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MTR

新聞稿

Press Release

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MTR Putting in Over $65 Billion
to Enhance Railway Maintenance in the Next Five Years
Adopting Innovation and Technology
to Implement Smart Railway Asset Management

The MTR Corporation announces today (21 June 2023) its plan to enhance railway asset management and maintenance regime with focus on five action areas, including putting in more than $65 billion on railway asset maintenance and renewal in the next five years. The Corporation will also accelerate the use of innovation and technology, advancing railway asset management to a higher standard.

The comprehensive review of MTR's railway asset management and maintenance regime was conducted in response to the incidents that occurred at Yau Ma Tei Station and Tseung Kwan O Station in November and December 2022 respectively, as instructed by the MTR Board in December 2022. An Expert Panel chaired by Ir Edmund Leung, former President of the Hong Kong Institution of Engineers, was appointed by the Corporation to conduct the review with the support of SYSTRA, an international consulting group. The review also took into account the views of the Independent Monitoring Panel of the Government.

The Expert Panel report mentioned that MTR railway asset management system is certified with ISO and MTR Passenger-Journey-On-Time consistently reaches over 99.9%. The Expert Panel concluded that MTR's railway asset management has a good foundation and to achieve a higher standard, improvement can be made to both the railway asset management system and the maintenance regime. It includes aligning asset management strategic objectives and integrating documentation, strengthening risk anticipation, strengthening asset registration and fostering staff awareness on asset management.

The Corporation is implementing the recommendations in the Expert Panel report with focus on five action areas, to enhance railway asset management and maintenance regime, including:

1. Put in over $65 billion on railway asset renewal and maintenance in the next five years;
2. Accelerate the application of innovation and technology in railway services and asset maintenance;
3. Enhance risk anticipation and management for early detection of abnormal conditions to minimise incidents of high consequence;

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4. Implement initiatives to gain extra working time in the non-traffic hours maintenance window; and
5. Address manpower challenges, while fostering staff awareness on asset and risk management.

The Corporation's goal is to achieve "data-driven" and digitised asset management. MTR will put in resources to accelerate the application of innovation and technology in the coming five years such as launching a digitised asset management system, setting up a joint laboratory with the Hong Kong Applied Science and Technology Research Institute ("ASTRI"), using big data and comprehensive analytical tools to enhance risk anticipation, and uplifting management of suppliers' products and contractor works.

"During the review process, the Expert Panel conducted a comprehensive and in-depth analysis of MTR's railway asset management, providing valuable suggestions on enhancing risk anticipation and incident prevention. The Independent Monitoring Panel of the Government also conducted a thorough examination and closely monitored the review. We appreciate the valuable suggestions and advice from the Expert Panel and the Independent Monitoring Panel. The Corporation will implement the recommendations in the report including increasing resources for railway asset renewal and maintenance, and will continue to provide service with dedication to respond to public expectations," said Ms Jeny Yeung, Hong Kong Transport Services Director of the MTR Corporation.

"The efficient and reliable railway service of MTR is down to the tremendous efforts of our colleagues. The company thanks our colleagues for their dedication and hard work, and will ensure that they have sufficient resources and solid plans, including innovative technology and maintenance window, to carry out railway asset management and maintenance, and provide 'Smart Railway' to serving passengers," said Dr Tony Lee, Operations Director of MTR Corporation.

Please refer to the annex for the full report on the Comprehensive Review on Asset Management and Maintenance Regime of MTR's Railway Operation.

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About MTR Corporation

To Keep Cities Moving, MTR makes encounters happen and rendezvous for a more connected tomorrow. As a recognised world-class operator of sustainable rail transport services, we are a leader in safety, reliability, customer service and efficiency.

MTR has extensive end-to-end railway expertise with more than 40 years of railway projects experience from design to planning and construction through to commissioning, maintenance and operations. Going beyond railway delivery and operation, MTR also creates and manages dynamic communities around its network through seamless integration of rail, commercial and property development.

With more than 40,000 dedicated staff*, MTR carries over 13 million passenger journeys worldwide every weekday in Hong Kong, the United Kingdom, Sweden, Australia and Mainland China. Together, we Go Smart and Go Beyond.

