

**National Grid Transco – Potential sale of
network distribution businesses**

**Allocations of roles and responsibilities
between transmission and distribution
networks**

Regulatory Impact Assessment

April 2004

Summary

This document contributes to the development of an operational, commercial and regulatory framework that could support a divested industry structure, in the event that Transco sells one or more of its distribution networks (DNs). This framework will form the basis of an alternative to the status quo in a future regulatory impact assessment (RIA) that encompasses the broader DN sales decision.

This RIA considers the various options for allocating roles and responsibilities between the national transmission system (NTS) and the DNs in the context of a potential DN sale. Provided that no new material information emerges through this consultation process, the Authority should be in a position to reach a decision on the role and responsibilities of DNs by the end of May 2004.

Ofgem's objective

Ofgem's principal objective is to protect the interests of consumers in relation to gas conveyed through pipes, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the shipping, transportation or supply of gas. When deciding whether to consent to the disposal of one or more DNs, the Authority will consider whether the interests of present and future customers are protected.

When deciding how to allocate roles between the NTS and DNs, Ofgem will consider the costs and benefits to consumers. The post-sale industry structure must also establish a relationship between the NTS and DNs that permits each network owner to fulfil its statutory duties, including its duty to develop and maintain an efficient and economical pipeline system. This, in turn, will depend upon the extent to which the allocation of roles and responsibilities ensures that accountabilities are clearly defined and creates an opportunity for the benefits of comparative regulation to arise.

Key issues

The key issues to be considered when assessing the various options for allocating roles between the NTS and DNs are accountability and clarity, security of supply and the scope for efficiency savings:

- ◆ **Accountability and clarity.** In the event of a DN sale, responsibility for the development of an economic and efficient pipeline system will be split between

Transco and IDNs. As such, it is important that responsibilities are allocated in a way that clearly defines which party is accountable for investment planning and system operation when problems arise. An absence of accountability has implications for contractual complexity, commercial incentives, regulatory costs and ultimately, the costs borne by customers.

- ◆ **Security of supply.** It is critical that roles and responsibilities are allocated in a manner that permits each network, and the national network as a whole, to be operated in a way that minimises the risk to security of supply. In particular, if roles and responsibilities are not appropriately allocated there is a risk that networks may not be efficiently maintained, developed and operated, which could ultimately result in costs to customers.
- ◆ **Scope for efficiency savings.** The scope for efficiency savings affects the potential benefits available as a result of a DN sale. Savings can be achieved through comparative regulation and economies of scope. It is also necessary to consider whether there is potential for loss of efficiency, for instance through losses of economies of scale or loss of operational synergies. Any loss of efficiency will ultimately have implications for the costs borne by customers.

Analysis of options

The RIA considers three options for the allocation of roles and responsibilities between the NTS and the DNs:

- ◆ Option 1 was proposed by Transco on the basis that it most closely reflects Transco's existing operational model. It contemplates a relatively active role for the DNs.
- ◆ Option 2 gives a passive role to the DNs. Most key decisions are made by Transco, who retains responsibility for system operation of the national network.
- ◆ Option 3 is a hybrid model designed to allow DNs to be responsible for making their own investment and interruptions contracting decisions, whilst having a single system operator control centre for all independent DNs (IDNs) and retained DNs (RDNs) operated by Transco.

Table 1 summarises Ofgem's assessment of the costs and benefits associated with each option. It has both qualitative and quantitative features. The quantitative analysis uses Option 1 as the base case.

Table 1 Summary of costs and benefits for each option

Issue	Option 1	Option 2	Option 3
Accountability and clarity			
◆ Contractual complexity	✓	✗	✗
◆ Regulatory costs	✓	✗	✗
◆ Commercial incentives	✓	✗	✗
Security of supply	✓	✓	✓
Efficiency savings			
◆ Comparative regulation	✓	✗	✗
◆ Economies of scope	✓	✗	✓
◆ Economies of scale	—	—	—
◆ Operational synergies	✓	✗	✗
Loss of potential benefit relative to Option 1¹	£ 0	Between £31 m £64 m	Between £17 m and £24 m

Ofgem's initial view

In light of the information available to date, Ofgem is minded to support Option 1. As demonstrated in Table 1, Option 1 appears to have clear advantages over Options 2 and 3 in both quantitative and qualitative terms.

Whilst Ofgem considers that, in the absence of new information, a strong case is made in favour of Option 1, it is clear that many stakeholders are concerned about the potential for fragmentation associated with Option 1. Ofgem's RIA on governance and agency, which is being consulted upon in conjunction with this RIA, addresses this issue.

¹ The results of Ofgem's quantitative analysis, and the assumptions and methodology used to derive these results, are set out in Appendix 2.

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1. Introduction

Purpose of this document

- 1.1. The purpose of this document is to consult upon Ofgem's regulatory impact assessment (RIA) of the various options for allocating roles and responsibilities between Transco's national transmission system (NTS) and the gas distribution networks (DNs) in the context of a potential DN sale.
- 1.2. This RIA is intended to contribute to the development of an operational, commercial and regulatory framework that could support a divested industry structure. Following the completion of the consultation process, the framework that is developed will form the basis of an alternative to the present Transco owned and operated transmission and distribution arrangements. The conclusions of the RIA will be included in Ofgem's broader RIA on whether or not the Gas and Electricity Market Authority (the Authority) should consent to National Grid Transco's proposed disposal of DNs.

Background

- 1.3. In May 2003, NGT publicly announced that it would consider the sale of one or more of its DNs if it were to maximise shareholder value. Any such sale would require the consent of the Authority, the Health and Safety Executive and the Secretary of State.
- 1.4. In July 2003 Ofgem issued a consultation document on the regulatory, commercial and operational changes required to facilitate the sale of one or more DNs.² Following this consultation, in December 2003 Ofgem issued its Next Steps document setting out responses to the July consultation, Ofgem's current views and a proposed way forward for considering NGT's proposals including the establishment of workgroups to take forward the development of a commercial and regulatory framework.³

² *National Grid Transco – Potential sale of network distribution businesses, A Consultation Document.* Ofgem, July 2003.

³ *National Grid Transco – Potential sale of network distribution businesses, Next Steps Ofgem,* December 2003.

Workgroup processes

- 1.5. Since the release of the December document, Ofgem has established several workgroups including a Development and Implementation Steering Group (DISG), a Commercial Interfaces Workgroup (CIWG), a Regulatory Architecture Workgroup (RAWG) and an Agency Workgroup to continue the proposed DN sales consultation process.
- 1.6. Each of these workgroups has met regularly since January. The workgroups have been successful in providing industry participants with an opportunity to contribute to the development of a possible commercial and regulatory framework that would enable the implementation of Transco's proposals, should Transco obtain the necessary consents. They have focussed upon two key issues:
 - ◆ the allocation of roles and responsibilities between Transco, as owner of the NTS, and each of the DNs (both retained and independent); and
 - ◆ the development of appropriate governance and agency arrangements for shipper (and customer) interfaces, particularly focusing on supply point administration frameworks.
- 1.7. The discussions that have occurred through the workgroup process have highlighted the importance of these issues to the development of the commercial and regulatory framework.
- 1.8. In light of these discussions, in March 2004, Ofgem issued a way forward document indicating that it would be appropriate to develop for consultation separate Regulatory Impact Assessments (RIAs) on these two issues.⁴ Ofgem considered that the release of these RIAs would be consistent with the Authority's duty to carry out impact assessments.⁵ Since the release of Ofgem's way forward document, the workgroups have undertaken further work on the allocation of roles and responsibilities so as to inform the development of this RIA.
- 1.9. The way forward document indicated that Ofgem would issue its consultation on these RIAs in the event that the Authority took the decision at its April meeting

⁴ 'Potential sale of gas distribution networks, Ofgem update on way forward', Ofgem, March 2004

⁵ This duty is contained in section 5A of the Utilities Act 2000.

that it is appropriate for work to continue on the proposed DN sales project. As the Authority made an affirmative decision, this RIA is now being issued.

1.10. Ofgem hopes to reach a decision by the end of May 2004, although this will depend on whether any new and material information is received from respondents which results in Ofgem having to carry out further analysis.

1.11. The document is structured as follows:

- ◆ Chapter 2 sets out Ofgem's objectives with respect to the proposed DN sales and the RIA on network owner roles and responsibilities;
- ◆ Chapter 3 describes the key issues that arise in allocating roles and responsibilities between the NTS and DNs;
- ◆ Chapter 4 describes the different options that have been put forward;
- ◆ Chapter 5 considers the broader industry impacts of the proposals, in particular the potential impacts on competition and the environment;
- ◆ Chapter 6 evaluates the potential costs and benefits associated with the various options, and also considers the broader industry impacts; and
- ◆ Chapter 8 sets out Ofgem's current view.

1.12. Many industry participants have expressed the view that the benefits or otherwise associated with the sale of a DN are dependent on whether industry fragmentation is permitted to occur. The governance and agency RIA, which is being consulted upon in conjunction with this RIA, aims to address these issues.

Views invited

1.13. Ofgem welcomes views on this RIA, to be received by close of business 17 May 2004. Respondents are requested to provide views in a timely manner.

Responses should be addressed to:

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(Telephone: 020 7901 7412)

- 1.14. Electronic responses may be sent to tracey.hunt@ofgem.gov.uk
- 1.15. Respondents are free to mark their reply as confidential, although we would prefer, as far as possible, open responses that can be placed in the Ofgem library. Ofgem would also prefer that non-confidential responses are sent electronically so that they can be placed on the Ofgem website.
- 1.16. If you wish to discuss any aspect of this paper, Mark Feather (telephone 020 7901 7437) or Jessica Hunt (telephone 020 7901 7431) would be pleased to help.

2. Objectives

- 2.1. This chapter sets out the objectives that the Authority must fulfil when it decides whether to consent to the DN sales process. It also sets out Ofgem's objectives with respect to determining an appropriate allocation of roles and responsibilities for network owners.

Regulatory approval process

- 2.2. In order to dispose of a DN asset, Transco will require the consent of the Authority in accordance with amended standard condition 29 of Transco's Gas Transporter's (GT) licence.⁶ In deciding whether to give consent, the Authority must act in accordance with its statutory objectives and duties as set out in the Gas Act 1986, as amended (the Gas Act) as well as other public law duties.
- 2.3. The principal objective set out in section 4AA of the Gas Act provides that the Authority is 'to protect the interests of consumers in relation to gas conveyed through pipes, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the shipping, transportation or supply of gas'.
- 2.4. Having regard to these objectives, when deciding whether to consent to the disposal of one or more DNs, the Authority will assess, on the basis of the evidence available, whether present and future customers are protected.

Objectives of the roles and responsibilities RIA

- 2.5. When deciding how to allocate roles between the NTS and DNs, Ofgem will need to consider its principal objective as set out above, as well as its general duties. Ofgem considers that a number of these general duties have particular relevance to the allocation of roles and responsibilities of network owners in the context of DN sales. These include:

⁶ This condition also provides the Secretary of State with a power of veto over any proposal on the part of Transco to dispose of a transportation asset to the extent that it comprises a significant part of the gas conveyance system in Great Britain.

- ◆ the need to secure that, so far as it is economical to meet them, all reasonable demands in Great Britain for gas conveyed through pipes are met (section 4AA(2)(a));
- ◆ the need to promote efficiency and economy on the part of licence holders to carry on any activity and the efficient use of gas conveyed through pipes (section 4AA(5)(a)); and
- ◆ the need to secure a diverse and viable long-term energy supply (section 4AA(5)(c)).

2.6. In addition to meeting Ofgem's statutory duties, the post-sale industry structure must establish a relationship between the NTS and DNs that permits each network owner to fulfil its own statutory and licence obligations. These include:

- ◆ the duty of each GT to develop and maintain an efficient and economical pipeline system (section 9(1)(a) of the Gas Act); and
- ◆ the duty of each GT to avoid any undue preference or undue discrimination in the terms on which it undertakes to convey gas (section 9(2)(b)).

2.7. Further, as set out in standard condition 4D of the GT licence, each GT has an obligation to ensure that it conducts its transportation business in a manner best calculated to secure that neither it nor its affiliates and related undertakings obtain any unfair commercial advantage, including, in particular, any advantage from a preferential or discriminatory arrangement.

2.8. Therefore, Ofgem will need to consider each of these obligations and duties, as well as any others raised as being relevant through the consultation process, in determining an appropriate allocation of roles and responsibilities and assessing the costs and benefits of each of the options set out in Chapter 4.

2.9. In addition, Ofgem will consider the experience of the electricity industry. In electricity, there is a relatively fragmented industry structure which supports multiple distribution network operators. When it makes a decision on the allocation of roles and responsibilities that could apply in the gas industry, Ofgem will, where appropriate, take advantage of the lessons from electricity. However, it is important when drawing on the electricity experience to keep in

mind that the starting position in gas and electricity varies considerably and therefore comparisons may not always be appropriate.

- 2.10. In considering these obligations and duties, Ofgem has identified a number of key issues that will need to be addressed in determining an appropriate allocation of roles and responsibilities between the NTS and the DNs. These are set out in the following chapter.

3. Key issues

3.1. This chapter outlines the key issues that need to be addressed when allocating roles and responsibilities between the NTS and DNs. These issues include:

- ◆ accountability and clarity;
- ◆ security of supply; and
- ◆ scope for efficiency savings.

Accountability and clarity

3.2. In the event of a DN sale, the ownership of Transco's pipeline network will be split between different parties. As such, it is important that responsibilities for system operation and planning across the separately owned networks are allocated in a way that clearly defines which party is accountable for each of these functions. Ofgem considers that clear levels of accountability and clarity in responsibilities should facilitate efficient system planning and operation and security of supply. The need to ensure accountability and clarity in responsibilities has different implications for contractual complexity, commercial incentives and regulatory costs depending upon which option is adopted. An absence of accountability and clarity could ultimately increase costs to customers.

