Gas Networks Ireland

Executive Summary

April 2024

Private & Confidential

1. Executive Summary

GNI has the technical, commercial and financial capability to deliver the Strategic Gas Emergency Reserve for Ireland.

The 'Ask'

- GNI has considered DECC's criterion that the project needs to comply with the N-1 infrastructure standard (pursuant to Regulation (EU) 2017/1938) (the "N-1 Standard") but has also considered the risks associated with a full outage of gas supply from Great Britain.

Emerging N-1 Solution

- It is recommended with respect to Ireland's compliance with the N-1 Standard that a Floating Storage and Regasification Unit ("FSRU") which meets DECC's criteria should be delivered as a transitional measure.

Emerging Full GB Outage Solution

- GNI is of the opinion that serious consideration should be given to the early implementation of a long-term solution which guarantees energy security during a full outage of gas from Great Britian to the island of Ireland.
- Our analysis suggests that a [redacted] project combining the delivery of a salt cavern facility [redacted] along with separate jetty infrastructure and an FSRU (as an interim measure) in the Republic of Ireland best meets this need.

Process

- GNI has applied a structured and systematic process for the purpose of identifying an emerging preferred option
- Strategic Objectives have been used to assess the credibility of options at each stage of the process.
- Proposal has been informed by the Government's Policy Statement on the Importation of Fracked Gas

Key Assumptions

- Costs are currently indicative given the accelerated business plan development, will be refined for Final Business Case.
- GNI has undertaken a comparison of options to accelerate the delivery schedule for DECC / Government to consider.
- Exact funding mechanism to be finalised but the use of a Regulated Asset Base (RAB) model where GNI will have certainty of return of Capex/ Opex has been assumed.

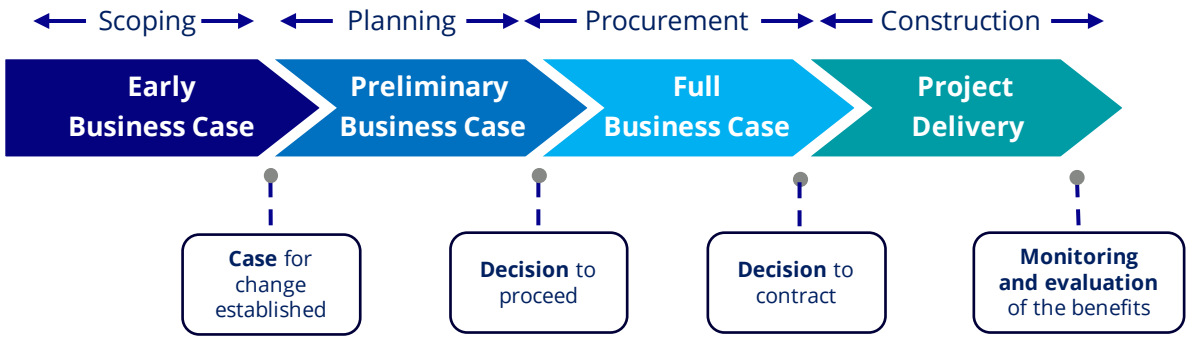
Next Steps

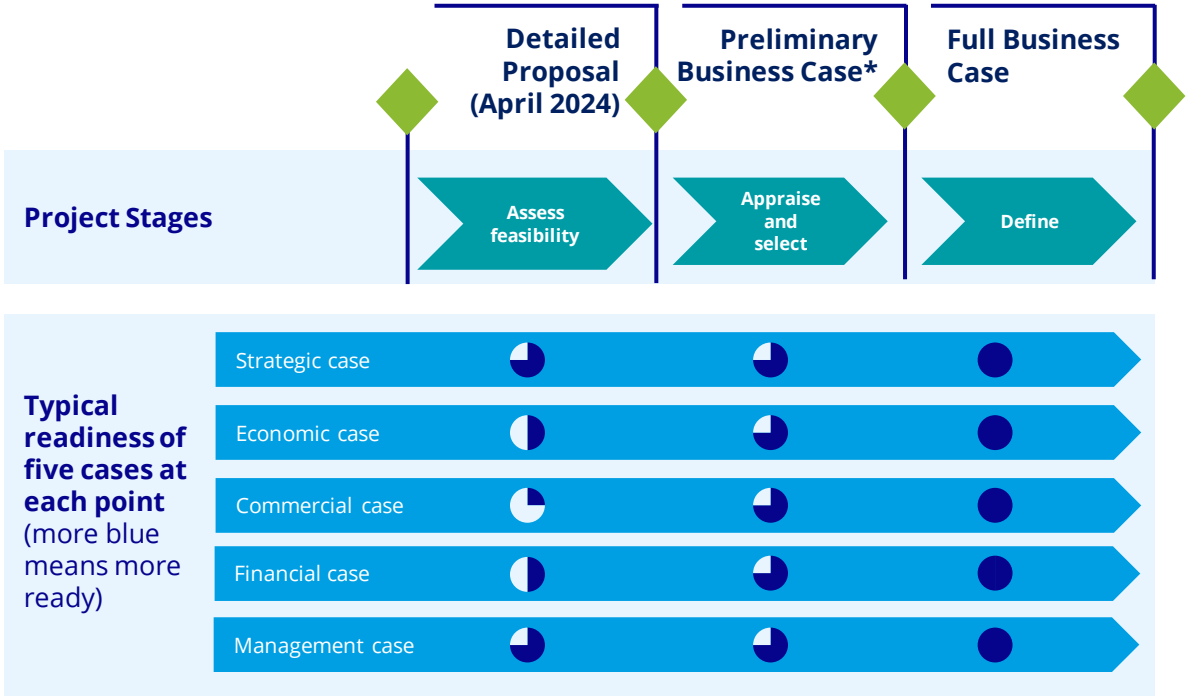
- A site selection process will be progressed with clear process and criteria once the technology solution is approved
- Financial and economic models to be further refined with sensitivity analysis
- Additional Reference Class Forecasting, Risk Analysis (QRA) and Cost Estimation work

