver safe, secure, sustainable transport; and*
- *Promote a culture of efficiency in everything we do.*

[1] National Infrastructure Delivery Plan 2016 -2021, Infrastructure and Projects Authority (reporting to HM Treasury and Cabinet Office) March 2016

[2] Transport Investment Strategy, Department for Transport, July 2017

[3] The Government's first four Carbon Budgets have been set covering the period out to 2027. The Government is also committed to implementing the EU's 2030 Green House Gas (GHG) target of at least a 40% reduction in domestic EU GHG emissions through EU Emission Trading System (EU ETS).

The MML KO1a Programme is designed to contribute to the objectives set out above by achieving the following outcomes:

- *Provide modern, flexible rolling stock for Intercity MML services, improving passenger experience;*
- *Increased capacity and reduced crowding on Intercity services;*
- *Improved journey times for Nottingham services*
- *Reduce environmental impact by allowing Intercity services to utilise available electrification infrastructure.*

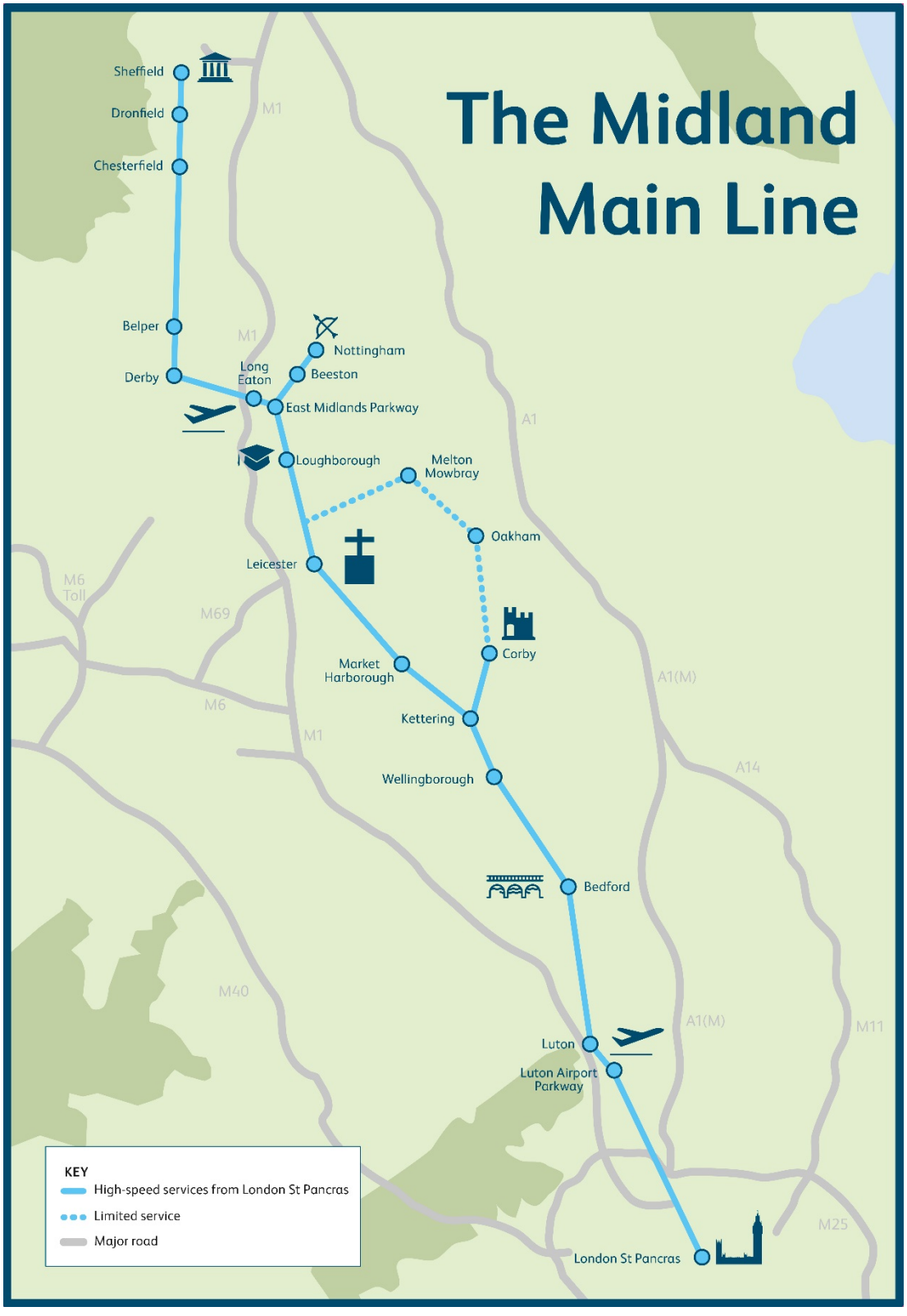


Figure 1: Midland Main Line

2.2 Options

Three options exist for the future of Midland Main Line intercity (i.e. to Nottingham & Sheffield) services:

1. Continue as we are: deliver KO1 and continue to use diesel rolling stock for intercity services
2. Introduce flexible bi-mode rolling stock, allowing for incremental expansion of electrification where affordable
3. Fully electrify the Midland Main Line

Option 1: Continue with diesel trains (do minimum)

This is the lowest cost, lowest risk option, that minimises any negative impact on the East Midlands franchise premium accruing to the Department. It provides for the continuation of a largely mid-life high performing fleet and allows the decision on whether to pursue full electrification or introduce bi-mode rolling stock to be taken in the future, in the context of further technological advances and the delivery HS2.

