Security and Reliability Council

Gas transmission network security and reliability

19 March 2018

Note: This paper has been prepared for the purpose of the Security and Reliability Council (SRC). Content should not be interpreted as representing the views or policy of the Electricity Authority.

Background

The Security and Reliability Council (SRC) functions under the Electricity Industry Act 2010 include providing advice to the Electricity Authority on reliability of supply matters. As part of taking a more proactive approach of risk assurance, the SRC has previously received presentations explained HVDC risk management, information security and arrangements for restarting the power system from blackout. The SRC also received post-event reporting about the 2011 Maui Pipeline failure.[1]

As explained in the paper on agenda item #7 for the 28 March 2018 SRC meeting, natural gas is a vitally important part of New Zealand's electricity generation.

Given that, failures on the gas transmission network have the potential to create high impact reliability events for electricity consumers.

The gas transmission network is operated by First Gas. First Gas have provided a presentation explaining their risk management approach, with a focus on high impact low probability events that have the potential to cause major disruption to electricity consumers. Representatives from First Gas will attend the 28 March 2018 SRC meeting to deliver the attached presentation and answer any questions from the SRC.

The SRC may wish to consider the following questions.

Q1.	What further information, if any, does the SRC wish to have provided to it by the secretariat?
Q2.	What advice, if any, does the SRC wish to provide to the Authority?

[1] This was presented at the 13 December 2011 SRC meeting. Papers are available from https://www.ea.govt.nz/development/advisory-technical-groups/src/meeting-papers/2011/13dec11/

Gas Transmission Security and Reliability:
Pipeline System

28 March 2018

Agenda

- Purpose of presentation
- Gas transmission system overview
- Security of supply
- Principal risks
- Gilbert Stream pipeline realignment
- White Cliffs pipeline realignment
- Emergency management
- Example – emergency repair of the refinery pipeline
- Takeaways and how the SRC can help

Purpose of presentation

- Describe how security of supply risks are managed on the gas transmission system
- Increase awareness of specific risks and steps taken to manage those risks
- Explain First Gas emergency response capability
- Discuss how SRC can influence outcomes for security of supply on the gas transmission

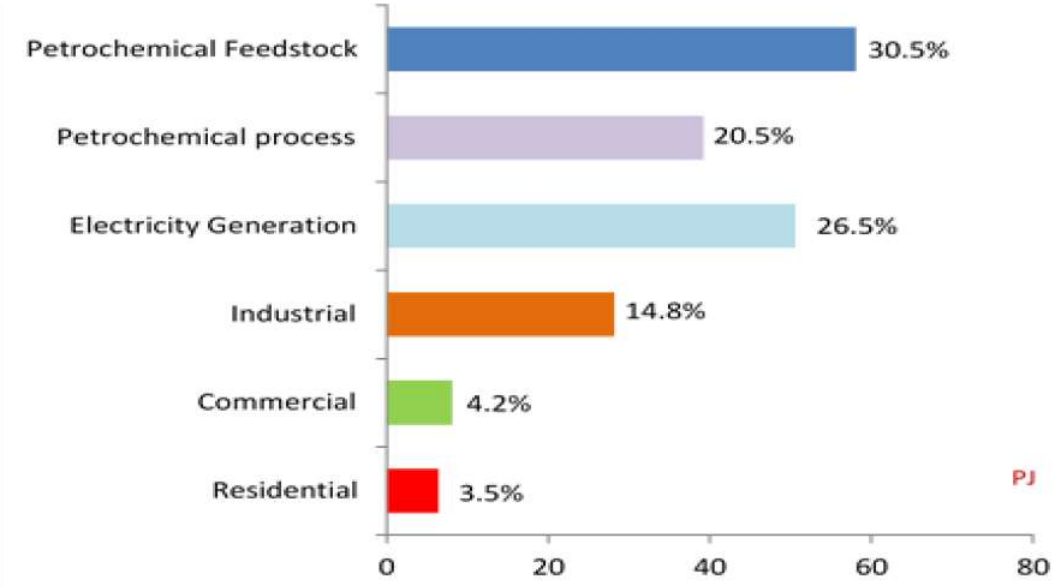
Does not cover:

- Short term gas delivery risks arising from production station outages and shipper imbalances (http://gasindustry.co.nz/work-programmes/pipeline-security-and-reliability/developing/update-on-security-and-reliability-matters/)
- Gas Governance (Critical Contingency Management) Regulations (http://gasindustry.co.nz/work-programmes/critical-contingency-management/current-arrangements/)

