RAIL RELIABILITY TASKFORCE REPORT

Submitted to:

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1 Table of Contents

2 Executive Summary 2
3 The Action Plan 7
3.1 Addressing Recent Service Disruptions 7
3.2 Enhancing Asset Management 8
3.2.1 Asset Renewal and Spares Management 8
3.2.2 Design Standardisation across Rail Systems 15
3.2.3 Leveraging Technology and Data to Improve Reliability 16
3.3 Deepening Workforce Capabilities 18
3.3.1 Building a More Technologically-Skilled Workforce 18
3.3.2 Expanding the scope of the Singapore Rail Academy 19
3.3.3 More staff rotations between the LTA and rail operators 22
3.3.4 Expanding Professional Certification of O&M staff 23
3.4 Improving Rail Service Recovery and Commuter Management 24
3.4.1 Enhancing standard operating procedures to manage service disruptions on the ground 24
3.4.2 Improving alternative travel options for commuters 28
3.4.3 Improving Guidance to Commuters during Disruptions 28
4 Conclusion: An Ongoing Process 32
Annexes 33
Annex A: Composition of Taskforce 34
Annex B: Composition of Independent Advisory Panel 35
Annex C: List of recommended key action plans and enhancements 37
Annex D: Condition Monitoring Baseline 39

2 Executive Summary

1. Singapore's rail reliability remains one of the highest in the world. Since 2019, the mean kilometres between failure (MKBF) has been above one million train-km for the MRT network, which is higher than most other cities. This was achieved through the combined efforts of the rail operators, the workers and the regulator to prioritise the reliability of train services, focusing on maintenance and regular system upgrades.

2. However, maintaining a high level of rail reliability is increasingly challenging, as the MRT network continues to age. Parts of the MRT network are now over 40 years old. As new train lines are built, it will be increasing challenging to integrate new technology with older ones, while maintaining and upgrading the existing systems and components to meet desired reliability levels.

3. It is in this context that the series of train service disruptions that occurred from July to September 2025 should be assessed. The 15 incidents, which disrupted or delayed services across different rail lines, were due to different and unrelated causes. Notwithstanding this, the Rail Reliability Taskforce was formed on 19 September 2025 to examine the incidents more closely and to develop and implement solutions to improve rail reliability and responses to train service disruptions. An Independent Advisory Panel was also appointed to advise the Taskforce, comprising five industry leaders and experts who have held key engineering and management roles in the rail industry around the world, with deep experience in the operations, management and maintenance of core rail systems.

4. The Taskforce commenced its review with joint technical audits of systems related to the train service disruptions from July to September 2025. The Taskforce also undertook a comprehensive and in-depth review of rail operations and maintenance – specifically asset management, workforce capabilities, as well as rail service recovery and commuter management. Detailed technical workshops, site visits, direct ground observations, and interviews with ground staff were conducted. This report presents the joint findings of the Taskforce, including the advice of the Independent Advisory Panel.

<u>Addressing Recent Service Disruptions</u>

5. The train service disruptions from July to September 2025 occurred across different MRT and LRT lines, and involved different systems such as signalling, power, and rolling stock (i.e. trains). The Taskforce found that while the underlying causes of the incidents were unrelated, there were several areas for improvement. These include adding additional backup or bypass systems and procedures to allow train operations to continue or resume more quickly after a minor fault has occurred.

This should be done with safety remaining the top priority, and the prevailing approach to halt service and assess the cause of the fault first, so that the safety of commuters is never compromised.

Enhancing Asset Management

Asset Renewal and Spares Management

6. Currently, renewals of major rail systems are scheduled based on: (a) the Original Equipment Manufacturers' (OEMs') recommendations on service life and whether the system's components continue to be supported by manufacturers; (b) the system's historical operational performance; and (c) its current condition. The ability of the LTA and rail operators to schedule and execute the renewals is also constrained by the availability of engineering hours and manpower.

7. Given an ageing MRT network and consequently a higher propensity for component failures, this Taskforce recommends prioritising the renewal of three core systems (trains, signalling, and power) and to shorten the time taken to renew these systems. This is because a major failure for any of these three systems has direct and significant impact on operations with longer service delays or stoppages. To achieve this, more engineering hours should be set aside, including through full day service closures, to carry out such works expeditiously, efficiently and safely.

8. In addition, the immediate availability of spare components to replace faulty ones is necessary to speed up the resolution of major incidents. There are thousands of component types on average for a single train line. The management of spares is a balancing exercise. Keeping more spares incurs additional costs for storage and upkeep, and the risk of technological obsolescence. But if the required spare parts are not immediately available, the fault will take more time to fix. The Taskforce thus recommends the LTA work with the rail operators to collect and use more data to forecast the need for spares and build additional buffer into spares projections. To manage the overall cost from this approach, the Taskforce further recommends to procure more spares during initial production to leverage economies of scale, and for the LTA and the operators to co-share the cost of holding a larger buffer. The Taskforce also recommends procuring extended service support from OEMs, localising capabilities to produce such spares and carry out repairs, and increasing the range of sources for such spares.

Design Standardisation across Rail Systems

9. In the longer run, the Taskforce also identified the importance of more upfront design standardisation across rail systems to simplify operations and maintenance. This should include more modular systems architecture, to facilitate incremental upgrades as well as simpler and faster replacement of sub-systems. These adjustments will require significant changes to the LTA's procurement approaches. The Taskforce also recommends that the LTA form strategic partnerships with other metro operators and OEMs on common design and procurement standards.

Leveraging Technology and Data to Improve Reliability

10. In addition, the Taskforce also recommends using technology and data more to improve the reliability of the rail network. In particular, data held by the LTA and the rail operators should be better integrated to improve joint decision making. These include several different condition monitoring systems, acquired at different times from different manufacturers. The LTA and operators should work towards one common system of monitoring and analysing the data across the entire rail network rather than at the line level, and take advantage of advancements in digital technology, artificial intelligence and automation to improve maintenance capabilities. Specifically, the Taskforce recommends:

    a. Establishing a comprehensive and standardised practice of condition monitoring across the MRT network, based on an integrated data collection and management system across the LTA and rail operators, so as to make more timely interventions on pre-emptive maintenance and replacement of critical components.

    b. More extensive use of robotics and automation to augment the rail workforce, so that maintenance tasks can be carried out more efficiently.

Deepening Workforce Capabilities

Building a More Technologically-Skilled Workforce

11. With digitalisation and automation, maintenance capabilities in the rail sector will move increasingly towards data-driven diagnostics and proactive intervention. Traditionally, the rail sector has not been a lead adopter of such technologies. In order to benefit from such technological advancements, the workforce must be equipped with the skills required for this new way of working. To catalyse this shift, the Taskforce proposes for the LTA to co-fund and work with the rail operators on initiatives to identify and implement new approaches, workflows and upskilling for staff in areas such as condition monitoring and predictive maintenance.

12. The Taskforce also recommends that the LTA and operators step up the use of new tech-enabled training methods such as scenario/team-based training and the use of simulators for enhanced coordination and communication, to improve the ability of the rail workforce to respond to incidents.

13. To support the rail operators in the above transformation efforts, the Taskforce proposes that a fund be set up by the LTA to provide targeted grants to deploy innovative projects that support the growth of a more technologically-skilled workforce. This initiative will raise the perception of the sector to one that offers high-value and skilled jobs in a digitalised environment.

Expanding the scope of the Singapore Rail Academy

14. The Taskforce recommends strengthening efforts to improve the standard, structure, and scope of rail workforce training. The Singapore Rail Academy's (SGRA) training mandate should be expanded to include the harmonisation of training policies and standards for the entire rail operations and maintenance (O&M) workforce and to prepare the rail workforce for future job scopes that will be more digital, automated, and knowledge-intensive. To strengthen the SGRA to play these roles, the Taskforce recommends for the SGRA to be jointly administered by the LTA and the rail operators. This is so that there is joint ownership of training outcomes, including on policies, standards, assessments and certifications for the workforce, combining frontline experience with a broad-based understanding of systems design and asset management across different operators and lines.