Complexity of contractual framework

3.3. If the allocation of roles and responsibilities are not clearly defined, it may become necessary to develop highly complex contractual frameworks to ensure effective accountabilities for planning and operation. The development of these frameworks could increase costs borne by customers.

3.4. Additional contractual complexity may also increase the level of legal and technical resources required to prepare and manage contracts. Further, as different network owners will have commercial incentives to test the limits of the contract, more resources may be required to resolve disputes associated with the contract.

Alignment of commercial incentives

- 3.5. A clear and appropriate allocation of accountabilities is important in ensuring that there are effective commercial and operational incentives to secure efficient system planning and operation. In particular, if a network operator is not fully accountable for its actions, the incentive to develop, maintain and operate the network in an efficient and economic manner may be reduced, to the cost of customers. For instance, the network operator may take risks or allow performance standards to drop in a way that would not otherwise occur.
- 3.6. Whilst regulatory mechanisms can be developed to appropriately align commercial incentives, the information asymmetries associated with network regulation can hinder the effectiveness of such arrangements. As such, where it is possible, Ofgem considers that roles and responsibilities should be allocated in a manner that reduces the need for complex regulatory arrangements.

Regulatory costs

- 3.7. An absence of accountability and transparency may also increase the costs of the regulator and ultimately customers. For instance, contractual complexity may give rise to increased costs associated with contractual oversight. Further, misaligned incentives could create a requirement for the development of regulatory incentive structures. These incentives would also need to be monitored.
- 3.8. In addition, as discussed above, arrangements that do not correctly allocate accountabilities may diminish the ability of the regulator to regulate effectively. For instance, the regulator may be unable to correctly allocate financial responsibility for cost overruns, failures to invest or inefficient system operation.

Security of supply

- 3.9. Ofgem considers that it is critical that roles and responsibilities are allocated in a manner that permits each network, and the national network as a whole, to be operated in a way that minimises the risk to security of supply resulting from a network failure.

- 3.10. In particular, risks to security of supply could arise if roles and responsibilities are allocated in a way that prevents the system operator from having access to a complete set of information with respect to the assets for which it has operational responsibility. Further, risks could also arise if the allocation of roles and responsibilities fails to clearly define accountabilities, so that network operators are not fully exposed to the costs associated with a failure to invest or a failure to operate their pipeline systems efficiently.⁷
- 3.11. These issues overlap with the other key issues described in this chapter.

Scope for efficiency savings

- 3.12. The allocation of roles and responsibilities between the NTS and DNs will have an impact on the level of efficiency savings available. Efficiency savings could arise as a result of comparative regulation, managerial incentives or economies of scope.
- 3.13. Many of the efficiency savings associated with a DN sale are likely to arise irrespective of the allocation of roles and responsibilities. This is because a significant proportion of potential savings that could arise from a sale stem from changes to support services and workforce management, and the DN will have responsibility for these functions regardless of which option is adopted. The savings considered in this RIA are only those that could be impacted upon by the allocation of roles and responsibilities between the NTS and the DNs.

Comparative regulation

- 3.14. As with electricity distribution networks, under comparative regulation, the regulator has the opportunity to compare the efficiency levels and costs submitted by each business and therefore attain a better understanding of where the efficiency frontier lies. In these circumstances benefits to customers arise because the regulator is able to make more accurate assessments of the DNs' true costs and therefore set more challenging regulatory targets.

⁷ Ofgem's review of international experience of allocating roles and responsibilities and incidents of significant losses of supply suggests that a lack of clarity and accountability in roles and responsibilities could increase risks to security of supply. This review is set out in Appendix 3.

- 3.15. Independent DN owners will also introduce new management, who are likely to have incentives to extract more efficiency savings than the previous managers.⁸ The opportunities to extract such savings will increase in accordance with the scope of the roles and responsibilities within the new management's remit.
- 3.16. The benefits of comparative regulation arising under the different options could differ insofar as different sets of operating costs will be incurred by each DN, depending on how roles and responsibilities are allocated. For example, if there was only one body responsible for system operation, then benefits associated with the innovative provision of system operator (SO) services would not be susceptible to comparative regulation.
- 3.17. Further, it has been suggested in the workgroups that an autonomous DN management team is likely to have greater incentives to innovate and generate cost savings than a management team that has relatively limited control over its business.

Economies of scope and scale

- 3.18. Economies of scope will arise if a DN purchaser is able to reduce costs by managing the DN in combination with another utility network, such as a water or electricity network. Whilst many of the key roles and responsibilities considered in the RIA are unlikely to benefit from economies of scope, it may be a relevant consideration in some instances.
- 3.19. Similarly, it is also important to consider whether any losses of economies of scale may arise as a result of a decision on how to allocate roles and responsibilities between the NTS and DNs. Economies of scale are savings that are available to a single large business but not to multiple smaller businesses.
- 3.20. Ofgem would note that any costs arising from losses of economies of scale would arise out of Transco's commercial decision to sell one or more DNs. As such, DN purchasers will need to factor any such costs into its purchase decision. Ofgem will not allow additional costs associated with losses of economies of scale to be passed through to customers.

⁸ This point has been made by a number of commentators, including Oxera; *Potential sale of Transco's gas distribution networks: Critical review of the preliminary regulatory impact assessment*, September 2003, pg. 3.

Operational synergies

- 3.21. At present, Transco is able to structure and operate its business in a way that takes full advantage of the synergies associated with network planning and system operation. Going forward, it is desirable to allocate roles and responsibilities between the NTS and the DNs in a way that retains these advantages so far as is possible.

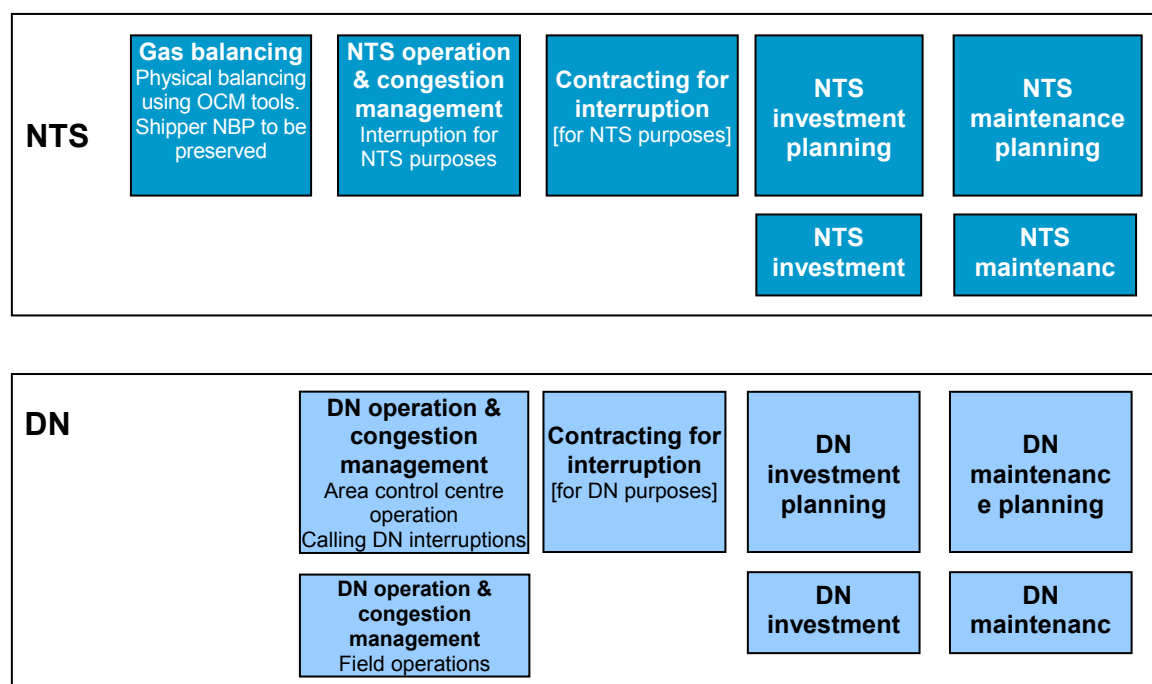
4. Options

4.1. This chapter provides a high level description of the key roles and responsibilities that need to be assigned, and explains how these responsibilities are currently allocated within Transco's existing business structure. The chapter also describes the models that were developed and discussed as part of the workgroup process.

Roles and responsibilities to be assigned

4.2. The workgroups have identified a number of roles as ones which must be assigned to either the NTS or DNs prior to a sale. The key roles and responsibilities and current assignment are set out in Figure 4.1.

Figure 4.1 Roles and responsibilities to be assigned



4.3. Some of the roles described above are assigned to the same entity under each option, namely, all NTS functions, plus DN investment and maintenance, and the field operations associated with DN operation and congestion management. These roles are relevant because of linkages with other functions.

Gas balancing

- 4.4. Under the present gas balancing arrangements, shippers have commercial incentives to balance their inputs and offtakes each day. Shippers face different 'cash-out' prices depending on whether they end the day long on gas (their gas inputs exceed their gas offtakes) or short on gas (their gas offtakes exceed their gas inputs). The cash-out prices provide an incentive for shippers to achieve a daily balance and seek to target the costs associated with any imbalances back to the companies causing them to be incurred.
- 4.5. Under the gas balancing regime, Transco is responsible for residual gas balancing on the NTS. As residual gas balancer, Transco ensures that NTS pressures remain within safe parameters by trading on the on-the-day-commodity-market (OCM) and by managing stock changes and flows to the DNs. There is some flexibility in the system, through storage in the pipes, to accommodate imbalances within the day and from day to day. This flexibility is known as system linepack. NTS linepack is used to meet within-day fluctuations in supply and demand and within-day input and output profiling on the NTS.
- 4.6. Importantly, each of the options considered in this RIA assign the role of gas balancing to the NTS. In all cases the existing gas balancing regime, including the national balancing point, would be retained. The retention of the national balancing point arrangements are discussed further in Chapter 6.

NTS operation and congestion management

- 4.7. At present Transco operates the NTS through a central control centre with responsibilities that include the scheduling of gas flows on the system taking account of expected gas flows onto and out of the NTS as required by shippers and connected system operators. Transco also manages congestion and constraints through physical and commercial tools, including, compression, diurnal storage, entry capacity buy back actions and supply point interruption. In future, Transco intends to perform this function from its Gas National Control Centre at Warwick.

Contracting for interruption for NTS purposes

- 4.8. Transco currently enters into transportation interruption arrangements with shippers under the Network Code. Transco may call interruption under these arrangements on the NTS or DNs to address NTS constraints, and under high system demand conditions. The development of appropriate exit capacity and interruption arrangements on the NTS and across the DNs is currently being considered by the Commercial Interfaces Workgroup (CIWG). As part of this process the CIWG is considering whether the NTS should be able to continue to contract for interruption with shippers that supply gas to sites that are connected to the DN. The CIWG is also considering appropriate arrangements for the pricing of interruption on the NTS and DNs.

NTS investment planning & investment

- 4.9. In addition to its Gas Act obligations to develop an efficient and economical pipeline system, standard condition 16(2) of the GT licence specifies that Transco shall plan and develop its system such that it can meet peak aggregate daily demand that is only likely to be exceeded (whether on one or more days) in 1-in-20 years.
- 4.10. In order to meet its planning and development obligations, Transco's NTS planning engineers undertake an annual planning process.⁹ This process involves industry consultation and the development of a Ten Year Statement which Transco is required to provide under amended standard condition 25 of its Gas Transporter's licence. In addition, Transco's NTS planning is informed by the signals it receives from long term auctions of system entry capacity.

⁹ This process is co-ordinated with, but conducted separately to, the DN annual planning process.
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NTS maintenance planning & maintenance activity

- 4.11. Transco is currently required, under Section L of the Network Code, to prepare and publish maintenance programmes each year outlining planned maintenance of the NTS. The maintenance programme identifies the duration and expected impact of planned maintenance on Transco's ability to accept gas deliveries or to make gas available for offtake. In planning its maintenance programme, Transco takes account of the signals it receives from entry capacity auctions in order to minimise the potential costs to it of buying back entry capacity to undertake maintenance. Transco bears a share of the costs of any entry capacity buy-backs it undertakes under its present System Operator incentives package.

DN operation and congestion management

- 4.12. Transco has indicated there are two discrete aspects to DN operation and congestion management, namely, operational management activities undertaken by the area control centres and field activities.¹⁰

Area control centre activities

- 4.13. Area control centres remotely operate pipeline and plant associated with the higher pressure tiers of the distribution system, including the control and management of the NTS offtakes into the DNs as well as operation of most of the local gas holders. These functions also include triggering interruption when there is insufficient local transportation capacity to maintain supply to all loads within a locality. In undertaking this process, the DN area control centre takes account of the availability of DN pipeline and flow management capability.

Field activities

- 4.14. Transco has indicated that the operation of the lower pressure tiers of the DNs is conducted by field staff. For example, field staff set network pressures at local governors depending on expected demand. Field staff also undertake pipeline maintenance and construction activity as well as providing emergency cover.

¹⁰ This is in contrast to the NTS, where it is possible to control the entire network from the Gas National Control Centre.

- 4.15. The assignment of DN operation and congestion management roles is one of the key differences between the various options.

DN investment planning and investment

- 4.16. As described in paragraph 4.10, Transco undertakes an annual planning process in order to meet its statutory duties under the Gas Act and its 1 in 20 licence obligations contained in its GT licence. At present, DN investment planning is carried out as part of a co-ordinated process to deliver the requisite NTS and DN capacity. The specification of DN requirements draws heavily on detailed local knowledge. If a DN sale occurs, responsibility for DN investment planning and investment activity going forward will depend upon which option is adopted.

DN maintenance planning and maintenance

- 4.17. As with the NTS, DN maintenance planning is carried out in accordance with section L of the Network Code. The planning process in the DNs draws heavily on detailed local knowledge. As with investment planning, if a DN sale occurs, responsibility for DN maintenance planning and maintenance activity going forward will depend upon which option is adopted.