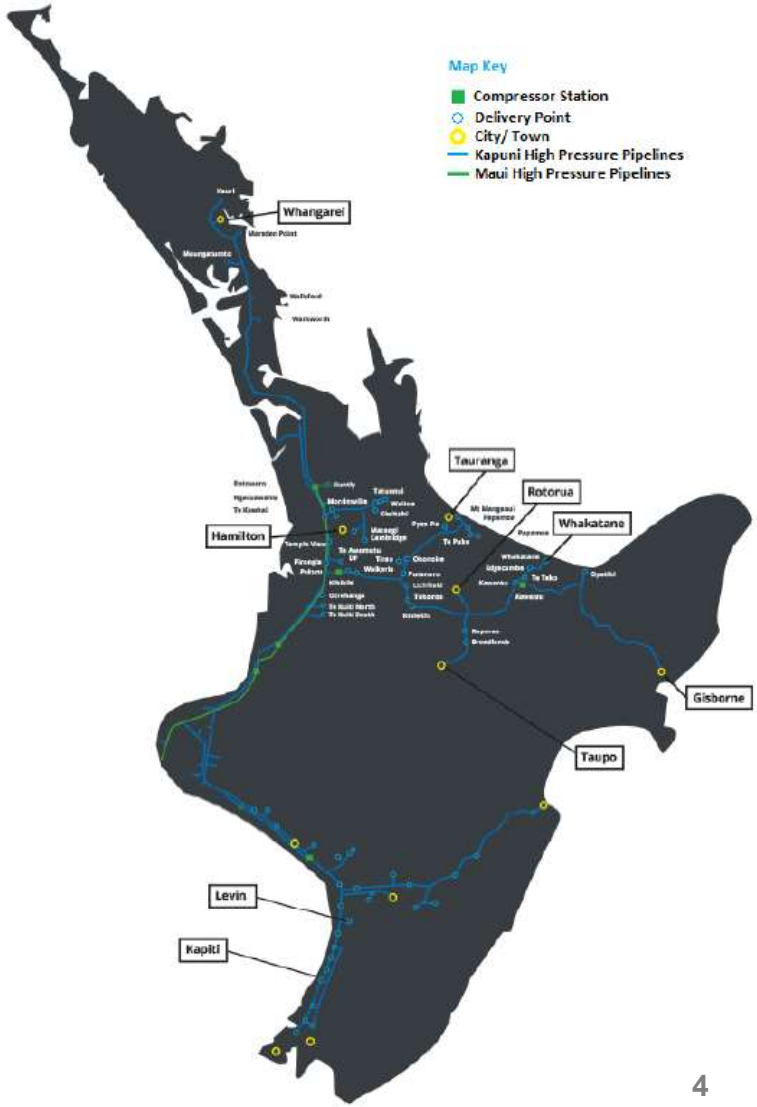
Gas transmission system overview

Firstgas

STATISTIC	VALUE
System length (km)	2,523Km
Compressor stations	9
Compressor units	23
Delivery points	119
Gas conveyed (PJ/pa approx. value)	229



Source: 2017 Energy in New Zealand
Together, petrochemical feedstock and process gas use amounts to 97.3PJ, or 51.0 percent of total gas use.



Two dimensions to pipeline security of supply

Two areas to consider:

- Reliable operation of above ground assets, such as compressor stations and delivery points
- Effective mitigation of external threats to integrity, such as landslides and third party activity

Reliable operation:

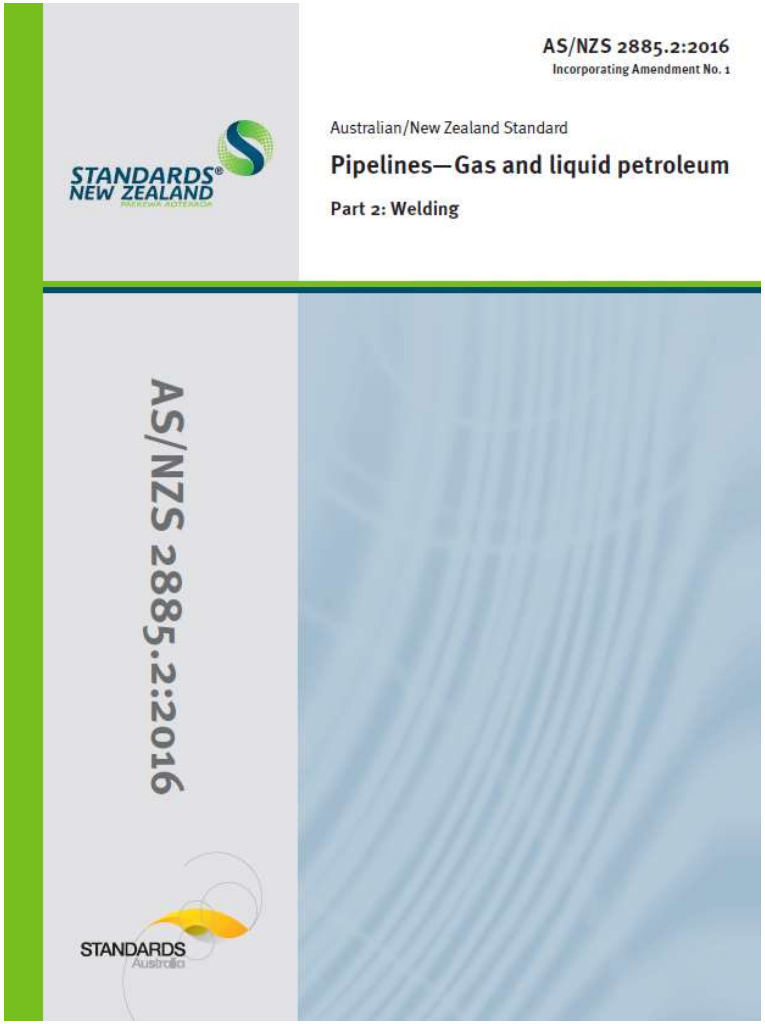
- Set under the terms of the System Security Standard
- Conventional maintenance optimisation and reliability practices and equipment redundancy for:
  - Compression
  - Pressure regulation at delivery points where peak demand > 20GJ/day
- System flexibility provides additional resilience (e.g. compressor stations at Mokau and Rotowaro)

Mitigation of external threats:

- The integrity and safe operation maintained in accordance with approved pipeline management system set out in a recognised standard: AS / NZS 2885: Pipelines – gas and liquid petroleum

AS/NZS 2885: Summary of requirements

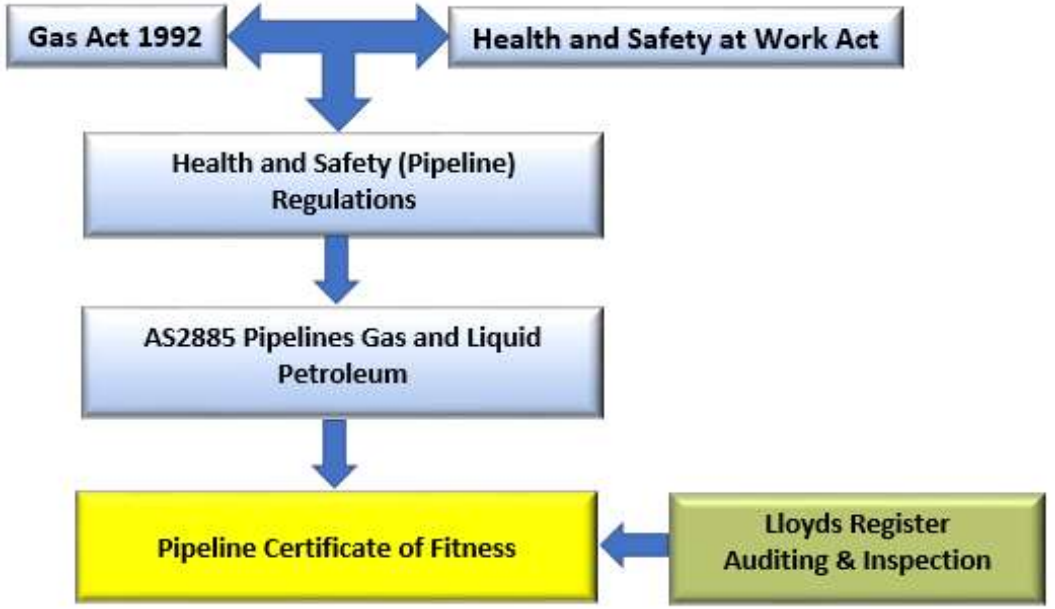
- AS/NZS 2885 sets out the requirements for the safe management of a pipeline throughout the asset life (http://www.apga.org.au/issues/australian-standards/)
- A pipeline is to be designed and constructed to withstand all design loads to which it may be subjected during construction, testing and operation. This design is to be reviewed, assessed and approved
- All threats to a pipeline are to be identified and either controlled or the associated risks shall be evaluated and managed to an acceptable level
  - Documented in a Safety Management Study (SMS). Every 5 years or when significant changes occur
  - Mitigation of SMS risks executed through a Pipeline Integrity Management Plan (PIMP)



Independent Audit and Review

An Approved Inspection Body (currently Lloyds Register) provides independent auditing and review of the processes described. This is primarily done through:

- Issuing a Certificate of Fitness every five years (requirement for pipeline operation under NZ law)
- Carrying out annual surveillance audits to examine (on a sample basis) physical assets and the pipeline management system, including adherence to AS/NZS 2885
- Approving additions and alterations to the transmission system such as relocations and delivery point capacity expansions



Recent GIC review of security and reliability issues

- GIC reviewed arrangements for gas transmission security and reliability in 2016
- Found that commercial and regulatory arrangements provide for effective security and reliability:
  - Contractual requirements to operate as an RPO
  - Commercial incentives given reputation impacts
  - WorkSafe AS/NZS 2285 certificate of fitness regime (described above)
  - Commerce Commission quality path (which includes a requirement for no major interruptions)
  - Critical contingency arrangements
- 2017 update reviewed our first “whole of system” transmission AMP and noted progress made in articulating and communicating key risks

Principal risks to gas transmission pipeline integrity

- There are three principal threats to pipeline integrity:
  - Corrosion
  - Third party damage
  - Geohazards (earthquakes, erosion, flooding, slips etc)

Corrosion prevention

Controls include:

- Pipelines are coated with various non-conductive materials intended to isolate the pipe metal from the soil and groundwater to prevent corrosion
- Where required by design codes thicker wall pipe was used, for example road, waterway or railway crossings
- A dedicated impressed current Cathodic Protection (CP) system provides back-up corrosion protection to cover defects in the coatings either from construction, damage, or deterioration over time
- Where possible, pipelines are subject to In Line Inspection (ILI) pigging
- Excavations to verify ILI data and repair any defects found are undertaken following ILI surveys
- Electronic surveys for coating breakdown are also conducted periodically

Third party damage prevention

Risks arise from:

- Land owner / user activities
- Utility contractor activities
- Pipeline operator activities (shared easement operators or pipeline contractors)
- Malicious activities

Risks addressed using a standard threat assessment to determine a baseline set of control activities

Controls include:

- 3rd Party Pipeline awareness – mailouts, presentations, visits, trades and shows, publications/press
- Pipeline route marking signage
- Pipeline patrolling (air, vehicle, foot)
- Vegetation management
- Signage maintenance and upgrades
- Risk assessment based site-specific actions

Geohazards

Routine surveillance is carried out to identify areas susceptible to natural events (which may be gradual or episodic)

- Surveillance identifies both the presence of features that may pose a risk and includes monitoring of features identified for change in risk profile
- Methods of surveillance vary from foot patrol along pipeline route to use of drone for detailed land feature mapping

Mitigation of risks from natural events involves modification to the design of the pipeline itself or modifying the landscape (such as by installing additional drainage)

