Public Transport Portfolio Board –

Chairman's Action

Date: **26th July 2017**

Item: **Sandilands Modifications – Vigilance Support Device – Supplier Comparison and Recommendation**

---

1 Summary

1.1 This paper seeks the Public Transport Portfolio Board's (PTPB) endorsement for adoption of the Seeing Machine vigilance support device.

1.2 This paper provides a comparison between the Seeing Machine device and an alternative product from PCG products, both of which generally fulfil the Vigilance Support Device Technical Specification issued by London Trams (LT) and have been initially trialled on the LT network

2 Recommendation

2.1 PTPB Chairman is asked to:

(a) Note this paper and the importance of this work

(b) Endorse and approve the adoption of the Seeing Machine vigilance support device. This will provide LT with the most efficient delivery of a proven product which exceeds the intent of the LT Technical Specification

(c) Endorse and approve the spreading of the capital cost over a contract lease period which reduces the initial outlay.

3 Background

3.1 Following the Sandilands incident, LT instigated a global search for appropriate technologies that will, as far as possible, prevent a reoccurrence of such an event. These technologies will integrate driver vigilance and tram over-speeding control measures. The delivery of such a product is not expected before early 2019.

3.2 However, the occurrence of an event on 17th May 2017 where a driver is alleged to have fallen asleep at a traffic signal has prioritised the need for a more immediate solution.

3.3 An established solution is preferred so as to reduce the assurance burden and allow it to be operational as quickly as possible.

3.4 The solution should offer simple vigilance support only, e.g. an alert should the driver fail to make normal inputs within expected timescales.

3.5 Market research by LT and Tram Operations Ltd (TOL) identified Seeing Machines and PCG as having products which generally provide the required functional solution. The products can be installed within a very short timescale, allowing immediate realisation of associated safety benefits while the longer term and more detailed vigilance/ tram control exercise is scoped, designed and installed.

3.6 The PCG device has been developed specifically in response to LT's needs, while the Seeing Machine device is an established product already deployed across FirstGroup bus fleets, and elsewhere globally.

4 Evaluation

Functional Compliance

4.1 A comparison of functional compliance between the Seeing Machine and PCG products demonstrates that despite general compliance by both products, both are non-compliant in certain areas.

4.2 However, areas where Seeing Machine is non-compliant see them provide an alternative solution that actually exceeds the specification requirement, whereas PCG non-compliances are in contravention of the specification.

This is important in two critical areas;

4.3 The Specification requires any vigilance device to connect to defined tram controls non-intrusively.

5.1.1 The PCG device does connect to defined tram controls in Bombardier trams, but PCG are unable to provide a non intrusive solution for installation on Stadler trams.

5.1.2 The Seeing Machine device does not connect to the defined tram controls, but this is because the product has no need to do so. This solution is preferred as it reduces installation risk and allows the device to be fitted unobtrusively to both types of tram.

4.4 The Specification requires any vigilance device to provide an alert to the driver at regular intervals.

5.1.3 The PCG device conforms to the specification and provides vigilance prompts at regular intervals.

5.1.4 The Seeing Machine device does not do this; rather it constantly monitors driver behaviour and applies vigilance prompts as and when required. This solution is preferable as it provides constant fatigue management as well as vigilance prompts, contributing to a higher level of safety management.

4.5 The Specification does not require any reporting of vigilance events.

> 5.1.5 This functionality is not offered by PCG.
> 5.1.6 Seeing Machine provides continuous fatigue and vigilance event reporting via an off site manned control centre as part of its product offering, together with a configurable suite of reports which LT and TOL can use as part of any fatigue management regime.

4.6 In review, Seeing Machines have provided a solution which exceeds LT's specification and one with safety and fatigue management benefits beyond that offered by the PCG product.

4.7 A more complete comparison of both products is made in Appendix 2: Technical Specification – Supplier Compliance.

5 Programme

5.1 Both Seeing Machine and PCG state that they are able to facilitate LT fleet roll out of their product by the end of August 2017.

5.2 Seeing Machine appear far more likely to achieve this date, as they have product available off the shelf which comes with full design, manufacturing and assurance compliance certification, transferable to tram application.

5.3 PCG's device is a prototype and while they are in the process of setting up procurement and manufacturing capability for a larger run of their product, no compliance certification currently exists. This will not be available until the end of August. There is therefore considerably more risk with the PCG product as the required compliance certification may be delayed.

6 Financial Implications

6.1 PCG's cost proposal is summarised as follows:

[redacted] to cover proof of concept, Bombardier only initial installation on tram and depot test.

A further [redacted] to cover supply of 77 units @ approx. [redacted] per unit.

One year warranty on a unit replacement basis is included.

PCG offer note 8, "Due to the development of a two-stage delivery programme and recently requested LT modification changes, there is a potential risk premium of seven per cent to the Phase 2 quoted cost." While it is unclear what this item is or what would trigger it, it could potentially add a further [redacted] to the cost. The outturn cost for the PCG device is therefore [redacted]

6.2 Seeing Machine's capex cost proposal is summarised in the table below, (note the quote is two units short of full order size as these units are already with LT for evaluation). Both capital buy and leasing options are offered:

With a capital buy of [redacted] (approx. [redacted] per unit) and very minor one off installation costs of [redacted] the total cost is [redacted].

Under the capital buy option, the monthly fee for support and licencing is [redacted].

With the leasing option it can be inferred that over five to six years (or longer), LT could expect to see monthly costs reach parity with the capital buy monthly costs of circa [redacted], spreading the capital cost over the period of the lease and avoiding the need for an initial capital outlay.