For more information about MTR Corporation, please visit www.mtr.com.hk.

*includes our subsidiaries, associates and joint ventures in Hong Kong and worldwide

Photo Caption:

1. Ms Jeny Yeung, Hong Kong Transport Services Director (right) and Dr Tony Lee, Operations Director of MTR Corporation (left) announce today (21 June 2023) the Corporation plans to enhance railway asset management and maintenance regime with focus on five action areas, including putting in more than $65 billion on railway asset maintenance and renewal in the next five years.

Annex

Executive Summary

As a follow up to the Yau Ma Tei and Tseung Kwan O incidents in November and December 2022, MTR Corporation appointed the Expert Panel on 23 December 2022 with the support from SYSTRA, an international leading engineering and consulting group, to conduct a comprehensive review of the Corporation's asset management (AM) and maintenance regime to ensure they are being managed at a high standard, while follow-ups arising from the investigation of the said two incidents have been progressing accordingly.

MTR railway network is a complex and sophisticated system which operates over 7600 train trips per day with a daily patronage of over 4.5 million. The Expert Panel noted that MTR is committed to fulfilling the AM strategic objectives with good service quality to the public through the implementation of the Asset Management System (AMS) and maintenance regime that cover assets of different disciplines and varying years of service. Since MTR has a structured AMS which covers the whole asset life-cycle and is certified with ISO55001 since 2015, SYSTRA opined that the AMS adopted by MTR provides a good framework, as foundation, for future AMS work. Indeed, it has supported the persistent achievement on Passenger-Journey-On-Time at a high level (99.9+%) to keep the city moving. The Expert Panel reckoned it is a result of tremendous efforts made and is well recognized internationally.

On the other hand, public expectation on continuous improvement on service reliability has been high with MTR being the major backbone of the public transport system in Hong Kong, and individual major incidents in the past had led to inconvenience to passengers. The Expert Panel considered that ongoing efforts should be made on optimizing the AMS to sustain a high level of service quality and asset performance to further minimize the occurrence of high consequence low frequency incidents.

To facilitate further advancement of the AMS, the Expert Panel concurred with SYSTRA's recommendation to enhance the clarity and alignment of AM strategic objectives and relevant integration of AM documentation, foster staff awareness on AM, enhance optimization of committees/working groups, and asset digitalization.

On the maintenance regime, the Expert Panel considered that the enhancement approaches should encompass risk anticipation for high consequence low frequency incidents, strengthening asset maintenance practices such as asset registration process and Reliability Centered Maintenance (RCM) study, enhancing work quality assurance, and uplifting management of supplier's product and contractor works.

To achieve the AMS advancement goal, the Expert Panel considered and highlighted enablers including continuing to putting resources in asset maintenance and renewal, accelerating the application of Innovation & Technology (I&T), extending Non-Traffic-Hour (NTH) maintenance window, promoting Just Culture and addressing manpower challenges.

In summary, the Expert Panel made recommendations with focus on the following five action areas.

1. Continue putting adequate resources into asset maintenance and renewal, noting that MTR has committed to put in over $65 billion in the next five years;

2. Accelerate the application of I&T, noting that MTR would set up a joint lab with ASTRI, and launch the new integrated information management system for asset management, known as Enterprise Asset Management System (EAMS), for data-driven AM;

3. Enhance processes for risk anticipation and management, and optimizing maintenance works through RCM study championed in aviation industry;

4. Explore and implement initiatives to gain extra working time in the NTH maintenance window; and

5. Foster staff AM awareness and Just Culture, and address manpower challenges while pursing all the recommendations.

The Expert Panel acknowledges that, in bringing on board the recommendations, the Corporation has demonstrated its full commitment in serving the public with a safe and efficient railway. The Expert Panel trusts that MTR will bring a new era of “Smart Railway” for its railway service and continue to stand in the forefront in the industry, setting a world-class example from Hong Kong.