DN contracting for interruption

- 4.18. Transco has contracts for interruption with shippers supplying gas to DN supply points. In future DNs could take on an active role in determining their interruption requirements, striking contracts for interruption and calling on these contracts as necessary. One of the issues considered in this RIA is whether the NTS or the DN should be responsible for contracting for interruption for DN purposes.

Description of options

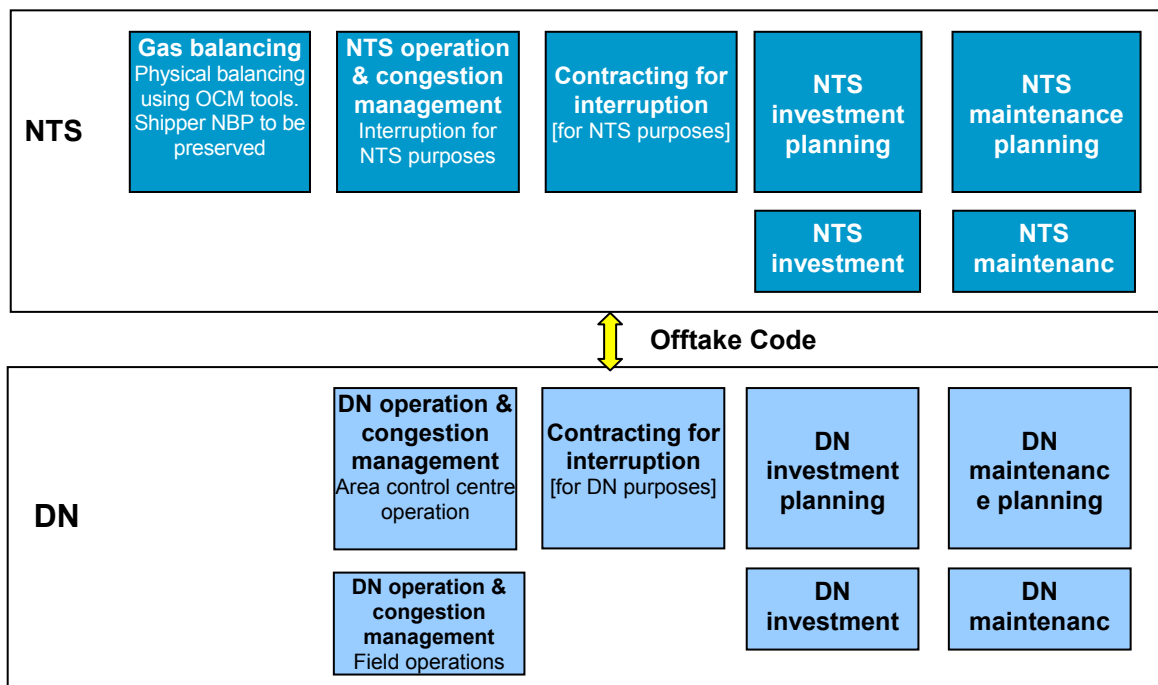
- 4.19. Several possibilities exist for the allocation of operational responsibilities between the NTS and DNs. This section describes the three main options that were developed and discussed as part of the workgroup process, and are considered in the cost benefit analysis in Chapter 6. Appendix 1 contains a series of tables that describe the allocation of roles under each option in more detail.

4.20. Given that the purpose of this RIA is to assist in understanding the potential options for allocating roles and responsibilities in the context of a possible DN sale, Ofgem is not considering the present arrangements as one of the options.

Option 1

4.21. This option was proposed by Transco on the basis that it most closely reflects Transco’s existing operational model. It contemplates a relatively active role for DNs. The allocation of roles and responsibilities under Option 1 is depicted below.

Figure 4.2 Allocation of roles and responsibilities under Option 1



4.22. Under Option 1, the DNs are responsible for DN system operation (both control centre activity and field activity) and congestion management. The NTS would retain responsibility for gas balancing. As such, the present gas balancing arrangements would remain with Transco acting as residual gas balancer.

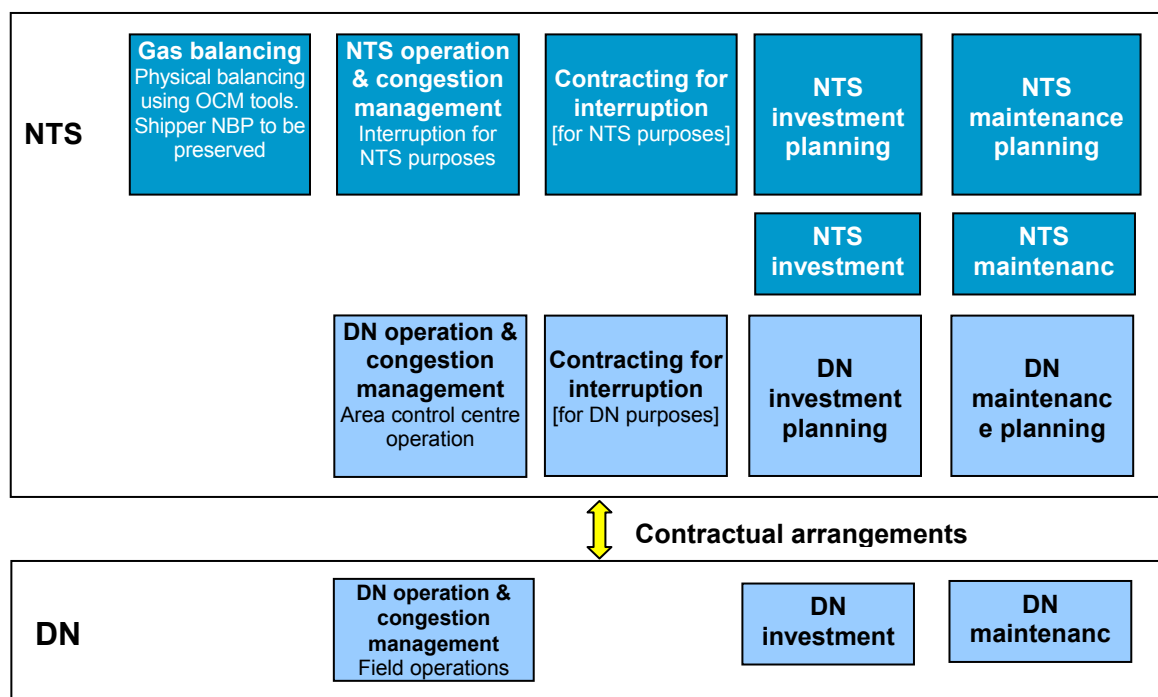
4.23. The DNs also have responsibility for determining the level of available capacity on their networks and for all network planning and investment decisions. Consistent with this, each DN owner would have its own set of SO incentives and, potentially, its own 1-in-20 investment and planning obligations.

4.24. Transco has proposed that a regulated offtake code be established to define and govern the operational and commercial relationship between the NTS and each DN, including DNs which are not sold by Transco. Under Transco’s proposal, this code would determine how much capacity is allocated by the NTS to the DNs and how investment and maintenance planning is coordinated. It would also address the management of operational flows, pressures and diurnal storage.

Option 2

4.25. Under Option 2 the role of the DNs is largely passive. The allocation of roles and responsibilities under this option is illustrated below.

Figure 4.3 Allocation of roles and responsibilities under Option 2



4.26. Under Option 2, Transco is responsible for system operation, as well as investment and maintenance planning for the NTS and all the DNs. Congestion management (including interruption) on DNs would be managed by Transco as system operator (SO), and the DN owners would not enter into any interruption contracts. Instead, Transco SO would contract with shippers or customers to manage any interruption on the DNs.

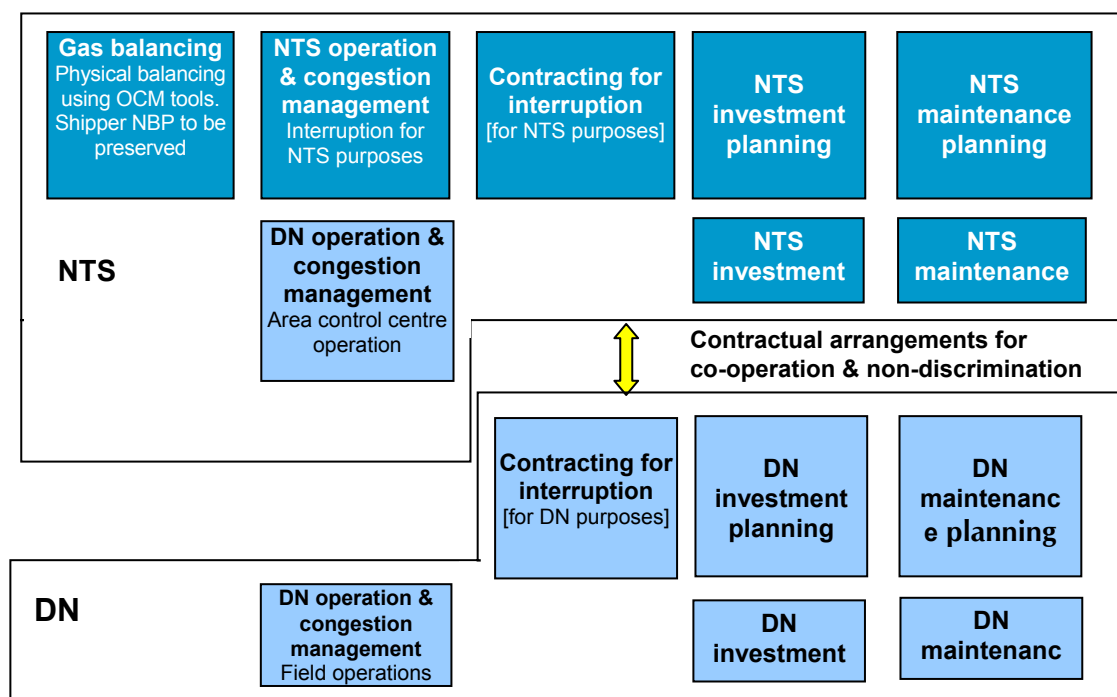
4.27. Transco SO would determine the level of investment required and develop the annual maintenance plan. If maintenance or investment programmes are not delivered, then the DNs would pay compensation to Transco SO under contract.

- 4.28. Under this option, Transco would have responsibility for all system operation functions including local field operations. Transco would be able to manage these functions by either contracting with each DN to perform system operation and congestion management activities at a local level (as illustrated in Figure 4.3) or by employing its own field staff.
- 4.29. Under this model there would be no offtake code in the sense proposed by Transco for Option 1 as there would only be one system operator.

Option 3

- 4.30. Under Option 3 each DN would be responsible for making its own investment and interruptions contracting decisions whilst having a single system operator control centre for all DNs that would be operated by Transco. The allocation of roles and responsibilities under Option 3 is illustrated below.

Figure 4.4 Allocation of roles and responsibilities under Option 3



- 4.31. Under this option, the NTS and the DNs would coordinate planning and investment across the NTS/DN interfaces, with each having responsibility for these roles on their respective networks. The DNs would therefore plan and undertake physical investment on their networks, utilise NTS diurnal storage as necessary and enter into contracts for interruption on their own networks.

- 4.32. The obligation for DN operation and congestion management would reside with Transco to be carried out by, and in conjunction with, its NTS SO function. However, each DN would continue to perform the field activities associated with its lower pressure tiers. Therefore, Transco SO would operate both the Gas National Control Centre and the Area Control Centres and would issue detailed instructions to DN field staff on operational matters.
- 4.33. In its role of DN operation and congestion management, Transco SO would be responsible for managing interruption on each DN. In managing interruption on the DNs, Transco SO would have access to the interruption contracts that have been struck by the DN owner with customers/shippers.
- 4.34. It is likely that contractual or incentive arrangements would need to be developed between Transco SO and each DN in order to allocate and share financial responsibility for the costs of interruption.

Option 3(a)

- 4.35. A variation on Option 3 has been raised through the workgroup processes. Under this option, the DNs would retain responsibility for investment planning and maintenance planning. However, DNs would not contract for interruption.
- 4.36. Option 3(a) was only briefly considered by the workgroups because it separates interruption contracting decisions from investment decisions. This model was rejected by the workgroups as it prevents efficient trade-offs being made between investment and interruption. In particular, this model is unlikely to promote the efficient development of pipeline networks as each DN would be unable to utilise an important commercial tool in determining how to manage network investment and constraints.
- 4.37. Ofgem notes that Option 3(a) has similarities to the model being proposed as part of the BETTA reforms for electricity transmission. In particular, under the BETTA model responsibilities for network operation are undertaken by National Grid Company (NGC) whereas asset owners Scottish Power Transmission Limited and Southern Hydro-Electric Transmission Limited are principally responsible for transmission planning in their respective areas. In England and Wales, NGC will undertake network operation and own the transmission assets. It is, however, proposed that the System Operation – Transmission Owner Code

(STC) will set down certain additional joint planning responsibilities which are intended to ensure appropriate coordination and to describe the system operator's role in providing information which is used in the planning process.

- 4.38. Whilst Ofgem believes that there are parallels between BETTA and the DN sales process, there are also some differences that mean that there is no direct read-across from the allocation of activities between Transco (as System Operator) and DN owners under the DN sales process. The DN sales process relates primarily to the interface between the high pressure system and the local distribution system. There are also different physical characteristics of gas and electricity networks (such as the ability to store gas within the pipeline system).
- 4.39. Under BETTA, the allocation relates to tasks carried out by the SO and the high voltage transmission asset owners. In addition, the objectives and starting point for the BETTA reforms are substantially different from those of the DN sales process. The initial allocation of activities proposed under BETTA is, in Ofgem's view, the most appropriate taking into account the BETTA objectives, the starting point for reforms and practicalities associated with implementing BETTA in a timely manner. The initial structure being implemented under BETTA at Go Live can evolve over time if experience of operating under the market suggests that this would be desirable. This would be achieved through STC amendments and, if appropriate, changes to transmission licences.