The lease option allows LT flexibility, as dependent on the result of LT global technology search (as referred to in 3.1 above), the vigilance device may be de-commissioned in 2019 in favour of that overarching solution. This would limit LT exposure to [redacted] as shown in the table below. LT/First Group will attempt to negotiate a leasing fee lower than that initially quoted by Seeing Machines. Due to their existing contractual relationship with Seeing Machine and their intended introduction of this technology to other parts of their business, FirstGroup have better financial leverage and will lead the negotiation.

[redacted]

Capital Buy & Monthly Fee Option	**QTY**	**Unit Price**		**Total**
Seeing Machine/Guardian System Hardware Cost	70	[redacted]		[redacted]
Seeing Machine/Guardian Installation Services (per day) Includes certification training for one Senior Field Support Technician	One Seeing Machines Technician for three days	[redacted]		[redacted]
Seeing Machine/Guardian Support Services (SafeGuard Centre)	Monthly Fee	[redacted]	[redacted]	[redacted]
Seeing Machine/Guardian Licensing and Software updates	Monthly Fee	[redacted]	[redacted]	
Total for 1 Year				[redacted]
Total for 2 Years				[redacted]
Total for 3 Years				[redacted]
Total for 4 Years				[redacted]
Leasing Monthly Fee Option	**QTY**	**Per Month**	**Per Year**	**Term Total**
Seeing Machine/Guardian System Hardware Cost	70			
Seeing Machine/Guardian Installation Services (per day) Includes certification training for one Senior Field Support Technician	One Seeing Machines Technician for three days			

Seeing Machine/Guardian Support Services (SafeGuard Centre)	Monthly Fee	Included		
Seeing Machine/Guardian Licensing and Software updates	Monthly Fee			
Total for 1 Year		[redacted]	[redacted]	[redacted]
Total for 2 Years		[redacted]	[redacted]	[redacted]
Total for 3 Years		[redacted]	[redacted]	[redacted]
Total for 4 Years		[redacted]	[redacted]	[redacted]

6.3 Warranty is offered at 13 periods under both capital and leasing options.

7 Assurance

7.1 The PCG device is a prototype. As “first in class” it has no established industry credentials for any aspect of its design, manufacture or operation.

7.2 Seeing Machine have tens of thousands of units operating successfully globally with various case studies to support this though no rail based applications

7.3 PCG have provided little in the way of product assurance as their device has been developed with LT help.

7.4 Although PCG fully intend to develop EMC, design compliance and manufacturing compliance evidence, they have yet to do so.

7.5 Seeing Machines have supplied full product assurance information.

7.6 Internal Project Assurance will be undertaken by the Project Assurance Team to the satisfaction of the Sandilands Governance Manager in line with the Pathway project assurance process.

7.7 Technical Assurance will be undertaken by the Project Assurance Team in satisfaction of LT-IMS-ENG-106 Assurance of New and Altered LT Assets

8 Installation Risk

8.1 Other than provision of a power supply, the Seeing Machine device has no system interface with either type of tram, relying on infrared scanning of the driver’s facial features for its operational inputs.

8.2 In compliance with the LT Technical Specification, PCG have strived to minimise installation risk and have achieved this on Bombardier trams.

8.3 However, they cannot achieve the same level of mitigation on a Stadler tram as intrusive connections are required, necessitating the disconnection and reconnection of operational tram circuits. Although these intrusive connections would be performed under controlled conditions, intrusive connections contravene the LT scope which prohibits them due to the increased risk of error or reliability impact they may impose.

8.4 Due to the nature of its design, the PCG device carries higher interface risk than the Seeing Machine device.

9 Operational Risk

9.1 In compliance with the LT technical Specification the PCG device provides vigilance support only. It employs a progressive two stage alarm (intermittent chirps followed by a continuous strident warble) if a driver fails to operate the Traction Brake Controller or Drivers Safety Device within a prescribed time. In certain circumstances the operation of these devices is non-preferred as that in itself imports a degree of risk.

9.2 Due to the Seeing Machine device's use of infra red facial scanning, no additional mechanical input is required from the driver beyond adopting (or re-adopting) an alert mode of driving.

9.3 The effect of the non mechanical interface provided by the Seeing Machines device is to eliminate nearly all operational risks identified against the implementation of the vigilance support device. This is demonstrated in Appendix 3: Operational Risk Register – Supplier Compliance, column "T".

9.4 Additionally, while the PCG device is capable of sending SMS alerts to any destination when that function is enabled, these SMS only inform the recipient that a vigilance event has occurred. (This function was not requested within the LT technical specification so is currently disabled. Enabling it is likely to incur an additional cost for GSMR SIM card provision and maintenance)

9.5 The Seeing Machine device offers as standard additional driver alertness monitoring via video feed to its own manned control centre, aiding fatigue management at all times as well as providing the required vigilance support.

Appendix 1: Authority Approval Signatures Sheet

Appendix 2: Technical Specification – Supplier Compliance

Appendix 3: Operational Risk Register – Supplier Compliance

Contact Officer: Rory O'Neill – Director, London Trams
Number: [redacted]
Email: [redacted]

Appendix 1: Authority Approval Signatures Sheet

	Signature	Date
This section should be edited according to the approval being sought with each submission.		
Rory O'Neill Director, London Trams	_____	_____
Gareth Powell Director of TfL Strategy and Contracted Services	_____	_____

Distributed to

Project Controls Finance Team	**SAP entry**

Appendix 2: Technical Specification – Supplier Compliance

Appendix 3: Operational Risk Register – Supplier Compliance