



Department for
Business, Energy
& Industrial Strategy

ofgem

Making a positive difference
for energy consumers

Future System Operator Consultation: Annex 1

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Annex 1: System Operator Roles

A1.1 Functions of the system operators

In the existing regulatory framework, the responsibilities of the gas and electricity system operators fall within three roles:

- system insight, planning and network development;
- market development and transactions; and
- control centre operations.

The table below summarises the key functions of the Electricity System Operator (ESO) and the Gas System Operator (GSO) as an integrated entity within National Grid Gas (NGG), under each of these roles:

Area	Electricity (ESO)	Gas (GSO within NGG)
System insight, planning and network development	<p>The ESO produces several key insight documents, including its annual Future Energy Scenarios (FES), which set out credible long-term pathways for the energy sector. These are used by the ESO and other industry parties to assess and identify the gas and electricity networks' long-term needs.</p> <p>The ESO makes recommendations on future electricity network investment through the Network Options Assessment (NOA) process, and alongside this, runs tenders to procure solutions to long-term operability issues. The ESO is responsible for improving the coordination of offshore network development, working with electricity Distribution Network Operators (DNOs) to support efficient whole system planning, and carrying out cost benefit analysis to support Ofgem decisions on major network investment.</p> <p>The ESO works with the electricity transmission network operators to coordinate network outages and to manage applications for future connections to the transmission system.</p>	<p>The GSO undertakes a Network Capability process to articulate the capability of the Gas National Transmission System (NTS) to meet customers' needs and evaluate the need for potential network investments versus use of operational tools or commercial solutions. This process culminates in the publication of the Annual Network Capability Assessment Report (ANCAR).</p> <p>NGG is responsible for producing the Summer and Winter Outlooks, which process long-term gas supply / demand forecasting data (where forecasts are undertaken by the ESO independently of NGG)</p> <p>The GSO works with the Gas Transmission Operator (GTO) and transmission-connected customers to coordinate network outages and to manage applications for future connections to the transmission system.</p>

Area	Electricity	Gas
Market development and transactions	<p>The ESO is responsible for contracting for services from the electricity market to provide the ESO with the tools it needs to operate the electricity system. It is responsible for promoting competition in these services by designing accessible, market-based procurement mechanisms and by clearly communicating its future operational needs.</p> <p>The ESO is also responsible for administering certain industry codes, providing insight and analysis on potential changes to market arrangements, and managing the process for levying network charges on market participants.</p> <p>Additionally, the ESO performs the function of Delivery Body for schemes under the government's Electricity Market Reform programme such as the Contracts for Difference Scheme and Capacity Market.</p>	<p>The GSO produces a market strategy (Gas Markets Action Plan and Future of Gas)¹, proactively identifying triggers for market change and ability to influence and shape future markets.</p> <p>Other market functions of the GSO include allocation of capacity rights to customers, defining and managing shrinkage strategy, and procuring gas and operating margins for utilisation in operating the network.</p> <p>The GSO is a leading player in the development and maintenance of Gas Market Rules, both nationally and at a European level. The GSO also ensures accuracy of transmission charging methodologies and is responsible for setting transmission charges to cover allowed revenue. Xoserve acts as the Central Data Services Provider (CDSP) for the gas industry and produces the invoices on behalf of NGG.</p>
Control centre operations	<p>The ESO control room (the Electricity National Control Centre – ENCC) responds to electricity imbalances and other short-term operational issues by dispatching balancing services from market participants. It also coordinates with network operators to optimise the short-term configuration and use of network assets. Physical network control is undertaken by the TNCC (Transmission Network Control Centre) in the TO.</p> <p>The ESO produces short-term energy forecasts and shares data and operational information with the industry in order to facilitate efficient decision making.</p>	<p>The GSO control room (the Gas National Control Centre – GNCC) is responsible for both energy balancing and physical network control. This involves ensuring that both the supply and demand balance over approximately a day and that system pressures stay within agreed limits. Physical network control is the primary tool used by the GNCC, with market participants generally incentivised to balance their own positions.</p> <p>The GSO produces short-term supply and demand forecasts and shares data and operational information with the industry in order to facilitate efficient decision making.</p> <p>The GSO is also responsible for emergency planning and ensuring the</p>

¹ GMaP is a discretionary publication produced by NGG and is an output of FOG, a forum which is comprised of stakeholders from across government and industry

	The ESO is also responsible for emergency planning and ensuring the system can be restored in the unlikely event of a system-wide power outage.	system can be restored following a Network Gas Supply Emergency.
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A1.2 Gas system safety case

Section 3.1.2 of the consultation document describes the differences between the electricity and gas networks. It discusses how these differences mean that system and asset operation are intrinsically linked in gas network operation, in a way in which they are not in electricity network operation. Section 3.1.2 also references the safety case for the gas system. Here we describe the gas safety case and the Gas Safety Management Regulations (GSMR), and their implications for the GSO, in more detail.