1. Introduction

1.1 On 13 November 2022 and 5 December 2022, major train service incidents took place at Yau Ma Tei Station (YMT) and on the Tseung Kwan O Line (TKL) respectively. The MTR Corporation attached great importance to the incidents, and on top of the in-depth investigations into the two incident cases, the Corporation arranged to conduct a comprehensive review on the asset management (AM) and maintenance regime to ensure that the management of railway assets is maintained at a high standard.

1.2 According to the subsequent incident investigations, the YMT incident, involving the failure of a metallic protection barrier at trackside, and the TKL incident, involving an energy absorption device failure inside a train coupler, were largely due to asset registration and supplier quality issues respectively. Follow-ups arising from the investigations have been progressed accordingly.

2. The Expert Panel

2.1 On 23 December 2022, the MTR Corporation appointed the Expert Panel with the support from SYSTRA, an international leading engineering and consulting group, to conduct a comprehensive review on asset management and maintenance regime of MTR's railway operation.

2.2 The Expert Panel is chaired by Ir Edmund Leung, former President of the Hong Kong Institution of Engineers, and it comprises four other distinguished and experienced engineers and experts as members, including Professor Alexander Wai Ping-kong (President and Vice-Chancellor of Hong Kong Baptist University); Professor

SC Wong (Associate Dean of the Faculty of Engineering of the University of Hong Kong); Professor SL Ho (former Associate Vice President (Academic Support) of the Hong Kong Polytechnic University); and Ir James Kwan Yuk-choi (former Executive Director and Chief Operating Officer of the Hong Kong and China Gas Company Limited).

3. Operational Performance

3.1 MTR railway network is a complex and sophisticated system which operates over 7600 train trips per day with a daily patronage of over 4.5 million. The Expert Panel noted that MTR is committed to fulfilling the AM strategic objectives with good service quality to the public through the implementation of the Asset Management System (AMS) and maintenance regime that cover assets of different disciplines and varying years of service. Since MTR has a structured AMS which covers the whole asset life-cycle and is certified with ISO55001 since 2015, SYSTRA opined that the AMS adopted by MTR provides a good framework, as foundation, for future AMS work. Indeed, it has supported the persistent achievement on Passenger-Journey-On-Time at a high level (99.9+%[1]) to keep the city moving. The Expert Panel reckoned it is a result of tremendous efforts made and is well recognized internationally[2].

3.2 On the other hand, public expectation on continuous improvement on service reliability has been high with MTR being the major backbone of the public transport system in Hong Kong, and individual major incidents in the past had led to inconvenience to passengers. The Expert Panel considered that ongoing efforts should be made on optimizing the AMS to sustain a high level of service quality and asset performance to further minimize the occurrence of high consequence low frequency incidents.

[1] The number of 8-minute delay incidents has generally been on a decreasing trend, except in 2021-22 when there were a higher number of delay incidents relating to initial teething period of the Tuen Ma Line and mixed fleet operation in East Rail Line and these have stabilized after the period.

[2] According to COMET results in 2021, MTR is one of the few metros who achieved a performance of over 99.9% in both the COMET KPIs of Passenger-On-time and Train-On-time. In 2022, Oliver Wyman Forum ranked Hong Kong atop the Public Transit Sub-index, and commented that MTR operates a multi-layered network that serves 166 heavy rail stations/light rail stops with very few delays or service disruptions.

4. Overview of Review Results

Asset Management System

4.1 The AMS of MTR's railway operation has been accredited to ISO 55001: Asset Management and is embraced by an Integrated Management System (IMS) which also covers Safety Management System (SMS)(accredited to ISO 45001), Quality Management System (QMS)(accredited to ISO 9001), and Environmental Management System (EMS)(accredited to ISO 14001).

4.2 Within the IMS, AMS goes hand in hand with other management systems such as SMS and QMS in driving the asset performance and addressing safety, risk, and quality elements in AM. For example, for safety and risk management, the framework and mechanism are driven by SMS and are applied across HK railway operations, including the asset management.