However, this option would fail to deliver the passenger or environmental benefits offered by the other two options. It also would not meet political and stakeholder expectations, following the Secretary of State's announcement in July 2017 that bi-mode trains would be introduced for intercity MML services. There have been a series of major policy changes on the MML since 2012; a decision not to invest in either electrification or bi-mode rolling stock would represent a further such change.

Option 2: Maximise flexibility – bi mode trains (do something – RECOMMENDED)

This represents the 'medium benefit, medium cost' option. This would provide new rolling stock for intercity services that makes use of existing and planned electrification infrastructure, but is also capable of travelling under its own power. These trains provide passenger and environmental improvements over existing diesel rolling stock; providing new trains are assumed to increase peak service intercity capacity by 200 seats per hour. Further, the procurement of bi-mode rolling stock aligns with the Rail Minister's ambition (announced in February 2018) to see all diesel only trains taken out of service by 2040.

A key advantage of this option is flexibility; once bi-mode trains are procured, additional environmental and operational cost benefits are available in future through gradually expanding electrification infrastructure at a pace and in locations of our choosing, subject to value for money and affordability assessments.

Option 3: Full electrification (Key Output 2)

This option represents the original scope of MML Key Output 2, which was cancelled by the Secretary of State in July 2017. This would involve extending electrification infrastructure from Kettering to Sheffield and Nottingham, and procuring electric intercity trains.

This is a 'high benefit, high cost' option. Significant operational cost and environmental benefits can be achieved, however capital costs are high (c.£1bn), and have been determined unaffordable in CP6; as such delivery would have to take place in CP7 or later if funding were available. Further, the investment case benefits are significantly negatively impacted by the introduction of HS2.

2.3 Drivers for Change

The drivers for change represent the problems, issues and opportunities that have instigated this approach to investment in the Midland Main Line. In doing so they provide the rationale for the proposals for change.

2.3.1 Affordability

In July 2017, the SoS determined that the plan to electrify from Kettering to Nottingham / Sheffield (i.e. KO2), was not affordable. In this context, the proposal to introduce bi-mode trains through investment in KO1a has been developed as a means of delivering the majority of KO2 passenger benefits at a lower capital cost.

2.3.2 Maximising the use of electrification infrastructure

Introducing bi-mode trains will allow for maximised use of electrification infrastructure introduced under KO1, ensuring the full benefits of KO1 are realised. With this investment, bi-mode intercity services would run in electric mode between London and Market Harborough; by contrast, a do minimum option would envisage diesel services running between London and Nottingham and Sheffield.

2.3.3 Increasing rolling stock fleet flexibility

Bi-mode is the only fleet option that would ensure the benefits of any future incremental electrification could be realised. Once bi-mode trains are procured, additional environmental and operational cost benefits are available in future through gradually expanding electrification infrastructure at a pace and in locations of our choosing, subject to value for money and affordability assessments. Figure 2 illustrates below how electrification can be expanded in stages, where it is deemed affordable and beneficial. From a starting point of 30% of the route being electrified today from London-Bedford, works are already underway to reach 46% under KO1. The KO1a proposition increases that to 53%, and with HS2 Phase 2b assumed to operate to Sheffield the proportion of the route electrified would reach 62%. Although not part of any current plans, if the route were further electrified to just south of Leicester (seen as the last 'easy' bit), electrification could reach 72% of the route.