Depending on the issues identified, these can lead to significant projects

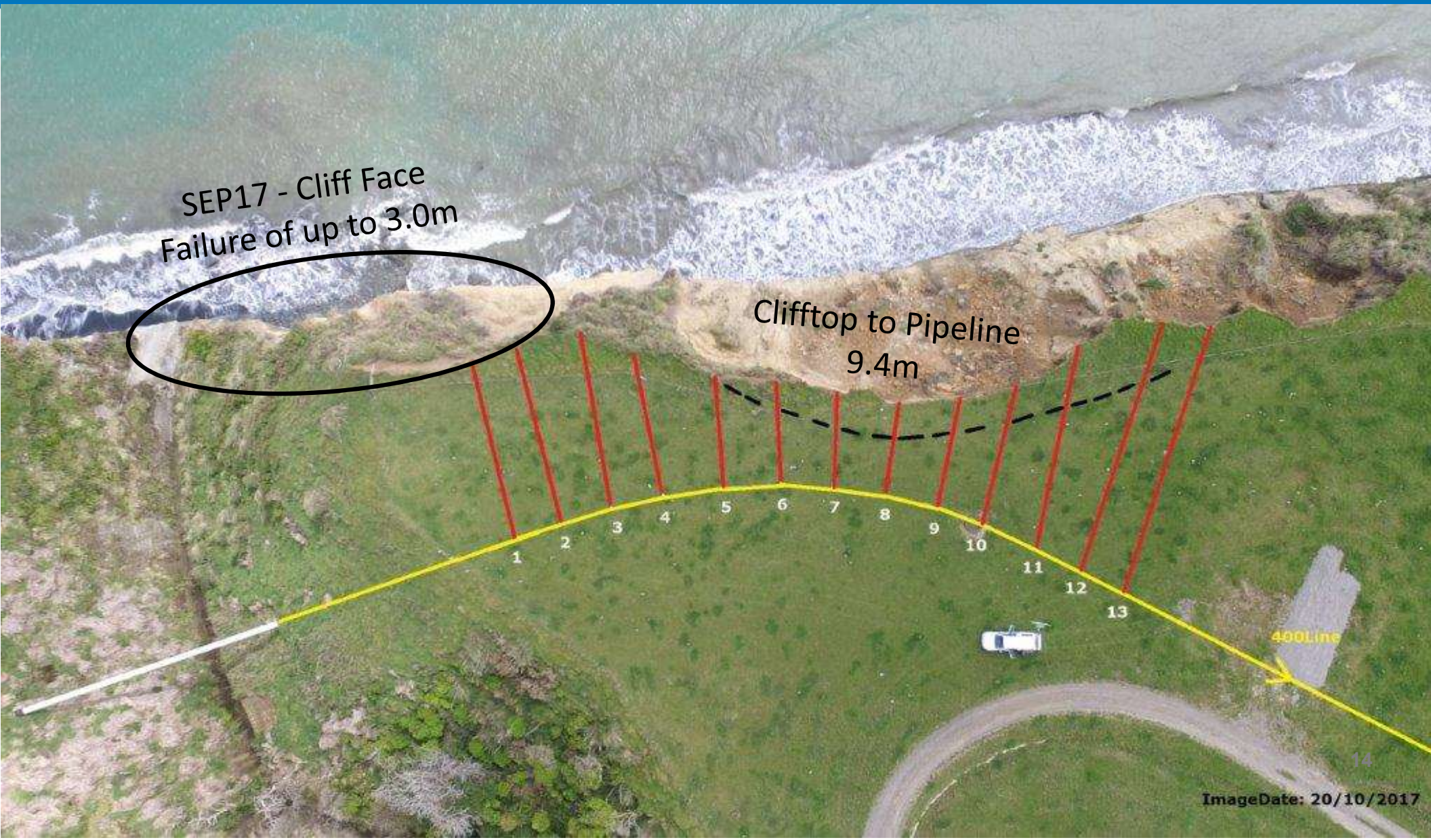
Currently two significant risk areas identified:

- Maui Pipeline at Gilbert Stream
- Maui and Kapuni Pipelines at White Cliffs

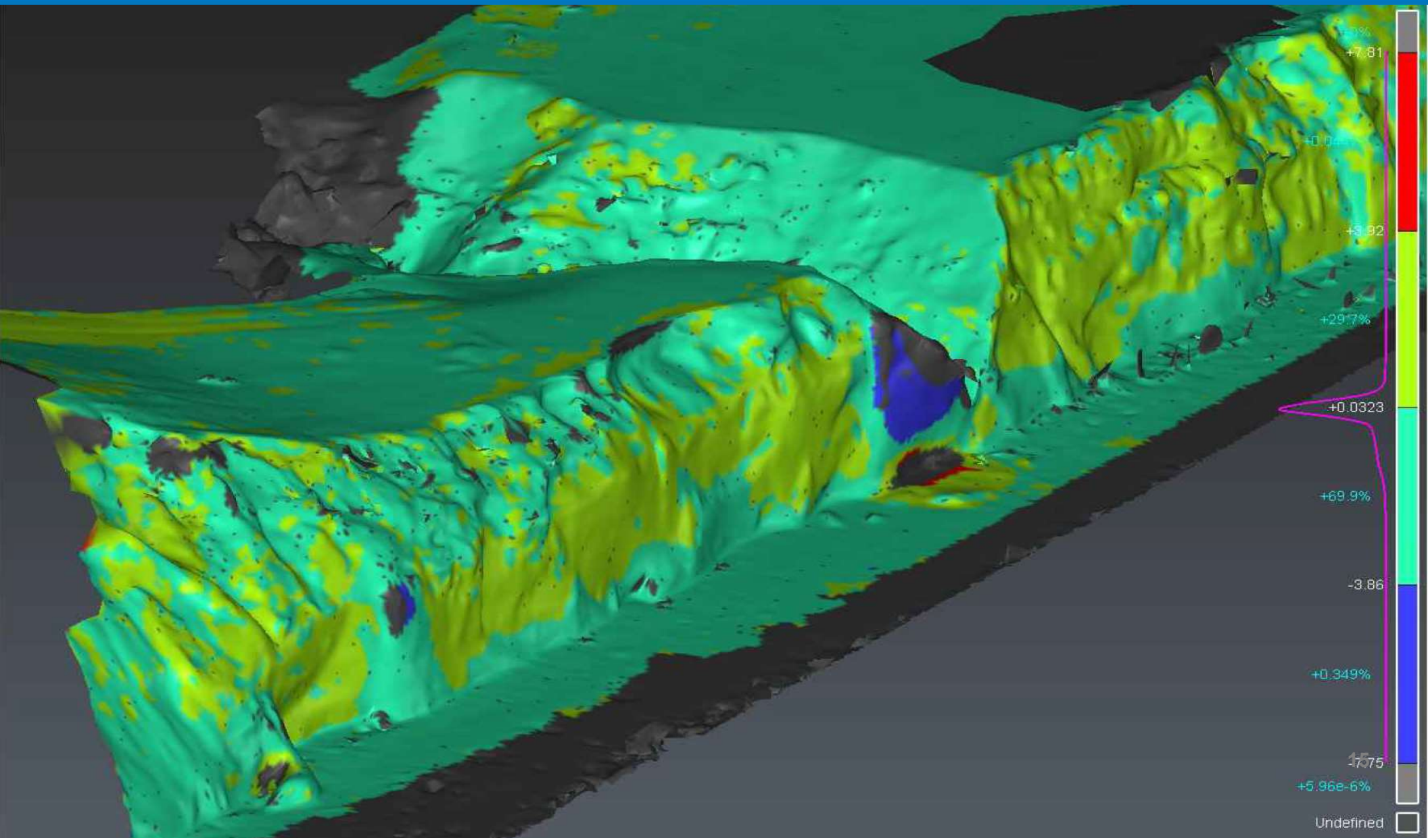
Gilbert Stream

Note: Pipeline (400/200Lines) alignment is indication only for the purpose's to display position associated with the background image

Gilbert Stream Monitoring - Overview



Gilbert Stream Monitoring – 3D Data Comparison



Gilbert Stream Remediation Plans

- We have completed significant preparatory work including FEED, and are commencing detailed design work
- We have worked closely with the Commerce Commission to ensure the expenditure for the project is covered by the DPP
- Work is in progress with forecast completion in 2019, following the consenting, detailed design and procurement phases of the project
- We continue to regularly monitor the site and have developed an emergency response plan, which involved the urgent ordering of emergency hot tap and stoppling equipment and fittings last year
- Should the coastal erosion reach a prescribed proximity limit, we intend to immediately install gas bypass pipework to protect against a loss of supply event
- The Gilbert Stream realignment project provides First Gas with a good opportunity to optimise our project planning and communications, prior to embarking on the White Cliffs remediation project