More staff rotations between the LTA and rail operators

15. To build common perspectives and capabilities, the Taskforce recommends more structured and frequent staff rotations between the LTA and the rail operators. LTA officers will gain valuable frontline experience to inform upstream system design;

while operators' staff will deepen their understanding of rail systems design and asset management, to better inform maintenance practices on the ground.

Expanding Professional Certification of Operations and Maintenance (*O&M) Staff*

16. The Taskforce also recommends enhancing the professional certification framework for rail engineers and technicians by setting clear certification targets and expanding certification coverage. This can be accomplished by having the SGRA develop certification schemes for more junior levels such as assistant engineers and technicians, as well as operations staff, and for rail operators to incorporate certification in their consideration of career progress and remuneration.

17. To drive this effort, the Taskforce recommends setting a target for a critical mass of the rail O&M workforce – around 20% – to be chartered or certified, as a core pool of master engineers, technicians, and operations staff to impart critical skills and knowledge to more junior colleagues.

<u>Improving Rail Service Recovery and Commuter Management</u>

18. Maintaining a high level of rail reliability reduces, but does not eliminate, delays and disruptions, which will still happen from time to time. Thus, it is the view of the Taskforce that strengthening service recovery processes and maintaining journey continuity for commuters is as important as efforts to maintain a high level of rail reliability. There is more that should be done on this front, including:

    a. Enhancing standard operating procedures to manage service disruptions on the ground, which will enable quicker and more effective resumption of service after faults. This includes developing and exercising such procedures in the course of normal operations.

    b. Improving alternative travel options for commuters by developing provisions for quicker deployment of bridging buses during service disruptions.

    c. Adopting a more commuter-centric mindset to guide commuters during service delays or disruptions. This includes providing more precise, tailored and real time information to commuters on system status and alternative travel routes, as well as better wayfinding on the ground to better support affected commuters at stations.

3 The Action Plan

3.1 Addressing Recent Service Disruptions

a. The Taskforce conducted joint technical audits of rail sub-systems related to the disruptions that occurred from July to September 2025. These incidents occurred across different MRT and LRT lines, and involved different systems such as signalling, power and rolling stock (i.e. trains). While the underlying causes of the incidents were found to be unrelated, the Taskforce determined that there were several areas for improvement, and recommends:

   i. Introducing additional backup systems to allow train operations to continue even after a fault has occurred, instead of having to wait for the fault to be fully resolved. This is especially critical for faulty components that may have long lead times for repair or replacement.

      1. For instance, the North East Line (NEL) is currently powered by two separate power intakes – one at the NEL depot in Sengkang and another near Stamford Road that is co-located with a power intake for the North-South East-West Lines (NSEWL). Currently, if one power intake encounters a fault, the NEL may only be able to operate at lower frequencies and/or lower speeds.

      2. The **Taskforce recommends implementing a more resilient backup system for the NEL**, by: (a) upgrading the NEL depot intake to a higher power capacity, so that it is capable of comfortably powering the entire NEL on its own and also providing buffer to cater for future needs; and (b) modifying another higher-capacity sub-station at the Stamford Intake (that currently serves the NSEWL) to be on standby, to serve as an additional back-up power intake for the NEL in the event of a fault at the NEL depot.

      3. In the longer term, **the Taskforce recommends that a new higher-capacity intake** be built in the city area as a dedicated back-up intake for the NEL.

   ii. Incorporating additional bypass systems and operating procedures that allow for faster recovery of train operations. This should be done with safety remaining the top priority, and the prevailing approach to halt service and assess the cause of the fault first, so that the safety of commuters is never compromised.

1. For instance, when a fault in signalling equipment onboard a train is detected, the Automatic Train Protection (ATP) sub-system will automatically engage the emergency brakes to bring the train to a halt for safety reasons. The signalling system will then need to be checked and any faults resolved, before the affected train can start moving automatically again.

2. **The Taskforce recommends looking into the feasibility of implementing an ATP bypass feature that would allow the affected train to be manually driven** (at slower speeds) to detrain passengers at the next station safely, even as checks on the signalling system are ongoing. Metro systems in other cities such as Hong Kong, Taipei and Guangzhou have implemented such an ATP bypass feature, which reduces the need for detrainment onto tracks, and allows the affected train to be withdrawn as soon as possible so that normal train operations can resume faster.

iii. **Training and familiarisation of rail operator staff with these new systems and processes**, so that they can help to facilitate faster service recovery in the event of faults.

b. Please refer to Annex C for the complete list of recommended key action plans and enhancements for the various sub-systems related to recent incidents, including both immediate and longer-term measures. Beyond these, potential vulnerabilities in the NEL and SPLRT power systems may need to be addressed through longer-term renewal solutions, which is addressed in the next section (see Box 1 below).

3.2 Enhancing Asset Management

a. The Taskforce also conducted a comprehensive review of the existing framework for managing rail assets, and recommends solutions for wider system-level improvements to build longer-term system resilience.

3.2.1 Asset Renewal and Spares Management

3.2.1.1 Prioritising Renewals of Core Rail Systems

a. The LTA currently schedules and prioritises the renewals of major rail systems by taking into account:

i. Original Equipment Manufacturers' (OEMs) recommendations on service life. OEMs typically provide the service life of equipment purchased from

them, which serves as an indication of the duration for which the equipment is expected to perform its function reasonably well.

ii. The Performance, Condition, and Supportability of the System. The LTA also takes into consideration the historical operational performance of the system; the current condition of the system based on physical inspections and functional tests; and whether the system components continue to be supported by the manufacturers. This is because actual equipment performance can vary widely under real operating loads and local environmental conditions.

1. For instance, some assets may remain serviceable even after their service life, if they have been well maintained, continue to function well, and the system components continue to be produced and supported by the manufacturers.

2. Conversely, some assets may deteriorate rapidly and unexpectedly, instead of in a linear or predictable manner, leaving little time for corrective actions before complete failure. This risk is intensified when components are no longer being produced or supported by manufacturers as the system ages, which complicates both procurement and management of replacement parts.

iii. Availability of Engineering Hours and Manpower. The timing of system renewals also takes into account the availability of engineering hours and manpower to carry out such works, which constrains the ability of the LTA and rail operators to schedule and execute the renewals. The current limited engineering hours each night have to be shared amongst various competing needs – routine maintenance tasks, system renewal works, as well as integration and testing works for rail expansion. System renewal works have to be carefully scheduled so that they do not come at the expense of important maintenance or testing works, and to minimise the impact on commuters.

b. This approach is intended to strike a balance between rail reliability, fiscal responsibility, and the availability of time and manpower for works. However, as the rail network continues to age, the LTA and the rail operators are starting to see the convergence of risk factors that lead to a higher propensity for component failures – similar components failing at the same time, increasing wear and tear, and components no longer being produced or supported by manufacturers. This makes high reliability standards increasingly difficult to sustain (see Box 1 below).

c. Following its review of the existing asset renewal framework, **the Taskforce recommends prioritising the renewal of three core rail systems – specifically rolling stock (i.e. trains), signalling, and power – and shortening the time taken to renew these systems.**

   i. This is in consideration of the fact that based on experience, a major failure for any of these three systems has direct and significant impact on rail operations, typically resulting in longer service delays or stoppages.

   ii. Over the next decade, there will be significant renewal works taking place for these rail systems – this includes the renewal of the power systems for the NEL and SPLRT, as well as the renewal of the signalling systems for the NEL and CCL.

d. To shorten the overall time needed to renew these systems, the engineering hours would need to be increased to carry out these works expeditiously, efficiently and safely. This means that more adjustments, of longer durations, to rail services will need to be scheduled, including full day service closures where needed.

e. This trade-off is necessary given that the simultaneous renewal of multiple systems, while maintaining day-to-day rail operations, inherently poses coordination challenges and carries risk. More dedicated time allows such renewal works to be carried out in a safe and timely manner, and for the new systems to be properly tested and stabilised.

Box 1: Renewal of Rail Power Supply Systems

An example of how ageing rail systems may see a convergence of risk factors that lead to a higher propensity for failure over time can be seen in rail power supply systems.

