



Network Emergency Co-ordinator (NEC) Industry Exercise 'Arctic' 2019

Industry Post Exercise Report

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Executive Summary

The 2019 Network Emergency Coordinator (NEC) emergency exercise, “Exercise Arctic”, was run over three days. This report covers:

- The National Grid **Pre-Emergency Commercial Strategy Exercise**, testing market tools and communications between the Electricity System Operator (ESO) and the Gas System Operator (GSO) (Pre-Emergency Day), 11th September
- **NEC Industry Exercise Day 1**, testing the declaration of an Emergency with specific focus on Stage 2 – firm load shedding, 2nd October
- **NEC Industry Exercise Day 2**, testing the declaration of a Stage 3 Emergency with specific focus on Network isolation, 3rd October.

The overriding aim of the exercise was to demonstrate that the gas industry is prepared and able to meet its obligations in the event of a Network Gas Supply Emergency (NGSE).

The NEC Exercise was a successful test of Gas Industry emergency arrangements because it demonstrated that the following objectives were met:

- Test emergency response communications (including the activation of the Gas Availability Status Report)
- Practice the response link between the Distribution Network’s response teams and National Grid’s Network Emergency Management Team
- Validate emergency procedures, specifically E1, National Grid’s E3, the E3 documents of the Distribution Networks, and the NEC Safety Case
- Embed, for testing, recommendations from previous industry emergency exercises, including NEC Exercise ‘Zeus’ (2018) Restoration Exercise ‘Alpha’ (2019) and Communications Exercise ‘Announce’ (2019).

The exercise also identified areas where further actions are required; these are

- The timeliness of communication from National Grid Gas to Gas Distribution Networks (GDN) and the UK Government Department for Business, Energy and Industrial Strategy (BEIS) about potential decision points
- The co-ordination of external communications with BEIS and all other industry parties, including the electricity industry
- The provision of a pre-emptive risk assessment for the admittance of Emergency Specification Gas, to avoid time delays and inconsistencies in dynamically assessing the impact of admitting this gas
- A review of training for the GSO Network Emergency Management Team (NEMT)
- Developing an agreed approach and language across the gas and electricity system operators to ensure that there is a common understanding of the situation and scenario planning which allows outcomes to be developed that will minimise the use of gas for power generation during a shortage of gas.

Exercise Arctic is assessed by the NEC as having provided appropriate levels of assurance of the Industry’s ability to respond to a Gas Deficit NGSE and as having provided valuable learning and experience to the wider Gas Industry.

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1 – Overview

The NEC Safety Case requires that the NEC systematically reviews the Industry Exercise and publishes the results of the review, including any changes to procedures, in a report to Industry and the Health and Safety Executive (HSE). This report has been authored by the Office of the NEC. It serves as a record of the three stages of Exercise Arctic. The outcomes of the exercise are presented in [Section 2](#). Lessons learnt are outlined in [Section 3](#) and the key learning points from which actions will be identified are summarised in [Section 4](#). Detailed appendices are provided for further reading. These include identification of participants [Appendix I](#), an overview of the scenario [Appendix II](#), and a glossary including an overview of the role of the NEC [Appendix III](#).

Table 1 provides a high-level summary of the three latter sections of this report.

Table 1 –Summary of outcomes

Objectives	Demonstration and outcomes	Lessons Learnt
<p>2.1 Test emergency response communications (including the activation of the Gas Availability Status Report)</p>	<ul style="list-style-type: none"> • Testing the revised process for pro-active regulator notification • Activation of the Gas Availability Status report • Success in the enhanced approach to NEC Briefings <p><i>Further reading in Section 2.1</i></p>	<p>3.2 The timeliness of communication from National Grid Gas to GDNs and BEIS about potential decision points [Learning point 2]</p> <p>3.3 The co-ordination of external communications across BEIS and all other industry parties, including the electricity industry. [Learning point 3]</p>
<p>2.2 Practice the response link between the Distribution Network’s response teams and National Grid’s Network Emergency Management Team</p>	<ul style="list-style-type: none"> • Testing of the process to deliver the load shedding directions on the NTS and in the LDZs • Initiation of Stage 3 Allocation and Isolation through isolation by rate versus reduction of end of day <p><i>Further reading in Section 2.2</i></p>	<p>3.1 Some data provided by a GDN was not transcribed into the decision support tool [Learning Point 1]</p> <p>3.4 National Grid Gas Load Shedding audit trail incomplete [Learning point 4]</p>
<p>2.3 Validate emergency procedures, specifically E1, National Grid’s E3, the E3 documents of the Distribution Networks and the NEC Safety Case</p>	<ul style="list-style-type: none"> • The specific area of the procedures that was tested in this case was those surrounding the potential for admittance of Emergency Specification Gas. <p><i>Further reading in Section 2.3</i></p>	<p>3.5 The provision of a pre-emptive risk assessment for the admittance of Emergency Specification Gas, to avoid time delays and inconsistencies in dynamically assessing the impact of admitting this gas [Learning point 5]</p>
<p>2.4 Embed, for testing, recommendations from previous industry emergency exercises, including NEC Exercise ‘Zeus’ (2018) Restoration Exercise ‘Alpha’ (2019) and Communications Exercise ‘Announce’ (2019)</p>	<ul style="list-style-type: none"> • Testing an enhanced means of communicating between the GSO and ESO during a shortage of gas <p><i>Further reading in Section 2.4</i></p>	<p>3.6 Developing an agreed approach and language across the gas and electricity system operators to ensure that there is a common understanding of the situation and scenario planning which allows outcomes to be developed that will minimise the use of gas for power generation if an NGSE is declared [Learning points 6, 7 & 8]</p> <p>3.7 A broader review of training should be undertaken [Learning point 9]</p>

2 - Outcomes

This section provides a narrative against the delivery of the four exercise objectives which demonstrate that Exercise Arctic was a success.

2.1 Test emergency response communications (including the activation of the Gas Availability Status Report)

The aim of this objective was for National Grid Gas to demonstrate that it can capture information from many upstream and downstream parties, collate, analyse and present it in a way which allows decisions to be made in a timely manner.

