SCIC- Joint Agencies Dialogue Session 2026: Operational Updates and Forward Plans for MHIs

Alvian Tan

Deputy Director, Major Hazards Department

Occupational Safety and Health Division

6 Nov 2026

Ministry of Manpower

Empowered *Workforce*,
Thriving *Workplaces*

Presentation Agenda

01 Shifts in Operating Environment

02 Staying Ahead of Emerging Risks

03 Building Industry Capability

04 Rejuvenating the Safety Case Regime

Ministry of Manpower

MHD has progressed from standing up the MHI regulatory regime set-up to a more mature, evidence-led Safety Case

2016
established

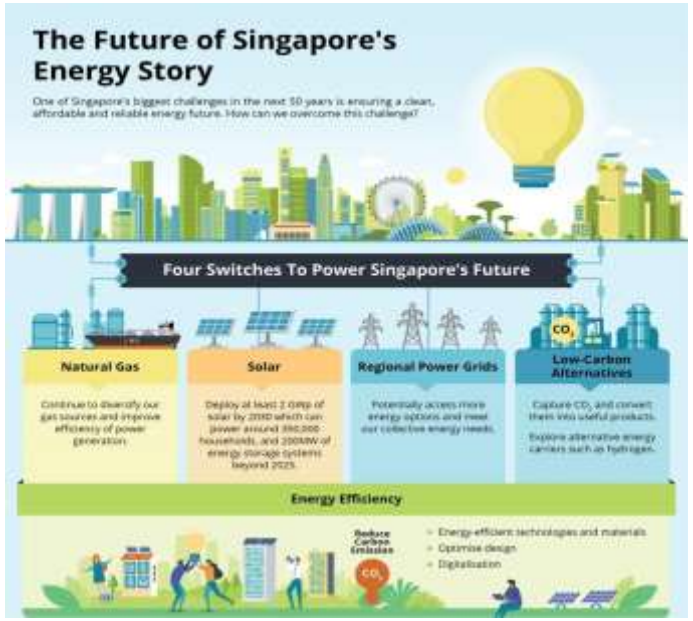
2025
guidance & sharing expanded

2016–17	**Regulatory foundation established** MHD formed; MHI Regulations enacted; first Safety Case submitted.	Regime stood up
2017–20	**Safety Case guidance library built** Technical, assessment, ALARP and Safety Instrumented System (SIS) guidelines published to clarify expectations.	Common standard
2018–23	**Assessment capability matured** First Safety Case Assessment concluded; Cycle 1 completed for existing MHIs.	Scaled delivery
2023–25	**Learning and future hazards expanded** MHI information sharing commenced; Human Factors and Hydrogen safety guidance published.	Next-phase readiness

Ministry of Manpower

Shifts in operating environment provides impetus to revise MHD's priorities

- Change in demand of oil and petrochemicals – decommissioning of facilities
- Ageing of facilities on Jurong Island
- Growth in semiconductor and wafer fabrication driven by AI adoption
- Transition to clean energy and green infrastructure









These bring about cross cutting implications on MHD's operations

Pace Outrunning Preparedness

Rapid capacity expansion compresses commissioning timelines; safety systems risk lagging operations.

Adverse weather risks

Intensifying extreme weather adds systemic risk to Jurong Island and other assets.

Novel Hazard Profiles

Lithium-ion, hydrogen, geothermal and nuclear energy sit outside existing regulatory playbooks.

Workforce Churn & Competency

New green jobs, retiring operators, and multi-contractor projects erode hazard knowledge.

Regulatory Readiness

MHD's existing framework may not capture emerging facilities — proactive review needed before incidents.

AI & Technology Opportunity

AI-assisted Safety Case review and predictive analytics can help MHD scale oversight capacity.

Ministry of Manpower

Staying Ahead of Emerging Risks





MHD has continued to conduct thematic inspections to focus on emerging threats/concerns to MHIs

Since 2025, we have identified themes based on emerging areas of concerns to help MHIs ensure their Safety Cases remain relevant and robust in the face of emerging risks or threats.