4.3 To facilitate further advancement of the AMS, the Expert Panel concurred with SYSTRA's recommendations on the overall aspects of the AMS, encompassing the following areas:

a. Enhancing clarity of AM strategic objectives and integration of AM documentation.

b. Raising staff awareness on AM including providing training, information sharing, etc.

c. Enhancing optimization of committees / working groups and asset digitalization.

Asset Maintenance Regime

4.4 Analysis on past major incidents and audit results were conducted in this comprehensive review. Enhancement areas were identified encompassing risk anticipation for high consequence low frequency incidents, asset management practices, work quality assurance, and management of supplier's product and contractor works.

Risk management

4.5 Risk management for railway operations is managed daily under the operational risk management framework in which risks are identified, monitored, reviewed, and reported by different levels within the business unit of HKTS, and as appropriate, brought up to corporate level and Board level.

4.6 Risks are currently registered by failure scenario, and are discipline-based to facilitate management by lead risk owner in different disciplines and working groups. Further enhancements are needed to better visualize the safeguards regarding interdependency of different disciplines to the key failure scenario for a more proactive and integrated review.

4.7 While the current risk control regime and matrix embrace both safety and service risks, there is also opportunity to rationalize two risk committees / working groups to reinforce focused management on safety and service risks, and foster escalation.

Asset Maintenance Practices

4.8 Through the review of incidents and audit observations, there were enhancements areas identified in relation to asset maintenance practices, e.g. registration of trackside assets[3] in the YMT incident. This is one of the key issues to be tackled, leveraging the introduction of the new Enterprise Asset Management System (EAMS).

4.9 Currently, Reliability Centered Maintenance (RCM)[4] study, as a maintenance analytic tool, is adopted as a good practice but yet to fully embrace those major assets in infrastructure. With the availability of asset data through Internet of Things (IoT) and big data, it warrants an extension of its coverage to embrace critical major assets particularly in infrastructure to achieve optimization of maintenance regimes with enhanced risk considerations.

4.10 Under the existing Release of Concession (ROC)[5] mechanism, ROC cases have been duly approved by the respective maintenance departments with mitigation measures formulated. While there is no observed evidence of direct relation between ROC and the reviewed incidents, the Expert Panel considered that it warrants more check and balance.

[3] After the Yau Ma Tei incident in Nov 2022, a comprehensive trackside infrastructure and equipment survey was conducted and concluded in June 2023. Upon its completion, it provides a full inventory of trackside assets for asset registration, and with necessary maintenance regimes for each asset type enhanced.

[4] RCM is a maintenance analytic tool to determine the most effective maintenance approach to an asset system to preserve its functions while minimizing or avoiding failure. It was first applied on a large scale to develop airplane maintenance programme in aerospace industry.

[5] ROC is a mechanism in which scheduled maintenance works could be approved to be rescheduled from the designated maintenance period, with specific mitigation measures applied to ensure safety and reliability.

Work Quality Assurance

4.11 Railway operations and maintenance involve multiple systems and equipment and their reliability upkeeping through appropriate maintenance works is important. Currently, line department of the corresponding system is responsible to assure work quality delivery with independent audit being conducted.

4.12 To give further assurance, the Expert Panel opined that the current quality assurance efforts independent to line departments could be strengthened through the set-up of a dedicated team to further enhance the quality assurance system and process, particularly bringing in cross-disciplinary perspectives into the audit mechanism. The Expert Panel noted that MTR will liaise closely with the Government in relation to these extra assurance efforts.

Supplier's Product/Contractor Works Management

4.13 There are mechanisms adopted by the Corporation on contractor management, and inspection and quality assurance on supplier's product. However, there were cases that the contractor/supplier may not have adequately fulfilled their obligations in providing their services or products in meeting the performance requirements. The Expert Panel opined that the use of I&T could give extra assurance and supervision on their quality delivery.

4.14 In relation to the TKL incident, it involved a proprietary equipment failure which was difficult to be identified. Nevertheless, the Expert Panel considered that the use of failure mode analytic tool could be considered to assess the impact of its failure for mitigation.

Key Enablers

4.15 The Expert Panel considered and highlighted key enablers including continuing to putting resources in asset maintenance and renewal, accelerating the application of I&T, extending NTH maintenance window, and promoting Just Culture and addressing manpower challenges.