5. Competitive and environmental impacts

- 5.1. This chapter considers the potential for broader industry impacts associated with the allocation of roles and responsibilities between the NTS and DNs. It considers the potential impact on wholesale and retail competition, the environment and distributional effects.

Competition

- 5.2. The sale of the DNs and allocation of roles and responsibilities could, potentially, impact upon both wholesale and retail competition. These potential impacts and the measures that are proposed to address them are discussed below.

Wholesale competition

- 5.3. Currently, all onshore gas trades are conducted at the National Balancing Point (NBP), a notional point on the gas network. The Network Code defines this single trading point, which has become the trading hub for the entire gas market and has led to significant positive effects. This includes creating a deep and liquid gas market (so that volume of gas trades amount to 6 times the throughput of the network) that has, in turn, encouraged price discovery.
- 5.4. Without careful management of the market and regulatory arrangements, there is a risk that the disposal of the DNs could lead to fragmentation of the NBP. This could potentially reduce liquidity at the NBP and therefore hamper price discovery. In turn, this could limit market entry, discourage trading and generally harm wholesale market competition. *In extremis*, nine such balancing points could arise if each DN were to insist that shippers balance on its individual network.
- 5.5. Clearly this would be a significant departure from the current trading arrangements. Indeed, Ofgem considers it would be particularly harmful to wholesale competition.
- 5.6. For this reason, in its July 2003 consultation document on the proposed DN sales and in its December 2003 Next Steps document, and throughout the workgroup discussions, Ofgem has proposed that the residual energy balancing

role is retained by Transco as operator of the NTS. Ofgem considers that this would ensure the retention of the National Balancing Point arrangements.

- 5.7. Ofgem would also note that the governance arrangements for the newly owned networks would not allow a new DN owner to develop its own balancing arrangements for its network without consultation and Authority approval.

Retail competition

- 5.8. Similarly, the DN sales process presents some risks to retail competition. For instance, were the DNs to be responsible for the change of supplier process (as the equivalent DNOs are in the electricity retail market) there is a risk that the process for customer switching could become non-uniform over time. This could impact adversely on retail competition in two ways:

- ◆ first, fragmented arrangements might increase the change of supplier failure rate as suppliers interact with a range of different systems and process. The consequent bad publicity might impact adversely on customer switching rates; and
- ◆ second, fragmented switching arrangements would increase the costs to suppliers. Ofgem considers that this would discourage market entry and weaken retail competition.

- 5.9. These are considered further in Ofgem's RIA on governance and agency.

Environment

- 5.10. In the absence of any evidence to the contrary, Ofgem does not envisage that there are any environmental impacts associated with the allocation of roles and responsibilities between network owners. The only potential environmental benefit that might arise would occur under Option 1 or Option 3 if a DN were to be acquired by another distribution infrastructure owner (eg an electricity distribution network or a water company). This raises the possibility of co-ordinated maintenance and replacement work by an integrated distribution business and, in turn, less disturbance in terms of reduced aggregate street and site works with consequential benefits to the environment.

Distributional effects

- 5.11. Distributional effects refers to changes in the relative welfare of different customer groups. In the absence of any evidence to the contrary, Ofgem does not envisage that there are any distributional effects associated with the allocation of roles and responsibilities between the NTS and DNs.

6. Costs and benefits

- 6.1. This chapter evaluates the costs and benefits of each option for allocating roles and responsibilities between the NTS and the DNs. The chapter assesses costs and benefits from both a qualitative and quantitative perspective.

Option 1

- 6.2. As discussed in Chapter 4, Option 1 contemplates a relatively autonomous role for each DN. This section sets out the costs and benefits of Option 1 and then seeks to evaluate them.

Costs

- 6.3. The following potential costs associated with Option 1 have been discussed in the workgroups:
- ◆ **Loss of economies of scale.** At present, Transco is in the process of co-locating all four Area Control Centres (ACCs) to a single location at Hinckley. Under Option 1, however, new DN owners would have responsibility for the operation of their systems. This will require them to establish and operate their own area control centres or to contract out this function to a third party. A loss of economies of scale could arise if it is more expensive overall to separately operate RDN area control centres and IDN area control centres. As noted in Chapter 3, any costs arising from losses of economies of scale would arise out of Transco's commercial decision to sell one or more DNs. As such, any buyer will need to factor any such costs into its purchase decision and Ofgem will not allow these costs to be passed through to customers. Accordingly, Ofgem does not believe that losses of economies of scale are a significant factor in assessing the costs and benefits of Option 1.
 - ◆ **Transitional cost relating to accountability.** Given the development of new control systems and the centralisation of ACCs at Hinckley it is not possible for Transco to include DN control centre assets in any sale. As such, Transco has proposed that during the period in which each IDN is establishing its own area system control centre, Transco will use the

Hinckley control centre to carry out system operation of the IDNs in accordance with an agency agreement known as the System Operation Managed Services Agreement (SOMSA). This agreement would not be regulated by Ofgem. In the event that Transco fails to deliver on these instructions the IDN would be able seek compensation under the SOMSA. Therefore, for a transitional period, it is intended that there will be some divergence between the party responsible for area control centre functions and the party that actually performs this role. However, Ofgem considers that the creation of the SOMSA will have minimal cost implication in terms of accountability as, in practice, the role undertaken by Transco will be largely operating IT and information systems under instruction from the IDN Head of Network Operations, as outlined above. However, Ofgem would note that under the SOMSA proposals there may be some potential for discrimination by Transco in favour of its retained DNs in the manner in which it performs the SOMSA function. This could create costs for customers. Ofgem would also note that the system operation arrangements, including those under a SOMSA, would need to be described in safety cases submitted to the HSE under the Gas Safety Management Regulations (GSMR). The HSE will examine the arrangements as part of their assessment of the safety cases to ensure they meet the GSMR obligations as regards safety and security.

- ◆ **Loss of operational synergies.** Two issues were raised by the workgroups:
 - ◆ Some workgroup participants suggest that the roles of gas balancing and DN congestion management overlap, and consequently, these roles should be carried out by a single entity. As such, some participants considered that separating responsibility for network operation across the NTS and DNs could create costs. However, Ofgem, Transco and a number of workgroup participants consider that it is possible to distinguish between gas balancing and constraint management in almost all cases. As such, we do not expect that there will be significant costs in this area associated with Option 1.

- ◆ Some workgroup participants have suggested that a single operator should manage both the Gas National Control Centre (GNCC) and the DN area control rooms. These participants have argued that if problems arise, Option 1 would lead to an increase in costs due to difficulties in achieving network co-ordination. Ofgem notes that Transco already operates the GNCC separately from its DN area control centres. On this basis, Ofgem considers that if significant synergies were present, Transco would have had sufficient incentives to minimise costs by adopting an integrated structure. Further, Ofgem would note that even under Options 2 and 3, local system control functions are performed by DN field staff which means that there will inevitably be a break in responsibility at some point under each of these two alternative options.

- ◆ **Industry fragmentation.** Some industry participants have indicated that Option 1 may give rise to costs to shippers as a relatively active DN is more likely to seek industry fragmentation through diverging network code and charging arrangements. Ofgem believes that the issue of fragmentation can be effectively addressed through the development of appropriate governance and agency arrangements. As noted previously, an RIA on governance and agency issues has also been issued at the same time as this document.

Benefits

6.4. Ofgem has identified the following potential benefits associated with Option 1:

- ◆ **Accountability.** Ofgem considers that accountability for operation and planning under Option 1 is clear as all operational and planning functions for each network are undertaken within the one organisation. In particular, this should avoid the potential for costs to customers which could arise as a result of contractual complexity, misaligned commercial incentives, and regulatory costs. These issues are discussed in more detail in the context of Options 2 and 3.

- ◆ **Comparative regulation.** Ofgem considers that the benefits of comparative regulation are likely to be greatest under Option 1 given that each IDN would have full operational responsibility for its respective

network. As such, when compared with Options 2 and 3, each IDN would have the opportunity to reduce its operational costs. Further, each IDN would also be able to take full advantage of any economies of scope that are available. (As noted in Chapter 3, this analysis relates to only a small proportion of the overall efficiency gains that would be available under any of the options.)

- ◆ **Commercial incentives.** Ofgem considers that the creation of a clear interface between NTS and DN systems under Option 1 should better enable the development of commercial services at the interface. For example, this could lead to more efficient investment in the provision of diurnal storage by the NTS and DNs. In particular, with commercial arrangements in place, each DN would be able to efficiently trade off the costs of investing or purchasing diurnal storage capability from the NTS. Ofgem would note that, in both the gas and electricity sectors, it has been able to set financial incentives on regulated companies to make efficient trade offs between capital and operating expenditure. The issues associated with the development of commercial arrangements and commercial incentives at the NTS/DN interface will be more fully explored through the workgroup process.
- ◆ **Economies of scope.** Under Option 1 there may be economies of scope associated with having gas investment and maintenance planning conducted in conjunction with the planning functions of another network, such as an electricity or water network.¹¹ Further, the synergies associated with joint planning functions could flow onto the conduct of field activities (such as construction and maintenance). However, given that economies of scope will only arise if another utility purchases a DN, Ofgem has not sought to quantify these benefits.
- ◆ **Retention of operating synergies.** As outlined in Chapter 4, under Option 1 both field staff and area control centre staff receive instructions from the Head of Network Operations, who is responsible for system operation. Transco has indicated that the Head of Network Operation's

¹¹ For example, there might be some economies of scope associated with maintaining the asset register and the coordination of maintenance schedules.

operational plans are formulated to take account of the implications of DN investment and replacement strategies in the context of detailed knowledge of operational experience within the network.¹² Ofgem considers that this will result in investment and operating decisions that are more economic and efficient than a model where such decisions are made by separate entities.

Security of supply

- 6.5. Under Option 1, a single entity (the DN) has responsibility for DN area control centre operations, DN investment planning and day to day field operations. Ofgem considers that this allocation of responsibilities is advantageous in terms of security of supply because accountabilities are more clearly defined than under Options 2 or 3. Further, the entity responsible for the area control centre has access to a full set of information regarding the distribution network.
- 6.6. Transco has outlined that, in its view, none of the options being discussed in this paper would jeopardise security of supply. However, it should also be noted that, in Transco's view, Option 1 would provide the best allocation of roles and responsibilities from a security of supply perspective.
- 6.7. It is also important to note that the HSE will need to be satisfied under the Gas Safety Management Regulations that the option that is adopted ensures safety and security. In this respect, the HSE has expressed the view that each of the options considered in this RIA have the potential to comply with the Gas Safety (Management) Regulations (GSMR), but that at present the models have not been developed in sufficient detail to determine whether safety and security requirements would be met. The HSE has however indicated that Option 1 potentially provides a clear allocation of roles and responsibilities, which it considers is essential to demonstrating safety and security.
- 6.8. Ofgem has sought to identify which allocation of roles and responsibilities is most robust in terms of security of supply by considering international experience. This analysis is set out in Appendix 3.

¹² National Grid Transco *System Operation Responsibilities & Contracting Framework: Document for Discussion*, paper submitted to DISG Meeting 9 March 2004.
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Evaluation of costs and benefits

- 6.9. Ofgem has undertaken a cost benefit analysis of each of the options in quantitative and qualitative terms.
- 6.10. In terms of a quantitative assessment, Ofgem has attempted to quantify the costs and benefits associated with contractual complexity, regulatory costs and comparative regulation. Ofgem has chosen Option 1 as the base case for the purpose of this analysis and as such, there is no quantification of the costs and benefits of this option in this section. As such, Options 2 and 3, which are considered later in this chapter, are assessed in quantitative terms as a variation on Option 1.
- 6.11. It should be noted in this context that, in assessing the quantitative benefits of comparative regulation, it is misleading to consider these benefits purely as a function of the choice of options for the allocation of roles and responsibilities when these benefits are the same as the benefits that have been identified for DN sales overall. Consequently, Ofgem has expressed the benefits of each option as a variation on the base case, where, as noted above, the base case is Option 1.
- 6.12. In terms of qualitative assessment, Ofgem has assigned ticks and crosses to each of the key issues for each Option that is being assessed.
- 6.13. Table 6.1 evaluates Option 1 in respect of each of the key issues.

Table 6.1 Evaluation of costs and benefits associated with Option 1

Column 1: Issue	Column 2: Qualitative assessment
Accountability and clarity	
◆ Contractual complexity	✓
◆ Regulatory costs	✓
◆ Commercial incentives	✓
Security of supply	✓
Efficiency savings	
◆ Comparative regulation	✓
◆ Economies of scope	✓
◆ Economies of scale	—
◆ Operational synergies	✓
Total NPV relative to Option 1	Not applicable

6.14. Option 1 rates positively in relation to all qualitative features. For reasons described in paragraph 6.3, Ofgem has not made a qualitative assessment of the potential losses associated with economies of scale.

Option 2

6.15. As noted in Chapter 4, this is the option that gives a passive role to the DNs. This section sets out the costs and benefits of Option 2 and then seeks to evaluate them.

Costs

6.16. Ofgem has identified the following potential costs associated with Option 2:

- ◆ **Contractual complexity.** In Option 2 Transco has all system operational and planning responsibility, including area control centre system operation and field operational responsibility across all DNs. In performing its system operator and planning role, Transco will need to enter into contractual arrangements with DNs for the provision of

investment and maintenance. In addition, Transco as system operator will also need to determine whether to employ its own field operations units or whether to contract this function out to DNs. As such, Ofgem considers that the nature and level of contractual interfaces in this model are likely to be both significant and complex.