Pro-active regulator notification: A new means of notifying the Gas Industry's regulators (BEIS and the Office of Gas and Electricity Markets (Ofgem)) was tested at the start of the exercise. This process allowed the notification of BEIS and Ofgem about an incident with immediate or imminent public impact, within 15 minutes of that impact being realised. This notification was delivered successfully. The expectation was then that the regulators would wait for the relevant response team to form and establish a formal communications protocol, rather than pressing the control room for further information. This was the outcome observed.

Gas Availability Status report (G.A.S Report): The amount of potential extra gas supply available at each entry terminal, which had not been encouraged to flow commercially, was identified early in the response via the G.A.S Report. The live completion of the G.A.S Report for Exercise Arctic proved successful, continuing to demonstrate its value in an incident. 11 of the 19 terminals completed the report within one hour. Follow up calls to the terminals with data outstanding allowed a full report to be compiled.

NEC Briefings: The NEC was active throughout all three days of Exercise Arctic. The process of briefing the NEC on a range of strategy options was tested in full. Efforts had been made to enhance this process pre-exercise following learnings from Exercise Zeus. The Incident Controller (IC) is now provided with enhanced data visualisation tools when constructing their strategy briefings. These allow the IC to deliver a clearer briefing consisting of:

- Strategy options
- Impact on line pack if no action is taken
- Impact on line pack for each element of the strategy
- Impact on extremity pressures if no action is taken
- Impact on extremity pressures for each element of the strategy.

Although elements of the above have always been fundamental in achieving the strategy approval from the NEC, the means of displaying the data led to a significant improvement in the ability to present these briefings. The process to generate this visualisation will now be embedded into process to assure it can be replicated using live data. The series of Critical Transportation Constraint (CTC) exercises, scheduled for delivery utilising live data in Q1 2020, will test this.

2.2 Practice the response link between the Distribution Network's response teams and National Grid's Network Emergency Management Team

The aim of this objective was to that firm load shedding could be carried out in line with expectations, and to test whether the communications between the NEMT and GDNs about the level of isolation required in Stage 3 had been improved.

Firm Load Shedding: A key activity in Stage 2 of an NGSE is firm load shedding. Exercise Arctic tested the ability of National Grid to contact and achieve a reduction in gas supplied to loads directly connected to the NTS as well as the GDN's ability to do the same for their largest 200 sites in each of the Local Distribution Zones.

The target performance as set by the NEC Safety Case Forum is detailed in Table 2. This target was just missed, but the data in Table 2, disaggregated in Table 4 & Chart 2, shows the significant improvement which is being made year on year across the GDNs.

Table 2 – Success measure summary

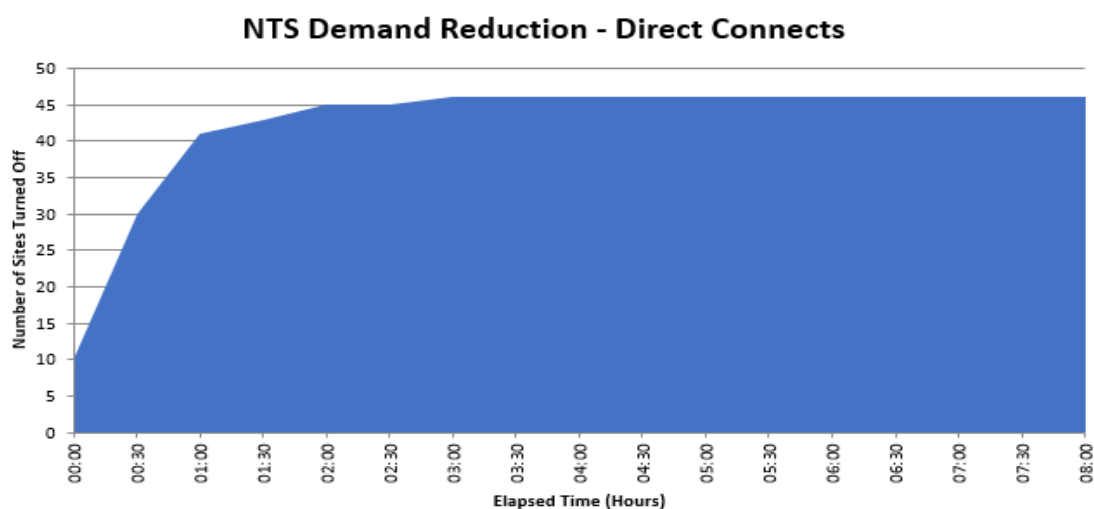
NEC Safety Case Forum Target	Outcome
National Grid to reduce 90% of the available load within one hour	87%
Distribution Networks to reduce 90% of the available load within two hours	88%

Table 3 – National Grid Load Shedding results

Exercise Name and Year of delivery	Percentage of sites who could be contacted and would stop using gas within one hour
Arctic 2019	87%
Zeus 2018	86%
Yield 2017	92%
X-Ray 2016	90%
Wolf 2015	79%