Bank erosion at White Cliffs site

Current location of pipelines at White Cliffs

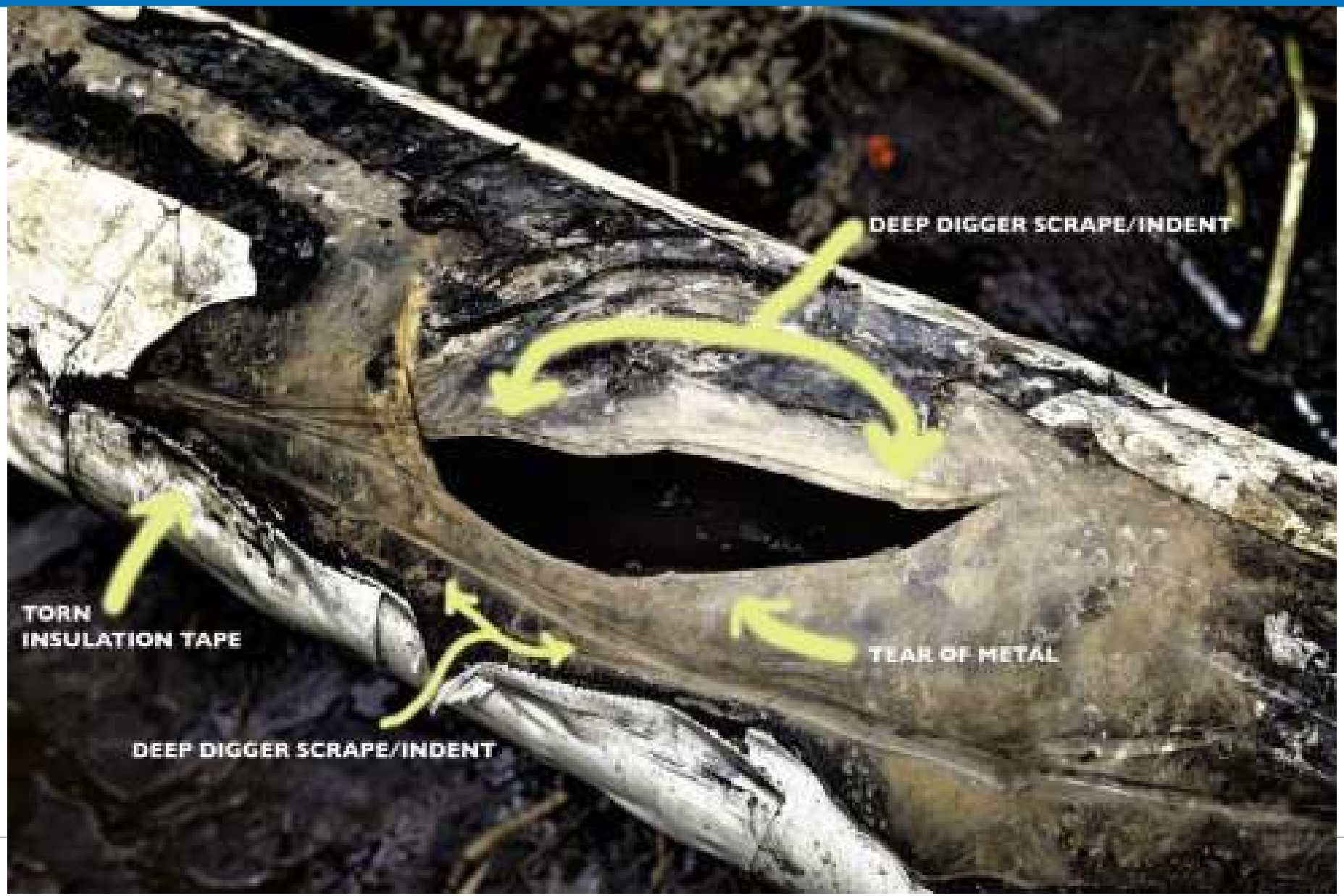
Next steps on White Cliffs realignment

- We are progressing the next stages of the White Cliff remediation project
- The completion date for this project has been brought forward to FY21 (previously FY23) to address the change in risk levels, with greater erosion experienced on site. UAV surveys of the area are being conducted at 3 monthly intervals to monitor any change in the area
- We have completed the initial project options phase. We have identified several options and will shortly begin working with stakeholders and affected land owners to proceed to completion of the FEED study, consenting, detailed design and execution
- Additional emergency hot tapping and stoppling equipment and fittings have been procured over the last year to allow faster emergency response if needed
- Project is not funded under the DPP and First Gas engaging with Commerce Commission on funding arrangements for the White Cliffs project
- Keen to avoid relitigating issues canvassed through recent DPP reset, and instead focus scrutiny on project need, selection, timing, and cost recovery