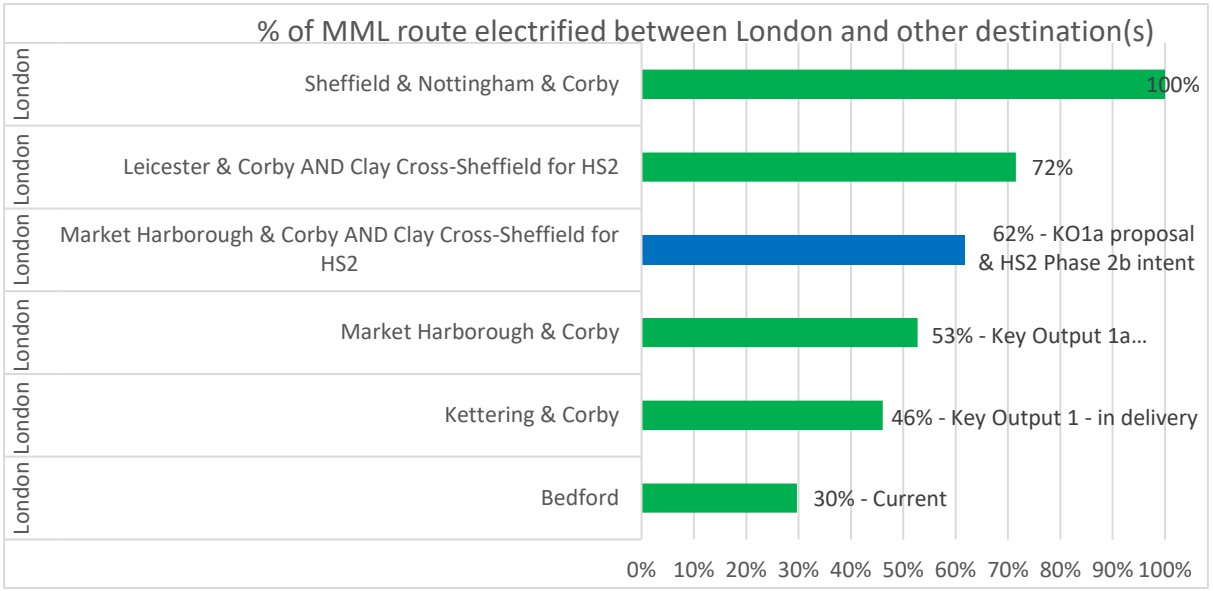


Figure 2: MML route electrification stages

If ultimately the MML is fully electrified, the bi-modes could either be refitted as pure electric trains (as is planned for part of the IEP fleet), or cascaded to other partially electrified parts of the network.

2.3.4 Shortage of 125mph Intercity rolling stock

Procuring new trains for the MML also has wider strategic benefits for the rail network. With HSTs reaching the end of their life, there will soon be a shortage of high quality 125mph rolling stock across the rail network – as such either new 125mph InterCity trains will need to be procured somewhere, or the HST's will require further refurbishment. There are three potential franchises where this could happen: East Midlands (for MML), Cross Country, or West Coast Partnership. As the MML is a heavily used main line, procuring new trains here will ensure the benefits of their use are maximised, thereby ensuring better value for money than any Cross Country procurement. It would also allow procurement of bi-mode trains to increase the benefits from the DfT's investment in electrification on MML. Pursuing this approach would then allow the current 222 Meridian fleet to be available for use as cascaded rolling stock for bidders on other franchises – most notably the Cross Country network.

2.4 The Programme

The MML KO1a Programme is designed to contribute to the industry strategies and drivers for change set out above by achieving the following outcomes:

- *Provide modern, flexible rolling stock for Intercity MML services, improving passenger experience;*
- *Increase capacity and reduce on train crowding on intercity services;*
- *Improve journey times for Nottingham services*
- *Reduce environmental impact by allowing Intercity services to utilise available electrification infrastructure;*

2.4.1 Background

The Full Business Case for the Key Output 1 (KO1) elements of the MML Enhancements Programme was approved by BICC and Secretary of State in August and September 2017 respectively. The delivery of KO1 by Network Rail is now underway.

In July 2017, the Secretary of State announced the cancellation of Key Output 2, electrification to Nottingham and Sheffield. The consultation for the next East Midlands franchise was launched at the same time and included a proposal to introduce new bi-mode trains on services between Nottingham, Sheffield and London from 2022. The infrastructure required to enable these new trains is the subject of this business case.

The new bi-mode rolling stock will be procured as part of the East Midlands franchise, the Invitation To Tender (ITT) for which is scheduled for April 2018. The new franchise is due to be awarded in April 2019, and begin in August 2019. Beyond this, the Secretary of State has expressed an ambition to have the first new bi-mode train in service by December 2021.

2.4.2 Approach and Scope

Key Output 1a aims to enable the use of bi-mode trains on electrified sections of the Midland Main Line and optimise the benefits of their use. Delivering this outcome will require power infrastructure work to be undertaken by Network Rail. Brief descriptions of the interventions required to enable this strategy are below:

South of Bedford 125mph running:

Currently, the Overhead Line Equipment (OLE) between Bedford and London limits train speeds to a maximum of 100mph. In order for future bi-mode intercity services to be able to meet current journey times while operating in electric mode, this maximum speed must be raised to 125mph. As such, improvements to OLE infrastructure between Bedford and St Pancras are required.

South of Bedford power:

MML KO1 will deliver 6 train paths into St Pancras. Currently, there is insufficient power to support trains operating in electric mode on all 6 of these paths (intercity services are currently diesel powered). To allow future bi-mode trains to operate in electric mode (alongside electric commuter services to Kettering / Corby), upgrades to power supplies south of Bedford are required.