Note: This data was only collected for the NTS from 2015

Chart 1 – Total NTS Demand Reduction



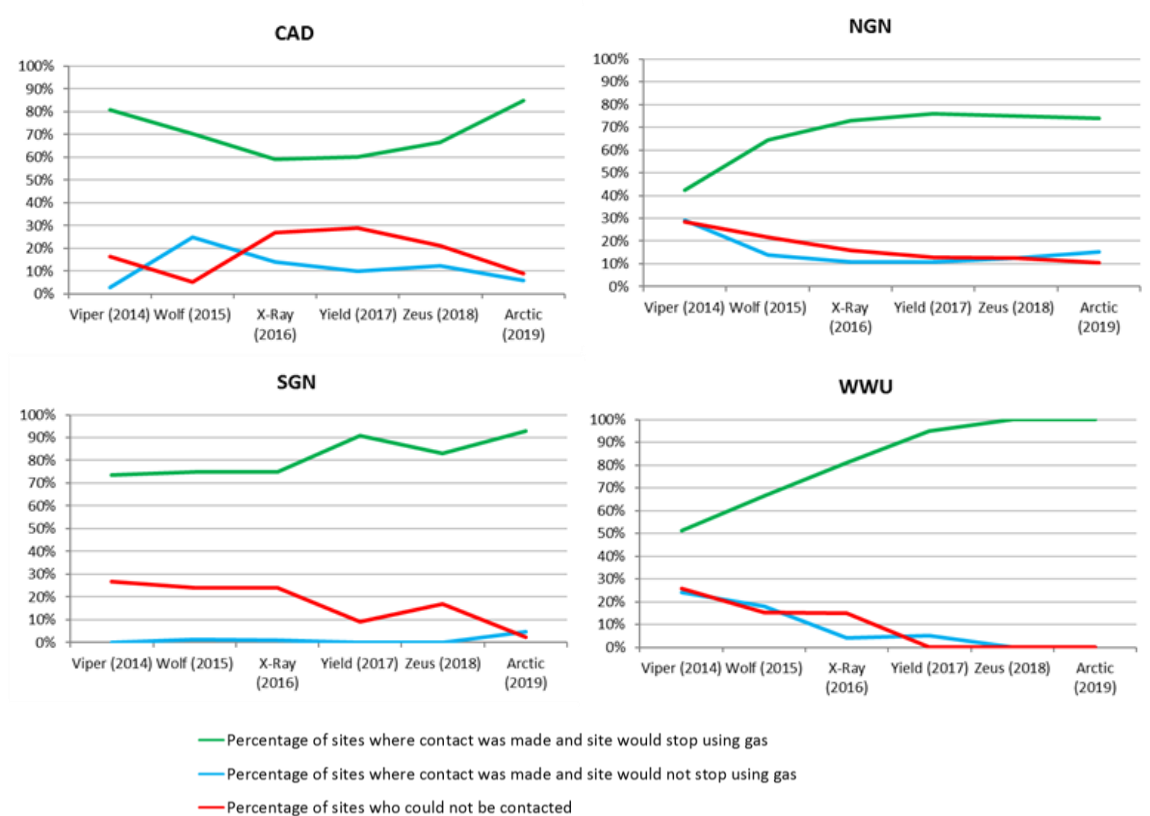
National Grid Gas reported to have contacted all sites. However, when collating data to analyse performance, National Grid Gas realised that the audit trail was incomplete. The team involved have subsequently been through another desktop exercise to demonstrate that the process for the collation of data arising from the load shedding process is robust. There is no doubt that the NEMT Shipper Team can make the required telephone calls and swiftly remove the demand from the NTS. What has been enhanced since Exercise Arctic is the training and tools to assure that this is accurately logged. [Section 3.3](#) details the associated learning points.

Table 4 – Aggregated GDN firm load shedding data

Exercise Name and Year of delivery	No of sites attempted to be contacted	No of sites where contact was made, and site would stop using gas		No of sites where contact was made, and site would not stop using gas		No of sites who could not be contacted	
		Count	Percentage	Count	Percentage	Count	Percentage
Arctic 2019	2751	2400	87%	164	6%	184	7%
Zeus 2018	2638	2088	79%	180	7%	370	14%
Yield 2017	2633	2031	77%	200	8%	402	15%
X-Ray 2016	2662	1935	73%	232	9%	495	19%
Wolf 2015	2725	1895	70%	450	17%	380	14%

Viper 2014	2493	1637	66%	282	11%	574	23%
Ulysses 2013	1673	920	55%	250	15%	503	30%
Titan 2012	1229	904	74%	134	11%	191	16%

Chart 2 – Comparison of GDN firm load shedding performance



Overall, performance has shown improvement with the GDNs maintaining or improving their performance from previous exercises.

There is a general agreement between National Grid Gas and the GDNs that there is a point at which the effort required to contact more sites does not give a significant return in terms of the volume of load shed. It is important that this assumption is tested to ensure that it is still valid, and to prevent isolation plans being enacted if there is a safer means of achieving load reduction.

The E3 Alignment Group will progress a review of this assumption to ensure there is robust evidence to support it going forward.

Isolation strategy: During the morning of day two of the industry exercise, all demand which could realistically be instructed to cease taking gas via a phone call, had been shed. In order to re-balance the system and avoid breaching critical pressures at the extremities of the Network, Stage 3 actions of allocation and isolation had to be implemented.

During the 2018 NEC Exercise Zeus, the NEMT and the GDN's Response Teams struggled to determine the appropriate percentage of remaining load to isolate in order to remove demand to prevent breaching critical pressures at the extremities of the Network. Several back and forth discussions between the NEMT Demand Team and the GDNs eventually led to the NEMT Demand Team requesting the GDNs isolate 25% of their remaining demand. Across these response discussions and the post exercise review at the E3 Alignment Group, the E3 community assessed that there was a lack of agreement between the NEMT and the GDNs as to how to arrive at a suitable figure to isolate in a timely and consistent way.

Ahead of Exercise Arctic the E3 Alignment Group worked to improve the understanding of the isolation process across their teams and created pre-emptive tools to support the response process. The GDNs have detailed isolation plans to achieve demand reductions in tranches of 5%

and crucially, there is a lead time to when these isolation plans achieve actual demand reductions. It was found that the instruction to reduce demand by reducing the GDNs end of day take from the NTS causes unnecessary confusion. It was therefore agreed to provide this information as a rate change rather than an end of day reduction. The following updates were made to process in attempt to provide clearer direction as to how to determine the most appropriate strategy for isolation:

- A pre-emptive question statement was utilised to understand the timings and capability of the GDN's isolation plans: 'Please determine the speed and resultant load reduction value in isolating domestic load by XX%, XX% and XX%'
- the enhanced method of data visualisation was used to present the analysis of the impact of demand reduction on the extremity pressures in tranches of 5%
- the instruction for the GDNs to reduce their NTS offtake by rate from a set time replaced the previous approach which required the GDNs to calculate the end of day impact of the isolation actions they were taking.

This led to a better quality of conversation between the NEMT Demand Team and the GDNs because:

- the GDNs knew what question they were going to be asked - which increased the speed at which a suitable isolation value could be determined and reduced ambiguity in calculations
- there was clarity of what could be achieved by the GDNs and an appreciation of lead times for demand reductions
- the amount of time taken by the GDNs to undertake analysis was reduced.

