A PATH OF CONTINUOUS IMPROVEMENT – NGC'S ASSET INTEGRITY MANAGEMENT (AIM) JOURNEY

Estimated read time: 8 min

ON THE GREEN AGENDA

KEY TAKEAWAYS

Asset integrity management (AIM) is a business-critical activity for NGC given the risks associated with natural gas infrastructure.

Following a 2015 AIM audit which revealed shortfalls in NGC's systems and equipment, the company embarked on an aggressive remedial campaign which significantly improved its AIM performance.

NGC is now sharing lessons learnt with the wider industry.

One September evening in 2010, a loud explosion rocked San Bruno — a residential suburb of San Francisco, California. A deadly fire broke out, killing eight people, injuring 58, and engulfing dozens of homes. After initial uncertainty around the cause, investigations concluded that the explosion was triggered by the rupture of defective welds on a buried, high-pressure natural gas pipeline running beneath the community.[1]

Tragedies such as the San Bruno explosion are sobering reminders of how crucial it is to monitor and maintain the structural integrity of high-risk energy assets.

With a natural gas pipeline network spanning 1,000km, NGC manages one of Trinidad and Tobago's most extensive and important energy infrastructure systems. Given the intrinsic dangers associated with the product running through its pipelines, NGC has always regarded asset integrity management (AIM) as business-critical. However, in recent years, the company has been taking an even more aggressive approach to AIM, intent on minimising risk in its business and across the energy sector as a whole.

WHY IS **AIM** IMPORTANT?

NGC's sprawling network comprises enough infrastructure to line the coasts of Trinidad more than twice over. Subsea lines aggregate gas from offshore fields, while the onshore grid carries gas cross-country for either LNG production or processing and distribution to power producers and industrial consumers. Despite its extensive footprint, NGC's network goes largely unseen. Save for yellow marker posts along the Rights of Way (ROW) and above-ground installations such as gas receiving facilities and valve and metering stations, the majority of NGC's infrastructure is buried underground.

WHILE THIS RELATIVELY LOW VISIBILITY HELPS SAFEGUARD THE NETWORK IN SOME WAYS, THE COMPANY STILL CONFRONTS DIFFERENT TYPES OF RISK:

Third-party interference — risk of damage caused by the actions of persons or entities external to the company, such as persons excavating or disturbing the ground along the ROW

Corrosion — risk of damage to infrastructure due to internal or external deterioration of pipeline hardware

Natural events — risk of damage due to landslides, earthquakes, washouts, rapid earth movement and other events linked to natural occurrences

Operational failure — risk of damage due to oversight, error or mismanagement in the course of network operation, or inherent engineering/design flaws.

[1]https://udspace.udel.edu/items/14648e1c-6bc1-402e-a2e9-40dbadfb795e; https://www.latimes.com/local/la-xpm-2011-aug-30-la-me-0831-san-bruno-20110831-story.html

Failure to address these risks could lead to catastrophic asset loss or infrastructural damage with a high potential for personnel injury/loss of life, which in turn would impact NGC's ability to service its customers. More importantly, certain risks can precipitate dangerous incidents along the line and cause harm to the public and environment.

This is why AIM is so important. NGC must consistently assess the risk in its operations and take action to pre-empt damage to its infrastructure. However, to properly assess and manage risk, the company's systems and equipment must be in optimal working order, in alignment with best practices and industry standards. In recent years, independent audits have been used to benchmark both systems and equipment at NGC and identify gaps that needed to be closed to help the company improve its AIM efforts.

NGC'S **AIM** JOURNEY

In 2015, the Ministry of Energy and Energy Industries engaged international firm DNV to conduct a National Facilities Integrity Audit. This audit investigated AIM processes, procedures, plans and resourcing at over 30 local companies and included physical asset inspections. Systems and Equipment evaluation scores were then assigned using the scale below.

An infrared camera is helping NGC visualise leaks along its lines

4 = Optimising	**The activity or practice is effective and efficient. Visible continuous improvement culture/efforts are in place.**
3 = Managing	**The activity or practice is documented and effectively implemented.**
2 = Implementing	**The activity or practice is documented with implementation ongoing but not fully mature.**
1 = Developing	**The activity or practice exists, although it may be incomplete and undocumented.**
0 = Learning	**The activity or practice is absent or ad hoc and little awareness of the expectation is in place.**

ON THE GREEN AGENDA

The national average for Systems was 2.02, while the Equipment score was 1.93. In comparison, NGC's scores were 1.79 and 1.64 respectively. Having scored below the national average, NGC decided to undertake an aggressive remedial campaign on its equipment and systems to address concerns raised by the auditors.