Putting resources into asset maintenance and renewal

4.16 With years of operations for various assets and some parts of the railway being in operation for over 40 years, resources put into asset maintenance and renewal has risen in recent years and is foreseen to rise substantially in coming years for upkeeping the asset performance.

4.17 The Expert Panel recommends an ongoing focus on putting adequate resources into asset maintenance and renewal for upkeep of asset performance and leverage opportunities for maintenance optimization with use of I&T.

Applying Innovation and Technology

4.18 There is internal I&T framework[6] for ongoing development of I&T including the setting up of Data Studio, and various external collaboration to facilitate smart maintenance. Ongoing introduction of I&T such as IoT, video analytics, big data, and infrastructure to support asset digitalization, etc., has facilitated the development from labour-led to technology-led maintenance.

[6] Internal I&T framework has been set up and facilitated by Operations Innovation Hub, Digital Factories in data, computer vision and robotization within the Corporation, and with various external collaborations.

In addition, MTR has embarked on the new EAMS to drive asset digitalization and data integration in AM, along the roadmap towards predictive maintenance, and in the long run prescriptive maintenance.

Manpower

4.19 There is existing mechanism in formulating manpower provision for maintenance needs based on requirements from scheduled works for preventive maintenance, estimated unscheduled work requirement, such as corrective maintenance, etc.

4.20 In recent years there have been ongoing challenges in manpower in view of the generally tight labour market resulting in a relatively high vacancy rate (overall ~11% in 2022 vs ~6% in 2017).

4.21 Various recruitment and retention measures, and interim manpower supply measures such as staff cross-team deployment, overtime, term labour, etc, have been taken, while maintenance activities would be optimized and/or prioritized, where necessary, to manage the work demand in a safe and reliable manner.

4.22 The review considers that maintenance requirements have generally been met with the above measures taken, while for specific disciplines with manpower challenges, there is presence of ROCs due to manpower issues, and that needs to be addressed. While there is no evidence of direct relation between manpower challenge and major incidents, deploying staff across teams and staff working overtime might give rise to staff morale and work efficiency issues which need to be addressed.

4.23 Due to the unique nature of railway engineering that requires

specific railway skills and strenuous effort to keep the railway moving daily, the flexibility of topping up by interim manpower supply measures may also be limited by availability of external skilled labour in railway disciplines, which are among the more specialized ones in the engineering field. As for staff overtime deployment, flexibility is limited by the finite NTH maintenance window for some infrastructure disciplines.

4.24 It is considered that the manpower situation, while being managed and coped with in short term in recent years, will continue to be challenging due to the vacancy situation and tight labour market expected to remain. Further efforts to manage this challenge need to be pursued, while various recruitment and retention measures will be proactively progressed to attract talents to MTR. The Expert Panel noted that MTR will continue to communicate with the Government on the manpower situation.

Non-Traffic Hour (NTH)

4.25 To serve the public with long operation hours to meet their travelling needs, in general, the NTH window for maintenance and project works for the railway has been a challenge and effective time window for maintenance in NTH can be left with around 2 hours each day.

4.26 With considerable amount of asset upkeep/renewal works, together with new/brownfield project works, there has been ongoing efforts made on maximizing NTH window and work efficiency. However, it is foreseen that NTH will become more critical, deriving from considerable amount of maintenance works, major asset replacement, and upcoming interfacing project works such as Tung Chung Line Extension, Hung Shui Kiu Station, Tuen

Mun South Extension, and Kwu Tung Station on running railway lines.

4.27 The projection of NTH possession demand and supply for all lines has been carried out. For example, for Urban Lines, and Airport Express and Tung Chung Lines, the NTH demands are projected to exceed the supply in some future time periods, and that are being addressed by the implementation of various initiatives planned to increase production time in NTH.

4.28 On the other hand, from experience, spikes of demand may occur when major projects/extension works reach critical stages and NTH possession for various testing activities intensifies to address prevailing circumstances. Hence, NTH resilience remains a challenge and ongoing efforts on enhancing the resilience to address NTH needs are necessary.