The E3 Alignment Group will continue to develop this capability, continuing education across the relevant teams within National Grid and GDNs and exercising the revised approach to determine isolation values in the 2020 CTC exercises.

2.3 Validate emergency procedures, specifically E1, National Grid's E3, the E3 documents of the Distribution Networks and the NEC Safety Case

Emergency Specification Gas: An element of the Stage 1 actions, implemented in parallel to the declaration of Stage 2, was the admittance of Emergency Specification Gas into the Network. The G.A.S. Report identified that two terminals had Emergency Specification Gas available. The NEMT therefore worked to confirm the exact specification parameters and quantity of this gas and communicated this to the organisations whose offtakes' would be impacted by the admittance of this gas. The NEC Safety Case requires the admittance of Emergency Specification Gas to be risk assessed. The completion of this risk assessment took valuable time plus the responses from those requested to accept the Emergency Specification Gas were inconsistent.

[Section 3.1](#) outlines learning points associated with the timeliness of communication from National Grid Gas to the GDNs and BEIS regarding potential decisions enhancing shared situational awareness beyond the declaration of each emergency stage.

2.4 Embed, for testing, recommendations from previous industry emergency exercises, including NEC Exercise 'Zeus' (2018) Restoration Exercise 'Alpha' (2019) and Communications Exercise 'Announce' (2019)

NEMT "Briefing-Meeting-Working" cycle: The NEMT's Briefing-Meeting-Working Cycle is now fully embedded and serves as the primary means of managing incident and emergency situations. This approach has been pressure tested in several incident responses and further developed to allow an Incident Assessment capability. The approach has been widely shared across industry in 2018/19, including within National Grid.

Electricity and Gas Interaction: National Grid have delivered a range of activities to improve awareness across the Control Rooms (GNCC and ENCC) and associated supporting response teams in the period between Exercise Zeus and Exercise Arctic. This allowed a general cross system understanding to develop. However, the existing scripts for use in the run up to, and during an NGSE are quite prescriptive. The teams are reluctant to move away from these scripts due to the risk of breaching the Utilities Act by inadvertently sharing commercially sensitive information.

A pre-meditated decision was made by Exercise Control to allow an open discussion to take place between GSO and ESO, without recourse to the limitations of commercial information sharing imposed by the Utilities Act, on the understanding that exercise data was being utilised and actions taken were simulated. This allowed a much broader discussion than had taken place in previous

exercises, which developed the ESO and GSO understanding of the whole energy system implications of the gas supply shortage. [Section 3.5](#) describes this further.

Restoration: Exercise 'Alpha', an Industry Restoration Exercise was delivered March 2019. The exercise proved to be a valuable opportunity to test assumptions and confirm the process associated with restoration. Exercise Arctic did not test the restoration phase. The next step for restoration will for the 2020 NEC Industry Exercise to test the process in detail.

NEC briefings: A range of documentation and process was produced to enhance the ability of the NEMT to deliver briefings to the NEC and for the NEC to be appropriately prepared to receive them. This included the creation of an NEC briefing pro-forma, and NEC task card and an NEC grab box containing situational awareness display tools. Successes on enhanced data visualisation are detailed in [Section 2.1](#).

Determining figures in Emergency strategies: Significant improvement was made on this subject through the 2019 CTC Exercises, 2019 NETMAN 1 exercises and Exercise 'Arctic'. During the 2019 CTC exercises there was an improvement on the communication about the level of critical pressures required. Further work will take place in this area during the 2020 CTC exercises.

[Section 2.2](#) sets out the improvement in process on agreeing an isolation strategy.

Exercise Announce: The outcomes of exercise Announce are detailed in [Section 3.2](#).

3 – Lessons Learnt

The NEC Industry Exercise is designed to highlight areas for improvement across the gas industry. The following areas will be carried forward into the work plans of various industry forums.

3.1 Some data provided by a GDN was not transcribed into the decision support tool

It was identified post exercise, that the NEMT Demand Team had not transcribed data from SGN that showed there was storage available which could have been utilised under Stage 1 actions. Whilst this storage would not have averted the declaration of Stage 2, it is important that all available gas is utilised to minimise the impact of the deficit on consumers. This is a repeat of the same issue from Exercise Zeus. SGN stated that in the event of a real emergency they would have worked harder to highlight this Stage 1 capability to the NEMT. The National Grid Gas Emergency and Incident Framework (EIF) Team will continue to present this case study at Demand Team training. Specific reference will be made in the Demand Team task card plus the provision of an emergency stages diagram in the Demand Team work area to encourage the cross checking of each stage's actions before progressing to further stages. These pro-formas will require sign off by the Demand Officer that all actions have been considered.

Learning point 1 - Training changes made to NEMT Demand team training as a result of the same issue the previous year had not been successful.

3.2 The timeliness of communication from National Grid Gas to GDNs and BEIS about potential decision points

The declaration of Stage 3 of the emergency was pre-empted by some members of the NEMT team leading to confusion about status across different internal and external parties.

It is important to let key internal and external parties know that the NEC is being briefed with options which may include various stages of emergency actions in order to raise general awareness and aid preparatory activities. It can be tempting for those who have been involved in provision of data or discussion on the proposed way forward to pre-empt an outcome. The NEC will make decisions based on the information and briefing they receive and may decide on alternative outcomes, or that they do not have enough information to make the recommended decision. Therefore, it is essential that no emergency actions are taken until the NEC has made a decision, and that the decision is then communicated rapidly and consistently across all relevant internal and external parties.

In order to avoid this confusion going forward, the EIF team will work with stakeholders to determine a means of communicating the options which are being presented to the NEC and to agree a process for timely communication of the actual decision. The EIF Team will also embed into process the discipline of calling a 'time-out' across the NEMT to communicate that approval for a strategy has been achieved and that a further Emergency Stage has been declared.

Learning Point 2 – National Grid should put more focus on sharing information about potential decision points and emergency declarations to key internal and external parties in a timely and consistent manner.

3.3 The co-ordination of external communications across BEIS and all other industry parties, including the electricity industry.