North of Kettering power:

A new power connection is also required to facilitate electric running to Kettering (i.e. the full extent of electrification under KO1). Prior to the decision not to progress with KO2, upgrades to the National Grid power supply point at Braybrooke were undertaken. Had KO2 progressed, the connection to Braybrooke would have been made using the OLE as it was extended north to Sheffield / Nottingham. Given this OLE extension is no longer planned, a connection to the power supply must be made as part of KO1a, in order to allow bi-mode trains to operate in electric mode on the current and planned electrified infrastructure.

Three options for making this connection have been examined, and are assessed as sensitives in the Economic case. These options are:

- Underground cables from Kettering to Braybrook;
- OLE from Kettering to the National Grid power supply point at Braybrook:
- OLE from Kettering to Market Harborough;

A summary of the assessments of these options is provided in section 2.5 (Value for Money).

These infrastructure works are summarised in Figure 3 below:

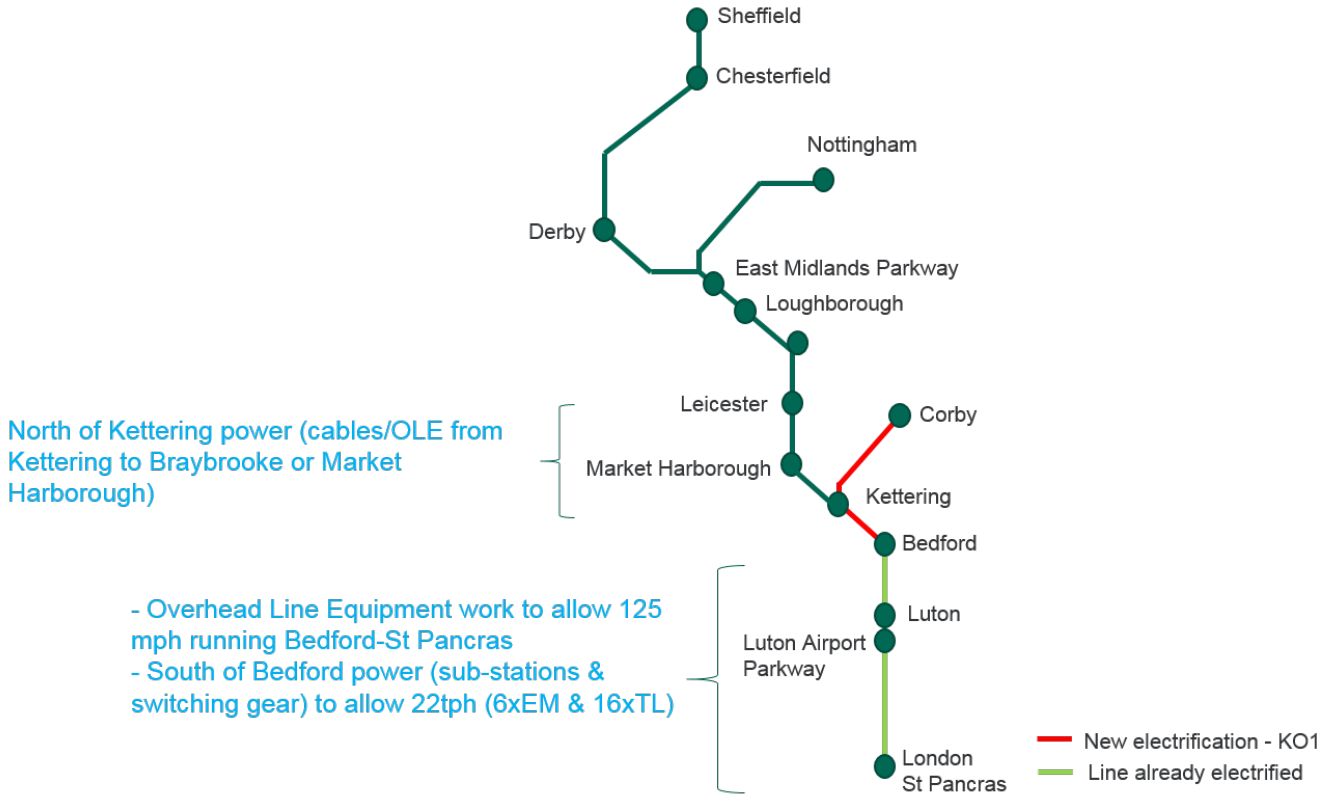


Figure 3: Infrastructure elements of KO1a of the MML Programme

2.4.3 Funding & affordability

The KO1a programme is affordable against the CP5 Portfolio defined by the Hendy Review in 2015.

The allocation of available SoFA funding for enhancements for Control Period 6 (CP6) has not yet been formally agreed. As such, affordability of the CP6 elements of this business case will be constrained by currently limited SoFA funding for enhancements.

As set out in the High Level Output Specification (HLOS) for CP6, infrastructure enhancements are expected to be dealt with separately from operations, maintenance and renewals for CP6 through a new process. This new pipeline process builds on the principles set out in the Memorandum of Understanding between Department for Transport and Network Rail.