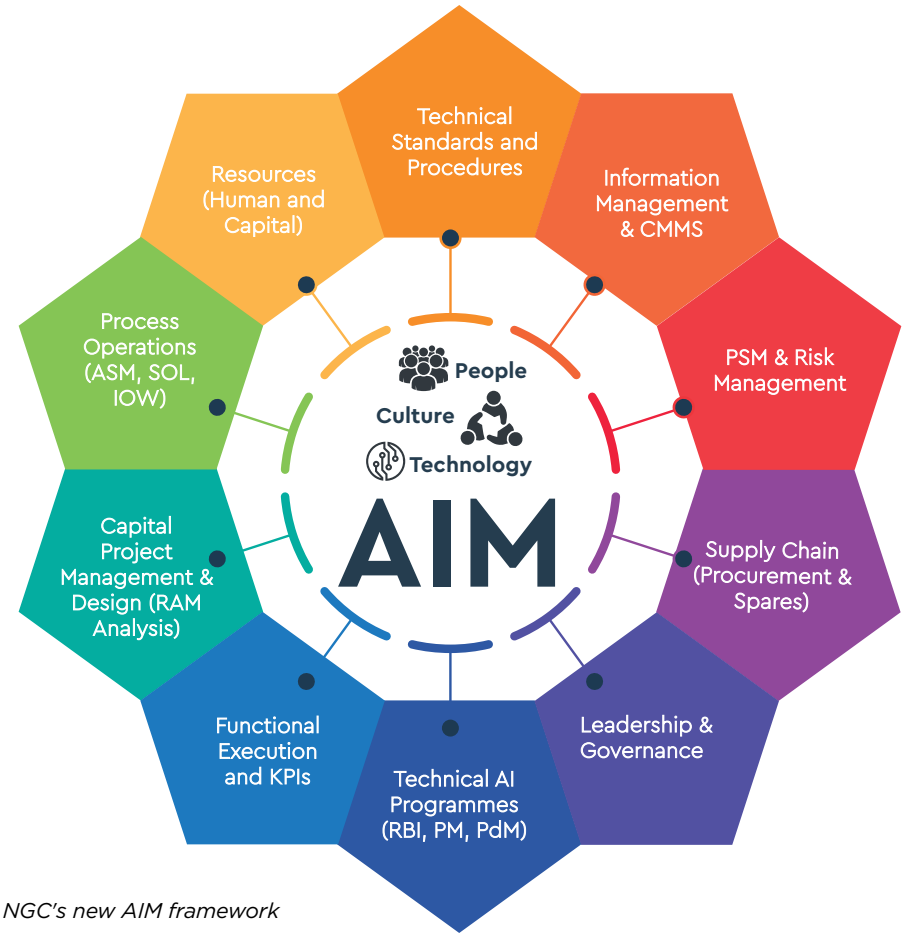
The organisation has since begun to focus on bringing its AIM capability in line with best-in-class standards, starting with organisational changes that have assigned more dedicated resources towards this area.

In 2019, NGC adopted a new AIM Framework based on 10 functions, aligned with ISO 55000 Standards in Asset Management.

THIS FRAMEWORK IS BUILT ON FOUR MAIN PILLARS:

- LEADERSHIP AND GOVERNANCE
- ADMINISTRATIVE MANAGEMENT SYSTEMS
- TECHNICAL MANAGEMENT SYSTEMS
- FUNCTIONAL EXECUTION AND PERFORMANCE

This framework specifies the requirements for an effective asset management system and integrates AIM with other business areas such as human resources, governance, technical document management and supply chain management.



NGC's new AIM framework

AREAS OF IMPROVEMENT

Maintenance Automation

One key function of the AIM Framework where significant strides have been made is in the area of Information Management, with the computerisation of maintenance planning and scheduling. Through the Computerised Maintenance Management System (CMMS), NGC has made great progress with planning and scheduling preventative maintenance works on its manned facilities and generated valuable data to streamline maintenance performance in the future.