- ◆ **Regulatory cost.** Ofgem considers that Option 2 may reduce regulatory effectiveness because:
 - ◆ It may not always be possible to determine whether a network failure has arisen as a result of inefficient system operation by Transco SO or due to a failure by a DN to deliver on its contractual obligations. This lack of accountability could result in reduced regulatory effectiveness. For instance, if Transco as system operator is required to call interruption at significant cost, Ofgem as regulator will need to determine whether these costs were attributable to a failure to invest or inefficient system operation and allocate them appropriately. Ofgem considers that it would be difficult to allocate costs correctly in circumstances where accountabilities are not clear, particularly given information asymmetries;
 - ◆ Ofgem also considers that given the additional level of contractual complexity under Option 2 there is an increased potential for disputes. This is likely to require additional Ofgem resources and create additional costs.
- ◆ **Misaligned commercial incentives.** Inappropriate commercial incentives may arise because the Transco SO is responsible for operating DN assets that it does not own.
 - ◆ For instance, Transco SO has access to diurnal storage facilities as and when they are required, whilst ownership lies with the DN owner. If the NTS carries out its SO functions in a way that benefits its own commercial interests rather than in a way that benefits the national system as a whole, then customers' costs may increase as a result of less efficient pipeline operation.

- ◆ Further, if Transco is responsible for operating part of a DN's network it may be more difficult to create meaningful economic signals at the NTS/DN interface (including signals for the use of diurnal storage and on the day system flexibility). An absence of economic signals could ultimately result in costs for customers.
- ◆ In addition, Ofgem considers that there may be greater potential for discrimination against IDNs by Transco in circumstances where it is responsible for operating DN assets that it does not own.
- ◆ **Loss of operational synergies.** Another consequence of the split between responsibility for the DN area control centre and field operations is that Transco SO will be responsible for issuing detailed operational instructions relating to a set of assets that it does not deal with at a local level. Transco and others have suggested that this will lead to a less efficient set of operational decisions than would be the case if these activities were carried out by a single entity. This may lead to costs that are over and above the costs associated with managing the contractual interface.

Benefits

6.17. Ofgem has identified the following potential benefits associated with Option 2:

- ◆ **Comparative regulation.** Option 2 assigns the narrowest role to the DNs. Consequently, under Option 2 the smallest set of operating costs would be available to be driven downwards by the forces of comparative regulation and economies of scope. (As noted in Chapter 3, this analysis relates to only a small proportion of the overall efficiency gains that would be available under any of the options.)
- ◆ **Retention of economies of scale.** Option 2 does not give rise to the potential loss of economies of scale associated with IDNs establishing and operating their own area control centres. However, as noted in paragraph 6.3, Ofgem considers that any costs arising from losses of economies of scale would arise out of Transco's commercial decision to sell one or more DNs. As such, any buyer will need to factor any such costs into its purchase decision and Ofgem will not allow these costs to

be passed through to customers. Accordingly, Ofgem does not believe that losses of economies of scale are a significant factor in assessing costs and benefits. Conversely therefore, the retention of economies of scale is also not a significant factor.

- ◆ **Accountability.** Option 2 has an advantage over Option 3 in terms of accountability, because a single entity is responsible for both the DN area control centre decisions and the DN's investment and maintenance planning decisions.

Security of supply

- 6.18. As discussed above, a key determinant of whether the allocation of roles and responsibilities is satisfactory in terms of security of supply is whether accountabilities are defined clearly.
- 6.19. As noted above, the HSE has expressed the view that each of the options considered in this RIA have the potential to comply with the GSMR, but that at present the models have not been developed in sufficient detail to determine whether safety and security requirements would be met. However, the HSE has indicated that under Option 2, an IDN may find it difficult to demonstrate that the safe and secure operation of its network will be ensured when key decisions with respect to its network will be made by the Transco SO.

Evaluation of costs and benefits

- 6.20. Table 6.2 evaluates the allocation of roles and responsibilities under Option 2 in respect of each of the key issues. Ofgem estimates that the benefits available under Option 2 are approximately £31 million to £64 million less than the benefit available under Option 1, depending on how many DNs are sold.¹³ In a qualitative sense, Option 2 rates indifferently or negatively in relation to most issues.

¹³ The difference between options 1 and 2 would be £31 million if one DN was sold, and £64 million if four DNs were sold. See Appendix 2.
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Table 6.2 Evaluation of costs and benefits associated with Option 2

Issue	Qualitative assessment	Net present value of costs relative to option1
Accountability and clarity		
◆ Contractual complexity	✘	£4 million
◆ Regulatory costs	✘	£1 million
◆ Commercial incentives	✘	
Security of supply	✓	
Efficiency savings		
◆ Comparative regulation	✘	£26 million – £59 million
◆ Economies of scope	✘	
◆ Economies of scale	—	
◆ Operational synergies	✘	
Total NPV relative to Option 1		£31 million – £64million

6.21. The following points should be made in relation to Table 6.2:

- ◆ Ofgem has sought to evaluate the benefits of comparative regulation under Option 2. However, since these benefits are lower than the benefits available under Option 1, they appear as a cost in Table 6.2.
- ◆ The contractual complexity cost reflects the additional costs incurred by network operators in managing a more complicated contractual framework, including costs associated with the greater risk of contractual disputes. Ofgem has assumed that Option 2 will give rise to a requirement for two additional full time equivalent staff members in total across the NTS and DNs.
- ◆ The regulatory cost reflects costs incurred by Ofgem in employing additional staff to deal with the lack of transparency and greater contractual complexity. Ofgem estimates that one additional full time equivalent staff member would be required.

- ◆ For the reasons outlined above in paragraph 6.3, Ofgem has not made a qualitative assessment of the benefits of any retention of economies of scale.
- ◆ Appendix 2 details the assumptions and methodology used to derive the estimates of costs and benefits.

Option 3

6.22. As noted in Chapter 4, under Option 3 each IDN would be responsible for making its own investment and interruptions contracting decisions whilst having a single system operator control centre for all DNs that would be operated by Transco. This section considers the costs and benefits of Option 3 and then sets out a summary.

Costs

6.23. Ofgem has identified the following potential costs associated with Option 3:

- ◆ **Accountability.** Several features of Option 3 reduce the level of clarity associated with accountability for various functions. For example, under this model Ofgem considers that there is a lack of clarity regarding accountability for inefficient system operation or a failure to develop and maintain an efficient pipeline system given that the DN is responsible for entering interruption contracts but its rights under those contracts are exercised by others. This lack of accountability leads to costs associated with contractual complexity, regulatory costs and misaligned incentives as described below.
- ◆ **Contractual complexity.** A consequence of Option 3 is that area control centre system operation is conducted by a different organisation to the 'on the ground' system operation. This effectively means that, rather than governing the relationship between 114 DN offtake points from the NTS (as occurs under Option 1), the offtake code will need to govern the relationship associated with a very much larger number of interface points between those parts of the DN system which are primarily

controlled from the area control centres and those which are primarily managed by field operations.¹⁴

- ◆ **Regulatory costs.** Option 3 reduces regulatory effectiveness because:
 - ◆ There is a lack of clarity as to whether a fault has arisen as a result of a decision made by Transco in the DN area control centre or due to flaws in the DN's investment and maintenance planning decisions. Ofgem considers that, given information asymmetries, this ambiguity will increase the costs of the regulator itself and will also impose costs by reducing the regulator's ability to make effective decisions.
 - ◆ Ofgem also considers that the potential for disputes could be higher under Option 3 relative to both Options 1 and Option 2. In particular, Ofgem considers that the separation of the role of entering into interruption contracts from the role of exercising those contracts could increase the occurrence of disputes between Transco and the IDN.

As a result, additional Ofgem resources may be required to monitor and enforce compliance with regulatory objectives.

- ◆ **Misaligned incentives.** Option 3 could give rise to misaligned incentives for a number of reasons:
 - ◆ If Transco SO is responsible for area control centre operation rather than the network owner, Transco may not have an incentive to operate the network efficiently. For instance, there is potential for reduced asset life in the long term because Transco SO would have no incentive to limit pressure cycling when operating on a day to day basis. Alternatively, Transco SO may cause the DN to consume a sub-optimal amount of own use gas for pre-heating prior to pressure reduction because it is not responsible for the DN gas costs.

¹⁴ The offtake code is described in paragraph 4.24.
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- ◆ Under Option 3, the DN is responsible for contracting for interruption. However, the Transco SO is responsible for calling interruptions. Consequently, a question arises as to who should bear the costs of the interruption contract. If it is the Transco SO that is bearing these costs then the DN owner would have no incentive to efficiently trade off the costs of investment and interruption. Alternatively, if it is the DN that is bearing the costs then Transco SO may have little incentive to exercise interruption rights efficiently. This misalignment of incentives could give rise to costs associated with a less efficient operation of the network.
- ◆ Given that Transco is responsible for operating part of the DN's network, Ofgem considers that it will be more difficult to create meaningful economic signals at the NTS/DN interface.
- ◆ **Loss of operational synergies.** Since responsibility for the DN area control centre and field operations is split, Option 3 requires NTS and DNs to co-ordinate the development of a set of detailed instructions to address a variety of potential operational scenarios. Transco and others have suggested that this will lead to a less efficient set of operational decisions than would be the case if these activities were carried out by a single entity. This may lead to costs that are over and above the costs associated with managing the contractual interface.

Benefits

6.24. Ofgem has identified the following potential benefits associated with Option 3:

- ◆ **Comparative regulation.** Under Option 3, the benefits associated with comparative regulation are less than benefits available under Option 1 and greater than the benefits available under Option 2.
- ◆ **Retention of economies of scale.** Option 3 does not give rise to the potential loss of economies of scale associated with requiring new DNs to establish and operate their own area control centres. For the reasons outlined above, Ofgem does not believe that losses of economies of scale are a significant factor in assessing costs and benefits. Conversely

therefore, the retention of economies of scale is also not a significant factor.

- ◆ **Economies of scope.** Under Option 3 there may be potential economies of scope associated with having gas investment and maintenance planning conducted in conjunction with the planning functions of another utility network. Further, the synergies associated with joint planning functions could enhance any synergies in the conduct of field activities (such as construction and maintenance). However, given that economies of scope will only arise if another utility purchases a DN, Ofgem has not sought to quantify these benefits.

Security of supply

- 6.25. The HSE has indicated that it is not clear at this stage how the DNs or Transco NTS would be able to demonstrate in a safety case submitted under GSMR that the arrangements for co-ordination and co-operation under Option 3 were sufficiently robust to ensure safe and secure operation of the system, because the nature of the interface arrangements which might operate between DNs and NTS under this model are not sufficiently clearly identified.
- 6.26. Ofgem is also concerned that because the IDN is contracting for interruption under this option, whilst the Transco SO is calling interruption, problems could potentially arise which would give rise to greater security of supply risks. Nevertheless, Ofgem recognises Transco's view that each of the options set out in this paper could, via appropriate contractual arrangements, be operated to deliver no deterioration in respect of security of supply.

Evaluation of costs and benefits

- 6.27. The allocation of roles and responsibilities under Option 3 is evaluated in respect of each of the key issues in Table 6.3.

Table 6.3 Evaluation of costs and benefits associated with Option 3

Issue	Qualitative assessment	Net present value of costs relative to option1
Accountability and clarity		
◆ Contractual complexity	✘	£ 10 million
◆ Regulatory costs	✘	£ 2 million
◆ Commercial incentives	✘	
Security of supply	✓	
Efficiency savings		
◆ Comparative regulation	✘	£ 6 million – £12 million
◆ Economies of scope	✓	
◆ Economies of scale	—	
◆ Operational synergies	✘	
Total NPV relative to Option 1		£17 million – £24 million ¹⁵

6.28. Ofgem estimates that the benefits available under Option 3 are £17 million to £24 million less than the benefit available under Option 1, depending on how many DNs are sold.¹⁶ In a qualitative sense, whilst Option 2 may have advantages in terms of economies of scope, it rates indifferently or negatively in relation to the other issues.

6.29. The following points should be made in relation to Table 6.3:

- ◆ Ofgem has sought to evaluate the benefits of comparative regulation under Option 3. However, since these benefits are lower than the benefits available under Option 1, they appear as a negative figure in Table 6.3.

¹⁵ The discrepancy between the sum of the costs and total NPV is due to rounding errors.

¹⁶ The difference between options 1 and 3 would be £17 million if one DN was sold, and £24 million if four DNs were sold. See Appendix 2.

- ◆ Ofgem has assumed that the contractual complexity associated with Option 3 will give rise to a requirement for six additional full time equivalent staff members in total across the NTS and DNs.
- 6.30. The regulatory cost reflects costs incurred by Ofgem in employing two additional full time staff to deal with the lack of transparency and greater contractual complexity.
- 6.31. Appendix 2 details the assumptions and methodology used to derive the estimates of costs and benefits

7. Conclusion

7.1. Based on the analysis contained in Chapter 6, Ofgem is currently minded to support Option 1. As demonstrated below, Option 1 appears to have clear advantages over Options 2 and 3 in both quantitative and qualitative terms.

Table 7.1 Summary of costs and benefits for each option

Issue	Option 1	Option 2	Option 3
Accountability and clarity			
◆ Contractual complexity	✓	✗	✗
◆ Regulatory costs	✓	✗	✗
◆ Commercial incentives	✓	✗	✗
Security of supply	✓	✓	✓
Efficiency savings			
◆ Comparative regulation	✓	✗	✗
◆ Economies of scope	✓	✗	✓
◆ Economies of scale	—	—	—
◆ Operational synergies	✓	✗	✗
Loss of potential benefit relative to Option 1¹⁷	£ 0	Between £31 m £64 m	Between £17 m and £24 m

7.2. Further, Ofgem’s review of international experience and incidents of significant losses of supply suggests that where there is lack of clarity and accountability in roles this could increase risks to security of supply.¹⁸

7.3. Whilst Ofgem considers that, in the absence of new information, a strong case is made in favour of Option 1, we recognise that many stakeholders are concerned about the potential for fragmentation associated with a sale, and in particular, with Option 1. Ofgem’s RIA on governance and agency, which is being consulted upon in conjunction with this RIA, addresses this issue.