Although funding assumptions for schemes deferred from CP5 to CP6 following the Hendy Review, were made for the purpose of preparing the SoFA this did not represent a CP6 budget for delivery of enhancements. This is because in line with the principles underpinning the new process it is only when a scheme has passed through the ‘commit to deliver’ that the budget for the completion of the scheme is confirmed. Up to this stage gate, schemes only have a budget for the next stage of works - i.e. for development or design work to allow them to reach ‘commit to design’ or ‘commit to deliver’ – and an indicative cost for completion.

The current full programme cost estimate for KO1a infrastructure is within the REDACTED assumed in the CP6 enhancements funding envelope, as contained within the Statement of

Funds Available (SoFA). This business case is seeking funding authority of REDACTED to progress the programme from Outline Business Case (OBC) to Full Business Case (FBC). This is to enable completion of the design stage, and any remaining development work, ahead of seeking a commit to deliver decision with an FBC, anticipated in January 2019. One element (the South of Bedford power scheme) is further developed than other areas of the programme; as such a commit to deliver decision for this element is being sought with this OBC.

As designs mature, NR and DfT will apply value engineering to each project, review spend profiles and challenge the necessity of proposed scope. The joint NR/ DfT Enhancements Portfolio Board will continue to be responsible for ensuring the programme continue to align with wider portfolio priorities. Together, this will ensure that an affordable programme is agreed prior to submission of the Final Business Case for KO1a (currently planned for early 2019).

In line with the new process for all enhancement schemes, KO1a will be subject to an ongoing assessment of value for money and affordability.

2.5 Strategic Benefits

Affordability

- In July 2017, the SoS determined that the plan to electrify from Kettering to Nottingham / Sheffield (i.e. KO2), was not affordable. In this context, the proposal to introduce bi-mode trains through investment in KO1a has been developed as a means of delivering the majority of KO2 passenger benefits at a lower capital cost.

Improved journey times for Nottingham services

- Nottingham services are currently split between 222 Meridian trains, and slower HSTs which have poorer journey time performance. Procuring new rolling stock for intercity services will allow all services to match the faster 222 Meridian journey times.

Increased on train capacity & reduced crowding

- New rolling stock will be fully accessible, and higher passenger capacity than current the current intercity fleet, reducing crowding and improving passenger experience.

Maximising existing electrification benefits

- This option will maximise use of electrification infrastructure introduced under KO1, as this will be used by bi-mode intercity services (a do minimum option would envisage diesel services running between London and Nottingham and Sheffield)

Flexible expansion of electrification

- Bi-modes would provide for the flexible rollout of any future incremental electrification of the MML; allowing the ability to “cherry-pick” the cheapest and

easiest sections of the line to be electrified first, while deferring or omitting the more difficult and expensive sections.

Encouraging market competition and innovation

- Encourage greater competition in the high speed bi-mode market – this is currently close to a monopoly for Hitachi.

Larger pool of flexible trains

- Provide a deeper resource of flexible vehicles in the market that could be used elsewhere in the future as the electrified network is expanded in the longer term.

Opportunity to reduce crowding elsewhere on the network

- Procurement of new trains for the East Midlands franchise allows for the possibility of cascading mid-life inter-city diesel trains in the early 2020s to relieve crowding issues elsewhere on the network (most obviously on the Cross Country franchise).

Political & stakeholder imperatives

- The delivery of new trains will help mitigate the strong stakeholder response to the deferral of KO2 beyond CP6.

2.6 Value for money

Investing in Key Output 1a has been assessed as offering poor to medium value for money, with a benefit to cost ratio of between 0.4 and 1.96. The wide range is a product of uncertainty over the specification of the bi-mode train, and associated uncertainty over the infrastructure required to accommodate this new train. The lower range is based on either the introduction of a homogenous fleet for the East Midlands franchise (i.e. if bi-mode rolling stock were used for all services on the franchise, rather than a mix of Electric Multiple Units (EMUs) and bi-modes), or if a fixed formation 8 car train were procured. The upper range assumes a 'flexible' 5 car formation (i.e. where two 5 car trains can be joined or separated as demand requires), and the use of EMUs for commuter services to Corby / Kettering.

This range also captures capital cost sensitivities; a 1.36 BCR represents the current KO1a budget, however this drops to 1.13 if capital costs rise to REDACTED. This higher figure is being tested in order to represent the risk of cost escalation for the currently defined scope. Several areas of the KO1a scope are at an early stage of development; as such some cost escalation is likely.

A summary of KO1a rolling stock sensitivities is provided in figure 4 below. Further detail on each of the sensitivities tested can be found in the economic case.