A1.2.1 Rationale for the gas system safety case

Whilst both electricity and gas systems are designed for safety, there are fundamental differences between electricity and gas.

- on the electricity network, non-availability will lead to blackouts, but this is not in itself a safety risk. If a safety parameter is exceeded on the transmission system, then automatic systems rapidly take action to isolate the problem; and
- on the gas network, availability of gas to meet demand is part of the safety system. Loss of pressure in the transmission system, due to an external event (such as loss of supply from the North Sea) or technical failure on the network (such as compressor or pipeline failure) can lead to a gas supply emergency that could culminate in a loss of supply to industrial, commercial and ultimately domestic customers. Loss of supply to domestic customers presents a significant health risk to vulnerable customers who could lose their gas heating, and a safety risk due to the potential for gas leaks from inadequately isolated appliances as the network is re-pressurised. It should be noted that incidents of this scale are extremely rare.

For these reasons, the gas transmission system operates under a safety case regime, regulated by HSE. This is a requirement under the Gas Safety Management Regulations (GSMR) – see below. The Uniform Network Code which governs the commercial relationships underpinning the operation of the gas transmission and distribution systems is an important element of the policy and procedures used to demonstrate that appropriate arrangements are in place to ensure the safe operation of the transmission network.

The electricity transmission system, whilst regulated by HSE in respect of health and safety matters, does not operate under a safety case regime. Instead, a system of grid codes,

engineering standards and regulations are in place to govern the technical operation of the sector with the objective of maintaining a safe and secure electric supply².

A1.2.2 Gas Safety Management Regulations (GSMR)

GSMR³ was introduced to ensure the safe transmission and distribution of gas to consumers post privatisation. GSMR requires each gas network to produce a safety case to demonstrate that it has established adequate arrangements to minimise the risk of a supply emergency. The focus of gas supply emergency arrangements under GSMR is to protect supplies to domestic customers in so far as it is practicable to do so.

To maintain safe flow, and to minimise the risk of a supply emergency, gas must be supplied to, and maintained in, the network in sufficient quantity to allow it to be pumped and routed through the network so it is delivered at the point of supply at an adequate pressure and gas quality. Failure to do this may result in a drop of pressure, or a loss of supply, which could put consumers at risk. For this reason, ensuring continuity of supply lies at the heart of safe gas flow management, and how continuity of supply is maintained is fundamental to the gas safety case.

The safety case sets out the arrangements each gas network has put in place to ensure that sufficient gas is available to maintain supply to consumers. This includes a description of the arrangements for the effective planning, organisation, control and monitoring of gas flow, for example, procedures for:

- forecasting long-term, medium-term, daily and within-day demand;
- ensuring that demand forecast is met, obtaining gas of a suitable composition from contracts with producers, spot market, other gas transporters, storage operators, etc., including, where appropriate, arrangements for blending;
- ensuring the gas supplied has sufficient quality, including that the Wobbe index is within agreed bounds;
- monitoring the gas flow to identify possible imbalances between supply and demand, including the arrangements for obtaining appropriate information about the availability of gas supplies; and
- adjusting the input of gas to maintain continuity of supply to prevent a supply emergency developing.

The Network Emergency Coordinator (NEC) must also hold an NEC safety case that has been approved by HSE.

The FSO undertaking real time system operation (**Option 2** in the consultation document) would constitute a significant enough change to require revised safety case submissions to HSE. Securing approval for a new safety case would require very careful consideration. The case would need to demonstrate that the new arrangements are at least as safe as current

² These include the Electricity Safety, Quality and Continuity of Supply Regulations (ESQCR), Ofgem licence conditions and incentives on supply reliability, the Grid Code / Distribution Code, the Security and Quality of Supply Standards (SQSS) and individual technical standards such as P2 (Distribution security standards), G98/G99 (Generator Connections), P28 (Voltage Fluctuations) etc.