For rail power supply systems, the impact of the failure of one component is rarely confined to that sole component; such failures may also impact adjacent components and equipment.

- Take for example a rail line whose traction power is being provided by a series of traction power sub-stations, each of which has a pair of complementing transformers.
- If one traction power transformer fails, it will result in the complementing transformer in the same traction power sub-station having to take on extra electrical load.
- In addition, if other traction power sub-stations are already operating at near maximum capacity, the traction transformers along the line at adjacent sub-stations will similarly be impacted and strained. This not

only increases the risks of cascading failures, but also has an impact on the condition of these other traction transformers.

As such aging transformers are more prone to failure, the Taskforce recommends to bring forward the renewal of the NEL power supply system to commence in 2026, and to cater for service closures, if necessary, for this to be completed in good time.

f. As part of this process, **the Taskforce also recommends that the LTA and rail operators work together to enhance the existing framework for scheduling and prioritising the renewal timelines of rail systems**, in particular how the performance, condition, and supportability of the system are being measured and assessed. This will help to improve the accuracy and effectiveness of renewal decisions. The Taskforce recommends:

   i. Leveraging more advanced methods, such as **more extensive condition monitoring** (see Section 3.2.3 below), to continuously and proactively identify parts and equipment showing signs of deterioration for earlier intervention.

   ii. **Increasing the frequency of inspections and tests** for parts and equipment that are critical to rail operations, to enable earlier identification of emerging issues.

   iii. **Giving higher priority to critical systems** whose failures would have a higher impact on rail services and public safety, when scheduling renewal works.

g. While the renewals of rail systems are ongoing, in the immediate term, **the Taskforce recommends for the LTA to work closely with the rail operators to identify and monitor specific sub-systems that tend to have a larger impact to train service, and develop a deeper understanding of their various failure modes and mitigating measures**.

   i. This is because different sub-systems within a broader rail system do not necessarily have the same service life, nor do they necessarily deteriorate at the same pace; some sub-systems may experience more frequent failures earlier than others.

   ii. Identifying these sub-systems requires close monitoring at the sub-system level, and timely intervention before risks materialise into faults. Condition monitoring systems (see Section 3.2.3 below) should be put in place for key systems such as doors, air-conditioning, brakes and propulsion, to help rail

operators track their health and performance regularly. When there are symptoms or data that trends upwards, the rail operators will be able to inspect and check for issues before they lead to other concerns.

3.2.1.2 Enhancing Management of Spares and Supply Chain Resilience

a. The rail system comprises thousands of electrical and mechanical components. In the event of a component failure, the immediate availability of spare components to replace faulty ones is necessary to speed up the resolution of major incidents. However, the management of spares is inherently onerous for the rail operators, for the following reasons:

   i. Accurately predicting the need for critical spares is challenging because component lifespans vary widely under different operating conditions, parts become obsolete at different paces, and failure patterns can be unpredictable.

   ii. Not all spares can be obtained on demand. The lead times required to procure foreign-sourced parts can be long and are not easily expedited, which may result in an extended period of system vulnerability if there are insufficient spares to remedy faults that could arise suddenly. This necessitates stocking up sufficient levels of such spares.

   iii. Stocking spares is costly. Spare parts can deteriorate if they sit in storage for an extended period of time. There is also the risk of systems and components becoming obsolete and having to be replaced early, resulting in any remaining spares becoming unnecessary. In such cases, spares must be written off, with operators bearing write-off costs in the order of millions of dollars.

b. Today, the LTA and the rail operators endeavour to strike a balance between procuring and stocking a reasonable level of spares to be able to respond to component failures, while also avoiding over-stocking of spares to minimise unnecessary costs. In most instances, there are sufficient spares for rail operators to tap on in the event of a fault or breakdown.

c. However, the Taskforce recognises that the inherent challenges in spares management will only become starker over time as the rail network continues to age and failure rates start to increase, and the growing burden the rail operators have to bear to manage a wider portfolio of assets due to an increasing number of lines and systems.

d. Therefore, to address this issue holistically as a sector and to better balance the risks involved in management of spares, the Taskforce recommends:

   i. **Systematically collecting more data on component performance, failure rates, environmental influences and maintenance history, to improve operators' ability to forecast the need for spares**. For example, with better data, operators can refine their assumed failure rates of components rather than relying on OEMs' recommendations, and stock more spares as necessary.

   ii. **Building additional buffer into spares projections and buying more spares, especially when components are nearing obsolescence** (i.e. the point when the OEM no longer produces or supports the components). When such obsolescence occurs, it will no longer be possible to procure spares for such components from the OEM, which affects the rail operators' ability to sustain reliable operations of the affected system over time, even if it is still generally performing well. By buying more spares while they are still available, there will be greater confidence in keeping systems operating reliably for a longer period of time, up to the point when it is eventually due for renewal.

e. These strategies will increase the cost required to stock spares. To manage the overall cost and risk to the system, the Taskforce further recommends:

   i. **Procuring extended service support from OEMs for critical rail systems**, with scope for a technology refresh (i.e. upgrading or replacing hardware/software of the system or sub-systems when support for older hardware/software ends). So far, the LTA and rail operators have secured such extended service support for systems such as signalling and rolling stock for some rail lines. Going forward, the Taskforce recommends procuring such extended service support across critical rail systems and lines. This approach will help to address potential obsolescence issues and safeguard the availability of spares and technical support from the OEM throughout the period of service support. For instance, some train manufacturers are moving towards guaranteeing their support for spares and overhauls for up to 17 years with milestone-based payment schemes.

   ii. **Procuring spares during the project phase to better leverage economies of scale during initial production.** The prices of spares can also be negotiated and locked in when systems are being procured for price transparency, and scheduled for delivery at a later stage to reduce the loss of spares to deterioration.

iii. **Appropriate co-sharing arrangements for the cost of holding a larger buffer of spares** could be explored between the LTA and the rail operators.

f. In addition, the **Taskforce also recommends strengthening supply chain resilience and safeguarding access to important spares through a multi-pronged approach** involving:

i. **Localising repair capabilities** to improve repair turnaround times for rail systems, and reduce the extent of reliance on stocking of spares in the longer run (see Box 2 below).

Box 2: Localising repair capabilities for electronic cards

For instance, one key area of focus would be strengthening local capabilities in electronic card repair and redesign.

Such electronic cards perform specific automated functions or tasks in different rail systems, such as signalling and communications systems. When these electronic cards fail, they would have to be sent back to their OEM's facilities overseas and subsequently shipped back after repairs. In the meantime, spare cards must be used.

The LTA and the rail operators have recognised the need to strengthen capabilities in this area, which would allow faulty electronic cards to be repaired more quickly, and reduce the need to maintain higher stock levels of such electronic cards, which will incur additional costs and which may also deteriorate over time. The LTA and rail operators have been proactively taking steps to enhance capabilities in this area. As of today, operators have achieved the capability to perform basic to moderate repairs to electronic cards, and will aspire towards being able to make more advanced repairs in the future.

ii. **Exploring a wider range of alternative sources for spares if localisation is not feasible**. Given Singapore's small market, the Taskforce recommends explore consolidating purchases with other metro operators and tapping into their network to reap economies of scale and secure greater accessibility to spare parts.

g. The recommendations above will result in higher costs in the steady state, due to the need to accommodate the storage of higher stock levels of spares, and to manage obsolescence risks. However, this should be seen as an "insurance premium" for a much more resilient system that is better able to respond to unexpected failures through timely component replacements. By partnering with like-minded metro operators, there is also the potential to reduce such costs in the long run through leveraging economies of scale by working with

such partners when negotiating with OEMs, as well as investing in the localisation of repair capabilities.