Identify key safety themes

- Analysis of past incidents (PRIs)
- Emerging threat scans
- New regulatory areas

Communicate themes to MHIs

- Highlight areas of focus
- Provide guidance when necessary

Conduct thematic inspections

- As part of safety case assessment
- Incorporate into regular inspections on intervention plans

Themes Covered

- Combustible Dust 
- Adverse Weather Effects 
- Mechanical Integrity Programme 
- Environmental Haze 

Ministry of Manpower

Findings from combustible dust operations

MOM introduced new requirements in 2025 to strengthen the management of combustible dust hazards. Our recent enforcement operations at workplaces handling combustible dust found:

140+
companies inspected

92
Notices of Non-Compliance

5
Composition Fines

1
Stop Work Order

COMMON LAPSES: KEY AREAS OF IMPROVEMENT

1
Control measures
Ineffective measures to protect workers against potential combustible dust hazards

2
Risk assessments
Inadequate assessments that did not address the fire and explosion hazards of combustible dust

3
Safe work procedures
No safe procedures for handling combustible dust, e.g. wet cleaning or explosion-proof vacuum cleaners

4
Labelling
Incomplete labelling of combustible dust packages

Ministry of Manpower

Learning points from combustible dust operations



HOUSEKEEPING

Dust build-up raises the risk of an explosion. Keep it from accumulating through good housekeeping.



LABELLING & PROTECTION

Label packages to warn workers, and install explosion protection on vessels holding combustible dust.



STATIC CONTROL & CLEANING

Earth and bond equipment to dissipate static charge. Clean with wet methods or explosion-proof vacuums.



NOTIFICATION

Workplaces handling combustible dust must notify MOM:

go.gov.sg/cd-notify-mom

Ministry of Manpower

Why Computational Fluid Dynamics is needed and how it is applied

Selective Computational Fluid Dynamics (CFD) adoption strengthens QRA where empirical models struggle: 3D site effects and mitigation design

WHY CFD IS NEEDED

CFD complements QRA where spatial complexity or physical phenomena are not adequately represented by simpler models.

Guidelines refresh

Last major review in 2016; simulation tools have matured

Clean-energy transition

Hydrogen / ammonia hazards need nuanced modelling

Complex site effects

Congestion, layout and mitigation measures influence outcomes

HOW CFD IS APPLIED

1 Existing QRA baseline

Scenario selection → consequence modelling → risk contours

2 CFD layer for suitable scenarios

Refines consequence zones where 2D empirical models are insufficient

3 Guideline output

Criteria for when CFD is required, with consistent inputs and sensitivity checks

Targeted use: apply only where it changes decisions

Ministry of Manpower

CFD proof of concept: timeline

Proof of concept (POC): integrating CFD into current QRA requirements

NOW – Q4 2026

Tender for POC study

Government tender to study how CFD can be incorporated into QRA

Q1 2027

Commence POC study

Develop technical guideline, assessor guidance and representative facility demonstration

BY END-2027

Implement

Industry consultation before integration into QRA requirements

As sites and hazards grow more complex, CFD gives a more detailed and realistic picture of how a release will behave, so safety decisions are better informed.

Indicative timeline; subject to the outcome of the POC study.

Ministry of Manpower

Building Industry Capability



In 2026, MHD engaged the industry across 13 events, and delivered 17 topics on operational findings and key regulatory requirements

1 **27 Jan**

Chempact 2026

Randy Cha

2 **30 Jan**

Seminar on Management of Aging Process Plant

Jerome Tan

3 **28 Apr**

JIVZ Forum on Contractor Management (Virtual)