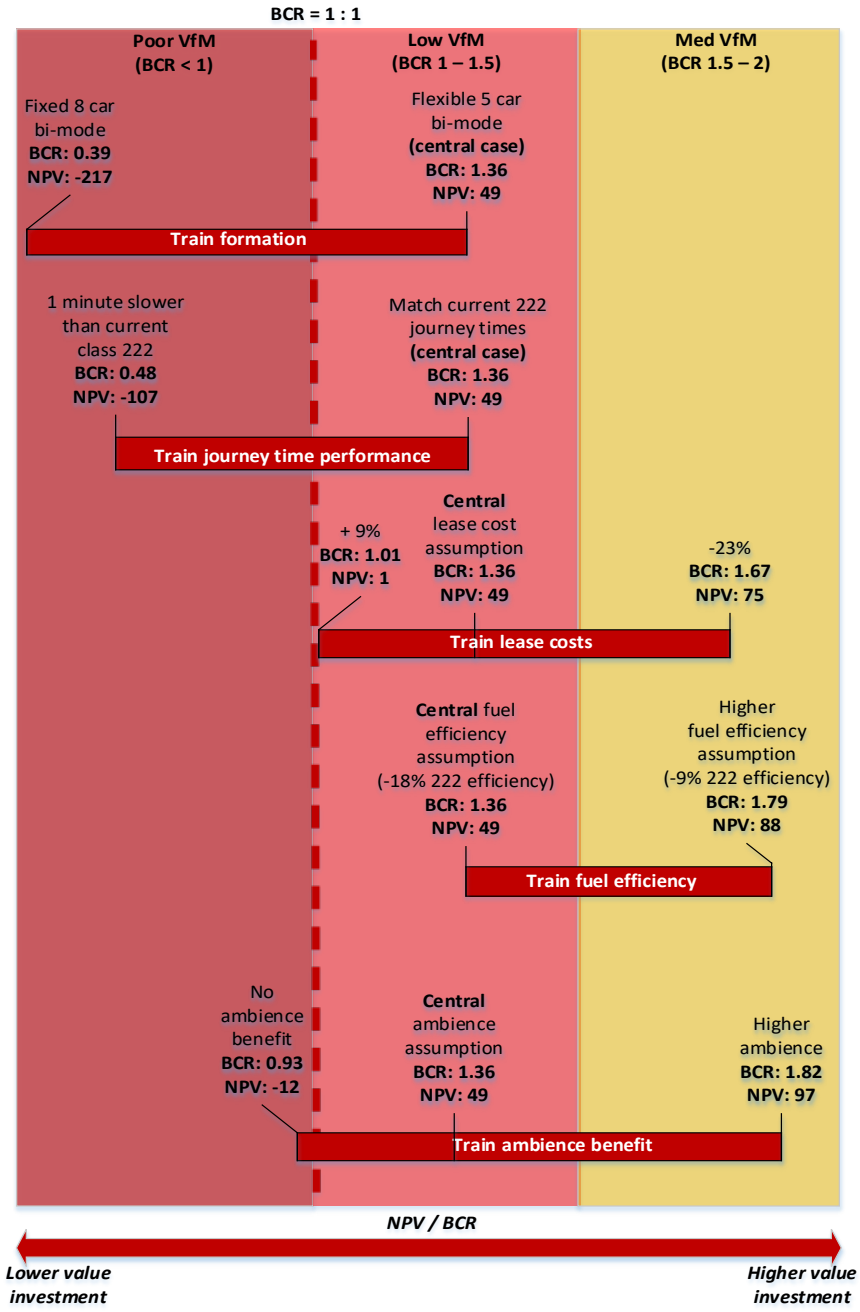


Figure 4: Rolling Stock sensitivity tests for Key Output 1a

2.6.1 Connection to Braybrooke power supply – options

Three capital investment scenarios have for KO1a have been tested, representing the three options for linking the electrification infrastructure at Kettering delivered under KO1 to the power supply at Braybrooke.

Option 1: Cable feed from Kettering to Braybrooke (BCR 1.07 : 1)

An underground cable is laid to link the OLE at Kettering to the power supply. This option has a marginally higher capital cost estimate than options 2 & 3 (which use Overhead Line

Equipment), without any of the benefits extending OLE brings. At this early stage of development, these costs carry a high degree of uncertainty compared with options 2 and 3 and NR is still developing a detailed cost assessments for this option. However, even if costs were significantly reduced this option would compare poorly to options 2 & 3 on strategic and economic grounds, and as such this option is not recommended.

Option 2: OLE from Kettering to Braybrooke (BCR 1.31 : 1)

OLE is extended 6 miles from Kettering to Braybrooke. Using OLE to make the link back to the power supply has the advantage of increasing carbon savings and reducing fuel costs, as the bi-mode trains are able to operate in electric mode for a greater distance. The value of these additional benefits exceeds the additional capital costs; as such this represents a better value for money option when compared to cabling. The cost of this option is more certain than option 1, however benefits are lower than for option 3; as such this option is not recommended.