³ Health and Safety Executive *A Guide to the Gas Safety (Management) Regulations 1996. Guidance on Regulations.*: <https://www.hse.gov.uk/pubns/books/l80.htm>

arrangements. This would involve demonstrating that all safety-related operational processes operate seamlessly between the FSO and NGG, and that the ability of NGG to assure the safety and security of the physical network is not compromised by the new arrangements.

However, we note that any changes to accountability for gas activities, including **Option 1**, would require further discussions with HSE on safety case implications.

A1.3 Gas functions and activities proposed to be undertaken by the FSO under preferred option

Section 3.1.2 of the consultation document set out which of the current gas functions and activities we consider the FSO should undertake under our preferred option (**Option 1**). These are:

- **strategic network planning:** undertaking long-term network capability assessment, needs case production, optioneering, economic options assessment, and publication of the Annual Network Capability Assessment Report (ANCAR), the Gas Ten Year Statement (GTYS) and Gas Future Operability Planning (GFOP);
- **long-term forecasting:** undertaking medium to long-term gas supply and demand forecasting, as an output of the Future Energy Scenarios (FES), which provides an input into the Gas Winter/Summer Outlook publications; and
- **market strategy functions:** leading market participants in developing gas market strategy, publication of the Gas Market Plan (GMaP), and leading Future of Gas (FoG) forums.

The following sections provide more detail on these functions and the rationale for their inclusion in the proposed functions of the FSO.

A1.3.1 Gas strategic network planning

At the start of the gas network planning cycle, NGG undertakes an analysis of network capability. Network capability refers to the process to articulate the capability of the NTS and illustrate whether the network is appropriately sized to meet the needs of gas customers now and into the future (needs case production). The output of the network capability process informs what changes may be necessary to market / commercial rules, operational tools, or to physical network assets, to ensure continued safe and efficient operation of the NTS (optioneering). NGG undertakes an economic assessment to determine the preferred options to meet the identified needs cases (economic options assessment).

The long-term network capability process culminates in NGG publishing an Annual Network Capability Analysis Report (ANCAR) each June (in accordance with the NGG Gas Transporter Licence Special Condition 9.10: 'Long term network planning'). The publication of industry scenarios of supply and demand in the FES is an input to this process, as are various other network, legislative and licence triggers. Gas Distribution Networks (GDNs) and Gas Shippers also participate in the network capability process.

Based on the determined capability of the NTS, in its current state, to accommodate expected supply and demand patterns, NGG reviews projects in the previous year's investment plan to

verify whether they are still required and/or whether new investments, in addition to those already identified, are necessary to ensure network capability.

The planning cycle concludes with NGG publishing the Gas Ten Year Statement (GTYS). The GTO uses the needs cases (triggered by network capability, customer requests and general asset work) and the GTYS (informed by FES) when planning future investment in its network and submitting its plans to Ofgem for approval via its RIIO business plan, or via funding mechanisms such as re-openers within the RIIO Price Control period (such as the Funded Incremental Obligated Capacity (FIOC) re-opener, asset health re-openers). Based on Ofgem's approval of these plans, the GTO undertakes development of the NTS.

Additionally, NGG periodically undertakes GFOP. GFOP aims to shape the debate on how the NTS should develop to meet the needs of the changing energy landscape, based on the FES produced by the ESO, as well as FOG considerations. As part of this process, NGG engages with the gas industry on issues of operability concern.

NGG currently performs these functions as an integrated GSO and GTO entity. Hence the organisation that owns the NTS is also responsible for assessing the need for development of the NTS, as well as the economic case for investment in the NTS versus other options (such as market / commercial rules or asset-based and operational tools). We therefore consider that an independent FSO would be well placed to undertake gas strategic network planning roles, taking responsibility for long-term network capability assessment, needs case production, optioneering and economic options assessment described above, and publishing the ANCAR and GTYS. Ultimately the above processes may form part of a Network Options Assessment (NOA) analogous to the one which the ESO performs for the electricity transmission networks today. The FSO would also be well placed to lead on GFOP. The independence of the FSO would remove the potential for any perceived bias towards network investment in the gas planning process. It would also enable the FSO to consider alternative options to satisfy needs cases, such as distribution-level or cross-vector solutions. In the future, this may extend to considering the role that developing technologies, such as hydrogen and heat networks, can play in meeting the needs of customers. Ofgem would remain the ultimate decision-maker on network investment plans submitted by NGG, but would be able to do this in reference to the independent assessment of network capability produced by the FSO in the ANCAR and GTYS, as well as utilising the expertise of the FSO in long-term strategic planning.