Chin Shao Ming

4 **4 May**

SCIC SC Refresher Workshop

Foong Wei Xiong

5 **7 May**

ASEAN Regulatory Co-operation Platform (ARCP) Webinar

Ong Pei Fen

6 **13 May**

SCIC Combustible Dust Workshop

Kee Zhi Yong · Oh Hong Jia

7 **15 May**

CAPETC and HSETC Joint Seminar 2026

Lim Eng Wee · Khong Beng Wee

8 **23 Jun**

ChemEng Connect Asia Pacific

Jaime Lim

9 **15 Jul**

SCIC Safety Case Seminar 2026

Alvian Tan · Jolyn Ho · Kwa Soo Khim

10 **13 Aug**

NFEC Fire Safety Seminar 2026

Alvian Tan

11 **14 Aug**

SCIC T&PS Sharing on Safe Operating Limits

Leslie Lee

12 **26 Aug**

SCIC Ageing Process Plants in the Artificial Intelligence (AI) Era

Jacqueline Liew

13 **25 Sep**

NUS Seminar on Risk, Safety, Resilience & Sustainability

Alvian Tan

13

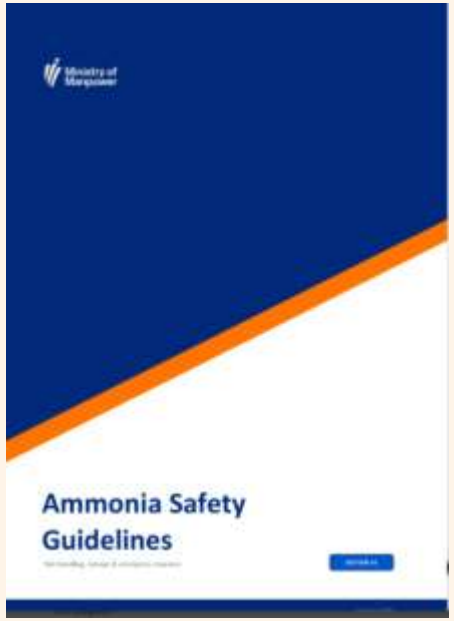
Events

17

Topics Delivered

Ministry of Manpower

Two recent guidelines introduced to fill knowledge gaps



Clean Tech Guidelines (incl. Ammonia)

- Ammonia technology is evolving rapidly, particularly as a marine fuel and hydrogen carrier.
- Does not apply to aqueous ammonia, ammonia solutions, fertiliser applications, industrial refrigeration or ammonia production facilities, which involve different conditions, hazards or regulations.

Launched on MOM's website
Inviting SCIC members' comments

Decommissioning Guidelines



- Decommissioning changes how major hazards are controlled; it needs the same rigour as normal operation, shutdown and commissioning.
- The MHI occupier remains accountable for identifying MAHs, implementing controls and verifying them, including contractor-led work.

Undergoing further revisions
To be released later this month

Ministry of Manpower

Rejuvenating the Safety Case Regime





Changes made to the Quantitative Risk Assessment (QRA) process

Revised service standard in effect from 1 Jan 2026, aiming to cut QRA clearance from ~6 months towards a ~4-month standard.

ENHANCED QRA PROCESS

1
Pre-submission
Comprehensive guidelines and self-help checklist

2
Consultation
To confirm QRA requirements

3
Submission
Quality report and complete data

4
Review
Tighter service standards for comments

5
Approval
Issuance of In-Principle No Objection (IPNO)

WHAT CHANGED

Two rounds of comments
Agencies limited to two rounds, issued within 15 and 10 working days respectively

One clarification meeting
Remaining issues resolved in a single meeting, reducing back-and-forth

Earlier communication
QRA requirements shared at project start; review cycles focus on the safe design basis

Tracking and accountability
Dashboard visibility, agency ownership and monitoring of delays and blockers

Ministry of Manpower

Results achieved

Review timelines improved significantly after the changes.

8 of 8
QRA submissions received in 1H2026 cleared

37%
improvement in timeline for cleared submissions

~4 months
target clearance period

AVERAGE CLEARANCE TIMELINE (WORKING DAYS)



Closer to target

Average timeline fell from 140 to 88 working days, closer to the four-month clearance target.

Speed comes from better upfront planning, streamlined reviews and stronger inter-agency coordination, not from reducing technical scrutiny.