3.2.2 Design Standardisation across Rail Systems

a. The rail network comprises different operating lines made up of hundreds of sub-systems, with the procurement of rail systems carried out separately for each line over the past forty years. Tender specifications have typically been scoped at the line level, rather than limiting tenderers to supply systems of the same design across lines to avoid limiting the competitiveness of tender proposals. Keeping with this value-for-money procurement approach has resulted in some degree of variability across rail sub-systems within the rail network.

b. In the longer term, the Taskforce identified the need for **more upfront design standardisation across rail sub-systems, and to avoid the proliferation of customised solutions**. Having more standardised designs will improve predictability of system performance and simplify maintenance planning. Standardised designs also mean that components and spares can be shared across different rail lines, making sourcing and replacement of these parts easier. In these ways, standardised designs can strengthen the resilience of the rail system.

c. In addition, **the Taskforce also recommends a move towards modular architecture in designing rail systems**, to facilitate incremental upgrades as well as simpler and faster replacement of sub-systems when they no longer perform well. A modular approach also allows systems to be scaled incrementally without the need for a complete overhaul, minimising downtime and ensuring service continuity.

d. These adjustments will require significant to changes to the LTA's current procurement approaches. To this end, **Taskforce recommends that the LTA promote these design changes across rail systems, and to better coordinate this area of work with the rail operators**, by:

    i. **Forming strategic partnerships with other metro operators and OEMs to unlock economies of scale**. Such partnerships can also foster a cooperative environment for sharing knowledge, technologies, and best practices, ultimately improving technical knowledge and local maintenance capabilities.

    ii. **Adapting procurement strategies to achieve standardised designs and higher system commonalities among rail systems**. For instance, the

procurement of new trains has typically been conducted separately for each rail line in the past, which results in having to engage different OEMs, different maintenance procedures, and separate stockpiles of different spare components for each line. Going forward, one possibility is to look into clustering train buys across lines where opportune (e.g. for both the NEL and CCL as both lines require expansion and renewals to their fleets during a similar timeframe).

iii. **Developing the necessary contractual frameworks to facilitate collaboration with metro partners and suppliers**. These frameworks provide a structure for long-term partnerships, enabling agile procurement and ensuring alignment across all parties.

3.2.3 Leveraging Technology and Data to Improve Reliability

3.2.3.1 More Comprehensive Use of Condition Monitoring

a. While there are currently various condition monitoring systems used across the rail network, these are not always standardised across lines and operators, as each system was acquired at different times from different manufacturers. **The Taskforce recommends establishing a more comprehensive and standardised practice of condition monitoring across all lines and operators in the rail network**.

b. In order to promote this, as part of the Taskforce's work, the LTA and rail operators have established a preliminary baseline standard for condition monitoring across the entire rail network, which outlines the specific sub-systems or assets that should be equipped with condition monitoring capabilities, as well as the specific parameters that should be monitored.

c. These unified standards for condition monitoring aim to establish better monitoring of rail asset health across the whole network, and enable pre-emptive fault detection through big data analytics. A first draft of the condition monitoring baseline accompanied with a roadmap to implement these systematically is at Annex D.

d. This effort is expected to take place over several years. While there are currently no international standards to guide the setting up of comprehensive condition monitoring systems, the LTA and rail operators will establish collaboration with like-minded metro operators in other cities to shorten the learning curve.

3.2.3.2 Establishing a Common Rail Data Platform

a. As rail systems are equipped with a higher common baseline of condition monitoring capabilities, it is equally important that the data collected is properly used to enhance decision-making at a systems level, rather than only at the line level. Currently, the respective operators collect their own data that they deem necessary for the maintenance and operational processes. **The Taskforce recommends establishing a common and integrated data collection and management system across the LTA and rail operators**, so that data can be made available to different users, who would also be empowered with the necessary data analytics tools.

b. This fundamental shift will mean that standardised data on asset condition and performance can be shared among the LTA and rail operators. This level of transparency will be mutually beneficial – more comprehensive and up-to-date data on asset performance across the entire network will facilitate performance benchmarking across different systems and lines, joint decision-making between the LTA and rail operators on asset management and renewals, and more timely interventions on pre-emptive maintenance and replacement of critical components by the rail operators.

c. This will take a concerted effort from the LTA and rail operators to devise and establish a common digital architecture across the rail sector to capture data, as well as the harmonisation of data standards across different systems in different lines, and different rail operators. At the ground level, staff will also need to be trained with the necessary skills and discipline to capture good quality data for the common system.

d. To ensure that this effort achieves its desired outcome, a governance system has to be put in place. **The Taskforce recommends that the LTA and the rail operators establish a formal agreement: (i) on the design, installation and use of condition monitoring tools, and (ii) to share the data across the sector for better monitoring and insights in asset management**.

e. The time and effort to establish this integrated data collection and management system is a worthwhile investment, as it will set a strong foundation for the rail sector to eventually better deploy digital technology such as AI to improve rail reliability.

3.2.3.3 Augmenting the Rail Maintenance Workforce with Robotics and Automation

a. As the rail network expands and asset complexity grows, **the Taskforce recommends further augmenting the rail maintenance workforce with**

more extensive use of robotics and automation, so that routine maintenance tasks can be carried out more efficiently. This should build on existing efforts by the rail operators to introduce robotics and automation into maintenance processes (see Box 3 below), and go beyond pilot trials to scaled-up implementation across the rail sector.

i. For example, one area that the LTA and rail operators are currently looking into is the use of robotic inspection capabilities and video analytics for infrastructure maintenance, which will enable consistent high-precision scans of tunnels and tracks, freeing up engineers to focus on more complex analytics rather than relying on manual checks.

Box 3: Efforts to introduce Robotics/Automation into Maintenance

Recently, SMRT has implemented automated processes for train overhauls at the Bishan Depot, which has halved the time needed to overhaul a train. This has allowed the depot to double its monthly train overhaul capacity without having to expand its footprint, while also freeing up maintenance staff to focus on more complex maintenance tasks – which are both critical in overcoming challenges such as land constraints and a shrinking and ageing workforce. The target is to expand similar provisions and capabilities to other rail depots.

SBST has also developed an autonomous, AI-enabled robot equipped with sensors and 360° cameras to conduct train inspections. Leveraging advanced video analytics, it can detect anomalies such as missing screws and panels on the underside of the carriage, allowing for prompt rectification. This innovation streamlines the inspection process, enhancing efficiency and reliability while enabling technicians to focus on more complex maintenance tasks. SBST plans to expand the adoption of this technology and is currently conducting a trial with a 'wheeled' version of the robot at Sengkang depot.

3.3 Deepening Workforce Capabilities

3.3.1 Building a More Technologically-Skilled Workforce

a. Digitalisation and automation are critical levers to address the fundamental challenges facing the rail sector, such as asset renewal, maintenance, operations, cyber risks, and an aging workforce demographic. This shift requires a transformation in workflows, which must evolve to integrate advanced analytics, automated decision-support systems, and coordinated digital platforms.

b. To catalyse this shift, **the Taskforce proposes for the LTA to co-fund and work with the rail operators on initiatives to identify and implement new approaches, workflows, and upskilling for staff** in areas such as condition

monitoring, automation, enhanced cybersecurity, asset management systems, and predictive maintenance.

c. **The Taskforce also recommends that the LTA and rail operators step up the use of new tech-enabled training methods** such as scenario/team-based training, as well as more extensive use of training simulators, to improve the ability of the rail workforce to respond to incidents. In particular, rail training simulators are essential to providing realistic, risk-free practice for both routine O&M and emergency procedures. Today, rail operators have a range of training simulators e.g. CABSIM for train driving simulations, Computer Simulation Facility (CSF) for signalling system simulations, and maintenance test jigs for training on various maintenance tasks.

d. To support the rail operators in the above transformation efforts, **the Taskforce proposes that the LTA set up a fund to provide the rail operators with targeted grants to conduct small-scale deployments of innovative projects that improve the use of technology by rail workers**. This aims to reduce the barriers to innovation and enable validation of the operational impact of such deployments, which will hopefully pave the way for full-scale implementation. Ultimately, this serves the shared goal between the LTA and rail operators, to raise the perception of the rail sector to one that offers high-value and skilled jobs in a digitalised environment.