¹⁷ The results of Ofgem’s quantitative analysis, and the assumptions and methodology used to derive these results, are set out in more detail in Appendix 2.

¹⁸ Ofgem’s review of international experience is set out in Appendix 3.

Appendix 1 Allocation of Responsibilities under each option

1.1 These tables are an extract from a discussion paper prepared by Transco for the Development & Implementation Steering Group.¹⁹

Table 1 Capacity Development

	Transco – No DN Sales	Option 1	Option 2	Option 3
<i>National demand forecasting</i>				
◆ Firm	Transco	NTS	Central SO	Transco
◆ Interruptible	Transco	NTS	Central SO	Transco
<i>Local demand forecasting</i>				
◆ Firm	DN	DN	Central SO	DN
◆ Interruptible	DN	DN	Central SO	DN
<i>Capacity Planning</i>				
◆ NTS offtake (capacity/flexibility)	Joint NTS/DN planning	Joint NTS/DN planning	Central SO	Joint NTS/DN planning
◆ Telemetered DN network	DN	DN	Central SO	DN
◆ DN Diurnal storage	DN	DN	Central SO	DN
◆ Non-telemetered DN network	DN	DN	Central SO	DN
<i>Capacity Construction</i>				
◆ NTS offtake	NTS	NTS	NTS	NTS
◆ Telemetered DN network	DN	DN	DN	DN
◆ DN diurnal storage	DN	DN	DN	DN
◆ Non-telemetered DN network	DN	DN	DN	DN
<i>Replacement Expenditure</i>				
◆ Planning	DN	DN	Central SO	DN
◆ Construction	DN	DN	DN	DN

¹⁹ National Grid Transco System Operation Responsibilities & Contracting Framework: Document for Discussion, paper submitted to DISG Meeting 9 March 2004.

Table 2 Operations

	Transco – No DN Sales	Option 1	Option 2	Option 3
<i>Development of Operational Plans</i>				
◆ NTS offtake	DN	DN	Central SO	Transco
◆ Telemetered DN network	DN	DN	Central SO	Transco
◆ DN diurnal storage	DN	DN	Central SO	Transco
◆ Non-telemetered DN network	DN	DN	Central SO	Transco
◆ Interruption for DN purposes	DN	DN	Central SO	Transco
◆ Interruption for NTS purposes	NTS	NTS	Central SO	Transco
<i>Operation – Normal Day</i>				
◆ NTS offtake	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ Telemetered DN network	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ DN diurnal storage	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ Non-telemetered DN network	DN Field Operations	DN Field Operations	DN Field Operations	DN Field Operations
◆ Interruption for DN capacity	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ Interruption for NTS purposes	NTS Control Room	NTS Control Room	National Control Room	National Control Room
<i>Operation – Local Failure</i>				
◆ NTS offtake	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ Telemetered DN network	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ DN diurnal storage	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ Non-telemetered DN network	DN Field Operations	DN Field Operations	DN Field Operations	DN Field Operations
◆ Interruption/load shedding	DN Control Room	DN Control Room	National Control Room	National Control Room
<i>Operation – National Failure</i>				
◆ NTS offtake	NEC	NEC	NEC	NEC
◆ Telemetered DN network	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ DN diurnal storage	DN Control Room	DN Control Room	National Control Room	National Control Room
◆ Non-telemetered DN network	DN Field Operations	DN Field Operations	DN Field Operations	DN Field Operations
◆ Interruption/load shedding	DN Control Room	DN Control Room	National Control Room	National Control Room

<i>Emergency operations</i>	DN Field Operations	DN Field Operations	DN Field Operations	DN Field Operations
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Table 3 Prospective Licence Responsibilities

	Transco – No DN Sales	Option 1	Option 2	Option 3
Efficient & economic development, maintenance & operation of system:				
◆ NTS				
- Offtake demand forecast	Transco	NTS/DN	Central SO	NTS/DN
◆ DN				
- Demand forecast	Transco	DN	Central SO	DN
- Plan	Transco	DN	Central SO	DN
- Construct	Transco	DN	Central SO (via contract)	DN
- Operate	Transco	DN	Central SO (via contract)	Central SO/DN
- Maintain	Transco	DN	Central SO (via contract)	DN

Table 4 Co-ordination and Incentive Mechanisms

	Transco – No DN Sales	Option 1	Option 2	Option 3
<i>Contracts for co-ordination</i>	No contracts. Co-ordination is achieved through joint development of capacity plans and operational plans.	The NTS offtake capacity and allowable flow characteristics need to be agreed between the NTS and DNs at each DN offtake.	Central SO outsources construction.	The NTS offtake capacity and allowable flow characteristics need to be agreed between the NTS and DNs at each DN offtake. In addition, Transco and DN would need to agree operating plans at each point where Transco and DN operation of the DN meet.
<i>Incentives</i> Incentives under price control Are additional incentives required? Incentives provided by comparative regulation	All price controls within Transco give incentive to optimise financial performance across NTS and DNs. No comparative incentives for DNs (arguably incentive to dampen benchmark comparisons).	Self contained DN price control would provide incentives to optimise financial performance of DN. Incentives are required to ensure that the DN and NTS agree optimum capacity and flow characteristics at NTS offtake. Comparative benchmarking incentive between DNs.	All price controls within Central SO give incentive to optimise financial performance across NTS and DNs. No comparative incentives for DNs (arguably incentive to dampen benchmark comparisons).	Misalignment between price controls and operating responsibility provides incentives for Transco to impose costs on DN in order to reduce costs in NTS. Incentives are required to ensure Transco seeks to minimise total operating costs. Transco and DN will need to adjust revenues between themselves to extent DN operating conditions depart from those foreseen in setting DN control. Cost drivers could include: <ul style="list-style-type: none"> ◆ DN capital investment ◆ Volume of DN diurnal storage used ◆ Network pressures driving emergency costs in DN Comparative competition reduced by Transco operational control.

Appendix 2 Cost benefit analysis assumptions and methodology

2.1 This appendix sets out the assumptions and methodology used to derive the quantitative estimates of costs and benefits associated with each of the three options for allocating roles and responsibilities between the NTS and the DNs.

Costs

2.2 Two types of additional on-going costs have been quantified:

- ◆ costs incurred by the regulator; and
- ◆ costs incurred by network owners as a result of the industry's additional contractual complexity.

2.3 In each case, the incremental costs have been assessed in terms of full time equivalent (FTE) staff members required relative to the baseline of Option 1 (which is considered to be equivalent to the current situation). Two types of FTE staff members are considered:

- ◆ legal staff, who are assumed be valued at £300,000 per annum, including salary, benefits, and overhead costs; and
- ◆ gas industry staff, who are assumed be valued at £80,000 per annum, including salary, benefits, and overhead costs.

2.4 These values are consistent with the assumptions made by ILEX.²⁰

2.5 Table A2.1 sets out Ofgem's assumptions with respect to the number of additional staff required, and the resulting additional costs associated with each of Options 2 and 3. Ofgem's assumptions are based on representations made by industry participants including Transco and potential buyers, and its own assessment of the likely additional staff requirements. In Ofgem's view, these

²⁰ ILEX Energy Consulting, *Regulatory Impact Assessment of the Potential Sale of Network Distribution Businesses; A report to Ofgem*, December 2003, pg 11.
NGT – Potential sale of network distribution businesses
Office of Gas and Electricity Markets

assumptions are conservative (i.e. relatively high) in their assessment of the likely additional costs of Options 2 and 3 relative to Option 1.

A2.1 Additional ongoing costs associated with Options 2 and 3 relative to Option 1

	Option 2	Option 3
Additional costs to the regulator		
◆ Gas industry staff (valued at £80,000 per annum)	1 FTE	2 FTE
◆ Legal staff (valued at £300,000 per annum)	0 FTE	0 FTE
<i>Net present value of additional regulatory costs</i>	£1 m	£2 m
Additional costs to network operators associated with contractual complexity		
◆ Gas industry staff (valued at £80,000 per annum)	1 FTE	4 FTE
◆ Legal staff (valued at £300,000 per annum)	1 FTE	2 FTE
<i>Net present value of additional contractual complexity costs</i>	£4 m	£10
Total net present value of additional costs	£5 m	£12 m

2.6 In estimating the additional ongoing costs, a discount rate of 6.25% has been applied to the costs incurred over the period 2004 to 2022 (i.e. from now until the end of the current pricing period, and then covering the next three pricing periods). The costs have been discounted to be in 2003 terms.

Benefits

2.7 Consistent with previous RIAs, Ofgem has sought to identify the benefits of comparative regulation by attributing higher annual efficiency savings to the operating costs of an independent DN. The operational costs allocated to the DNs under each of the options are shown in Table A2.2. These are costs based on cost data supplied by Transco.

Table A2.2 Allocation of DN operating expenditure between NTS and DNs²¹

Allocation	Benefits under each option		
	1	2	3
DNs	£650 million pa	£544 million pa	£628 million pa
Transco	£0	£106 million pa	£22 million pa
Total	£650 million pa	£650 million pa	£650 million pa

²¹ Since the total DN costs did not exactly match those used in previous modelling, they were scaled to match the total operational costs modelled for each of the years 2004 to 2007 (that is, £662 in 2004, £639 in 2005, £619 in 2006, and £599 in 2007).

2.8 In Option 1, the DNs are allocated all of the operational costs, in line with the demarcation between roles and responsibilities under this option. In Option 2, some of the roles and responsibilities are allocated to Transco, with a corresponding reduction in costs allocated to the DNs. In Option 3, most of the roles and responsibilities remain with the DNs, with only a small amount of cost transferred to Transco.

2.9 This allocation of operating costs between the NTS and the DNs results in the set of potential benefits associated with Options 2 and 3 relative to Option 1 shown in Figure A2.3. As Option 1 assigns the full range of roles and responsibilities to the DN, it generates the full set of potential benefits associated with DN sales, which is £157 million if one DN is sold, and £360 million if four DNs are sold. The figures cited in Table A2.3 represent variations on these base figures.

A2.3 Loss of potential benefits associated with Options 2 and 3 relative to Option 1

Number of DNs sold	Loss of benefits under various options (£m NPV)		
	1	2	3
1	0	-26	-6
2	0	-42	-9
3	0	-53	-11
4	0	-59	-12

2.10 To derive these estimates of the benefits of comparative regulation under each option, Ofgem used a model with the following key features:

- ◆ it performs a Monte Carlo simulation of the DN sales process, forecasting cash flows over the period 2004 to 2022;
- ◆ the cash flow is discounted at a rate of 6.25% to give an NPV in 2003 terms;
- ◆ operational costs under each option are allocated to each DN in proportion to their share of the total DN costs;

- ◆ between one and four of the five DNs available for sale are chosen to be sold, with the other retained by Transco;
- ◆ the sold DNs achieve a 4.3% per annum rate of reduction in their controllable operational costs during the period 2008 to 2022, reflecting the full benefits of comparative regulation;
- ◆ the retained DNs achieve a rate of reduction in their controllable operational costs during the period 2008 to 2022, reflecting the partial benefits of comparative regulation. The rate of reduction depends on the number of DNs sold (being 3.0% if no networks are sold, increasing to 4.0% when four networks are sold);
- ◆ sold DNs are assumed to have different owners; and
- ◆ the DNs to be sold are randomly selected from those available for sale.

2.11 The net benefit is the difference between the NPV of total operational costs assuming no DNs are sold, and the NPV of total operational costs assuming X (between one and four) DNs are sold. Consistent with previous RIA analysis, economies of scale and scope are excluded from the benefits analysis, and there are assumed to be no immediate merger benefits.

Results

2.12 Table A2.4 shows a summary of the costs and benefits. Both the costs and the benefits are expressed relative to Option 1. Therefore, Option 1 has zero costs and benefits. Options 2 and 3 have negative benefits because their benefits of comparative regulation are lower than those of Option 1.

Table A2.4 Summary of costs and benefits for each option

Number of DNs sold	Costs (£m NPV)			Benefits (£m NPV)			Net (£m NPV)		
	1	2	3	1	2	3	1	2	3
1	0	5	12	0	-26	-6	0	-31	-17
2	0	5	12	0	-43	-9	0	-47	-21
3	0	5	12	0	-53	-11	0	-58	-23
4	0	5	12	0	-59	-12	0	-64	-24

2.13 Clearly, both Option 2 and Option 3 produce outcomes that give rise to fewer benefits than Option 1. The gap between Option 1 and the other options increases as the number of DNs sold increases. This is because the benefits grow faster under Option 1 due to its greater share of the controllable costs allocated to the sold DNs. In particular, Option 2 is the least attractive net result because it had the largest share of operational costs retained within Transco, and hence a relatively small portion of the costs were exposed to comparative regulation.

Appendix 3 International experience

- 3.1 This appendix considers the international experience of allocating roles and responsibilities. The first part maps international energy network structures to options for the allocation of roles and responsibilities discussed in the RIA. The second part of this appendix provides context by setting out further detail on each jurisdiction.
- 3.2 Finally, the appendix seeks to draw some lessons in terms of security of supply by considering the network structure in place in locations that have recently experienced major outages. As outages are generally the result of a series of incidents, these lessons should not be considered to be conclusive.