Option 3: OLE from Kettering to Market Harborough – RECOMMENDED (BCR 1.36 : 1)

OLE is extended 3 miles further than in option 2, to Market Harborough station. When compared to option 2, the marginal increase in capital costs for this further extension is exceeded by the increased benefit of reduced carbon emissions and fuel costs; a such this represents the highest VfM option. The estimated costs for option 1 would need to reduce by REDACTED from the current forecasts, with no equivalent reduction to the OLE costs, for this not to be the case. Further, costs for this option are more certain than for option 1. As is explained in further detail below, the bi-mode package is highly sensitive to a number of factors; as such it is critically important to pursue all every opportunity to strengthen the investment case. Given this, **option 3 is the recommended option.**

2.7 Strategic Dependencies and Interfaces

2.7.1 East Midlands Franchise

The MML Programme is dependent on the next East Midlands franchise to realise the benefits of the KO1a investment, through the procurement of new bi-mode rolling stock.

Bi-mode rolling stock with the required operational characteristics for the MML does not currently exist; as such manufacturers will have to develop new proposals for the new franchise. As outlined in section 2.5 above, the investment case for KO1a is extremely sensitive to the specification and capability of the bi-mode train; if the train procured diverges to any great extent from that assumed in our central assessment case then the benefits of this investment are significantly reduced.

The interdependencies between the MML programme and East Midlands Franchise Competition have been extensively mapped by the respective teams in Network and Passenger Services. The business case for bi-modes shows extreme sensitivities in the following areas, with very small changes in costs and benefits moving this investment from being medium to poor value for money:

- Journey times
- Infrastructure costs
- Rolling stock lease costs
- Rolling stock fuel efficiency

- Environmental impacts (i.e. rolling stock emissions)
- Rolling stock formation

The ITT is due to be published in April 2018. Details of how the franchise competition plans to realise the benefits of introducing bi-mode trains to the MML with technically deliverable, affordable, and value for money bids are contained in a separate BICC paper, provided alongside this submission.

2.7.2 HS2

The MML does interface with the planned introduction of High Speed 2, in particular the second phase of HS2 which extends the route from the Midlands to Leeds, Sheffield and Newcastle (HS2 phase 2b).

HS2 phase 2b requires electrification infrastructure to be installed between Clay Cross and Sheffield Midland station; this was due to be electrified under the MML programme Key Output 2. In July 2017, following the decision not to progress with KO2, it was confirmed that this section of route would be 'HS2 ready'; i.e. electrification would be carried out prior to the planned opening of HS2 phase 2b in 2033. Funding arrangements and options for the delivery of this commitment are currently being developed, and are yet to be confirmed.

If it is assumed that Clay Cross to Sheffield is electrified, HS2 phase 2b will impact KO1a in two ways:

1. Demand is reduced, as passengers transfer from the MML to high speed services. This will negatively impact the investment case and is assessed to be in the order of £13m (PV) reduction in the £52m (PV) revenue uplift as a result of KO1A/ bi-modes.
2. Operational costs are reduced and environmental benefits increased, through both reduced vehicle mileage (as a result of timetable changes reflecting reduced demand), and by trains operating in electric mode for a greater distance. This positively impacts the investment case.

A sensitivity test within our economic analysis has been carried out on these two impacts, which indicates the net effect on the investment case is negligible (a drop in BCR from 1.36 to 1.35). This is because the reduction in passenger benefits (from the reduced demand) is offset by the reduction in operational costs and increase in environmental benefits.

A further sensitivity test was carried out to highlight the impact of HS2 if the benefits of Clay Cross to Sheffield electrification are not included (i.e. only the drop in demand is factored, not the operational and environmental benefits of electrifying this section). The impact here is greater (a drop in BCR from 1.36 to 1.27), however does not materially impact the investment case.