3.3.2 Expanding the scope of the Singapore Rail Academy

a. A best-in-class rail system requires a highly professional and technically competent workforce, working together in cohesive teams that are well-schooled in real-world operational scenarios. Today the rail operations and maintenance (O&M) workforce is around 9,000 strong, comprising approximately: (i) 700 engineers; (ii) 4,000 assistant engineers and technicians; and (iii) 4,300 operations staff. This number is expected to grow by more than ~1,500 by 2030 as the rail network expands. Therefore, it is critical to upgrade the standard, structure and scope of rail workforce training to build capabilities, retain talent and meet future needs.

b. The SGRA was set up by the LTA in 2017 to provide common training to engineers newly-recruited by the LTA and rail operators. More than 20 courses are conducted every year to cross-train about 500 rail engineers who are new to the rail industry. These engineers learn about the interdependencies among the sub-systems – with the rail operators' engineers better understanding upstream design considerations, and LTA engineers better appreciating downstream O&M implications.

c. Complementing the SGRA, both rail operators have their respective well-established training institutes, which focus on training their respective wider O&M workforces, including in line-specific competencies.

   i. The SMRT Institute (SMRTi), formed in 2009, was built upon the foundation of the SMRT Training School, which began operations in the 1980s. It conducts onboarding programmes, vocational and task qualification programmes, and other skills development courses including safety, services, leadership courses. All SMRT employees undergo training at the SMRTi.

   ii. SBST had a training department that started in 2000s before the formation of the Rail Training Institute (RTI) in 2022. The RTI created new capacity for training development and building of capabilities. It also strengthens the technical training in SBST by redesigning training curriculums and leveraging new technologies. Today, all newly hired SBST O&M staff undergo training at the RTI.

d. The existing training system has enabled the LTA and rail operators to equip engineers, assistant engineers and technicians, and operations staff with the necessary skills and knowledge to maintain and operate the rail system. However, there is room to enhance the system. As the LTA expands the rail network, open new lines, and procure more advanced trains/systems, there are opportunities to more effectively harness technology to transform the nature of work and optimise finite training resources.

e. Building on the strength of SGRA's current training of rail engineers, as well as the rail operators' well-established training programmes for their wider O&M workforce, **the Taskforce recommends that SGRA's training mandate be expanded to cover the harmonisation of training policies and standards for both rail maintenance and operations across the rail operators, and that these standards be elevated to prepare the workforce for the future**, where job scopes may become more digital and automated, requiring deep expertise and experience.

f. To strengthen the SGRA to play these roles, **the Taskforce also proposes that the SGRA be jointly administered by the LTA and the two rail operators going forward**, to ensure joint ownership of training outcomes and enable active participation of the rail operators in shaping common training policies, standards, assessments and certifications for their O&M workforce. A joint training approach will improve the quality and rigour of SGRA's curriculum and uplift standards across a wider proportion of the rail operators' workforce, by harnessing the rail operators' frontline O&M experience, while the LTA ensures that new rail staff gain a broad-based understanding in systems design and

asset management across different operators and lines. This ultimately aims to transform the rail workforce into a professional, progressive and prestigious one.

g. **The Taskforce recommends for the restructured SGRA to undertake the following capability development initiatives for the rail sector**:

i. Common curriculum for engineers. The new SGRA will continue to **develop and deliver common training for rail systems engineers employed by the LTA and rail operators**. The engineers will learn about the interdependencies between the sub-systems, and between the various life stages from design, build, to operations & maintenance.

ii. Common initial skills/knowledge for new O&M staff. While training specific to the characteristics of individual lines and systems will continue to be carried out by the respective rail operators' training institutes, the Taskforce recommends that the **SGRA develop and standardise the training policy and curriculum for common initial skills and knowledge across the rail O&M workforce**. SGRA will work with partners such as the Institutes of Higher Learning (IHLs) for content development and course delivery, and possibly frontload some of the content into IHLs' pre-employment training syllabus. For example, ITE is introducing a 3-year Higher NITEC course for Rapid Transit Engineering with a 6-month work attachment to the rail operators, during which on-job-training for common basic skills like lock wiring, torque loading and other relevant maintenance hand skills, may be incorporated.

iii. Set standards on rail operators' training of their staff. To ensure rail operators' training for specific lines/systems is of quality and continues to be rigorous, **SGRA will review and benchmark the curriculum and training programmes for O&M job roles**, taking reference from best practices by overseas operators. The objectives are to ensure adherence to the jointly defined O&M job roles' competencies and that any training gaps are addressed. To ensure uniform implementation of the common standards and criteria developed, SGRA will also audit the training and assessment carried out by the rail operators' respective training institutes.

iv. Level up workforce with OEM System knowledge. **Engage OEMs to conduct subsequent in-depth training** after the systems have been commissioned, and organise targeted training where system/design knowledge gaps are identified.

v. Procure Integrated Training Simulators. There are opportunities to step up the use of advanced simulation equipment for training across the rail sector.

Simulators are now available for joint operational scenario drills that cover a much wider range of O&M procedures, such as system failures, train disruptions, outbreaks of fire within the train cabin etc. Staff can be put through individual or team drills on the established procedures. The Taskforce recommends that **the SGRA study and consider procuring such integrated training simulators and test jigs to support training across the entire rail sector**.

vi. Periodic re-assessment of staff competency. As part of efforts to ensure that the workforce remains updated and competent in their respective jobs**, a periodic re-assessment framework will be developed and conducted by the SGRA**. The existing assessment standards of the rail operators will be aligned and benchmarked against international best practices. New integrated simulators/test jigs (see above) will be used for assessment of skillsets, for drill practices, and for testing of troubleshooting procedures.

3.3.3 More staff rotations between the LTA and rail operators

a. Under Singapore's rail financing framework, the LTA designs and builds rail lines and extensions, while rail operators are responsible for the operation and maintenance of their respective lines. This creates an inevitable gap between the asset owner (LTA) and the rail operators. For instance, the LTA, as the initial designer, has a more comprehensive understanding of the overall system, and how the sub-systems interact with each other, compared to rail operators who are focused on the lines they run/maintain. Conversely, rail operators will build up more detailed understanding of the systems as they maintain and operate the assets; and would have insights on how to improve the design of the system. These insights may not necessarily percolate to the asset owner, to improve future systems. With staff and organisations having ownership of different phases of the lifecycle of a rail line, it is important to build mutual understanding of the challenges and considerations faced in designing, building, operating and maintaining systems for reliability and performance.

b. More frequent staff rotations provide mutual benefits where (i) LTA officers will gain valuable frontline experience to inform upstream systems design; and (ii) the rail operators' staff will deepen their understanding of rail systems design and asset management, to better inform maintenance practices on the ground. This exchange will ultimately build a stronger and more well-rounded leadership bench, and foster stronger alignment across the sector.

c. While there are already secondments between the LTA and rail operators, doing so in a more structured and extensive manner will better equip the next generation of rail leaders with the necessary competencies across the asset

lifecycle. **The Taskforce recommends more structured and frequent staff rotations between the LTA and rail operators**, with the LTA and rail operators jointly identifying priority areas for secondment and establishing an annual target to guide such deployments.

d. Currently, the project management of new MRT lines and renewal of systems are managed by the LTA. **The Taskforce also recommends that dedicated rail operator staff be involved in these projects full-time** to develop a good grasp of the systems and equipment that will be handed over to them for maintenance.