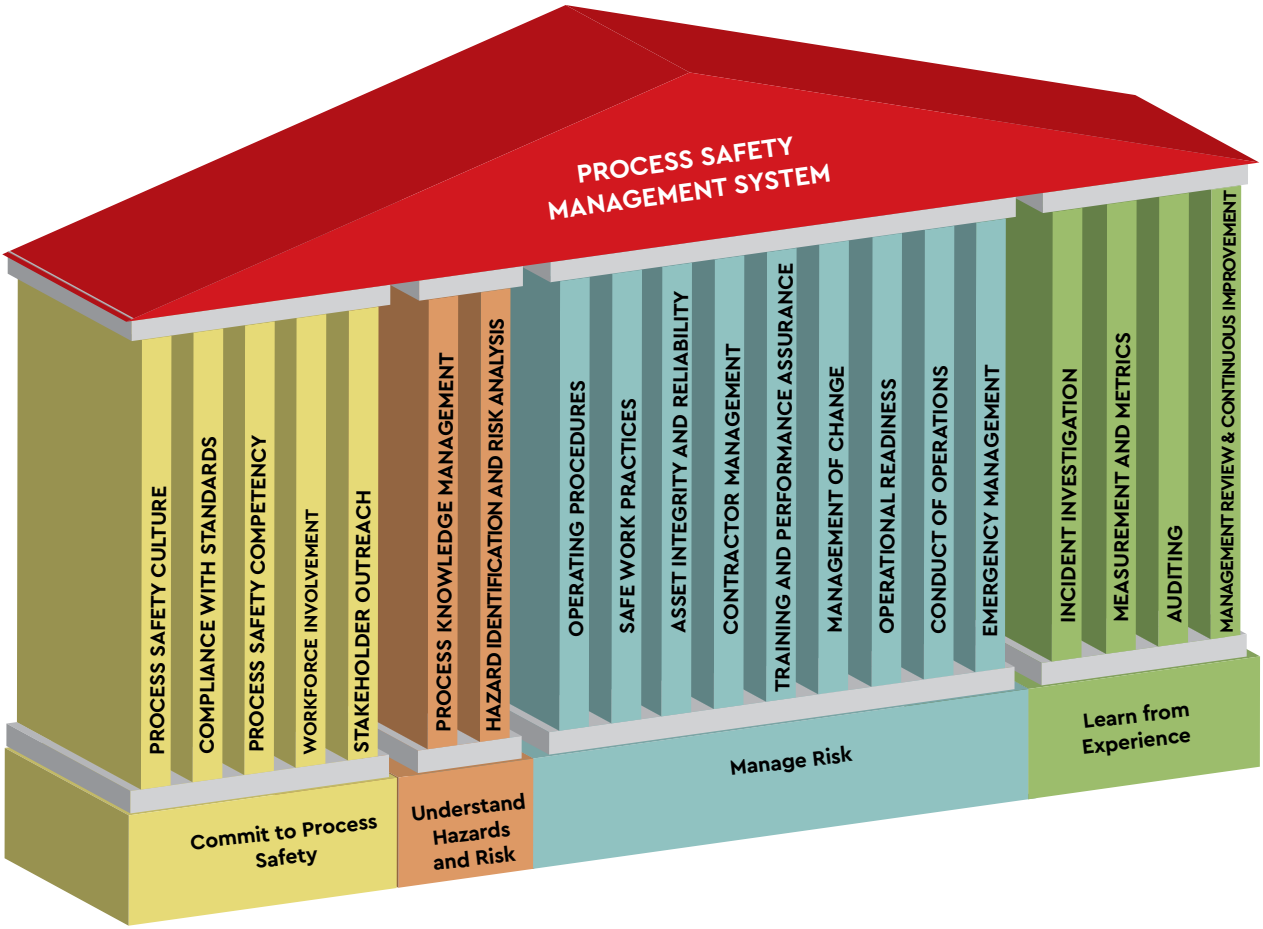
Mitigating risk

In 2019, in line with the overall goal of reduced risk to operations, NGC began transitioning from a traditional time-based asset inspection programme to a Risk-Based Inspection (RBI) programme. This best-practice approach focuses on reducing risk by channelling resources and priorities towards inspecting assets in areas that are high risk and more prone to failure.

NGC has also adopted the Centre for Chemical Process Safety (CCPS) Risk-Based Process Safety (RBPS) guidelines, which are built on four pillars:

- COMMIT TO PROCESS SAFETY
- UNDERSTAND HAZARDS AND RISKS
- MANAGE RISKS
- LEARN FROM EXPERIENCE

A path of continuous improvement — NGC's Asset Integrity Management (AIM) journey | CONTINUED



PSM and occupational safety are continuously reinforced through communication, training and system improvements to strengthen the safety culture.

Technology

Technology is also being integrated to help sustain best-in-class capability in the maintenance function. A specialist drone has been drafted into use, capable of carrying payloads such as infrared cameras, Light Detection and Ranging (LiDAR) sensors and gas detection sensors, all of which can aid in asset integrity efforts.

On the field, tablets and digital forms are now being used to capture information and prepare and submit reports in real time, truncating and streamlining the process for identifying and addressing potential or actual risks.

Exploration of applications for Extended Reality technologies, which can assist with work planning, scenario modelling, emergency response training and even virtual tours for visitors, are also in progress. These would reduce the exposure of NGC's infrastructure to the risk of third-party interference, and the exposure of people to the inherent risk in its operations.