Just Culture

4.29 5C[7] Safety Culture, Just Culture and essential attitudes of "Don't Walk By and Do Speak Up" have been promoted within MTR. Apart from daily communication amongst staff and management, various reporting channels, such as AAA[8] iSPOTit etc. have been developed to encourage staff to report any anomaly, hazard, near miss, fault, etc.

4.30 Just Culture helps create an atmosphere whereby staff can report safety issues without fear of punishment. It focuses on what went wrong rather than who caused the problem. By focusing on what went wrong, this helps to investigate and correct the root cause

[7] 5Cs represent Consequence, Compliance, Communication, Competence, and Culture

[8] AAA refers to Anomaly, Alert and Action

and learn from mistakes. Staff are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training but will receive appropriate disciplinary actions for inappropriate behavior, i.e., intentional, and reckless violations. Clear yardstick is established between acceptable and unacceptable behavior, which managers and supervisors assess consistently and fairly.

4.31 In line with MTR's learning organization culture, the Expert Panel opines that cultivating a stronger Just Culture could bring earlier opportunity for specific issue to come to light for follow up.

4.32 Ongoing two-way communications to collect frontline wisdom can help bring insights on AM issues which could be addressed timely.

5 Conclusion

5.1 Through the review, the asset management and maintenance regime of MTR's railway operation have been examined and reviewed.

5.2 The Expert Panel considered that the railway network of the Corporation is a complex and sophisticated system. The persistent achievement of Passenger-Journey-On-Time at a high level (over 99.9%) is a result of tremendous efforts made and well recognized internationally. On the other hand, public expectation on continuous improvement on service reliability has been high in Hong Kong, and individual major incidents that happened in the past had led to inconvenience to passengers.

5.3 Distilling through the review, the Expert Panel considered that to facilitate further advancement of the AMS, it requires further efforts in enhancing clarity and alignment of AM strategic objectives and relevant integration of AM documentation, foster staff awareness on AM, enhance optimization of committees/working groups, and asset digitalization. As for the asset maintenance regime, enhancement should be made in areas encompassing risk anticipation for high consequence low occurrence incidents, asset maintenance practices such as asset registration and application of RCM study, assurance of work quality, as well as management of supplier's product and contractor works.

5.4 To achieve the AMS advancement goal**,** the Expert Panel considered and highlighted key enablers including continuing to putting resources in asset maintenance and renewal, accelerating the application of I&T, extending NTH maintenance window, and promoting Just Culture and addressing manpower challenges.

5.5 The Expert Panel acknowledges that, in bringing on board the recommendations, the Corporation has demonstrated its full commitment in serving the public with a safe and efficient railway. The Expert Panel trusts that MTR will bring a new era of “Smart Railway” for its railway service and continue to stand in the forefront in the industry, setting a world-class example from Hong Kong.

6. Recommendations

The recommendations arising from the review focus on five key action areas as below with the aim to further enhance the AM system and regime of MTR's railway operation and ensure that they are being maintained at a high standard.

I. Continuing to put resources in asset maintenance and renewal

II. Accelerating the application of I&T

III. Enhancing processes for risk anticipation and management, and optimizing maintenance works

IV. Exploring and implementing initiatives to gain extra working time in the NTH maintenance window

V. Fostering staff AM awareness and Just Culture, and addressing manpower challenges while pursuing all the recommendations

The Expert Panel noted that MTR will take the corresponding actions as detailed in Clauses 6.1 to 6.5.

6.1 Continuing to put resources into asset maintenance and renewal

a) Put adequate resources to enhance asset performance and maintainability through asset maintenance and renewal.

[To put in over HKD65 billion in the coming five years for asset maintenance and renewal, which would be reviewed on an annual basis]

6.2 **Accelerating the application of I&T**

b) Further accelerate I&T development to achieve technology-led and data-driven asset management and maintenance optimization.