3.3.4 Expanding Professional Certification of O&M staff

a. The Institute of Engineers Singapore (IES) currently certifies the Chartered Engineer (CEng), Technician (CETn) and Technologist (CETg) for the rail industry. These IES chartership schemes serve as nationally-recognised credentials that provide professional recognition of the deep expertise of these more experienced rail engineers and technicians.

   i. Currently, about 16% (~115) of the rail operators' engineers have been successfully certified as Chartered Engineers.

   ii. On the other hand, less than 2% (~76) of maintenance Assistant Engineers and Technicians are currently certified as Chartered Technicians or Technologists.

   iii. There are no available certification schemes under the IES for rail operations staff.

b. **The Taskforce recommends that SGRA: (i) develop a certification scheme for Assistant Engineers and Technicians**, which will not only cover expertise in rolling stock and signalling systems, but also include other domain areas like permanent way, engineering trains, power systems, and communications & controls systems; and **(ii) develop and implement a certification scheme for operations staff**.

c. **The Taskforce furthers recommends setting a target for a critical mass of the rail O&M workforce – around 20% – to be chartered or certified**. These chartered/certified staff will then serve as team trainers and/or supervisors to impart their skills and knowledge to their junior colleagues. The target of around 20% aims to generate and sustain a core pool of master engineers, technicians and operations staff to impart critical skills and knowledge to more junior colleagues.

d. **The Taskforce also recommends that the rail operators incorporate certification in their consideration of career progress and remuneration**, to encourage continual skill development among the rail workforce.

3.4 Improving Rail Service Recovery and Commuter Management

a. Efforts to strengthen asset management and workforce capabilities aim to improve operations and maintenance, and thus rail reliability. Maintaining a high level of rail reliability reduces, but does not eliminate, delays and disruptions, which will still happen from time to time. Thus, it is the view of the Taskforce that strengthening service recovery processes and maintaining journey continuity for commuters is as important as efforts to maintain a high level of rail reliability, as the risk of a disruption cannot be fully eliminated.

b. To achieve this, the Taskforce focused on: (i) enhancing standard operating procedures to manage service disruptions on the ground, which will enable quicker and more effective resumption of service after faults; (ii) improving alternative travel options for commuters, and (iii) improving the guidance to commuters during disruptions by adopting a more commuter-centric mindset.

c. Underpinning all these efforts is an unwavering commitment to safety. While the objective is to restore services swiftly and maintain seamless journeys, the safety of commuters and staff will always take priority during recovery operations.

3.4.1 Enhancing standard operating procedures to manage service disruptions on the ground

a. The immediate moments right after a major fault occurs are typically marked by high levels of uncertainty for everyone on the ground within the affected sector. Rail operators' technical staff will be diagnosing the fault based on the available information at hand, developing the necessary fixes, and determining how best to implement these taking into account operational circumstances. Station staff will be ensuring the safety of passengers on board impacted trains, while also managing the buildup of crowds at the affected stations and redirecting affected commuters. Commuters will also be trying to figure out the likely impact of the disruption on their journey, and how to adjust their travel plans.

b. Under such circumstances, it is important to ensure that there are clear, simple, and standardised operating procedures for operator staff to manage service disruptions on the ground. In most situations, operator staff must be able to

immediately apply these standardised responses to manage the situation, to resume service as soon as possible and help commuters to continue their journey.

c. Today, the LTA and rail operators already have in place standard operating procedures for service disruption management, which are continuously reviewed and refined after each disruption to ensure that useful lessons are incorporated.

d. In this spirit, the Taskforce conducted a review of common railway failures, focusing on those more likely to occur and with the potential to cause longer delays, to determine if the existing procedures for dealing with these failures could be further enhanced and standardised across both operators. Specifically, **the Taskforce recommends the following enhancements to the existing standard operating procedures for specific faults, which should be adopted by both operators**:

   i. Point[1] failures. When point machines encounter a fault, operators can typically use a mechanical device (e.g. portable G-clamp) to secure the defective point, until the fault can be rectified during engineering hours. However, while this can be done relatively quickly, current operating procedures require trains to pass through the affected area at very low speeds. The Taskforce has looked into the practices of metro operators in other cities such as Hong Kong and Taipei to evaluate how this process can be improved, and assessed that it is possible to safely operate trains through the affected area at a higher (though still reduced) speed, to avoid causing longer delays in train service. The rail operators should update their processes to speed up the securing of defective points, and to safely operate trains at higher speeds through the affected sector.

   ii. Train faults requiring rescue trains to perform push-out/haul-out operations. If a train stalls and cannot be restarted to move on its own, a rescue train is needed to push or haul the stalled train to the nearest station for passengers to disembark, before withdrawing the faulty train to the depot. The process of coupling the rescue train to the faulty train can be a time-consuming process, extending the period of service disruption or delay. In order to speed up such coupling operations, the Taskforce suggests improving the placement of the isolation switches and valves for easier access by rail

[1] A point (also called a switch or turnout) is a mechanical device that allows trains to move from one railway track to another. It consists of moveable rail sections that can be positioned to direct a train either straight ahead or onto a branching track. When point failures occur, trains may not be able to continue their intended route unless the point failure is resolved.

operator staff, which will allow the overall rescue operation to be carried out more quickly.

iii. Power system failures requiring detraining of passengers to track. The detrainment of passengers onto the tracks is a last resort measure that is only carried out when it is not possible to move a stalled train within a reasonable period of time, such as a traction power outage that cannot be quickly rectified, or in the event of an emergency. This is because it takes time for passengers to safely travel to the nearest station on foot. To avoid detrainment to track as far as possible during traction power outages, newer trains on the North-South and East-West Lines, as well as for the upcoming Jurong Region Line and Cross Island Line, will be fitted with emergency batteries, which will allow the train to move to the nearest station to exit directly onto the platform. The Taskforce recommends extending this to all future procurements of new trains.

e. To reap the benefits of the enhanced standard operating procedures above, the Taskforce notes that it is critical for operator staff to be familiar with them and well prepared to execute them. This should be achieved through regular and realistic rehearsals of these plans.

i. Today, the LTA and rail operators conduct regular table-top exercises and rehearsals of disruption scenarios. Beyond joint exercises, the rail operators also conduct their own exercises and rehearsals regularly at different scales to simulate disruptions that affect a single line or multiple lines (see Box 4 below). This is important to ensure that all employees can familiarise themselves with the required procedures as well as their roles and responsibilities during disruptions. Where feasible, exercises could involve volunteers from members of public to simulate the experience of commuters.

Box 4: Disruption management exercises by rail operators and the LTA

Both rail operators regularly conduct ground deployment exercises to exercise their rail incident management plans across various scenarios.

- For instance, one exercise scenario that the operators regularly conduct and validate their response to is the occurrence of a traction power fault leading to a train stalling along a rail line, with passengers onboard.
- Such a scenario would test the operators' response capabilities in the event of a major service disruption, including train-to-track detrainment procedures, traction power recovery operations, public communications, deployment of wayfinding signages, and activation of bridging bus services.

- SBST conducted such an exercise in November 2025 at Sengkang MRT station along the NEL, which simulated the stalling of a train between Sengkang and Punggol stations due to a traction power fault.
- SMRT also conducted such an exercise in February 2025 at City Hall MRT station along the NSEWL, which simulated the stalling of a train between City Hall and Raffles Place stations due to a traction power fault.

In addition, since 2012, the LTA has conducted an annual joint exercise with the two rail operators, codenamed Exercise Greyhound. This exercise aims to maintain a high level of operational readiness in managing major incidents, and to validate the response of the rail operators during a multi-line disruption and their ability to adopt an integrated and coordinated approach to incident management. Exercise Greyhound follows a three-year cycle, where two years of table-top exercises culminate in a multi-line disruption ground deployment exercise in the third year, involving the LTA and both rail operators.

For example, for Exercise Greyhound 2023, the LTA conducted a joint ground deployment exercise with the rail operators at Outram Park MRT station.

- During the exercise, the LTA and rail operators simulated a multi-line disruption due to a traction power fault on the Thomson-East Coast Line and a track fault on the North East Line.
- In response, the rail operators activated their service disruption management plans, and deployed station staff onsite to direct commuters to the unaffected East-West Line and designated bridging bus points. The LTA and rail operators also simulated the dissemination of situational updates to commuters through station and in-train announcements, including the use of both physical and digital displays.
- As the exercise coordinator, the LTA also assessed the rail operators' contingency plans in managing the train service disruptions, their incident report and management processes, as well as their implementation of bridging bus services.