Across all three days of Exercise Arctic, consideration was given to the management of media queries and a series of teleconferences were held to discuss the media management implications of the scenario amongst corporate affairs representatives from National Grid, National Grid ESO, the GDNs, BEIS and the Energy Networks Association (ENA). This interaction was designed to be a light touch follow on from Exercise 'Announce' held summer 2019.

Most of the operational communications processes across Exercise Arctic worked well; however, some did not and require further attention. These were:

- Pre-defined media messages were not available
- There was a difference in expectation on the level of involvement of media response teams across different participants
- Accountability for co-ordination of industry communications in the event of a shortage of gas is not clear.

The Communications Task Group (CTG) already has actions, based on Exercise Announce, covering the co-ordination of industry communications and the preparation of pre-prepared material. Broadly, the Exercise Announce actions were:

- Arrange a means of pro-actively collaborating in the face of developing incidents
- Exercise Arctic to test the process for establishing an industry communications teleconference
- CTG to produce an updated set of pre-prepared messaging to be used during NGSEs
- CTG to define the requirement for a central function to coordinate and endorse messaging.

Further energy industry exercises are required to demonstrate that actions have been progressed and embedded. Exercise “Broadcast” is being sponsored by the Communications Task Group and is scheduled to take place in May 2020. The scope of the exercise is still being finalised, but it is expected to use a scenario of a shortage of gas, similar to Exercise Arctic, in order to provoke interactions across the gas and electricity networks and to test industry, BEIS and Energy Network Association (ENA) communications routes

Learning point 3 - Further work is required on industry communications. The Communications Task Group has already agreed to manage the development and delivery of Communications Exercise ‘Broadcast’ in May 2020.

3.4 National Grid Gas Load Shedding audit trail

As set out in Section 2.2, some of the supporting evidence to record the delivery of the instruction to cease taking gas to NTS directly connected sites was not available post exercise and further investigation revealed the audit trail had not been completed by the team. The same team have since run another desktop exercise to demonstrate they do understand the audit requirements and training has been updated.

Learning point 4 – The training for the shipper team had not been successful in emphasising the importance of maintaining an audit trail.

3.5 The provision of a pre-emptive risk assessment for the admittance of Emergency Specification Gas, to avoid time delays and inconsistencies in dynamically assessing the impact of admitting this gas

The NEC Safety Case requires the admittance of Emergency Specification Gas to be risk assessed. The completion of this risk assessment took time. The responses from those requested to accept the Emergency Specification Gas were inconsistent.

The E3 Alignment Group has already progressed an action to review the process for admitting Emergency Specification Gas. This has led to the GDNs agreeing to complete pro-active risk assessment and approval document to allow them to accept Emergency Specification Gas, on the proviso that it avoids or reduces the safety consequences of an NGSE. A similar process is required for admittance of gas to the NTS, though the admittance of gas at the lower Emergency Wobbe Margin will continue to be dynamically risk assessed. This is for its potential impact on the operation of compressor stations. Whilst compressor stations can be configured to operate against gas with Emergency specification lower Wobbe, this is not achievable during the timescales of a response. The risk assessment would therefore analyse the likelihood of emergency specification lower Wobbe impacting a compressor station running to manage high demand flows.

Learning point 5 – The process for the GDNs to agree to accepting the Emergency Specification Gas was inconsistent. Time could be saved by having a process that has been defined in advance of an event, that can be swiftly utilised during an event. All Gas Transporters would need to have this process in place for their own networks for it to be effective.

3.6 Developing an agreed approach and language across the gas and electricity system operators to ensure that there is a common understanding of the situation and scenario planning which allows outcomes to be developed that will minimise the use of gas for power generation in the event that an NGSE is declared.

The market based demand reduction actions taken on the Gas Network in times of significant imbalances between gas supply and demand before an emergency is declared could have a significant impact on the supply/demand balance in Electricity, because reductions in gas demand can be achieved quickly and safely if gas fired power stations stop taking gas. It is essential that GSO can appropriately and swiftly communicate to the Electricity System Operator (ESO) intentions to deliver demand reduction measures on the Gas National Transmission System’s directly connected CCGT generators. Significant steps were made this year, aided by tools created between the delivery of the pre-emergency day and the live Industry Exercise, in the ability of the NEMT to articulate the NGSE response strategy and in turn the ENCC to respond with the implications of this strategy to the operation of the Electricity Network.

Work is now required to build on the conversations that took place during this exercise, with a view to revising the scripts, and to further explore the market actions that could be taken as a result.

Using ESO staff who are based at Warwick could help make the conversations between ESO and GSO more effective, and aid interaction with colleagues in the geographically separate ENCC.

There are elements of National Grid GSO's and ESO's market obligations which have not been designed to recognise the close interaction between the two markets at times of system stress. There is further work to do to map these obligations with a view to conferring with BEIS and Ofgem to develop a means of assuring that both parties market obligations do not create a situation unnecessarily detrimental the whole energy system.

Anecdotal conversations on the day between various parties highlighted the uncertainty that surrounds the increasing volume of embedded gas fired generation that could be called on to provide reserve services to ESO, in the event of a shortage of electricity generation. The issue under discussion was whether reducing gas demand taken by transmission connected CCGTs would lead to an increase in distribution connected gas fired generation, thus reducing or negating the impact of the load shedding actions taking place to restore a balance on the transmission network. There is insufficient information available to any single party to fully assess the potential impact of this issue at the present time.

Learning point 6 – There is further work required to ensure that the ESO and GSO employees who will be communicating with each other during a shortage of gas have a good enough understanding of each other's networks to make the communications quick and effective, while complying with the Utilities Act.

Learning Point 7 – Communications between GSO and ESO were made more challenging because they were not face to face. There are ESO staff based at Warwick and it may enhance the process if they are utilised during a shortage of gas.

Learning Point 8 – Establishing a common understanding across a range of industry and regulatory parties of the market actions available to GSO and ESO, and their potential impact on distribution connected loads from both a gas and electricity perspective, would provide a foundation to support analysis of the increasing level of embedded gas generation.

