



# Train Connectivity and Information Systems (TCIS) Full Business Case Merseytravel Rolling Stock Programme



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## Liverpool City Region Combined Authority – Strategic Investment Fund

### Final Business Case for November 2019 Investment Panel

#### Project Summary Table

<b>Name of Project</b>	Train Connectivity and Information Systems (TCIS)
<b>Sponsor</b>	Merseytravel
<b>Nature of Applicant</b>	Passenger Transport Executive
<b>Economic Sector</b>	Transport
<b>Indicative Funding Sought</b>	£16.17m
<b>Indicative Funding Source/Fund</b>	Transforming Cities Fund (TCF)
<b>Location</b>	LCR wide
<b>Call or Commission</b>	Commission

#### Combined Authority and LEP Project Team

<b>SIF Investment Team Lead</b>	Paul Buntin
<b>Investment Team Members</b>	Sam Graham, Nick Green
<b>Legal Lead</b>	Jan Leong
<b>CA Policy Input</b>	Huw Jenkins – Lead Officer for Transport

## 1. Summary of Investment Team Considerations

The project, at concept stage, was endorsed by the external panel in October 2019. The panel discussions focussed on three key areas which have been addressed as follows:

- **Commercialisation of the fibre network:** The sponsor has engaged with the CA's legal team to ensure that the funding agreement for TCIS is subject to the CA having a share of any future revenue generated from commercialisation.
- **External appraisal:** An independent appraisal of the proposed investment has been undertaken on behalf of the CA. The appraisal deemed the business case to be proportionate and adequate. Overall, the TCIS scheme is estimated to have a positive NPPV of c. £10.0 M, and a BCR of 2.18, indicating a high value for money.

If the panel are satisfied with the above, then endorsement is sought to proceed to the CA for approval.

## 2. Project Overview

### 2.1 Background

The current fleet of Merseyrail rolling stock is now 40-years-old. This rolling stock is being replaced with a modern fleet of 52 Class 777 trains which will be owned by Merseytravel. The new fleet will be introduced over the course of 2020/21 and will be both third rail and overhead line compatible. The project is in its delivery phase. Within the contract is an option for up to an additional 60 units to be purchased.

The new fleet will be introduced over the course of 2020/21 and will deliver many benefits to the whole LCR including:

- Improving service reliability;
- Reducing journey times;
- Reducing energy consumption;
- Meeting passenger quality and comfort aspirations;
- Reduce fleet maintenance costs;
- Reduce track damage, thereby reducing track access charges; and
- Accommodating growth in passenger demand.

The new trains are predominantly microprocessor controlled (allowing computer systems to talk to each other) and have a comprehensive suite of technologies which will assist both passengers and operational staff in a variety of ways including:

- Comprehensive CCTV coverage;
- Multiple full colour screens throughout the saloons which could be used to display real time information such as details of connecting services to other public transport services. This would be a first for the U.K;
- Help points;
- Vehicle diagnostics (to allow better understanding of maintenance requirements);
- Passenger counting through train doors; and
- Advertising content, which will provide a revenue stream for Merseytravel.