The next joint ground deployment exercise under Exercise Greyhound will be held in Jan 2026.

f. **The Taskforce affirms the importance of such exercises, and recommends that the LTA and rail operators include the new measures that the Taskforce has recommended within future exercises**, so that operator staff are well prepared and confident of executing them well. This includes the proposed enhancements to standard operating procedures above, as well as periodic dry runs of alternative travel options for commuters (see Section 3.4.2)

and deployment of volunteers to practise responding to disruptions in terms of providing wayfinding guidance (see Section 3.4.3.2).

g. In addition, the Taskforce recommends **further enhancing such exercises through greater involvement of volunteer commuters where possible.** This approach will help to stress-test the ability of operator staff to engage affected commuters during different disruption scenarios.

3.4.2 Improving alternative travel options for commuters

a. Bridging buses are currently activated when train service is disrupted or in cases of more major delays, to provide commuters with an alternative travel option. Time is required to progressively mobilise such bus bridging services, as bus operators will need to re-deploy buses from regular bus services to serve as bridging buses. This may result in a buildup of commuters at the affected train stations until sufficient buses are made available, resulting in unnecessarily long delays to commuters affected in the initial phase.

b. In view of the above, **the Taskforce recommends that the LTA and rail operators develop a provision for standby buses**, at different locations across the island for quicker deployment during the initial activation of bus bridging operations.

3.4.3 Improving Guidance to Commuters during Disruptions

3.4.3.1 Providing more precise, tailored, and real-time information to commuters

a. When incidents occur, commuters may be anxious and uncertain about the available alternative travel options to get to their destination. It is essential to provide accurate, timely and relevant information to help commuters plan or reroute their journeys in such situations.

b. Previously, during an incident, rail operators would provide the estimated delays on social media using the maximum possible additional travel time across the longest journey distance affected by the delay. However, the LTA and rail operators had received feedback that this approach of publishing the same advice to all commuters was not necessarily helpful.

   i. Different groups of commuters may have different needs depending on which stage of their journey they are at. For instance, for incidents that are likely to be resolved quickly, commuters who have not begun their journey

and who are unlikely to be impacted may choose to make unnecessary or costly detours as a result, even though they could have still made the journey by public transport.

ii. Providing the maximum possible additional travel time did not accurately reflect the impact on individual commuters, as the impact on each commuter would depend on their specific origin and destination. Extraneous details are also sometimes provided, which are not relevant to commuters. For instance, operators often cite the type of system that caused the problem. But this is not pertinent to the commuter in deciding what to do next.

c. In addition, while social media remains an important form of outreach to commuters, posts could appear on commuters' social media feeds at different times, including even after incidents are resolved and service is back to normal. This only served to confuse commuters further, as to whether services had resumed. Furthermore, the rail operators only published information on the incidents for the lines that they were operating. This meant that commuters would get updates for their journeys from different operators depending on the affected line, which might also not be standardised. There was no single centralised platform that commuters could access to check on the status of different rail lines across the whole network.

d. On the whole, the current approach was too complicated. During times of delay or disruption, where commuters can easily feel disoriented, it is important that information is kept accurate, pertinent, and simple. Standardising how the message is structured also allows commuters to become more familiar over time, and further eases decision making.

e. Indeed, some cities tier their communications approach based on the severity of the issue to better advise commuters. Instead of sharing delay estimates, some overseas operators focus on providing guidance to commuters and sharing useful information such as alternatives available.

f. Given the above, **the Taskforce recommends: (a) developing a more tailored public communications approach based on the extent of the service delay and taking into account which stage of their journey a commuter is at; and (b) centralising the status of rail lines and public messaging on service delays into a single location for easy access by commuters**.

g. In line with these recommendations, service delays will be classified into two broad categories and will be accompanied by relevant advisories for commuters:

i. Minor Delays. This refers to service delays which are estimated to be under 30 minutes. Factors such as whether the incident affects only a shorter stretch of the rail network, or whether it is occurring during off-peak hours, will also be taken into account. Commuters can continue to use train services, which would remain the most direct and convenient option for commuters in general.

ii. Major Delays. This refers to service delays which are estimated to be over 30 minutes. Factors such as whether the incident affects a larger sector of the rail network, or whether it is occurring during peak hours, will also be taken into account. Commuters will be advised on the next best course of action (e.g. taking alternative MRT lines or free bus services at affected stations).

h. Accordingly, the LTA launched a new webpage on 13 Dec 2025 to provide real-time updates of the operating status across all MRT and LRT lines, as well as provide information on minor delays and major delays. This would serve as a single information platform to help commuters better plan their day-to-day journeys, that complements the existing push notifications on service delays via the MyTransport.sg mobile app.

i. In addition, major delays will continue to be posted on the rail operators' social media platforms, so that upstream commuters who are likely to be affected by such delays will be able to receive this information in a timely manner, before they enter the affected sector.

ii. As with the current practice today, passengers who are within the affected sector will continue to receive localised support and information to proceed with their journeys, such as in-station and on-train Public Address (PA) announcements, digital displays in trains, as well as from marshals deployed to assist commuters.

i. Beyond the centralised webpage for rail operating status, **the Taskforce recommends that the LTA develop more tools to provide real-time, journey-specific information to help commuters plan what to do when a disruption occurs.** The LTA is currently working with Google Maps to enable personalised journey time estimates for commuters caught in a disruption, based on their specific location and destination, which will make it easier for commuters to adjust their journeys during an incident.

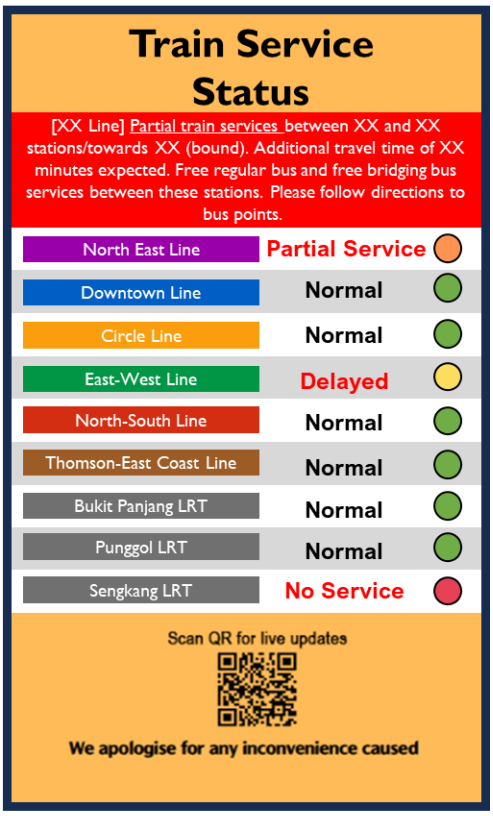
3.4.3.2 Better wayfinding for commuters during disruptions

a. Effective wayfinding is crucial during service disruptions. Clear signages and digital displays help minimise confusion among commuters and reduce the strain on the limited number of station staff. **The Taskforce recommends enhancing wayfinding information to better support commuters**, through: **(i) more prominent and clearer signages to guide commuters to bus points to continue their journey**, such as through the use of flashing directional lights; and **(ii) providing more digital screens to display incident information and wayfinding guidance** (see Box 6 below).

Box 6: Mock-ups of wayfinding enhancements at stations

a. Sequential flashing arrow lights placed above existing yellow directional signs

b. New bridging bus logo to be placed at bridging bus stops



c. Additional digital screens to display all line statuses

b. Beyond signages and digital displays, station staff and crowd marshals play a critical role in helping commuters get to where they need to get to, especially for more vulnerable commuters who may require dedicated assistance.

i. However, as the total number of staff at each station is typically limited and time is required to re-deploy operator staff from other stations, there may be

an initial stage of confusion for commuters right after a disruption occurs if there are insufficient staff on the ground.

ii. To address this, **the Taskforce recommends that the LTA and rail operators engage community groups such as Caring Commuter Champions and People's Association (PA)'s volunteer networks, as well as interested members of the public, to serve as volunteers to assist vulnerable commuters during disruptions**. These volunteers could undergo structured training such as station familiarisation, and could be activated to help should there be a service disruption at a station near their homes or workplaces. They would augment station staff on the ground to support affected commuters, such as by guiding them to alternative transport options depending on their destinations, and provide dedicated support to vulnerable commuters who require additional assistance.