2. Detailed Proposal / Preliminary Business Case – status of work

Business Case structure:

- The business case has been prepared in compliance with both the Infrastructure Guidelines: Strategic Assessment and Preliminary Business Case, December 2023[1] and the Infrastructure and Projects Authority's Infrastructure Business Case five-cases model[2]. The business case includes: strategic, economic, commercial, financial and management cases – the five dimensions of the case.
- The Project is currently at the Preliminary Business Case stage, which if approved, will enable the Project to proceed to Final Business Case, where detailed design and procurement activities will determine the final scope, cost and schedule for the project.





Source: Infrastructure Project Authority (2022) Project Routemap[3] *Target for Government submission in June

[1] Department of Public Expenditure NDP Delivery and Reform (2023), Infrastructure Guidelines: Strategic Assessment and Preliminary Business Case. Available here
[2] Infrastructure and Projects Authority (2022), Infrastructure Business Case: International Guidance. Available here
[3] Infrastructure and Projects Authority (2022), Project Routemap. Available here

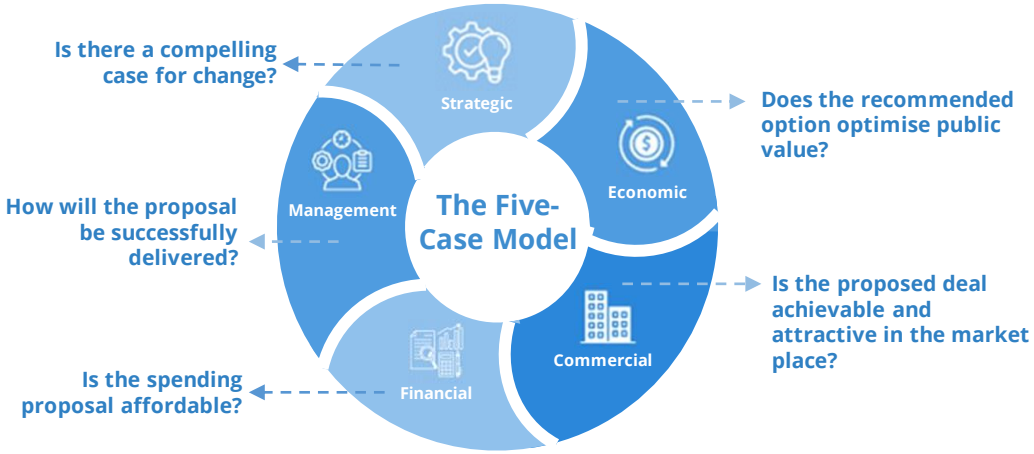
3. How to Read this Detailed Proposal / Preliminary Business Case

The Detailed Proposal / Preliminary Business Case contains five individual business cases for review. While each business cases considers different aspects of the Project, they are interdependent.

Strategic Case	Economic Case	Commercial Case	Financial Case	Management Case
Provide the rationale for the project, evidence the strategic fit, define the project objectives, and outline the potential scope for the project.	Appraise a wide range of possible options and refine to a shortlist. Provide high level estimates of costs and benefits for the shortlisted options, based on any applicable feasibility studies, and identify a 'Preferred Option'	Provide initial thought to the potential commercial and procurement arrangements for the preferred option	Provide indicative whole-life costs for the preferred option and consider potential funding and financing options.	Give initial thought to delivery arrangements, and the resource requirements to deliver the preferred option.