Table A3.1. Roles undertaken by asset owner

Option	Operator	Planner
1	✓	✓
2	✗	✗
3	✗	✓
Other	✓	✗

Figure A2.2 Mapping of international energy network structures to R&R options

Jurisdiction	Industry	Network	R&R Option			
			1	2	3	Other
England & Wales	Electricity	Transmission	✓			
Scotland	Electricity	Transmission	✓			
Great Britain (BETTA)	Electricity	Transmission			✓	
Great Britain	Electricity	Distribution	✓			
Great Britain	Gas	Transmission	✓			
Great Britain	Gas	Distribution	✓			
Germany	Electricity	Transmission	✓			
Germany	Electricity	Distribution	✓			
Germany	Gas	Transmission	✓			
Germany	Gas	Distribution	✓			
Italy	Electricity	Transmission		✓		
Italy	Gas	Transmission	✓			
Italy	Gas	Distribution	✓			

Jurisdiction	Industry	Network	R&R Option			
			1	2	3	Other
France	Electricity	Transmission	✓			
France	Electricity	Distribution	✓			
France	Gas	Transmission	✓			
France	Gas	Distribution	✓			
Spain	Electricity	Transmission	✓			
Sweden	Electricity	Transmission	✓			
Norway	Electricity	Transmission				✓
Republic of Ireland	Electricity	Transmission	✓			
Republic of Ireland	Gas	Transmission	✓			
Republic of Ireland	Gas	Distribution	✓			
Ontario, Canada	Electricity	Transmission				✓
New England, USA	Electricity	Transmission			✓	
Mid-Atlantic region, USA	Electricity	Transmission			✓	
USA	Gas	Transmission	✓			
USA	Gas	Distribution	✓			
Argentina	Electricity	Transmission			✓	
Brazil	Electricity	Transmission		✓		
Singapore	Electricity	Transmission		✓		
Singapore	Electricity	Distribution		✓		
Singapore	Gas	Transmission	✓			
Singapore	Gas	Distribution	✓			
New Zealand	Electricity	Transmission	✓			
New Zealand	Electricity	Distribution	✓			
New Zealand	Gas	Transmission	✓			
New Zealand	Gas	Distribution	✓			
South Australia, Australia	Electricity	Transmission	✓			
South Australia, Australia	Electricity	Distribution	✓			
New South Wales, Australia	Electricity	Transmission	✓			
New South Wales, Australia	Electricity	Distribution	✓			
Victoria, Australia	Electricity	Transmission				✓
Victoria, Australia	Gas	Transmission		✓		
Count (out of 44)			32	5	4	3
Percentage of total count			73%	11%	9%	7%

Note: For consistency, Singapore Electricity has been split into separate rows for transmission and distribution, and similarly for Singapore Gas.

International comparison of allocation of roles and responsibilities in gas and electricity

3.3 The attached table provides details on the allocation of roles and responsibilities in the gas and electricity sectors for a number of jurisdictions. It details:

- ◆ the owner of the gas or electricity, transmission or distribution assets in that jurisdiction;
- ◆ the operator of those assets; and
- ◆ the party responsible for investment decisions in those assets.

3.4 This section also contains a glossary.

Table A3.3 International comparison of allocation of roles and responsibilities

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
England & Wales	Electricity	Transmission	NGT (defined as equal to or greater than 240kV).	NGT	Responsibility for investment and maintenance resides with NGT and all reasonable demands are met. Subject to regulatory approval, assets are included in the regulatory asset base. As well as planning based investment, investment incentive scheme encourage NGT to invest where it is economic and efficient to do so.
Scotland	Electricity	Transmission	SSE and SP (defined as equal to or greater than 132kV)	SSE and SP of their respective transmission assets	Responsibility for investment and maintenance resides with the respective asset owners and all reasonable demands are met. Subject to regulatory approval, assets are included in the regulatory asset base.
Great Britain (following implementation of BETTA)	Electricity	Transmission	NGT, SSE and SP	NGT as GBSO	Responsibility for investment and maintenance resides with the asset owner. There are a number of interactions with the GBSO through the SO-TO Code to ensure an overall efficient level of investment. The current E&W incentive scheme may be extended to Scotland.

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
Great Britain	Electricity	Distribution	14 Regional Electricity companies	Asset owner	Asset owners responsible for maintenance and investment in accordance with planning standards. Regulator encourages enforcement of performance through the information and incentives project.
Great Britain	Gas	Transmission	NGT	NGT	NGT responsible for maintenance and investment in accordance with planning standards (the 1 in 20). Efficient investment costs recovered through price control. In addition, NGT subject to deep SO incentives with regard to the provision of entry capacity and invests in response to market signals for entry capacity.
Great Britain	Gas	Distribution	NGT	NGT	NGT responsible for maintenance and investment in accordance with planning standards (the 1 in 20). Efficient investment costs recovered through price control.
Germany	Electricity	Transmission	Four major companies, two private, and two largely public (E.ON, RWE, Vattenfall Europe, EnBW), some municipal ownership connected to regional or municipally owned generation	Owner or related legal entity	The industry is currently self-regulating, based on agreements between participants. The Competition Authority can veto these agreements. Investment in the grid usually takes place in combination with generation investment, though there is current debate over who will cover the cost of grid extensions and upgrades due to additional wind generation in northern Germany. There are no specific incentives for companies to keep up maintenance (other than typical commercial drivers)
Germany	Electricity	Distribution	The four major vertically integrated transmission owners cover about 75% of market; remainder is municipally owned.	Owner or related legal entity	The industry is currently self-regulating, based on agreements between participants. The Competition Authority can veto these agreements. Investments are commercially driven, and grid usage tariffs include a certain percentage for projected investment, though there is currently no enforcement of the projected investment. There are no incentives (other than commercial ones) for companies to keep up maintenance.

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
Germany	Gas	Transmission	Multiple private and municipally owned companies (including Ruhrgas, BEB, Wingas, VNG, EnBW Gas, RWE Gas, EWE)	Asset owner or related legal entity	<p>The industry is currently self-regulating, based on the Gas Associations Agreement, and no special regulation exists for investment planning.</p> <p>Maintenance and new investments are at the discretion of the commercially driven owners, and returns on justified outlays are included in tariffs set according to agreements between participants in the industry.</p> <p>The Competition Authority can veto agreements between participants.</p>
Germany	Gas	Distribution	Multiple companies, mostly municipally owned, but some with partial or complete private ownership	Asset owner or related legal entity	<p>The industry is currently self-regulating, based on the Gas Associations Agreement.</p> <p>Maintenance and new investments are at the discretion of the commercially driven owners. Where ownership of a company is minority privately owned, the private partner will advise the public controller of the assets on actions concerning those assets. The municipal controller is likely to follow the advice. Return for justified outlays are included in tariffs set according to agreements between participants in the industry.</p> <p>The Competition Authority can veto agreements between participants.</p>
Italy	Electricity	Transmission	State owned Terna (a wholly owned subsidiary of Enel) owns 94%, the rest is owned by a number of private and public companies	GRTN	<p>GRTN is responsible for planning the development of the national grid and coordinating maintenance of grid-connected facilities to guarantee security and continuity of supply.</p> <p>AEEG regulates safety, security, and quality of supply.</p> <p>GTRN and Terna are slated for merger, either before or after Terna is privatised in 2004.</p>
Italy	Gas	Transmission	Snam Rete Gas, Edison T&S, SGM, TMPC	Asset owner	<p>Asset owners are responsible for maintenance and expansion, and submit projected new capacity plans to AEEG. Transmission owners coordinate to plan maintenance.</p> <p>AEEG regulates safety, security, and quality of supply.</p> <p>Regulated gas tariffs set by AEEG are determined to incentivised efficiency and support new investment in the system (both in the network and in LNG terminals).</p>

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
Italy	Gas	Distribution	Enel distribution and 23 others	Asset owner	AEEG regulates safety, security, and quality of supply, and awards bonuses or penalties based on the performance of the distribution companies against these benchmarks.
France	Electricity	Transmission	RTE	RTE	RTE is owned by EDF, but must be independent in terms of management. The network managers are responsible for maintaining and operating the network and ensuring quality of electricity supply. The electricity transmission system operator prepares an annual investment programme, which is then submitted to CRE for approval. CRE also proposes safety and quality standards for the electricity system, which may be approved or rejected by the government, and monitors the performance of the system operator. CRE recommends tariffs for approval by the government.
France	Electricity	Distribution	EDF and local authorities	Asset Owner, some RPDs operated by EDF on behalf of local authorities	The network managers are responsible for maintaining and operating the network and ensuring quality of electricity supply. CRE enforces security and quality of service standards, and must be informed of operators' investment programmes and development projects, though their approval is not required. CRE recommends tariffs for approval by the government.
France	Gas	Transmission	Gaz de France	Asset owner	CRE enforces security and quality of service standards, and must be informed of operators' investment programmes and development projects, though their approval is not required. CRE also recommends tariffs for approval by the government.
France	Gas	Distribution	Gaz de France and 22 local distribution companies	Asset owner	CRE enforces security and quality of service standards, and must be informed of operators' investment programmes and development projects, though their approval is not required. CRE also recommends tariffs for approval by the government.

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
Spain	Electricity	Transmission	REE owns most of the grid, but portions are owned by others	REE	The National Government Office is responsible for electricity planning. REE is responsible for implementing the plan for maintaining, developing, and expanding the grid. Transmission tariffs are regulated by CNE, who are also responsible for inspecting and enforcing reliability and quality of supply standards.
Sweden	Electricity	Transmission	Svenska Krafnät	Svenska Krafnät	Svenska Krafnät plans and directs grid expansion and maintenance. Expansion plans are prepared on a three-yearly cycle. Transmission tariffs are not regulated, but ex-post intervention by STEM is allowed.
Norway	Electricity	Transmission	Around 85% is owned by Statnett, Statnett lease the remainder from the owners – regional companies and generators	Statnett	NVE is responsible for power system planning. Statnett is responsible for implementing grid expansion and enhancement. NVE sets transmission tariffs, which include an allowance for RoI on transmission assets, and supply quality standards.
Republic of Ireland	Electricity	Transmission	ESB	ESB NG (in near future ESB NG will become Eirgrid, which will be a separate legal entity to ESB)	ESB NG creates plans for upgrades, subject to approval by the regulator. New asset build is undertaken by ESB and incorporated into its regulated asset base.
Republic of Ireland	Gas	Transmission	BGE	BGE	BGE responsible for maintenance and investment planning and undertakes the investment, subject to regulatory oversight by the CER.
Republic of Ireland	Gas	Distribution	BGE	BGE	BGE responsible for maintenance and investment planning and undertakes the investment, subject to regulatory oversight by the CER.

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
Ontario, Canada	Electricity	Transmission	Hydro One Networks (97%), other (3%)	Asset owner	<p>NPCC prepares reliability standards compliant with NERC guidelines, and IEMO may make additions as deemed necessary. These must be adhered to by TOs – Hydro One is responsible to the IEMO for the reliability of the grid.</p> <p>IEMO has responsibility for determining whether the existing and proposed transmission is adequate to meet Ontario’s needs.</p> <p>Beneficiaries of grid enhancements may be required to contribute to the cost of the project. Where no beneficiaries are identifiable, the costs are taken into account when the OEB is setting the allowed return for transmitters.</p>
New England, USA	Electricity	Transmission	Multiple privately owned companies (BHE, CMP, CVPS, CZN, GMP, MEPCO, NRTG, NEP, NU, NSTAR, UI, VELCO)	ISO-NE has oversight, actual switching performed by four sub-regional control areas operated by transcos.	<p>NPCC prepares reliability standards compliant with NERC guidelines. These must be adhered to by TOs.</p> <p>ISO-NE prepares a Regional Transmission Expansion Plan each year, with input from TOs. The RTEP identifies problems and potential problems with the grid, and in the first instance, leaves those problems to be solved in the marketplace as appropriate. If the market does not respond with adequate solutions, the RTEP provides regulated transmission solutions.</p>
Mid-Atlantic region, USA	Electricity	Transmission	Multiple privately owned companies (Allegheny Power, BGEC, Conectiv, First Energy, Orange and Rockland, PECO, Pepco, PPL, PSE&G, UGI)	PJM OI for facilities on the ‘Designated Facility List’ ²² , Transmission Owners for the rest.	<p>PJM OI prepares a Regional Transmission Expansion Plan. If enhancements or modifications to the system are necessary, TOs have the responsibility to finance, construct and own the necessary enhancements or modifications.</p> <p>PJM OI directs maintenance of facilities on the DFL, TOs direct maintenance of other facilities.</p> <p>MAAC sets reliability principles and standards that the areas of PJM within its boundaries must adhere to.</p>

²² This list contains facilities that are ‘vital to the operation of the PJM RTO’.

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
USA	Gas	Transmission	Dozens of private utility companies, mostly owned by large commercial entities	Asset owner	Asset owners are responsible for planning and executing the operation, expansion, and maintenance of their assets. OPS provide safety and reliability regulations, codes and requirements, which are enforced based on required filings by pipeline companies. Incentives for the construction of new facilities are almost purely commercial. FERC regulates the rates of return allowed on interstate pipelines.
USA	Gas	Distribution	Hundreds of distinct organisations ranging from large commercial entities to small non-profit customer owned cooperatives	Asset owner	Asset owners are responsible for planning and executing the operation, expansion, and maintenance of their assets. OPS provide safety and reliability regulations, codes, and requirements. State authorities oversee and enforce safety and reliability requirements. Incentives for the construction of new facilities are almost purely commercial.
Argentina	Electricity	Transmission	TRANSENER is the owner of transmission assets	CAMMESA is the system operator	CAMMESA is responsible for maintenance planning. Two approaches to new investment. Either investment is undertaken on a "merchant" basis or the regulator may decree that new investment is required. In the latter case, the regulator also decides on who the beneficiaries are from the investment who are charged accordingly.
Brazil	Electricity	Transmission	Eletrobras is the asset owner for 64% of transmission assets. Other transmission assets owned by state companies and leased to Eletrobras	ONS is the SO	ONS is responsible for system planning. Subject to approval by the regulator, Eletrobras implements these plans and the assets are funded through standard regulatory practice.