4 Conclusion: An Ongoing Process

a. This report outlines the Taskforce's recommendations to enhance the reliability of the rail network and minimise the impact on commuters in the event of disruptions. These recommendations span various areas, including enhancing asset management, deepening workforce capabilities, as well as improving rail service recovery and commuter management on the ground. The Taskforce also recognises that technical solutions alone are insufficient. Building a reliable rail system requires an ongoing dialogue and effective communication with commuters.

b. Given the complex nature of the rail network, time and resources will be needed to pace the implementation of these recommendations in order to complete them safely while ensuring that commuters can access day-to-day service. At times, adjustments to train operations, including more and longer scheduled closures of segments, may be necessary, but commuters will have alternatives in these instances.

c. The rail network has developed significantly over the years. Continuing to improve it is an ongoing process, one that will take time and effort across all the stakeholders involved. The Taskforce was a joint effort by the #OneTransportTeam – the LTA, SBST, and SMRT. The Taskforce is also deeply grateful to the Independent Advisory Panel for its valuable insights.

d. This report sets the stage for the LTA and rail operators to continue to work closely together to improve the reliability of rail services for commuters.

Annexes

Annex A: Composition of Taskforce

S/No	Name	Designation
Land Transport Authority		
1.	Mr Ng Lang	Chief Executive
2.	Mr Lim Zhi Jian	Chief Operations Officer/ Deputy Chief Executive, Public Transport, Policy & Planning
3.	Mr Yee Boon Cheow	Deputy Chief Executive, Infrastructure & Development
SMRT		
4.	Mr Ngien Hoon Ping	Group Chief Executive Officer
5.	Mr Lam Sheau Kai	President (Rail)
SBS Transit		
6.	Mr Jeffrey Sim	Group Chief Executive Officer
7.	Mr Lee Yam Lim	Chief Executive Officer (Rail)

Annex B: Composition of Independent Advisory Panel

Name	Profile Description
 **Ir Dr Tony Lee Kar Yun**	**Ir Dr Tony Lee Kar Yun** has 40 years of experience in the areas of rail engineering systems for modern transit systems, covering infrastructure and rolling stock domains. Dr Lee is currently a Fellow Member of The Hong Kong Institution of Engineers and holds the Professorship at Beijing Jiaotong University. Formerly the Operations and Innovation Director at MTR Corporation and a Member of the Executive Directorate of MTR Corporation, Dr Lee managed and oversaw the MTR's rail-related asset performance, asset management, rail projects operations planning and development, operations safety and quality. Dr Lee serves on the Hong Kong Quality Assurance Agency Governing Council, the Common Spatial Data Advisory Committee of Hong Kong Government, and the Technical Committee of National Rail Transit Electrification and Automation Engineering Technology Research Centre (Hong Kong Branch).
 **Mr Patrick Bauchart**	**Mr Patrick Bauchart** is a seasoned executive with nearly 40 years of international experience mainly in the rail signalling and transport technology sector, most notably with Thales. Throughout his career, he has held senior leadership roles spanning rail signalling, revenue collection (tolling, parking, ticketing), telecommunications, power distribution, steel construction, water treatment, and defence systems. His assignments took him across France, New Caledonia, Thailand, the UK, USA, Singapore, and other markets. As former Thales Vice-President for Urban Rail Signalling in Asia, he spearheaded major metro projects in signalling and fare collection, oversaw complex systems integration and testing, and forged strong partnerships with public transport operators and stakeholders.

 **Dr Cai Chang Jun**	**Dr Cai Chang Jun** has had more than 41 years of rail experience in engineering, operations, and maintenance. He currently holds the Vice-Chairmanship at the National Engineering Research Centre for System Safety and Operation Assurance of Urban Rail Transit. In his role as Deputy General Manager of the Guangzhou Metro Group from January 2017 to August 2025, he oversaw metro and intercity rail operations management, electrical systems, security inspection systems, new line construction and vehicle equipment business. Dr Cai is an experienced engineer who managed and led key divisions in Guangzhou Metro Group, notably the Equipment and Operations Department, Signal Workshop. He subsequently rose to be the Chief Engineer of Operations Headquarters. He holds a postgraduate and a doctorate degree in engineering, and the title of Senior Engineer (Professor Level).
 **Prof Tsay Huel-Sheng**	**Prof Tsay Huel-Sheng** is an advisory member of the National Transportation Safety Board of Taiwan. He serves as an adjunct professor at the Department of Transportation and Logistics Management, National Yang Ming Chiao Tung University. Prof Tsay has held the positions of Chairman and President of Taipei Rapid Transit Corporation (TRTC) for 1.5 and 8 years, respectively. He then served as Deputy Secretary-General of the Taipei City Government. Following that, Prof Tsay was the Director General of Department of Rapid Transit Systems (DORTS), which oversees the planning, design and construction of mass rapid transit systems for the Taipei metropolitan area.
 **Mr Kon Shinichiro**	**Mr Shinichiro** is currently the Managing Executive Officer of Meidensha Corporation Japan. He was previously the Managing Director of Meiden Singapore Pte Ltd from 2022 to 2024. He was involved in various Singapore MRT projects between 2009 and 2014 as a design engineer and manager of the power supply system. Meidensha Corporation has been supplying power supply systems for the Shinkansen and metro system in Japan, and also for mass rapid transit systems in South-East Asia and Middle East.

Annex C: List of recommended key action plans and enhancements

Power System

1. **Immediate 5 years:**

   a. DC Traction for **NEL**: A temporary Traction Power Sub-Station (TPSS) to be built to augment the traction power network, providing immediate additional capacity and facilitating upcoming power asset renewal. In the longer term, three additional permanent Traction Power Substation (TPSS) to be constructed to increase traction power capacity.

   b. Power supply for **NEL**: To provide additional resilience in the event of intake failure, the existing NEL Depot Intake to be upgraded from 40MVA to 75MVA.

   c. DC Traction for **SPLRT**: Two TPSS to be added to augment traction power capacity to support 2-car operations for SPLRT.

   d. Power Supply for **SPLRT**: Bring forward the plan to augment SPLRT with an additional intake source from SPPG. This will improve the resilience of SPLRT power supply.

2. **Longer term beyond 5 years:**

   a. Power supply for **NEL**: To study and assess the possibility of a new 66kV intake to augment NEL power supply intake to replace Stamford 22kV Intake (SFI)

Signalling System

1. **Immediate 5 years:**
   a. Point machines for rail network**:** In event of point failure that is not recoverable, rail operators' staff to be trained to secure the point using suitable mechanical devices (e.g. a portable G-clamp) and to keep the defective point in its desired direction until its rectification to allow trains to pass through the point safely at a higher operating speed.

   b. Point machines for **NEL** and **CCL**: Rail operators to step up the replacement regime of critical components like detector and relays.

2. **Longer-term beyond 5 years:**
   a. Point machines for **NSEWL, NEL, CCL, DTL**: The feasibility of implementing point detection bypass feature and secondary point detection monitoring system with video analytics will be explored.

   b. Train-borne signalling equipment for **NSEWL, NEL, CCL, DTL**: The feasibility of implementing Automatic Train Protection (ATP) bypass to allow manual driving without signalling protection (capped at 18kph) and detrain passengers at the next station will be explored. Collision avoidance systems for faster recovery and enhance signalling radio redundancies with secondary radio systems will be explored.

Rolling Stock

1. **Immediate 5 years:**
   a. Train circuitry for **NSEWL, NEL, CCL, DTL**: Targeted circuit redundancy to be introduced and additional bypass switches and sectional circuit breakers to isolate faults will be explored. Replace critical safety relays earlier to improve reliability.

2. **Longer term beyond 5 years:**
   b. Train circuitry for **NSEWL, NEL, CCL, DTL**: For faster diagnosis and fault isolation, critical coupling levers and brake isolation valves to be relocated for ease of recovery without the need for trackside access.

Annex D: Condition Monitoring Baseline