**Figure 2.1** General Information, Route Data and Route Indicator displays

## 2.2 Project Description

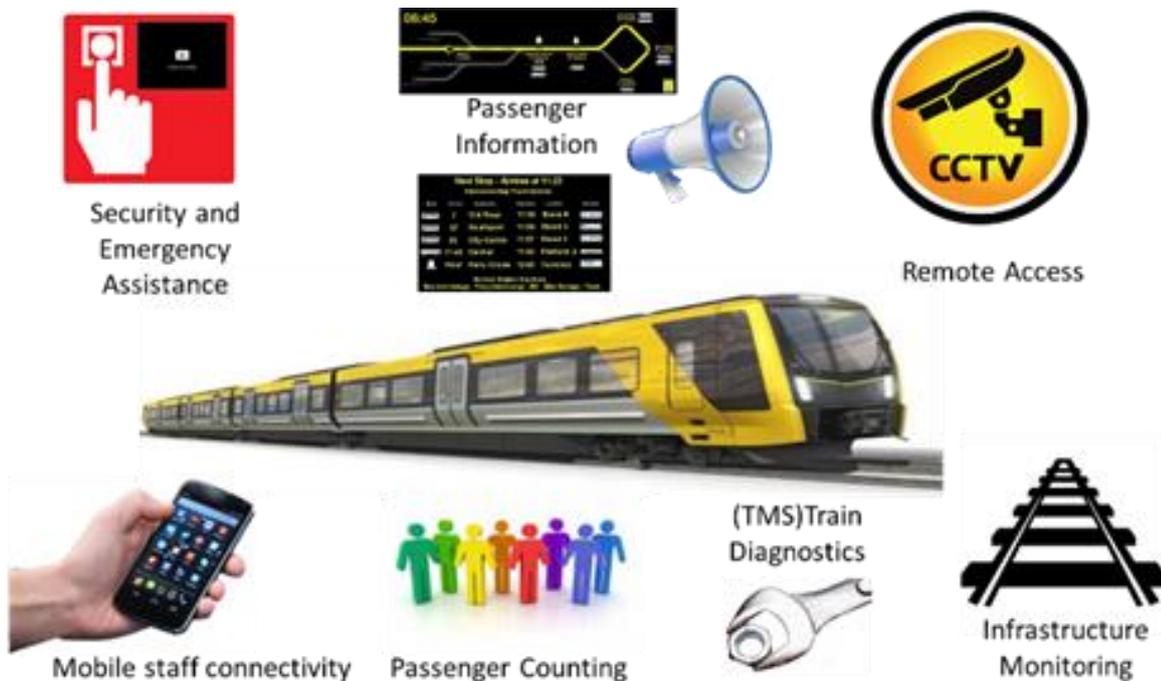
The TCIS project will deliver the installation of high fibre optic cables across the entire LCR train network map. Fibre cable will be laid across the entire 120km of the network. The installation of this cabling will allow the technological capabilities of the new rolling stock to be used. Without the cabling the capability referenced above will be redundant.

Enabling this technology will provide passengers with on board, real-time information, location services and Wi-Fi connectivity across the network. A review across the rail sector has identified that provision of 100 Megabits per second (Mbps) will provide a good quality Wi-Fi coverage for passengers. Delivering this project will give Merseyrail the UK's highest capacity, full coverage rail Wi-Fi system.

The SIF funding will be used to cover the full cost (capital expenditure) of installing a high capacity (432 core) fibre optic cable network, covering the entire Merseyrail Electrics geographic network.

Negotiations with Network Rail (who own the rail infrastructure) have agreed that the ownership of the cables will be transferred to Network Rail. Network Rail will be wholly responsible for all future maintenance, decommissioning and associated costs of the cables.

Meseytravel will retain use of 144 fibres (of the 432 in the core) from Network Rail at a peppercorn rent for 35 years. Of these, around 50 fibres are all that is required for TCIS to work. The remaining fibres will be made available to the CA through an agreement with Network Rail and this will allow for future commercial or TCIS related uses.



**Figure 2.2** Summary diagram of TCIS

## 2.3 Legal Structure

A draft funding agreement has been agreed between the CA and Merseytravel. This is a standard SIF Transport Schemes agreement. The agreement includes appropriate contractual protections for underperformance against the project outcomes and a unilateral right for the CA to terminate the agreement on 3 months' notice.

Drawdown will be made via claims and upon proof of delivery milestones. Claims will be quarterly.

## 2.4 Indicative Timescales

The timescales are as follows:

Final paper	November 2019
CA approval	December 2019
Grant Funding Agreement	January 2020
Commence installation	January 2020
Complete project	February 2021

# 3. Strategic Case

## 3.1 Fit with Investment Strategy and Case for Change

The LCR was awarded £172m, by the Department for Transport, to fund innovative transport projects through the Transforming Cities Fund (TCF). The CA set out three key themes for TCF projects to align with.

The TCIS project fits with Theme 1: Enhancing and expanding the public transport network to meet new areas of demand.

TCIS will contribute towards improving the quality of journeys and ensure greater resilience through digital monitoring of the both the network and rolling stock. It is an integral component of the Merseyrail Rolling Stock Programme.

## 3.2 Objectives

The objective of the project is to provide high capacity Wi-Fi (100Mbps) to all the new Merseyrail trains which will operate across the entire network, including the city centre tunnels. The control centre will be based at the Sandhills Station and it will monitor the trains' performance on a real time basis. The Wi-Fi will benefit both passengers and operator.

## 3.3 Outcomes of Options Analysis

Please refer to Appendix 1 for options considered.

### 3.4 Critical Success Factors

The following criteria have been identified:

- Delivery of a fully functional end to end system which delivers full functionality across the entire Merseyrail network;
- Delivery of the system into service in line with the introduction of the Class 777 fleet into passenger service; and
- Management of the budget within the parameters of the Rolling Stock Programme.