[To put in more than HKD1 billion in the coming five years in I&T, and set up an MTR-ASTRI[9] lab in Q3 2023 to drive the exploration of various I&T development in railway context]

c) Launch new EAMS to enable asset registration completeness and data-driven asset management and maintenance.

[Pilot launch for South Island Line in November 2023, and rollout to other lines in Q3 2024]

6.3 **Enhancing processes for risk anticipation and management, and optimizing maintenance works**

d) Extend the application of RCM methodology in a structured and data-driven manner to critical major assets, with data structure set up aided by the use of technologies such as IoT, for maintenance optimization and devising focused assurance efforts, including the use of I&T, on managing contractor works/supplier's product.

[Following a pilot study[10] by Q3 2023, a 5-year plan of RCM on major assets to be formulated by Q4 2023]

[9] ASTRI refers to Hong Kong Applied Science and Technology Research Institute.

[10] The pilot studies with support from external RCM expert are conducted on Electric Multiple Unit (EMU) door system of East Rail Line R-train, Automatic Platform Gate in Urban Lines, Axle Counter of Signaling System in Tuen Ma Line, Spherical Graphite Iron (SGI) Structure in Urban Lines.

e) Apply a risk model (namely Bowtie) in aiding visualization and management of risk and consequence, and the effectiveness of the mitigations.

[To conduct a review on high consequence low frequency risks in the existing system by Q3 2023 to assure mitigation effectiveness, and formulate a 3-year plan by Q4 2023 for progressively covering major risk scenarios by Bowtie risk model]

f) Rationalize risk management committees / working groups (for safety and service risks) to reinforce their linkages and information flow as well as to foster focused management and escalation of key operational risks.

[To be completed by end 2023]

g) Set up a centralized and independent Quality Assurance team to further enhance quality delivery by maintenance departments and contractors through strengthening surveillance and compliance audit on maintenance process and outputs, independent process checks for the revamped ROC process to enhance check and balance to ensure proper mitigation measures are in place if ROC is unavoidable, and spearheading promotion of quality delivery and Just Culture.

[Dedicated QA team with key roles to be formed by end 2023]

6.4 Exploring initiatives to gain extra working time in NTH maintenance window

h) Continue exploring initiatives to gain extra working time while implementing various NTH initiatives planned in the pipeline such as remote red flashing lights, remote earthing, and new engineering trains.

[To put in around HKD 500 million in 10 years for various NTH initiatives, and championed by NTH Office]

i) Proactively explore early end/late start of train service to allow more NTH time for time critical works upon exhausting all available means to increase NTH and with due consideration on impact to passengers.

[To set up dedicated taskforce under NTH office by Q3 2023 for the purpose, in consultation with government departments to coordinate the efforts]

6.5 **Fostering staff AM awareness and Just Culture, and addressing manpower challenges**

j) Foster AM awareness among staff and strengthen ongoing two-way communication with frontline colleagues to gain their wisdom for issue identification.

[Town hall briefing on AMS review to be conducted in Q3 2023]

k) Update AM Strategy and Manual and associated documentations as arising from the review.

[Documentation update by end 2023 with further staff briefing on such update]

l) Further promote Just Culture amongst staff by launching promotion campaign and formulating a Just Policy.

[Promotion campaign for Just Culture launched with series of communication and activities to be conducted by end 2023]

m) Drive various recruitment and retention initiatives, for example, deferred retirement, job referral by staff, diversified recruitment channel and promotion, employee wellness/friendly initiatives and policies, staff development programmes and expanding trainee intakes at different levels to meet future needs, etc.

[On-going]

n) Optimize work demand by streamlining processes and further use of I&T (for example, robotics, AI, etc.), putting resources for enhancing asset performance and maintainability, and in the long run by the structured rollout of RCM.

[On-going]

o) Enhance manpower resource resilience for specific disciplines with manpower challenges under the revamped ROC process[11].

[To be completed by Q1 2024 after reviewing the manpower deployment basing on the revamped ROC process to be completed by end 2023]

[11] It is envisaged that under the revamped ROC process, subject to internal review on manpower deployment, manpower resource resilience for specific disciplines needs to be enhanced so as to minimize ROC due to manpower issues.