To perform the strategic network planning functions, the FSO would require operational and asset data regarding the gas network to be provided by the GNCC, as well as by other functions within NGG. Also, since the customer connections function is not included in this option, the FSO will need to be aware of planned connections/disconnections/diversions, to take these into account in its network planning processes. Hence, data sharing agreements would need to be set up between the FSO and NGG, with guidance and/or methodologies underpinning these to promote efficiency and decision making.

We also understand that NGG would need to retain some capability in network capability assessment, to perform the short to medium-term network capability assessments required to facilitate operation and maintenance of the NTS and maintain the safety case. This is therefore an area where duplication of some capabilities may be necessary between the FSO and NGG. However, we consider that the potential inefficiencies introduced by data sharing between the organisations, and potential additional organisational capability requirements, are outweighed by the benefits set out above and assessed in the Impact Assessment.

A1.3.2 Gas long-term supply and demand forecasting

NGG is responsible for carrying out long-term supply and demand forecasting to encourage innovation based on signals from industry on anticipatory investment. This long-term forecasting is undertaken by the ESO on behalf of NGG, with inputs from the FES. These forecasts rely on:

- short-term forecasts and projections provided by the GNCC;
- historic gas supply and demand information; and
- modelling based on policy development, licence obligations, weather patterns, etc. as well as on other information received from the wider gas industry.

Further information provided by this long-term forecasting function is published as medium-term forecasts in the Gas Winter Outlook and Gas Summer Outlook. These publications are delivered by NGG and are used by the wider gas industry to inform their preparations for the season ahead.

Since long-term gas supply and demand forecasting underpins the strategic network planning process, we consider that an independent FSO would be well placed to provide this function, both as an input to strategic network planning and also as information to wider gas industry.

Short-term forecasting carried out by the GNCC would remain with NGG as an essential part of operating and balancing the NTS. The outputs of these short-term forecasting processes would need to be shared with the FSO as an input to medium to long-term forecasting activity. We also consider that NGG would retain responsibility for publication of its operational plans and assessments, in response to the FSO's medium-term forecasts, in the Gas Winter Outlook and Gas Summer Outlook documents.

A1.3.3 Gas market strategy functions

NGG is a leading player in developing and maintaining Gas Market Rules, both nationally and at a European level. It also ensures accuracy in transmission charging methodologies. Additionally, NGG is responsible for setting transmission charges to cover allowed revenue, in accordance with the charging methodology agreed with Ofgem (with Xoserve producing invoices and acting as the CDSP for the gas industry).

NGG currently chairs the Future of Gas (FOG) forum and publishes the Gas Markets Plan (GMaP), which is an outcome of FOG. Both FOG and GMaP are discretionary activities that NGG chooses to participate in; the focus of which is to proactively and strategically consider how market frameworks need to change across potential future scenarios.

We consider that an independent FSO would be well placed to deliver the longer-term market planning activities set out above. This would include leading market participants in developing gas market strategy, reviewing consistency of transmission (and potentially distribution) charging methodologies, publication of the GMaP and leading FoG forums. The independence of the FSO would remove the potential for any perceived bias in the future direction of market development. The cross-vector remit of the FSO would also enable it to lead the industry in consideration of how market frameworks can accommodate whole system solutions and developing technologies.

Under the preferred option, we propose that activities that involve market participation by the GSO, in order to operate and balance the NTS, would remain with NGG. This would include

operating the capacity and contract services, defining and managing shrinkage strategy, and procuring gas and operating margins for utilisation in operation of the network. NGG would also continue to set and ensure accuracy of transmission charging, in accordance with the charging methodology agreed with Ofgem, with Xoserve continuing to act as CDSP on behalf of the gas industry as it does today. NGG would also continue to participate in market change activities as a signatory to the Uniform Network Code (UNC).