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
Singapore	Electricity	Transmission and distribution	PowerGrid is the Asset Owner	PSO is the SO	PSO is responsible for system planning and approving or rejecting PowerGrid's capital expenditure budgets. PowerGrid makes the investment and conducts the maintenance. PowerGrid is penalised if it does not meet reliability (SAIDI, SAIFI and 22kV SARFI) targets set by the Energy Market Authority.
Singapore	Gas	Transmission and distribution	PowerGas ²³	PowerGas	PowerGas responsible for investment decisions for the network and investment. This is subject to approval by EMA. The planned reforms of the sector envisage that, in future, customers may have to commit to pay transmission charges over the long term before PowerGas can invest in new transmission capacity, through the so – called "open season" request process.
New Zealand	Electricity	Transmission	Transpower (a State-Owned Enterprise) owns transmission assets at 220kV and 110kV, with some assets at 66kV and 50kV.	Transpower is the SO	Transpower invests in grid maintenance and expansion, and is subject to Service Levels and Reliability Targets. Service levels are set in contracts with Transpower customers, and penalties are set out therein. Reliability Targets and performance against those targets are published annually. The Commerce Commission sets minimum levels for quality of service. Grid expansion is not directly incentivised, but arrived at in discussion with stakeholders and subject to final approval by the EC.
New Zealand	Electricity	Distribution	Distribution assets are owned by a number of lines companies (around 25, usually area specific, and under a variety of ownership structures – listed companies, consumer owned, or owned by local government.)	Asset owner	Individual asset owners are responsible for maintenance, and must meet reliability targets defined by the Commerce Commission.

²³ Another entirely separate gas transmission network in Singapore (operating at different pressures and specifications) is currently owned by SembGas. Ownership of and operational responsibilities for this network are due to be taken on by PowerGas in the near future.

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
New Zealand	Gas	Transmission	Transmission network is mostly owned by NGC (private company), but one important pipeline (Maui) is owned by the gas field owners.	NGC is the SO	Asset owners are responsible for maintaining and upgrading pipelines. Regulation is currently light-handed, but there is an ongoing inquiry into whether the industry should be controlled. NGC has commercial incentives to pursue grid expansion, but this is not incentivised in any other way.
New Zealand	Gas	Distribution	Distribution networks are owned by a number of companies (including NGC)	Asset owner	Asset owners are responsible for maintaining and upgrading pipelines. Regulation is currently light-handed, but there is an ongoing inquiry into whether the industry should be controlled. Owners have commercial incentives to pursue grid expansion, but this is not incentivised in any other way.
South Australia, Australia	Electricity	Transmission	ElectraNet SA owns the bulk of the grid. WMC Resources LTD owns two lines connected to a mining complex Some merchant interconnectors between states, privately owned and unregulated	ElectraNet SA Merchant interconnectors bid their capacity into the market operated by NEMMCO, and are dispatched as part of the market clearing processes	ElectraNet must conduct an annual planning review in consultation with ETSA Utilities, the distribution operator, and must meet targets set out in the National Electricity code and by the NECA Reliability Panel. ESIPC is a state-level entity that oversees this system planning and reliability. Asset owners are responsible for planning and implementing actual maintenance and expansion. Private interconnection between regions also occurs if commercially viable.
South Australia, Australia	Electricity	Distribution	ETSA Utilities	ETSA Utilities	ESIPC is a state-level entity that oversees system planning and reliability, and is ultimately responsible under the Electricity Code for the state's power planning. ETSA must conduct an annual planning review in consultation with ElectraNet, the transmission operator, and must meet minimum targets set out in the National Electricity Code and by the NECA Reliability Panel. Asset owners are responsible for implementing maintenance and expansion plans.

Jurisdiction	Industry	Network	Ownership of assets	Operator of assets	Allocation of responsibilities for investment planning and investment
New South Wales, Australia	Electricity	Transmission	TransGrid, some merchant interconnectors between states, privately owned and unregulated	TransGrid Merchant interconnectors bid their capacity into the market operated by NEMMCO, and are dispatched as part of the market clearing processes	TransGrid is responsible for the state's power planning. It jointly plans with the distribution companies, and must produce an Annual Planning Report to comply with the National Electricity Code. Grid expansion is usually driven by customer needs. NECA (the national regulator) has a Reliability Panel that is responsible for determining security and reliability standards based on the National Electricity Code. It also gives guidance to NEMMCO (the market operator), who can issue directions to maintain or re-establish the power system. Private interconnection between regions also occurs if commercially viable.
New South Wales, Australia	Electricity	Distribution	Multiple local distribution companies	Asset owner	Distribution companies must plan with TransGrid, and meet standards set by NECA.
Victoria, Australia	Electricity	Transmission	SPI PowerNet	SPI PowerNet under direction from NEMMCO (the national electricity market operator)	VenCorp is responsible for planning and directing augmentation of the transmission network. It must produce an Annual Planning Report to comply with the National Electricity Code. Private interconnection between regions also occurs if commercially viable.
Victoria, Australia	Gas	Transmission	GasNet	VenCorp (also market operator)	VenCorp is responsible for preparing an annual planning report, but this is reactive rather than proactive. Market participants must provide VenCorp with information about their assets, maintenance schedules, and expansion programmes. Asset owners are responsible for maintenance, but VenCorp dictates the operation of the pipelines and storage facilities. VenCorp must coordinate participants' maintenance schedules to ensure that system security is maintained. Expansion is at the discretion of asset owners, and is not incentivised in regulation.

A3.4 Glossary

Acronym	Definition	Jurisdiction
AEEG	Autorità per l'energia elettrica e il gas	Italy
AMM	Administrador del Mercado Mayorista	Guatemala
BGE	Bord Gais Eirann	Republic of Ireland
BGEC	Boston Gas and Electric Co	USA
BHE	Bangor Hydro Electric Company	USA
CAMMESA	Compañía Administradore del Mercado Mayorista Eléctrico	Argentina
CER	The Commission for Energy Regulation	CER
CMP	Central Maine Power Co	USA
CNE	Comisión Nacional de Energía	Spain
CRE	Commission de régulation de l'énergie	France
CVPS	Central Vermont Public Service Company	USA
CZN	Citizen Utilities Company	USA
EC	The Electricity Commission	New Zealand
EDF	Electricité de France	France
EnBW	Energie Baden-Württemberg Aktiengesellschaft	Germany
ESB	The Electricity Supply Board	Republic of Ireland
ESB NG	Electricity Supply Board National Grid	Republic of Ireland
ESIPC	Electricity Supply Industry Planning Council	South Australia
ETSA	Electricity Trust of South Australia	Australia
EWE	Energieversorgung Weser-Ems	Germany
FERC	Federal Energy Regulatory Commission	USA
GBSO	Great Britain System Operator	UK
GMP	Green Mountain Power Company	USA
GRTN	Gestore della Rete di Trasmissione Nazionale	Italy
IEMO	Independent Electricity Market Operator	Ontario, Canada
ISO	Independent System Operator	
ISO-NE	Independent System Operator	New England, USA
LNG	Liquefied Natural Gas	
MAAC	Mid-Atlantic Area Council	Mid-Atlantic, USA
MEPCO	Maine Electric Power Company	USA
NECA	National Electricity Code Administrator	Australia
NEMMCO	National Electricity Market Management Company	Australia
NEP	New England Power Company	USA
NERC	North American Reliability Council	USA
NGC	Natural Gas Corporation	New Zealand
NGT	National Grid Transco	UK
NPCC	Northeast Power Coordinating Council	North-eastern USA/Canada
NRTG	NEPOOL Regional Transmission Group	USA
NSTAR	Formerly Boston Edison Company, Cambridge Electric Company, and Commonwealth Electric Company	USA
NU	Northeast Utilities System	USA
OEB	Ontario Energy Board	Canada
ONS	Operador Nacional do Sistema Eléctrico	Brazil
OPS	Office of Pipeline Safety	USA
PECO	Philadelphia Electric Company	USA

PJM OI	Pennsylvania New Jersey Maryland Office of the Interconnection	Mid-Atlantic states USA
PPL	Pennsylvania Power & Light	USA
PSE&G	Public Service Electric and Gas Company	USA
PSO	Power System Operator	Singapore
REE	Red Eléctrica de España	Spain
RoI	Return on Investment	
RPD	Reseaux Publics de Distribution	France
RTE	Gestionnaire du Réseau de Transport D'Électricité	France
RWE	Rheinisch-Westfälische Elektrizitätswerke	Germany
SAIDI	System Average Interruption Duration Index	
SAIFI	System Average Interruption Frequency Index	
SARFI	System Average RMS Variation Frequency Index	
SGM	Società Gasdotti del Mezzogiorno	Italy
SO	System Operator	
SP	Scottish Power	UK
SSE	Scottish and Southern Energy	UK
STEM	Swedish Electricity Agency	Sweden
TMPC	Transmediterranean Pipeline Co	Italy
TO	Transmission Owner	
TRANSENER	Compañía de Transporte de Energía Eléctrica en Alta Tensión Transener S.A.	Argentina
UI	United Illuminating Company	USA
VELCO	Vermont Electric Company	USA
VNG	Verbundnetz Gas	Germany

A3.5 Recent major distribution and transmission outages in the electricity and gas industries

Name	Industry	Network	Timing	Description	Main causes
Italian Blackout	Electricity	Transmission	September 2003	An interconnector with Switzerland tripped following contact with a tree. A cascading failure followed, with almost all of the Italy's 57 million people affected.	Four root causes were identified: 1. unsuccessful re-closing of the Lukmanier line because of a too high phase angle difference; 2. Lack of a sense of urgency in taking countermeasures; 3. General tendency towards grid use close to its limits; and 4. Inadequate right-of-way maintenance practices.
Eastern USA Blackout	Electricity	Transmission	August 2003	50 million people affected over 8 states and 2 provinces; 60-65,000 MW of load initially interrupted (11% of Eastern Interconnection).	Three main groups of causes were identified: 1. Lack of effective contingency analysis capability; lack of monitoring and testing procedures/tools; 2. inadequate management of transmission rights of way; and 3. ineffective procedures & wide grid visibility to coordinate problems affecting boundaries between networks.
London Blackout	Electricity	Transmission	August 2003	724MW of supplies were lost, amounting to around 20% of total London supplies at that time. This affected around 410,000 of EDF Energy's customers, with supplies being lost to parts of London Underground and NetworkRail.	The main cause of the power loss was an incorrectly installed automatic protection relay which incorrectly read a change of power flow as a fault and automatically disconnected an area of south London from the rest of the transmission network.
Flooding in Germany	Electricity	Distribution	August 2002	330,000 customers were disconnected for up to 3 days as the result of flooding on the rivers Elbe and Mulde. Damage amounted to 50 million Euros.	Widespread flooding, resulting in damage along 4,500 km of the electricity network and some 10,000 substations and transformers were damaged. More than 45,000 electricity meters became unusable as a result of the flood. Eight power stations had to be temporarily disconnected from the network.

El Paso Natural Gas pipeline explosion	Natural gas	Transmission	August 2000	Mainline explosion near banks of Pecos River blew trench 86 ft long, 20 ft deep, killing 12 campers (including four children) in vicinity, shut down 1 Bcf/d gas supply to Arizona and California at height of "CA crisis" – worst pipeline rupture accident in US history.	Internal corrosion along "S" shaped pipe section connecting mainline to overhead river crossing – line could not be smart-pigged to detect corrosion. Pipeline section was constructed around 1950.
Melbourne gas explosion	Gas	Transmission	September 1998	Gas supplies for the most of the state of Victoria were cut for 3 weeks, following an explosion at the Esso gas treatment facility at Longford, affecting 4 million people and causing economic damages of around Aus\$1.3 billion.	The causes of the accident amounted to a failure to provide and maintain so far as practicable a working environment that was safe and without risks to health. An inquiry also identified some deficiencies in the design of the plant itself, and some of the equipment, in particular the lack of an automatic system to isolate the various fuel components at the plant in the event of a fire.
Mid-west USA Blackout	Electricity	Transmission	June 1998	Blackout of the Mid-Continent Area Power Pool Region and the northwestern Ontario Hydro system, affecting 152,000 customers and 950 MW of demand.	Multiple lightning strikes caused 345 kV transmission lines to trip, leading to overloading of lower voltage transmission lines which also tripped.
Auckland CDB Blackout	Electricity	Distribution	February 1998	Four underground cables failed during the summer of 1998, leading to a blackout in the central business district of Auckland, New Zealand for a period of up to three weeks for some consumers.	Deficient installation and maintenance of underground cables; inadequate risk management; and absence of clear Board accountability through effective shareholder and/or market disciplines.
Western US and Canada, Take 2	Electricity	Transmission	August 1996	7.5 million customers; 28,000 MW of demand shed by under-frequency load-shedding relays for up to 9 hours.	Failure to manage trees identified as a danger to the system caused flashovers of several 500 kV transmission lines. Also, operators were unknowingly operating the system in a condition in which one line outage would trigger subsequent cascading outages because adequate operating studies had not been conducted.

Western US and Canada, Take 1	Electricity	Transmission	July 1996	2 million customers were affected (10% of the customers in the Western Interconnection), representing 11,850 MW of demand, for between a few minutes to several hours.	A tree that was too close to a transmission line caused a short. Other protective devices erroneously tripped additional transmission lines, leading to a cascade of outages as the system became unstable.
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TableA3.6 Mapping between outages and R&R options

Outage event	R&R Option		
	1	2	3
Italian Blackout		✓	
Eastern USA Blackout			✓
London Blackout	✓		
Flooding in Germany	✓		
El Paso Natural Gas pipeline explosion	✓		
Melbourne gas explosion		✓	
Mid-west USA Blackout			✓
Auckland CDB Blackout			
Western US and Canada, Take 2			✓
Western US and Canada, Take 1	✓		✓
Count (out of 10)	4	2	4
Percentage of total count	40%	20%	40%

Tentative conclusions:

Out of the major outages listed, 40% occurred under an industry structure corresponding to Option 1, even though 73% of the networks in the international comparison are classified as Option 1. Conversely, 60% of the major outages occurred under alternative industry structures, even though only 27% of the networks in the international comparison have those structures.

Outages tend to be caused by a series of events rather than any single factor and consequently Ofgem has not relied on this analysis. However, Ofgem notes that the results support the view that a model which assigns responsibility for system operation to the network owner is preferable in terms of security of supply.