### 3.5 Equality and Diversity and Inclusive Growth

Merseytravel, Network Rail and their supplier; Panasonic is committed to inclusive growth and sustainability through the following measures:

- Network Rail and Panasonic do not pay any of their workers zero hours contracts and all Merseytravel staff who will be engaged in delivering the project will earn more than the real living wage;
- A local office to manage TCIS has been set up within Liverpool and around half of the staff are from the Liverpool City Region. As the project progresses, further recruitment will be needed, and Panasonic plan to recruit locally where possible; and
- All vehicles used by Panasonic are of EURO VI standard. Green travel plans will be developed as the project progresses.

Merseytravel submitted the social value questionnaire to the Investment Team and no issue have been identified.

## 4. Economic Case

### 4.1 Appraisal Results

An economic appraisal has been undertaken in line with the guidance set out in the Department for Transport's Transport Analysis Guidelines.

The appraisal considered two impacts of TCIS, namely:

- The value that passengers place on provision of Wi-Fi and the enhanced passenger information systems that will be facilitated by the introduction of TCIS; and
- Revenue that may be generated from sales of both Wi-Fi and advertising facilitated by TCIS.

Further detail of the appraisal methodology is provided in Appendix 2.

Overall, the TCIS scheme is estimated to have a positive NPPV of c. £10.0 M, and a BCR of 2.18, indicating a high value for money.

## 5. Financial Case

### 5.1 Business Plan

Merseytravel have negotiated key milestones with Network Rail and Panasonic with the end goal of ensuring that the TCIS project is delivered prior to the rollout of the new trains across the entire network.

The table below summarises the key milestones and when they are expected to be delivered. It also shows that milestones that have already been reached have been delivered by these dates.

**Table 5-1** TCIS delivery by milestones

Milestone	End date
Contract award milestone to Panasonic (note TCIS can be added to the existing contract)	18/09/2018
Mobilisation milestone	03/01/2019
Major system components procurement 1 (complete)	25/03/2019
Major system components procurement 2 (complete)	16/07/2019
Outline design	07/10/2019
Detailed design	12/10/2020
Installation of cables/ test and commissioning (we are awaiting copies of the 12-month delivery plan)	01/02/2021
System complete milestone	01/02/2021

The procurement of the major system components is separated into two phases and this includes fibre cable and trackside/train interface equipment. The outline design phase details how the cable and systems will be implemented into the rolling stock and existing infrastructure. This covers fibre cable design, civils design, electrification and plant design, radio design, control centre design and software solutions.

### 5.2 Funding Sought and Proposed Key Terms

Funding of £16.17m is sought. This covers 100% of the funds required for TCIS.

### 5.3 Financial Projections

The project is being financially managed within the context of the Rolling Stock Programme. Payment milestones are built into the business plan (section 5.1) but are split in some instances to pay when part of a phase is complete to maximise on spend.

**Table 5-2 TCIS Milestones by cost**

<b>Milestone</b>	<b>Cost (£)</b>	<b>Complete</b>
Contract award milestone	402,987	✓
Mobilisation milestone	402,987	✓
Major system components procurement 1	1,611,947	✓
Major system components procurement 2	1,611,947	✓
Outline design	805,974	✓
Detailed design	3,223,895	October 2020
Testing and Commissioning on 1st route	2,417,921	March 2020
System complete on 1st unit in service	3,223,895	December 2020
System complete on 50% of all units in service	1,611,947	December 2020
Full system finalised and fully functional on fleet	862,737	February 2021
<b>Total</b>	<b>16,176,237</b>	

## 6. Commercial Case

### 6.1 Risks and Mitigation

In line with the arrangements within the Rolling Stock Programme, a full risk register has been created for this project. This register has been analysed using @risk Monte Carlo simulation software (a Rail Industry standard). The most significant risks are summarised below.

#### 6.1.1 Risks to CA

<b>Risk</b>	<b>Probability &amp; Impact</b>	<b>Potential Mitigation</b>
Poor performance of the TCIS project	Low but would deliver sub-optimal capacity for the digital initiatives.	Close control of contractor through the contract and deliverables set out in it.
New technology advancements	High that new technologies emerge that supersede the current project being proposed	Horizon scanning of the market to ensure that any new technologies are considered, and future proofing of the digital platform is reviewed on an ongoing basis
Delay of rolling stock roll out across the LCR	Low as new trains have been ordered and the roll out is on track to start in 2020	Close control of contractor through the contract and deliverables set out in it.