One of the latest technology initiatives undertaken was the upgrade of the Synergi Pipeline Software — which NGC has been using since 2012 — to the latest version of the DNV Pipeline Integrity Management Software in 2022. The latest version of the software offers a host of advantages in classifying risk across the NGC onshore and offshore pipeline network collectively. It also uses NGC's Geospatial Information Services (GIS) database to source all geotechnical and statistical population data to formulate an overall risk rating, which informs NGC's preparedness in managing the risk. This allows for easier collaboration among user departments and greater process efficiency.

Focus on methane

In line with NGC's focus on sustainability and climate action, the company has made methane mitigation a priority focus area. This is intimately tied to AIM, since compromised assets can leak gas — and by extension methane — into the atmosphere.

ON THE GREEN AGENDA

Accordingly, the company has an active Leak Detection and Repair (LDAR) programme, which is supported by specialised equipment for emissions detection. This includes a Forward-Looking Infrared (FLIR) camera and satellite imaging of its facilities under a contract with Netherlands-based technology provider Orbital Eye. The FLIR camera provides data through scheduled periodic assessments as required by international standards, whilst the satellite technology provides a more real-time approach to leak detection.

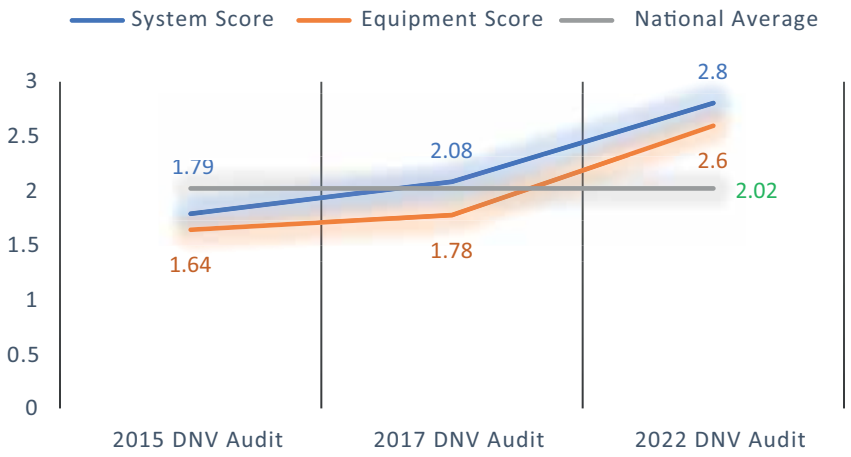
Complemented by staff training, certification and competency assurance initiatives, the company's LDAR programme is very stringent and is continuously being improved to align with and exceed international best practices.

Accountability

To keep the company accountable, AIM has been pegged to its corporate scorecard, so that work in this area is taken to be a key performance indicator. As part of the wider NGC Group, an AIM Steering Committee was also formed, which provides the platform for sharing best practices, methodologies and technologies.

NGC has also joined the voluntary Oil and Gas Methane Partnership (OGMP 2.0), which commits members to report on their methane emissions. NGC submitted its first report to the OGMP in 2022 and earned gold standard status for reporting of the targets it set with respect to curbing emissions in the coming years. This membership and learnings from other companies around the world will help NGC improve its emissions measurement, management and reporting, which will in turn strengthen its AIM capability.

NGC AIM PERFORMANCE



BUILDING **STRONGER**

Since the 2015 DNV audit, NGC has periodically re-assessed its AIM performance through internal assessments and two subsequent external audits — one in 2017 and the other in 2022. According to the results of the latest audit, thanks to its interventions over the past eight years, the company's AIM scores have markedly improved. Its Systems score is now 2.8 (2015: 1.79) and its Equipment score is 2.6 (2015: 1.64). This means NGC has moved from the 'Developing' to 'Implementing' bracket in the DNV scoring rubric. While there is still work to be done, the company is reassuringly on the progressive path.

Importantly, NGC is not just keeping its learnings to itself. The 2015 DNV audit revealed deficiencies in asset integrity management across the energy sector, which is a national concern. NGC has therefore resolved to share lessons learnt, best practices and even its technology with its industry counterparts.

NGC is an active member of the Point Lisas Energy Association's (PLEA) Asset Integrity Management and Technical (AIMT) Sub-Committee, whose mandate is to share, review and implement technical best practices and systems to ensure AIM objectives are met among the PLEA member companies.

NGC also hosted an event in April 2023 to share its AIM journey and learnings with invited guests from across the public and private sectors. These included energy companies, as well as representatives from agencies such as the Water and Sewerage Authority (WASA), which also manages ageing pipeline systems. Ultimately, NGC believes its journey can be of value to others and hopes to not only be an exemplar of AIM performance but a leader in domestic industry — a standard-bearer marshalling other companies to strive for excellence in safety and asset integrity. ■