Review Recommendations

- The overall submission is best understood if the material is reviewed in its totality and read as per the sequence above.
- A list of assumptions made to inform the preparation of the Preliminary Business Case is provided as an attachment, this should be read in conjunction with each of the cases.
- Additional information is provided in the appendices to each of the cases and should be reviewed.
- A list of acronyms are included in the appendix of each of the cases.



4. Detailed Proposal/Preliminary Business Case: Table of Contents

Strategic Case

1. Introduction
2. Policy Context
3. Case for Change
4. Potential Scope of the Solution
5. Main Benefits and Risks
6. Conclusion

Economic Case

1. Introduction
2. Project Optioneering
3. Economic Appraisal
4. Confirmation of Emerging Preferred Option

Commercial Case

1. Introduction
2. Routemap Procurement Method
3. Pillar 1: Understanding the Outcomes
4. Pillar 2: Engaging the Market
5. Pillar 3: Packaging the works
6. Risk Allocation
7. Pillar 4: Selecting the contracting model
8. Pillar 5: Defining and implementing a successful tender process
9. Pillar 6: Managing performance
10. Next Steps

Financial Case

1. Introduction
2. Costs
3. Revenues
4. Financial Model
5. Financeability Considerations
6. Financial Sources
7. Affordability Considerations
8. Preliminary Conclusions

Management Case

1. Introduction
2. Delivery Management and Governance
3. Asset Management Plan
4. Project Delivery Plan
5. Project Delivery Costs
6. Stakeholder Engagement
7. Change Control
8. Benefits Realisation Plan
9. Risk Management
10. Regulatory Framework , Legislative Compliance and Legislative Amendments
11. Sustainable Development

Five Cases: Key Insights

Policy Context: Security of Supply

EU and Irish energy legislation and policy has aligned over time

European Commission Regulation[4]

994/2010

Measures to safeguard the security of gas supply, introduced 'N-1 Infrastructure Standard' requiring Member States to take measures in the event of disruption to their largest single piece of gas infrastructure.

EU[5]

2017/1938

Enhances gas security through a new, efficient method to prevent and manage potential supply crises, and establishes a solidarity principle, where neighbouring Member States would be called upon to assist with gas supply to households and essential services during severe crises.

Policy Statement on Security of Electricity Supply[6]

2021

Updates national policy and includes government approval for considering the development of appropriate additional electricity and gas infrastructure.

EU Gas Storage Regulation[7]

2022/1032

Introduced new rules under which gas storage facilities are considered critical infrastructure, a new certification process and sets out the gas storage filling targets that EU countries have to reach including the 90% gas storage target by 1 November each year.

Energy Security in Ireland[8]

2023

A strategy to guarantee energy security and support a sustainable shift to a carbon-neutral energy system by 2050. Included a rigorous review of Ireland's electricity and gas networks ('CEPA report'[9]), public consultation, and an independent review of electricity supply security (the 'McCarthy Report').

2010 **2024**

[4] EU (2010), Regulation No 994/2010 of the European Parliament and of the Council concerning measures to safeguard security of supply and repealing Council Directive 2004/67/EC. Available here
[5] EU (2017), Regulation (EU) 2017/1938 of the European Parliament and of the Council concerning measures to safeguard security of supply and repealing Regulation (EU) No 994/2010. Available here
[6] DECC (2021), Policy Statement on Security of Electricity Supply. Available here
[7] EU (2022), Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage. Available here
[8] DECC (2023), Energy Security in Ireland to 2030. Energy Security Package. Available here
[9] CEPA (2022), Technical Analysis of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems. Available here

Case for Change: Risks that could materialise

The high dependency on gas to meet the nation's energy demands coupled with demand and supply-side risks, means that Ireland's energy security is vulnerable and intervention is required.

The energy system is subject to demand-side shocks related to unexpectedly low wind and low temperatures occurring together and supply-side shocks are focused on a technical failure of the physical infrastructure from Great Britain and geopolitical disruption, listed below:

Technical disruption

Sabotage/Attack

GB Supply risk

Extent of impact of technical failure dependent on:

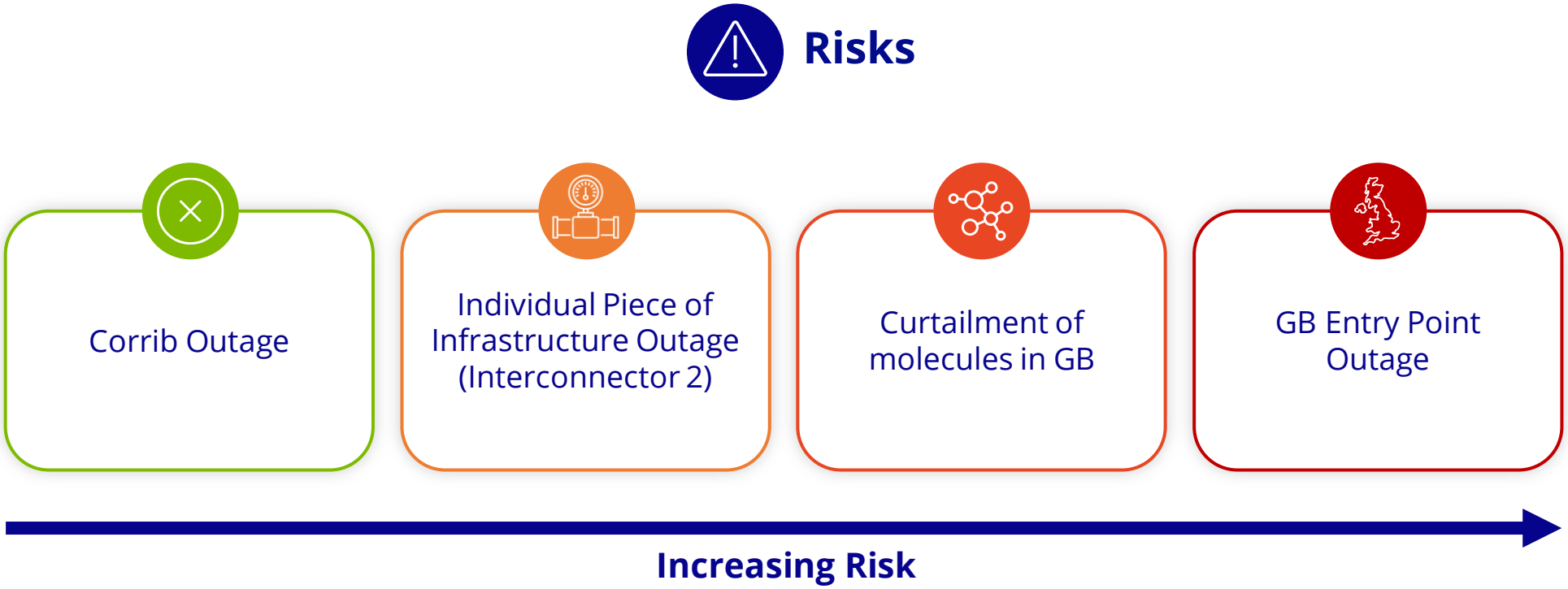
Different infrastructure outages

Different durations

- These shocks could result in Ireland not receiving flows, or having limited flows, through the interconnectors. Ultimately, the impact depends on the gas volume and supply route disrupted and the duration of the outage.
- The worst case for these scenarios involves physical sabotage of the subsea section of interconnector system 2 ("**IC2**"), which could take up to six months to repair. This is based on indicative timings from the recent outages on the Nord Stream and Balticconnector pipelines, together with taking account of GNI's emergency preparedness measures.

Case for Change: Gas Security of Supply Risk Profile

Historically, the ongoing safe and secure operation of the gas network would be considered the exclusive domain of the transmission system operator ("TSO"), however new risks are materialising whereby geo-political levers and sabotage have emerged as credible scenarios that must be considered.



Case for Change: Potential outage duration

Repair Time

A critical aspect in determining repair times is whether an 'Emergency Pipeline Repair System' ("**EPRS**") is in place prior to an incident taking place.

A robust EPRS ensures that GNI is ready to react to an incident, reducing the response/repair time and thus the duration of the gas outage.

Critical aspects of the EPRS include:

Access and Inspection;

Procedures that cover various repair scenarios;

Readily available materials and equipment;

Competent contractor to carry out repair work, including identification of a suitable installation vessel.

- GNI currently has an emergency pipeline repair contract in place for on-shore repairs and is in the process of implementing a full EPRS contract for subsea repairs, which is expected to be in place in 2025.
- IPC2016-64083, "Risk Based Strategy For The Development Of An Emergency Pipeline Repair System (EPRS)"[10] states that with a 'Full EPRS' in place, for pipelines greater than 20-inch diameter, the estimated 'Mean Time to Repair' is up to 6 months.

Outage Duration

- The outage duration is the amount of time required from the initial loss of containment to affect a repair that re-instates flow *(either N-1 or Full GB Outage, depending on the emergency scenario)*.
- As stated, in accordance with IPC2016-64083, the estimated 'Mean Time to Repair' is up to 6 months.
- Therefore, it is prudent to expect a period of 6 months for a subsea outage.

Recent Incident

- Balticconnector – Repair duration October 2023 to April 2024

Current Risk Resolution:

- In the event that an emergency scenario was to materialise before the Project is delivered, the TSO would affect a repair of the pipeline along with interim mitigation measures as set out in the National Gas Emergency Plan.