Ministry of Manpower

Information sharing exercise within clusters has been completed for Jurong Island and the 2 offshore islands



Group Cluster^	No. of MHIs	Info to be shared by
JI3	7	31 Oct 2023 ✓
JI4	14	30 April 2025 ✓
JI5	8	1 May 2026 ✓
JI6	12	
JI1	10	5 July 2026 ✓
OFS1	2	
OFS2	3	
JI2	16	2 Sep 2026 ✓
Total	**72**	

All 72 MHIs across the 8 clusters have shared information within their cluster; further deployment to the main island follows.

Ministry of Manpower

Two follow-up areas of work from the recent SCIC survey: (i) cross-cluster sharing, (ii) new / expanding MHI sharing

Why we ran the survey

Clusters were split by major roads and canals, but escalation effects may not stop at those boundaries.

What it showed

Not all respondents understood fire / explosion impact beyond their designated group, so results were not fully reliable.

i Sharing across clusters

- Contours exceeding plant and cluster boundaries were received.
- Domino effects extend beyond existing clusters
- Reviewing how best to facilitate sharing across cluster

ii New / expanding MHIs sharing

- Existing → new / expanding MHIs: share information early which could be useful for design and QRA purposes
- New / expanding → existing MHIs: share back before commissioning , to revise Emergency Response Plans and mutual-aid.

Ministry of Manpower

Safety case guidance review

Why now?

Currently at the 10th year mark, it is timely to review whether the Assessment Guide remains robust, current, and useful for both assessors and industry.

Progress to date

Issued 7 Safety Case related guides and FAQs, and 1 Learning Report to serve as companions in developing Safety Cases and bridging industry gaps towards best practices.

Areas of review

1. Potential approach and ideas for reviewing the Assessment Guide to optimise both industry and MHD's resources
2. Standardising submission format and workflow to allow for more efficient information and data consolidation
3. Identifying any new potential areas requiring better guidance and expectation alignment across the industry e.g. relevant qualifications, competency pathways, and industry experience of Safety Case personnel





Ministry of Manpower

Looking Ahead



Proposed Safety Case Regime 10th Year Celebration

Purpose

Celebrate the 10-year milestone of the Safety Case Regime and recognise the collective efforts of regulators and industry in strengthening Major Hazard Installations.

Programme Details

Full-day event with plenary and breakout sessions, featuring speakers from MHD and MHIs, industry sharing, and the unveiling of key initiatives to strengthen safety and engage with the wider industry stakeholders.

Target Audience

Senior management and stakeholders from Major Hazard Installations, Safety Consultants, and LRC firms involved in the development of Safety Cases and the design and maintenance of equipment and instrumentation in the industry.



Ministry of Manpower

Some highlights in the lead up to the 10th anniversary

1Q 2027

Technology Connect

WSH Technology Showcase for the Chemical Industries: promotes technology and innovation to improve WSH outcomes, reduce hazard exposure and enhance risk detection.

1Q 2027

Competency Building

Programmes with Singapore Institute of Technology on Safety Leadership & Risk Management, building the competency of process safety and safety case personnel.

2Q 2027

Continuous Improvement

Jurong Island Vision Zero Forum on Strengthening Process Safety Through Human Factors: designing systems for safe and reliable performance.

Ministry of Manpower

Key takeaways



- **Operating environment is shifting:** ageing facilities, decommissioning, semiconductor growth and clean energy bring new hazards.
- **Stay ahead of emerging risks:** thematic inspections on adverse weather, haze, mechanical integrity and combustible dust keep Safety Cases robust.
- **Build industry capability:** Ammonia safety and Decommissioning Guidelines introduced, plus 13 engagements in 2026.
- **Rejuvenate the Safety Case regime:** first phase of information sharing across all 72 MHIs is done; next is cross-cluster sharing and a guidance review.
- **Looking ahead:** Technology Connect, Competency Building and focus on Human Factors on the road to our 10th anniversary.

Industry partnership is vital to the Safety Case regime's success. Share your feedback and ideas.

Ministry of Manpower

Thank you

For further feedback/ suggestions:

alvian_tan@mom.gov.sg

Ministry of Manpower