3.7 A broader review of training for the NEMT

Given that this report identifies three separate learning points associated with training, it is assessed that a broader training review is required across the NEMT. This could include sharing good practice via the E3 Alignment Group.

Learning Point 9 - A broader review of NEMT training should take place to understand any further gaps and opportunities for enhancement.

4 – Learning points summary

The nine learning point areas arising from Exercise Arctic are detailed in Table 7. These areas will be reviewed and action plans progressed by the E3 Alignment Group (unless otherwise allocated). The Office of the NEC shall report progress against the actions to address each learning point through the bi-annual assurance report, and in regular NEC liaison meetings.

Table 7 – Exercise Arctic Learning Point summary

Action area	Learning point
Communications	Learning Point 2 – National Grid should put more focus on sharing information about potential decision points and emergency declarations to key internal and external parties in a timely and consistent manner.
	Learning point 3 - Further work is required on industry communications. The Communications Task Group has already agreed to manage the development and delivery of Communications Exercise 'Broadcast' in May 2020.
Training	Learning point 1 - Training changes made to NEMT Demand team training as a result of the same issue the previous year had not been successful.
	Learning point 4 – The training for the shipper team had not been successful in emphasising the importance of maintaining an audit trail.
	Learning Point 9 - A broader review of NEMT training should take place to understand any further gaps and opportunities for enhancement.
Emergency Specification Gas	Learning point 5 – The process for the GDNs to agree to accepting the Emergency Specification Gas was inconsistent. Time could be saved by having a process that has been defined in advance of an event, that can be swiftly utilised during an event. All Gas Transporters would need to have this process in place for their own networks for it to be effective.
Electricity and Gas Interaction	Learning point 6 – There is further work required to ensure that the ESO and GSO employees who will be communicating with each other during a shortage of gas have a good enough understanding of each other's networks to make the communications quick and effective, while complying with the Utilities Act.
	Learning Point 7 – Communications between GSO and ESO were made more challenging because they were not face to face. There are ESO staff based at Warwick and it may enhance the process if they are utilised during a shortage of gas.
	Learning Point 8 – Establishing a common understanding across a range of industry and regulatory parties of the market actions available to GSO and ESO, and their potential impact on distribution connected loads from both a gas and electricity perspective, would provide a foundation to support analysis of the increasing level of embedded gas generation.

5 - Conclusions

Undertaking emergency exercises is central to assuring the NEC that the Gas Industry can effectively manage an NGSE and that it remains committed to continuous improvement of its safety critical emergency processes. The annual NEC Exercise is a requirement under the NEC Safety Case and GS(M)R, and remains a critical annual focal point for all UK Gas Industry participants to test their own emergency processes.

The objectives to test the industry's adherence to emergency procedures were successfully met with action areas for improvement developed from observations and feedback received.

The exercise gave appropriate assurance to the NEC that the industry can demonstrate that it is able to effectively respond to a Gas Deficit Network Gas Supply Emergency (NGSE) in accordance with the current emergency arrangements and protect the general public and the gas network.

The exercise also provided valuable learning and experience to all parties; the improvements set out in this report will be delivered in 2020 and tested via the ongoing exercise schedule and objectives to be set for the next NEC Industry Exercise.



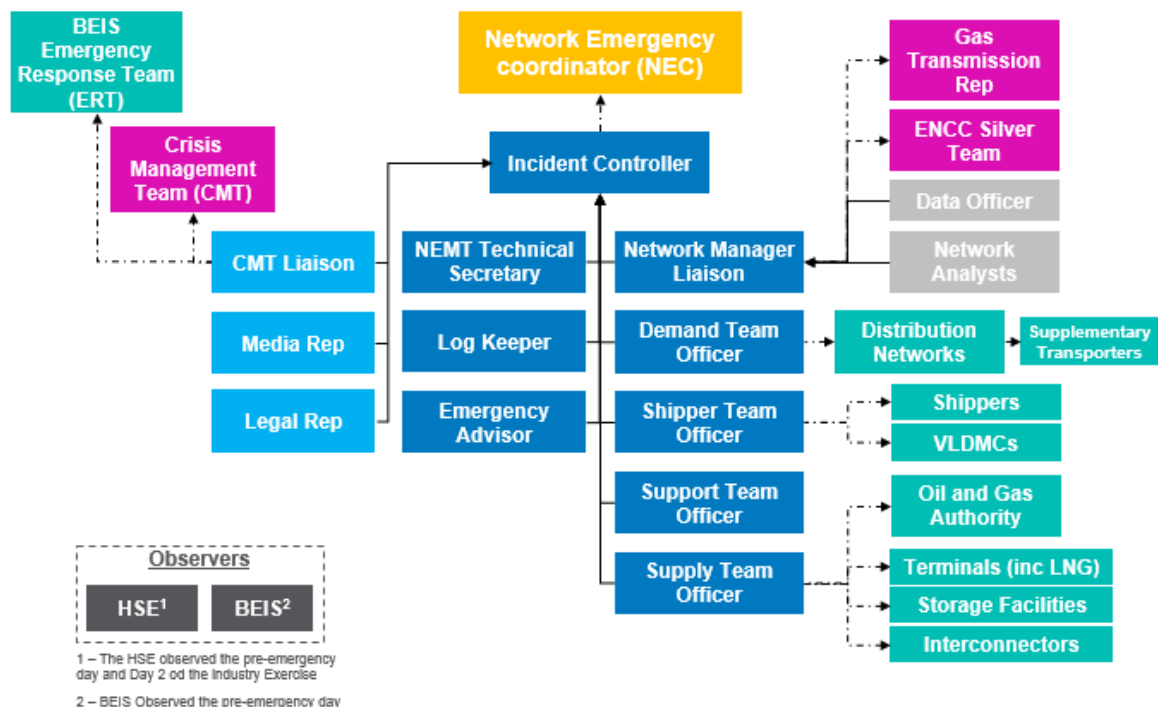
Appendices

Appendix I – Exercise participation

National Grid estimates over 300 industry participants took part in Exercise Arctic (further illustrated in Figure 1) from across a range of areas including:

- Network Emergency Coordinator (NEC)
- National Grid
 - Network Emergency Management Team (NEMT)
 - Representation from the Gas National Control Centre (GNCC)
 - Electricity National Control Centre (ENCC) Tactical/Silver Team
 - Representation from Gas Transmission
 - Representation from the National Grid Crisis Management Team (CMT)
 - Representatives from National Grid's Legal and Corporate Affairs departments
- Gas Distribution Network Operators (GDNs)
 - Cadent Gas (CAD)
 - Northern Gas Networks (NGN)
 - SGN
 - Wales & West Utilities (WWU)
- UK Government Department for Business, Energy & Industrial Strategy (BEIS)
- Office of Gas and Electricity Markets (Ofgem)
- Shippers
- Terminal Operators, including LNG Importation Terminal Operators
- Interconnector Operators
- Storage Facility Operators
- Supplementary Transporters
- NTS Directly Connected Loads (VLDMCs)
- The Oil & Gas Authority (OGA)
- Electricity Distribution Network Operators HSE¹

Figure 1 – Exercise Arctic Participants



Appendix II – Exercise Scenario

The key theme across the scenario for all three days of Exercise Arctic was a high demand for gas and losses effecting the gas supply pattern. The initial status and subsequent injects were based on a series of events directly affecting the NTS, which combined with extreme cold weather created reduced gas supply against a high demand for gas.

Table 8 – Pre-Emergency Day Starting Position

Inject:	Potential:	Expected Response:
<p>Instability in the LNG Market: Tensions in Iran have led to the Iranian Navy actively blocking marine transport through the Strait of Hormuz. LNG cargos have remained in port in Qatar. This is compounded by a port workers strike at Milford Haven which prevented offloads in the preceding week</p>	Reduction in supply Margins. LNG storage all but empty and delays to planned shipments.	Monitor Margins Notice. Trade to increase the price of gas in the UK and encourage interconnectors to flow at maximum
<p>Storage deliverability limitations: Despite storage being collectively 58% full, the sites with the highest delivery rates are the least full having maximised delivery in response to a fictional price spike in the month preceding the exercise.</p>	Storage sites unable to deliver maximum flows and risk breaching the deliverability safety monitor.	Monitor the deliverability safety monitor and the amount which storage withdraws.
<p>Extreme weather: Yellow, Amber and Red weather warnings, and nationwide low temperatures.</p>	High gas demand in response to cold weather and snow fall, with a re-forecast of higher demand mid-morning as the UK public stay at home instead of going to work.	Encourage more gas onto the NTS through the commercial strategy i.e. off peak exit capacity scale back and use of Operations Margins.
<p>Supply Failures: A series of supply losses are triggered in the North East by severe weather offshore. This is compounded by an incident off the Easington Coastline involving a trawler snagging its gear on subsea pipelines</p>	A sudden and significant deficit in supply	Issue a Gas Balancing Notification

Table 9 – NEC Industry Exercise Day 1 Starting Position

Inject:	Potential:	Expected Response:
<p>Langed Pipeline Shut in: It is discovered that the Langed pipeline has been struck by a trawler vessel's 'gear' and requires to be shut-in</p>	Loss of the majority supply point in the face of low supply Margins	Declaration of an Emergency at Stage 2 in order to maximise supplies and reduce demand
<p>Aircraft Incident at Bacton: An incident at Bacton requires the Shell terminal to shut down</p>	Further supply loss increasing the required severity of load shedding. Poor outlook for D+1	Continue Load shedding into the LDZs

Table 10 – NEC Industry Exercise Day 2 Starting Position

Inject:	Potential:	Expected Response:
<p>Storage site gas quality breach: A storage site's supply falls out of the required gas quality specification leading to the site being asked to cease withdrawing into the NTS</p>	Significant loss on top of a poor outlook and no supply margins	Complete Stage 2 actions by load shedding priority customers. Prepare a Stage 3 Allocation and Isolation Strategy
<p>Interconnector Constraint: A sudden increase in interconnector supplies creates a constraint at the Bacton Terminal</p>	Further significant supply loss	Declare a Stage 3 Emergency to balance the supply losses with a reduction in allocation of gas to Distribution Networks requiring isolation of domestic consumers in the LDZs.

The graphs in charts 3 and 4 depict the patterns of gas price and the supply & demand picture throughout the three of the days of Exercise Arctic.