[10] ASME (2016), Risk Based Strategy for the Development of an Emergency Pipeline Repair System (EPRS). Available here

Case for Change: Current Landscape/Challenges

Reliance on GB entry point

Ireland has a dependence on the GB Entry Point, being the only gas source which can cater for 100% of ROI demand in all demand scenarios.

Peak demand growth

Although annual gas demand is expected to decline over the next ten years, peak demand is growing and cannot be met by existing infrastructure. This risk will impact by Winter 24/25.

No domestic gas storage

Ireland is one of five European countries with no domestic gas storage. Three of these States have developed LNG, whilst Luxembourg has multiple pipe supply routes thereby leaving Ireland as an outlier.

Increased risk profile

The risk profile in relation to security of physical infrastructure has increased. Risks that were once considered improbable are now possible and, in some cases, have already occurred (Nord Stream and Baltic Interconnector Pipelines).

Supply curtailment

In the event of any curtailment of gas flows, Ireland will not have sufficient supply from indigenous sources to meet all customer demand, specifically power generation customers, resulting in possible blackouts across electricity networks. Per the CEPA report[20], this could have an economic impact on Ireland of €4.6bn over a 30-day period. The accompanying Economic Case to this document provides further analysis on likely the economic impact of outages in the coming years.

EU peer practice

Several EU Transmission System Operators (TSOs) have invested in floating storage and regassification units (FSRUs) to address short-term capacity shortfalls and / or onshore storage for long-term security of supply with a clear decarbonisation pathway.

Main Benefits and Risks: Goals and Benefits Summary

Improve security of gas supply

Facilitate an expansion of renewable energy

Facilitate the switch to renewable gas in the future

Economic

- Avoids the economic consequences of failing to meet gas demand in the event of a shortage.
- Avoids or reduces the costs of alternative strategies for improving security of supply.
- Protects the reputation of Ireland as an energy-secure economy.
- Reduces the need to reinforce entry point capacity in the future.

Social

- Avoids social cost of failing to meet gas demand.
- Provides local employment opportunities.
- As well as providing employment, the solution implemented could help develop skills required for the energy transition and other infrastructure projects.

Environmental

- Reduce emissions from use of secondary fuels in electricity generation during an outage.
- Supports the delivery of renewable electricity through a secure back-up gas supply.
- Supports future potential conversion of an existing gas interconnector to hydrogen.
- Provides hydrogen-enabled permanent infrastructure that supports transition to renewable gases.

Regulatory

- Allows Ireland meet the legal requirement set out in Regulation (EU) 2017/1938. Ireland is currently operating outside the legal requirement set by the EU.

Case for Change Conclusion

Gas plays a central role in Ireland's energy now and into the future: it facilitates the expansion of RES electricity generation targeted in the Climate Action Plan.

Ireland is an outlier for diversification of gas sources and storage, lacking both gas storage facilities and LNG terminals. This is particularly acute when compared to EU peers who have a similar reliance on gas for electricity generation.

Therefore, Irish security of energy supply is vulnerable, and the required intervention makes the **Case for Change**.

There are two ways in which the security-of-supply concern can be addressed:

Diversify gas supply to Ireland:
e.g. by building additional gas interconnectors or having LNG terminals which can receive LNG gas

Gas storage:
including underground gas storage (for example in salt caverns)

These options are explored in the Economic Case.

Main Benefits:

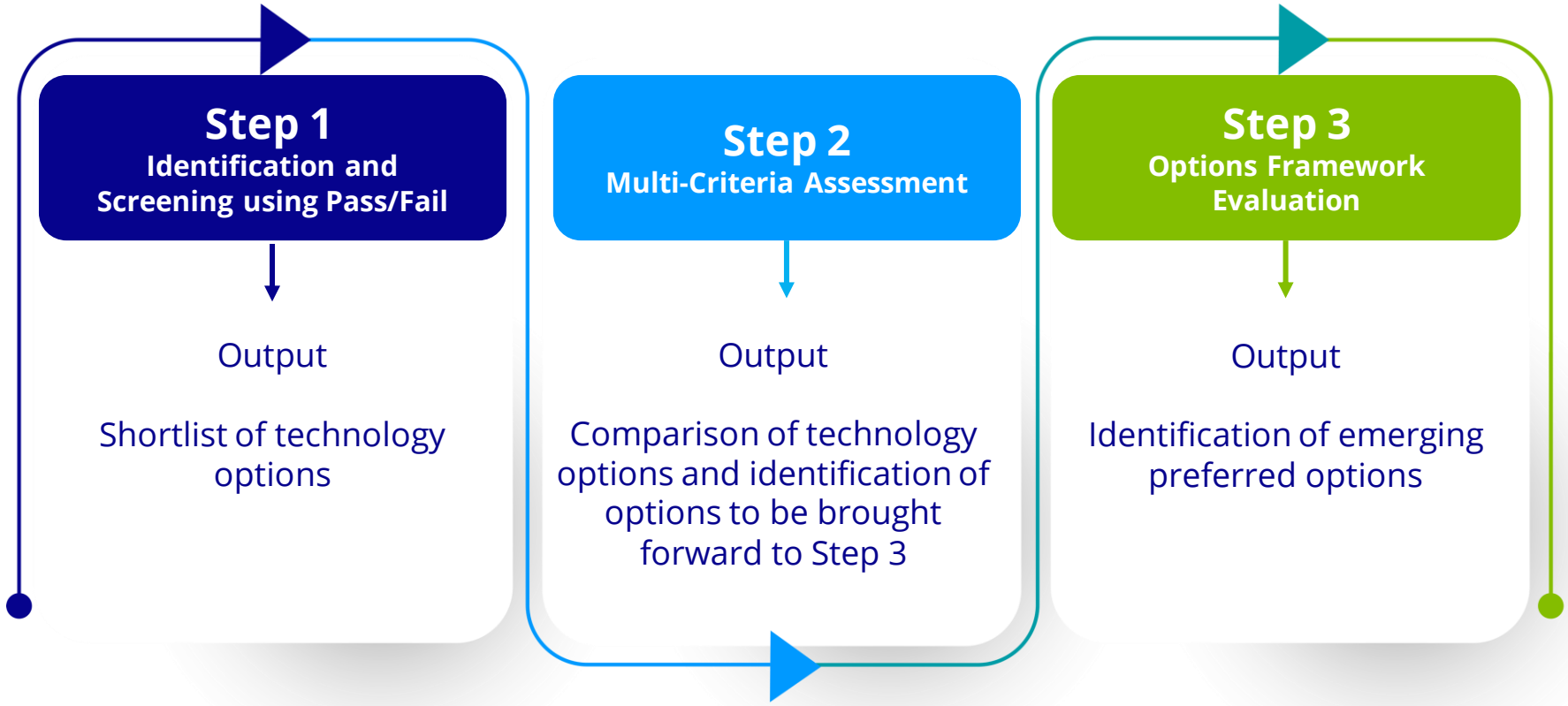
Economic & Social:
Avoids the economic consequences to Irish consumers and social cost of failing to meet gas demand in the event of a shortage

Environmental:
Supports renewable electricity through a back-up gas supply and provides hydrogen-enabled permanent infrastructure that supports transition to renewable gases

Regulatory:
Avoids Infringement Notice and/or fines from European Commission

Project Optioneering: Technology Selection Overview

- Project optioneering involves the development of a structured and systematic process for the purpose of identifying an emerging preferred option.
- A three-step process was developed as indicated below. This process aligns with the Infrastructure Guidelines[1] and Infrastructure and Projects Authority (IPA) Guidance[2].
- This process assess the impact of potential concepts and options on a wide range of factors that are critical to achieving the strategic objectives. In all three steps, scores are applied to judge the relative strength against these options; including amongst other criteria, scoring of strategic fit, affordability and deliverability. This optioneering process also considers environmental and climate related outcomes.



[1] Department of Public Expenditure NDP Delivery and Reform (2023), Infrastructure Guidelines: Strategic Assessment and Preliminary Business Case. Available here
[2] Infrastructure and Projects Authority (2022), Infrastructure Business Case: International Guidance. Available here

CBA Results

1 **CBA is positive and investment makes sense using CEPA/DECC values updated with published 2023 SEM decision in relation to electricity outages.**

2

	Emerging N-1 Solution	Emerging Full GB Outage Solution
Net Benefit	[redacted]	
Required Probability for a net benefit of zero		
Benefit Cost Ratio (BCR)	1.17	4.2

3 **Key Assumptions**

- An outage of 6 months from a 1-in-20 peak day
- The 6-month period is based on estimated repair time
- Benefits start at commissioning date
- Secondary Fuel is replaced by solution.
- 'Business as Usual' delivery schedule
- Any outage prior to commissioning is a loss to society and not modelled in this CBA

4 **Model inputs and calculation**

Assign a € value
Take the widely used EU Standard called **Value of Lost Load (VoLL)** that assigns a € amount to the loss of electricity/gas to society in every Member State – we used up-to-date Irish data from the CRU SEM decision in 2023[12].

Assign a theoretical probability
1% → used in previous major EU grant funding CBA, 1% probability linked to European Gas Incident Group reports[13] (not taking into account the recent three subsea outages in Europe in past two years).

Calculate a € Benefit
These are applied to a forecast of gas demand left unserved using GNI/CRU forecasts (to 2032)[14] and IEA Stated Policies (IEA STEPS)[11] (in period to 2050) in the potential 6-month outage over the period from commissioning to 2050.

