

Deana Burn

From: Nick Hon <Nicholas.Hon@planning.nsw.gov.au>
Sent: Tuesday, 12 May 2026 6:44 AM
To: Farooq Sharif
Cc: Michele Stromquist; Doris Yau; Deana Burn
Subject: Re: IXOM Chloralkali Plant MOD 6 - New Chlorine Liquefaction Plant - IXOM's Response to Submissions

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Hi Farooq,

Thanks for our discussion last week and your submission on the RTS below. We will incorporate your proposed conditions and technical points in our consent conditions.

Regards,

Nicholas Hon

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From: Farooq Sharif
Sent: Monday, 11 May 2026 5:46 PM
To: Nick Hon
Cc: Michele Stromquist
Subject: RE: IXOM Chloralkali Plant MOD 6 - New Chlorine Liquefaction Plant - IXOM's Response to Submissions
Hi Nick,

Further to our discussion. Mentioned below are the Proposed Conditions of Consent for the modification

1. All chlorine inventory to be stored inside Chlorine Liquefaction Building for all modes of operation
2. IXOM will ensure that quantity of chemicals required for Liquefaction Building Scrubber is always maintained at site to treat worst case chlorine leakage
3. IXOM will ensure that required capacity is always available at site to store the chemicals that are produced Liquefaction Building Scrubber operation for worst case chlorine leakage scenario
4. During operation one chlorine tank will remain empty and standby to accommodate any chlorine storage tank leak

5. The Chlorine liquefaction system, building, ventilation, and scrubber is designed minimum to the standards of “AS 2927, The storage and handling of liquefied chlorine gas”.
6. Liquefaction Building Scrubber will be installed with necessary instrumentation to evaluate the performance of scrubber against design at any time, including but not limited to chlorine monitor in the scrubber exhaust stream
7. Controls measures, performance indicators and performance standards developed for entire scope of modification and integrated with Safety Management System before commissioning of the modification

The points that must be at least studied, evaluated, and verified in the detail design are mentioned below.

1. Scrubber Design Validation with Active Ventilation

Objective

Verify that the scrubber remains effective even when the building ventilation system is operating (not isolated) as assumed in QRA Event Tree (Appendix F).

Key Analyses

- **Mass balance analysis:**
 - Chlorine leak rate vs. scrubber removal capacity
 - Ventilation air dilution vs. contaminant capture
- **Airflow interaction study:**
 - Modelling of Ventilation airflow patterns and Scrubber suction capture efficiency
 - Identify short-circuiting risks (air bypassing scrubber)
- **Design criteria**
 - Scrubber capacity \geq worst-case leak rate \times safety factor
 - Maintain negative pressure regime inside building

Deliverables

- Demonstrated zero/acceptable external release for above scenario
- Confirmation of QRA assumption validity

2. Sensitivity of Building Leakage vs Scrubber Performance

Objective

Assess how building integrity (leak paths) affects scrubber effectiveness.

Approach

- Define leakage scenarios:
 - Door gaps, penetrations, structural leaks
 - Crack equivalent area (e.g., m² leakage area)
- Perform parametric sensitivity analysis:
 - Vary leakage rate vs:
 - Internal pressure
 - Scrubber flow rate
 - External emissions

Key Output

- Maximum allowable building leakage rate
- Defines minimum building tightness criteria
- Engineering control to monitor and action against deviation

3. Continuous Monitoring of Building Integrity

Design Measures

- **Pressure Monitoring**
 - Continuous monitoring of building pressure
- **Alarm & Control Logic**
 - Low pressure alarm against possible leak or fan failure
 - High pressure alarm against risk of outward leakage
- **Instrumented Actions**
 - Auto start standby scrubber/train
 - Ventilation override (reduce supply / increase extract)
 - Initiate emergency response
- **Additional Monitoring**
 - Airflow monitoring in exhaust ducts

- o Scrubber liquid circulation status
- o Redundancy (2oo3 or 1oo2 voting where required)

4. Gas Mapping & Leak Detection Study

Objective

Detect chlorine leak location, magnitude, and response effectiveness.

Methodology

A. Sensor Layout Design

- Fixed chlorine detectors placed:
 - o Near leak-prone equipment
 - o Airflow discharge zones
 - o Building perimeter

B. Gas Dispersion Mapping

- Use **Modelling to develop**
 - o Concentration vs time profiles
 - o Dead zones / accumulation areas

C. Alarm & Response Philosophy

- Multi-level alarms:
 - o L1: Early detection
 - o L2: Process trip + scrubber activation
 - o L3: Evacuation
 - o

D. Output

- Gas concentration maps
- Detector coverage validation
- Response time validation

5. System Availability & Reliability Studies

Required Analyses

A. SIL (Safety Integrity Level)

- Define Safety Instrumented Functions (SIFs) for entire modification scope
- Determine PFDavg (Probability of Failure on Demand)

B. Fault Tree Analysis (FTA)

- Identify failure combinations causing scrubber system failure
- Include (but not limited to) Pumps, fans, valves, instrumentation and pipelines

C. Event Tree Analysis (ETA)

- Evaluate Leak leading to detection and mitigation success/failure sequences for detailed design

6. Detection & Response Time Study

Objective

Ensure no chlorine escapes outside before mitigation becomes effective

Components of Time Analysis

Total Response Time = Leak Detection Time + Signal Processing Time + System Activation Time + Scrubber Ramp-up Time

Study Elements

- Detector response time (seconds)
- Control system latency
- Equipment startup time (Pumps, Fans etc.)
- Scrubber absorption efficiency ramp-up

Acceptance Criterion

At any point in time after a chlorine leak (with normal scrubber operation and ramp up) no chlorine escapes through building leak paths, for all chlorine leak scenarios.

7. Integrated Safety Study Conclusion

The combined studies must demonstrate:

- Scrubber capacity exceeds worst-case chlorine release
- Building remains under negative pressure
- Detection + response is fast enough to prevent external release

- System availability meets SIL target
- Building leakage is within acceptable limits

8. Recommended Deliverables Set

- Gas dispersion modelling and gas mapping report
- Scrubber design validation report
- Building leakage sensitivity analysis
- Detection and response time study
- Repression system performance study
- SIL / FTA / ETA reports
- Failure on Demand analysis

Regards,

Farooq Sharif

Senior Safety Analyst | Major Hazard Facilities (MHF)

Authorisations & Verifications

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I acknowledge the traditional custodians of the land and pay respects to Elders past and present. I also acknowledge all the Aboriginal and Torres Strait Islander staff working with NSW Government at this time.

From: Farooq Sharif

Sent: Monday, 4 May 2026 2:55 PM

To: Nick Hon

Cc: Michele Stromquist

Subject: RE: IXOM Chloralkali Plant MOD 6 - New Chlorine Liquefaction Plant - IXOM's Response to Submissions

Hi Nick,

I have reviewed IXOM Response to Submission (RTS) on the proposed Chlorine Liquefaction Plant. The Proposed Conditions of Consent will remain the same as of the submission of 23rd September 2025 (<https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=DA35/98-MOD-6%2120251001T051406.254%20GMT>)

Since IXOM has stated that other considerations will be evaluated in detail design of CLP. So, it is important the SafeWork NSW is kept updated of the decision outcome of the modification, as the SafeWork NSW will then advise the for necessary notifications and other requirements.

Regards,

Farooq Sharif

Senior Safety Analyst | Major Hazard Facilities (MHF)

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SafeWork NSW

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