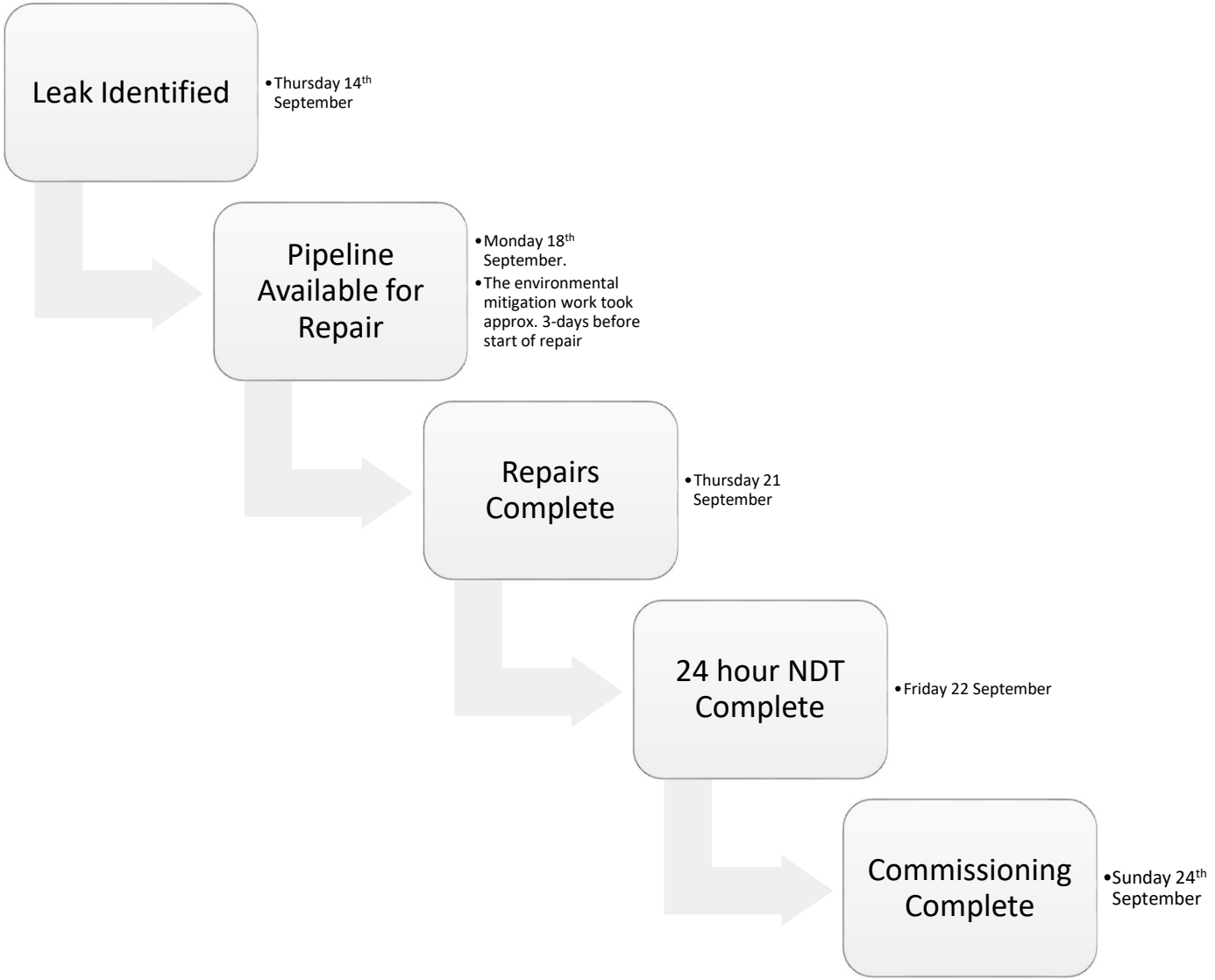
Pipeline emergency preparedness

- Emergency response preparation is required under AS/NZS 2885
- First Gas has the appropriate plans, trained and experienced people, equipment and spares to respond to an emergency repair on Gas Transmission pipelines and stations. This includes the following:
  - Full range of hot tapping and stoppling equipment, including a recent investment in an additional $5M of equipment in this area
  - Spare line pipe for emergency which is stored in a warehouse near the main operational bas
  - Undertaking annual emergency response exercises
  - Training and competency assessment of staff, including skills and tasks involved in emergency repairs
  - Procedures and strategies for managing the emergency response, engineering of repairs, and detailed repair plans
  - Experienced staff who have been involved in previous urgent repairs
  - Dedicated emergency control room adjacent to the pipeline control centre
  - On-call experienced contractors to support an emergency repair

Example – Refinery to Auckland Pipeline (RAP) failure point



Example – RAP incident response timeline



Example – RAP repair elements

- Permits, Procedures & other safety documentation
- Loss of Containment (LOC) site jet fuel clean-up
- Excavations at LOC site, Northern and Southern Stopple Sites
- Gravelling of sites and dewatering
- Welding of stopple fittings onto pipe
- Stoppling to isolate damaged pipe
- Fabrication and testing of 17m repair section
- Cut-out of damaged section of pipe
- Prep and welding in of new section of pipe
- NDT of welds and certification inspections
- Removal of stopples
- DCVG of immediate vicinity to check for further coating damage
- Commissioning of repaired pipe

Key takeaways for SRC

- Assuring security of supply to gas is a key priority and focus for First Gas (alongside Health and Safety)
- The gas transmission system is constructed and operated with security of supply in mind. This includes equipment redundancy (where economic) and a degree of system configuration flexibility
- While security of supply risks are effectively managed, residual risks remain
- Principle risk areas are corrosion, third party damage and geohazards. We are focusing attention on two identified erosion risks :
    - Maui pipeline at Gilbert Stream
    - Maui and Kapuni pipelines at White Cliffs
- Comprehensive emergency procedures and assets are in place should an event occur – used recently in responding to the RAP incident

How the SRC can help

- Engagement with major stakeholders is critical to First Gas
- We need stakeholders to understand the links between expenditure and the service levels we deliver, particularly in managing security and reliability risks
- Advisory groups such as the SRC can play an important role in feeding into the risk management decisions published in our asset management plans. Specifically:
  - What risks are most important in managing the impacts of gas outages in the electricity system?
  - What value should be ascribed to managing those risks (i.e. what should we be prepared to pay to reduce these risks)?
  - What information can First Gas provide to inform other parties' assessments of security and reliability risks?
- While technical solutions to manage risks are known, funding significant projects (such as the White Cliffs realignment) presents challenges. We welcome support for timely, efficient investment decisions that manage known security of supply risks