5 **Sensitivities with positive impact on € Benefits**

- Accelerated project delivery schedules increase project benefits
- Continued trend of society's increasing value of loss of electricity given increased electrification (i.e. electric cars, heat pumps, home heating, etc)
- Slower than forecasted transition from gas with higher annual and daily volumes
- Continued pressure on electricity supply to meet demand
- Different phasing of solution cost drivers could result in earlier benefits realisation
- Although not a societal benefit, the proposed project CBA would benefit from alternative revenue streams from obligation to use (Salt Caverns, unloading ships)

[11] International Energy Agency (IEA) (2023), Global Energy and Climate Model. Available here
[12] SEM Committee (2023), Calculation of a Single Value of Lost Load within the Single Electricity Market. Available here
[13] European Gas Pipeline Incident Group (n.d.), EGIG Reports. Available here
[14] GNI (2022), Gas Forecast Statement 2022. Available here

Commercially Sensitive

Confirmation of Emerging Preferred Option(s)

To invest?

- If no commercial use is foreseen, whether the Security of Supply benefits justify the investment mainly depends on the risk perception and valuation of an outage by policy makers. This applies to both N-1 and Full GB Outage scenarios.

Next steps

- Whether the FSRU will need to be leased or built needs further consideration
- Whether greater investment to cover a Full GB Outage is justified needs further consideration

5.4 Delivery Timescales – Assumptions for Schedule Acceleration

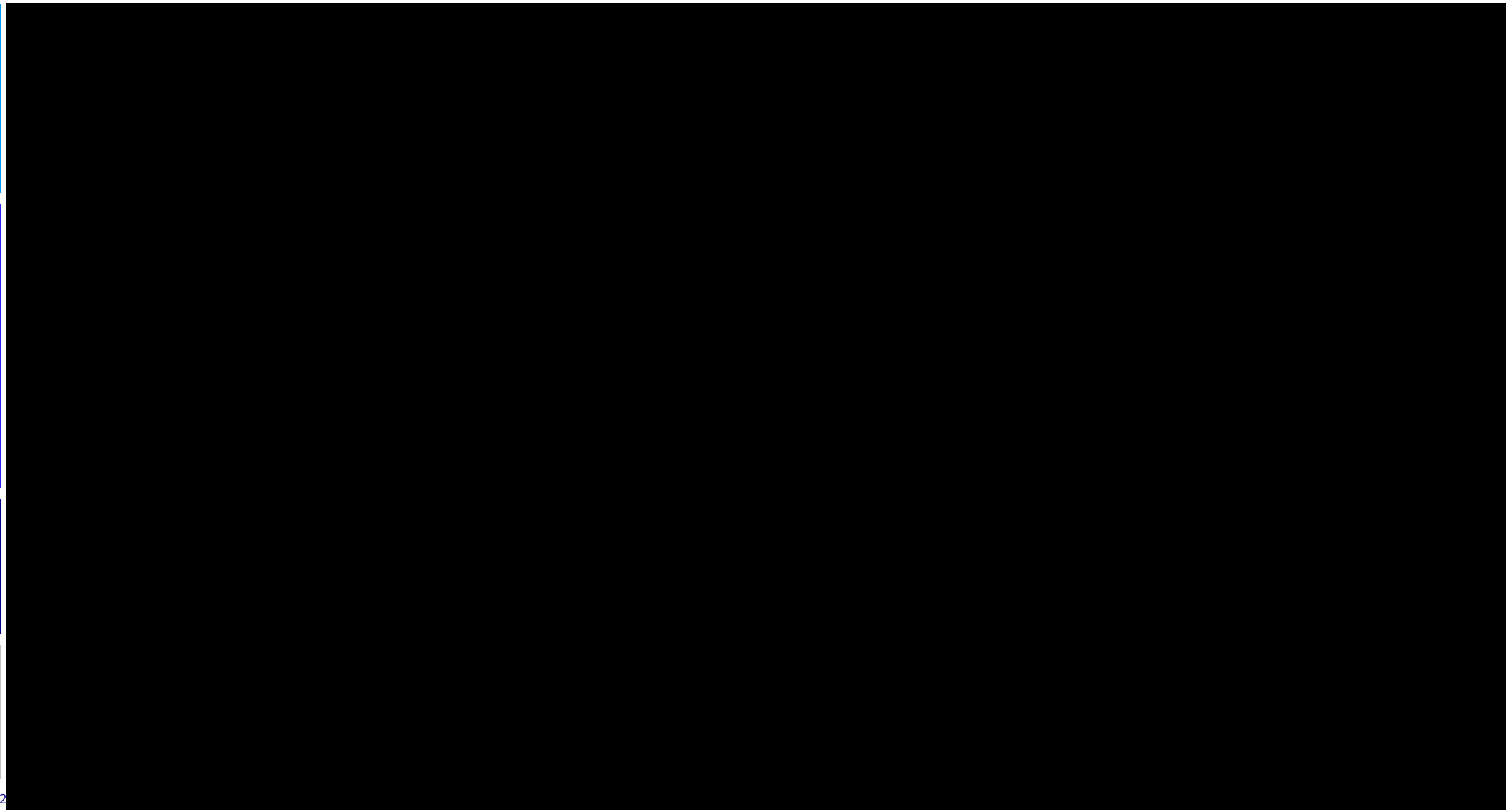
Gas Networks Ireland

Accelerated

Accelerated (High Risk)