## 6.1.2 Delivery Risks

Risk	Probability & Impact	Potential Mitigation
Intermittent connection	Low. Leading to poor system performance	Surveys and comprehensive testing
Insufficient bandwidth	Low. Leading to slow connections	Monitoring of system performance
Cyber security	Low. Systems could be rendered inoperative.	No safety critical use of the system. Suppliers have robust plans in place.

## 6.2 Diligence and Legal Commentary

We have scrutinised the TCIS scheme and wider Rolling Stock Programme to ensure that the two projects can be delivered in parallel. Based on the progress of the wider Rolling Stock Programme we are confident that delivery is achievable in the timeline provided.

A funding agreement between the SIF and Merseytravel has been prepared by the CA's legal team. The team have also been heavily involved with the contract development for the rolling stock programme. Project milestones have been included in the funding agreement, notably securing commercial rights to the digital infrastructure will be ensured.

The project can be undertaken within the existing Manufacturing and Supply Agreement (MSA) between Merseytravel, Network Rail and Panasonic.

## 7. Management Case

### 7.1 Deliverability and Leadership

The project naturally fits within the Rolling Stock Programme Project Delivery Group (PDG). It has been set up within this programme, alongside the original six projects – asset ownership, concession development & operations, depots, infrastructure, maintenance and rolling stock. The governance and project control processes for this programme are mature with a hierarchy of working groups, Operational Programme Board, Merseytravel Executive and Combined Authority.

The programme is led by a dedicated Programme Director, David Powell. The SRO is John Fogarty (CA Director of Corporate Services), who chairs the Operational Programme Board. The project itself is led by a dedicated project manager, Dimitrios Loumanis, who has industry specific, specialist knowledge.

The governance framework for the delivery phase in which TCIS will sit is attached at Appendix 3.

### 7.2 Monitoring and Management

Tracking of the project's benefits, outcomes and outputs will be a key element in understanding the success of the TCIS programme. This will be carried out by the CA's internal Programme Management Office (PMO). An assurance manager will be assigned to

ensure that Merseytravel/Panasonic are delivering on their primary objectives, as outlined in the SLA. PMO will require Merseytravel/Panasonic to report quarterly.

## **8. Further Considerations**

### **8.1 State Aid**

There are no state aid implications for this project. Contracts are already in place to provide assurance on this matter.

### **8.2 Outstanding Issues and Conditions to Funding**

Commercialisation/discussions with Network Rail are ongoing and will be sufficiently advanced prior to the funding agreement being signed.

**Appendix 1 – Options Considered**

<b>Option</b>	<b>Description</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>Do nothing</b>	Continue with the existing fleet		Fleet will eventually become redundant and have no technological improvements.
<b>Do something</b>	Continue to introduce new fleet but do not trial battery technology		Motive power choice for Merseyrail expansion is limited to 750V 3 <sup>rd</sup> rail or 25kV overhead
<b>Preferred Option</b>	Undertake IPEMU proof of concept project	Enables fully informed decision making when selecting motive power. Potential for significant capital and operational cost savings Reduced delivery timescales for route expansion projects	None

**Commentary:** The choice of options is binary: either undertake the project or don't.

**Appendix 2 – Economic Appraisal Results**
**Key Metrics**
**Table 4-1** Appraisal Summary Table

<b>Metric</b>	<b>Quality Impacts Only</b>	<b>Quality + Sales (Wi-Fi and advertising) Impacts</b>
Present Value of Costs (PVC)	11.3	8.5
Present value of Benefits (PVB)	18.5	18.5
Net Present Value (NPV)	7.2	10.0
Benefit Cost Ratio (BCR)	1.6	2.18
<b>Value for Money Category</b>	<b>Medium</b>	<b>High</b>

**Non-monetised Impacts**

There are *non-monetised* benefits expected to accrue to passengers and the rail operator from the implementation of TCIS, including:

- To passengers, TCIS will provide the connectivity to the on-board CCTV system and provide benefit to passengers in terms of their perception of safety and security when using the Merseyrail network;
- To operators, TCIS provides the means to improve diagnostics and develop timely and cost-effective maintenance programmes;
- To operators, TCIS provides the opportunity to deliver a sophisticated voice communication network involving staff on board the new trains and at the control centre. This will greatly improve the ability to manage incidents.
- To passengers, further reliability improvements to the rolling stock over and above those considered in the original business case, resulting from the operator’s ability to better manage incidents on the network.

**Appendix 3 – Rolling Stock Governance Framework**

**Governance Framework**

Delivery Phase