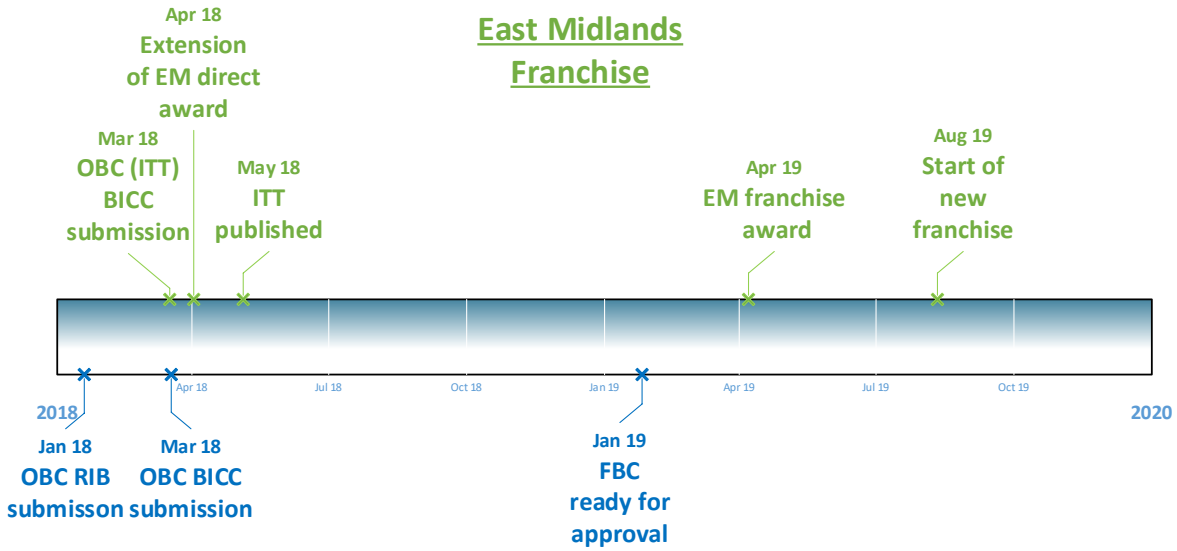
2.8 Strategic risks

2.8.1 Interface with the franchising programme

The winning bidder of the next East Midlands franchise will have a critical role in realising the benefits of this investment through the procurement of new bi-mode rolling stock. This will be covered by the Outline Business Case from the East Midlands franchise team in due course, building on the analysis done to date for this business case.

To improve the integration of infrastructure enhancements with franchising, the approval schedule for both the MML Programme and the East Midlands franchise competition have

been aligned, such that the franchise ITT will be published using an infrastructure baseline that has been approved at OBC stage and, as for KO1, agreed with NR under contractual-type arrangements. This will provide an agreed baseline for the franchise and introduce a change control process to ensure infrastructure and franchise remain aligned. The following diagram shows key dates for each of the key elements of the programme, including key franchise dates:



An agreed list of interdependencies between the franchise and KO1a Programme has been developed and allocated an accountable Deputy Director. This list can be found in the Management Case.

2.8.2 Bi-mode rolling stock procurement

Risk: The benefits of the bi-mode package are entirely dependent on the procurement of new bi-mode rolling stock, suitable for use on MML infrastructure. Given such rolling stock is not currently available, both the KO1a programme and the new East Midlands franchise are reliant on manufacturers developing a suitable offering, within cost and time parameters required by these programmes. Further, our economic assessments indicate that the KO1a investment case hinges on the new bi-mode train having a specific formation and set of capabilities; i.e. there is limited 'space' for manufactures to offer a range of solutions.

It is possible that, in some areas, issues with rolling stock formation / capability could be resolved through additional alterations to MML infrastructure. For example, if it is not possible (or prohibitively costly) to procure a train of the required length (i.e. no more than 240m), some platform lengthening could be carried out at certain stations. However, such additional infrastructure interventions are not included within the current KO1a scope, and as such would likely increases costs and impact the delivery schedule.

Mitigation: The MML programme team have been working closely with the East Midlands franchise competition team in the development of the ITT for the new franchise (due to be issued in April 2018). This is to ensure the specification in the ITT aligns with the findings of

this investment case. This includes the development of a Rolling Stock Assumptions Document (developed in partnership with Network Rail), which details outline technical specifications the new bi-modes will have to adhere to. This document will be shared with bidders for the new franchise as part of the tender process.

The risk of additional scope being required to enable the new bi-mode rolling stock (e.g. vehicle acceptance interventions such as gauge clearance, depot facilities, transition points etc.) will be transferred to the new franchisee. As such, if new scope of this sort is required, this should not increase the capital cost of KO1a; rather this will be translated as a reduced franchise premium accruing to the DfT.

2.8.3 Maturity of cost estimates;

Risk: Given the critical interface between this programme and the East Midlands franchise competition, the timing of this submission has been accelerated by a desire to align these two programmes. One impact of this is that certain areas of the KO1a programme are not as developed as would be desirable at this stage. Schemes at OBC stage are normally developed to at least GRIP 3; the North of Kettering power element is currently at GRIP 2. Also, uncertainty remains as to the specification of the new rolling stock, and how this may impact the planned KO1a scope. These factors increase estimating uncertainty, and as such the risk that infrastructure interventions required cannot be delivered within funds the available.

Mitigation: This risk is being addressed in a number of ways. First, Reference Class Forecasting has indicated that a provision of REDACTED should be included in the AFC, to cover the risk of cost escalation for the currently defined scope. This will be subject to further assessment prior to FBC.

Second, sensitivity tests have been carried out to identify the impact on the KO1a investment case of increasing capital costs. These are summarised above (under ‘Strategic & Economic assessments’), and are available in more detail in the OBC economic case.

Lastly, detailed assurance work alongside NR is ongoing, in order to assure that the process and outcomes for establishing the cost estimates continues to be robust, and that risk provision contained with the Anticipated Final Cost is appropriate for this stage of delivery. Reference Class Forecasting has been undertaken on the current cost and schedule estimates; further assurance will be undertaken prior to submission of the FBC. This will follow cost and schedule assurance processes established for the MML Key Output 1 programme approved in September 2017.