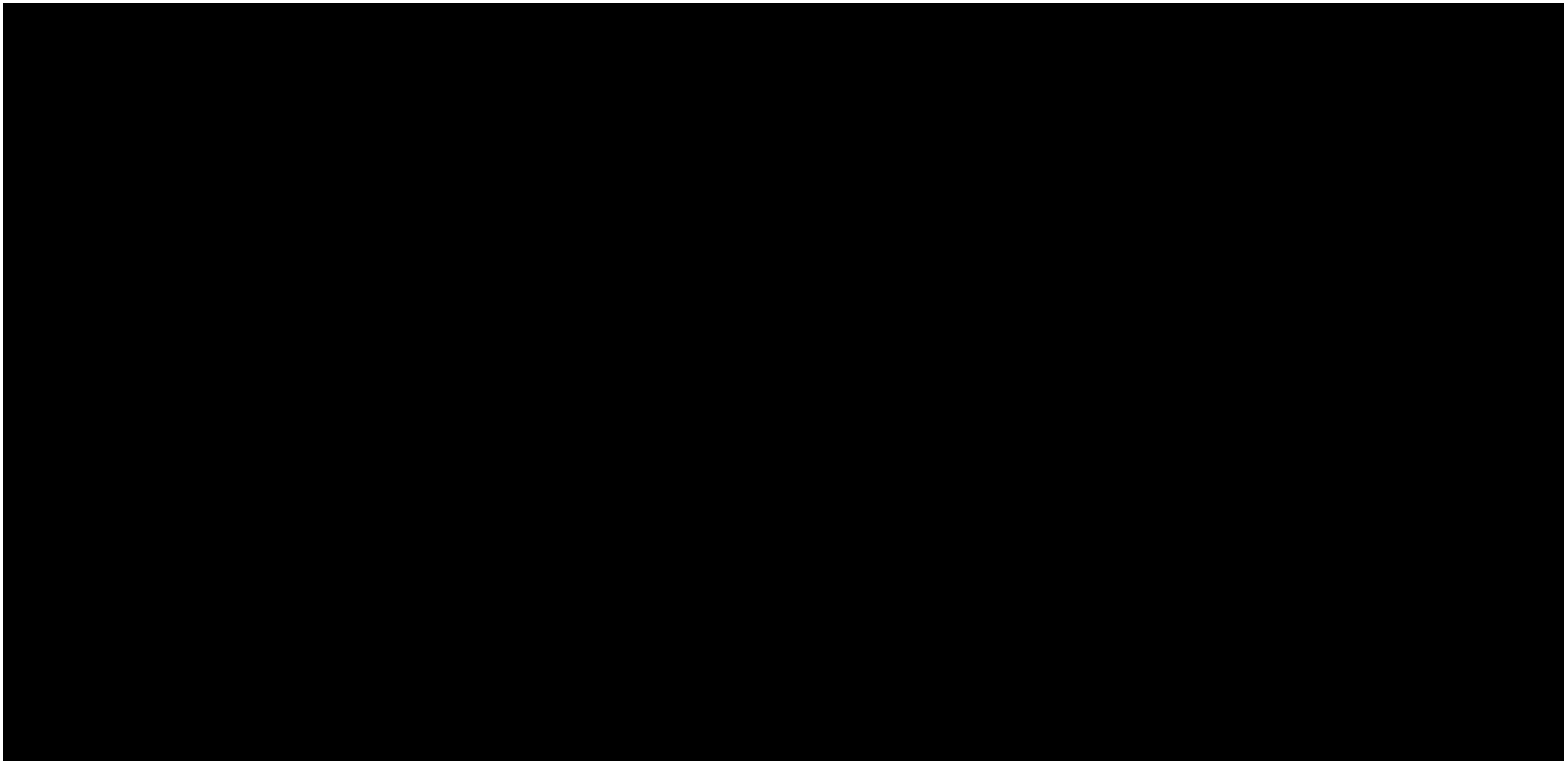
Emergency Status* (Very High Risk)

Business As Usual



[15] Government of Ireland (2022

5.4 Delivery Timescales for Emerging N-1 Solution: FSRU



5.4 Delivery Timescales for Emerging Full-Outage Solution: Salt Cavern + FSRU