Chart 3 – Gas Price on Days 1-3

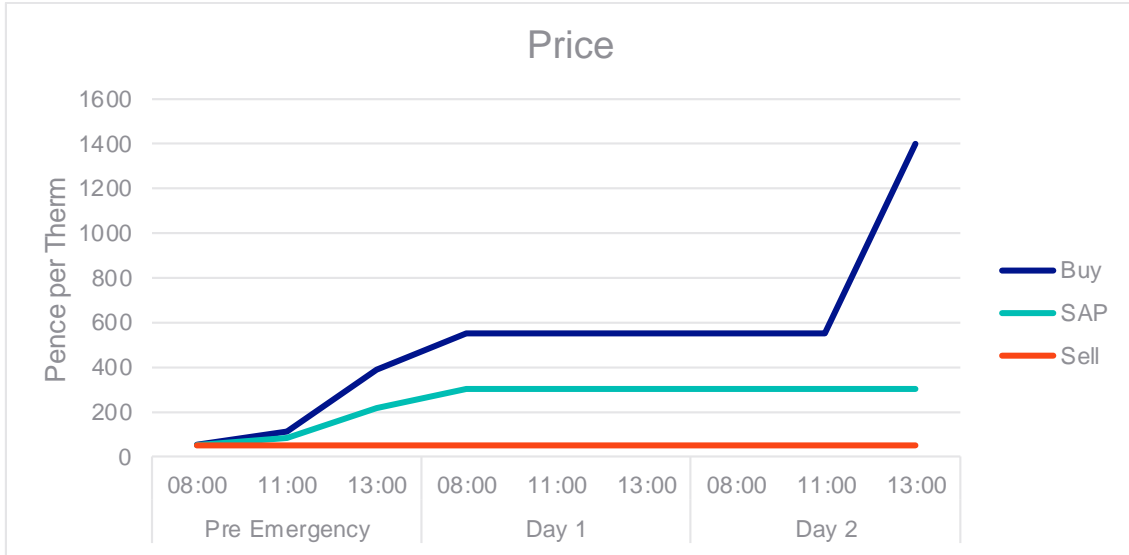
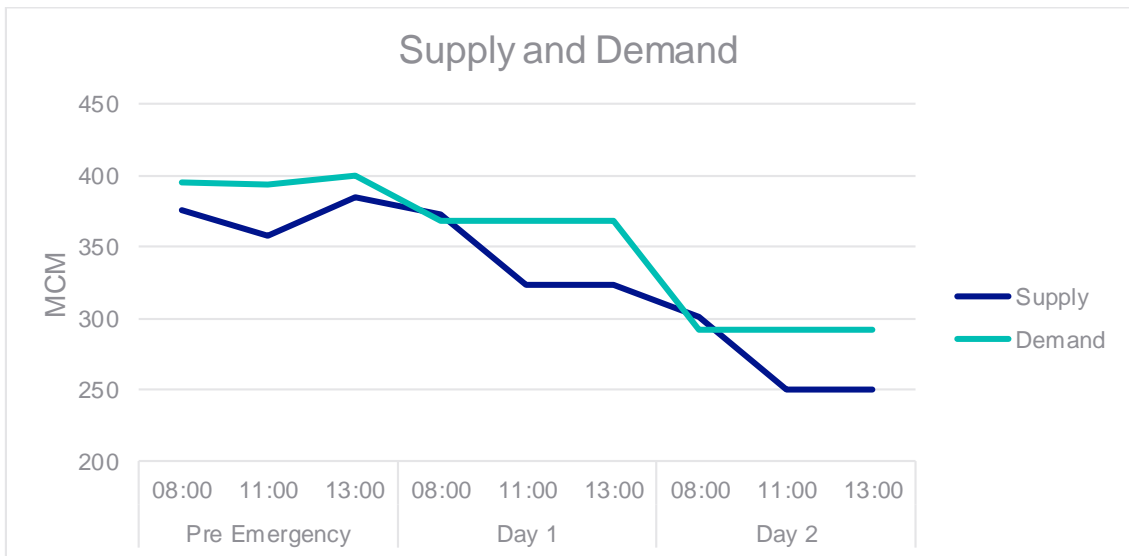


Chart 4 – Supply and Demand Picture of Days 1-3



A summary of the Emergency actions tested in Exercise Arctic is shown in Table 11.

Table 11 – Emergency Actions tested in Exercise Arctic

Emergency Stage	Action	Tested in Exercise
Stage 1 (Potential)	<ul style="list-style-type: none"> Gas conforming to Schedule 3 Part II of GS(M)R 	Yes
	<ul style="list-style-type: none"> NTS Linepack utilisation 	Yes
	<ul style="list-style-type: none"> Distribution Network Utilisation <ul style="list-style-type: none"> - Distribution Network Storage - Emergency Interruption 	Yes (Data gathering only)
	<ul style="list-style-type: none"> Public Appeals 	Yes
Stage 2	<ul style="list-style-type: none"> National Grid Gas plc's participation in the OCM will be suspended 	Yes
	<ul style="list-style-type: none"> Maximise Supplies 	Yes
	<ul style="list-style-type: none"> Load Shedding 	Yes
Stage 3	<ul style="list-style-type: none"> Allocation & Isolation 	Yes
Stage 4	<ul style="list-style-type: none"> Restoration 	No

Appendix III – Glossary and References

BEIS	Department for Business Energy and Industrial Strategy
CTC	Critical Transportation Constraint
CAD	Cadent Gas
CCGT	Combined Cycle Gas Turbine
CMT	Crisis Management Team
DN	Distribution Network
DNCCs	Distribution Network Control Centres
E&IF	Emergency and Incident Framework Team (Gas Operations)
ENA	Energy Networks Association
ENCC	Electricity National Control Centre
ERT	Emergency Response Team
ESO	Electricity System Operator
GDE	Gas Deficit Emergency
GDN	Gas Distribution Network
GDW	Gas Deficit Warning
GNCC	Gas National Control Centre
GNCC/E/3	Network Emergency Management Team's Emergency Procedure
GNI	Gas Networks Ireland
GS(M)R	Gas Safety (Management) Regulations 1996
HSE	Health and Safety Executive
IC	Incident Controller (NEMT)
kWh	Kilowatt-hour
LDZ	Local Distribution Zone
LGSE	Local Gas Supply Emergency
LNG	Liquefied Natural Gas
MCM	Million Cubic Metres
MJ/m ³	Mega Joules per Cubic Metre
NEC	Network Emergency Co-ordinator
NEMT	Network Emergency Management Team
NGN	Northern Gas Networks
NGSE	Network Gas Supply Emergency
NTS	National Transmission System
OCM	On-the-day Commodities Market
OGA	Oil and Gas Authority
OM	Operations Margins
PCLP	Predicted Closing Linepack
SAP	System Average Price
SOQ	System Offtake Quantity
T/PM/E/1	Procedure for Network Gas Supply Emergency
TFA	Terminal Flow Advisory (notice)
VLDMC	Very Large Daily Metered Customer
WWU	Wales & West Utilities

The Network Emergency coordinator (NEC)

The Network Emergency Co-ordinator (NEC) is an independent industry role, established under the Gas Safety (Management) Regulations (GS(M)R), whose duty is to co-ordinate the actions across affected points of the gas network to prevent or minimise the consequences of a Network Gas Supply Emergency (NGSE); this is defined as “an emergency endangering persons arising from a loss of pressure in a network or part thereof”. The role of the NEC is currently undertaken by National Grid Gas and is independent from any commercial interests of any organisation within the Gas Industry.

Industry participants such as Gas Transporters and Shippers have a legal duty to cooperate with the NEC, who has the powers to direct the defined duty holders. The arrangements and procedures put in place to facilitate these powers are tested annually and this report covers the 2019 NEC Exercise “Exercise Arctic”.

National Grid’s Emergency Webpages:

<https://www.nationalgridgas.com/safety-and-emergencies/network-gas-supply-emergencies-ngse>

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