

Electricity transmission network reliability incentive schemes

Initial proposals

October 2004 240/04

Summary

This document sets out for consultation initial proposals for the development and introduction of electricity transmission network reliability incentive schemes for transmission asset owners in Great Britain. It is the intention to publish final proposals in November 2004.

Background

Ofgem (the office of the Gas and Electricity Markets Authority) recently investigated two loss of supply incidents on the England and Wales transmission network, one of which occurred in London and the other in Birmingham. The failures occurred within approximately a week of each other, resulted in the combined loss of some 518MWh of demand, directly affected around 677,000 customers and caused severe disruption to many more.

Following the investigation, the Authority concluded in June 2004 that the introduction of an incentive scheme within the transmission licence of National Grid Company plc (NGC) would enhance the existing regulatory and legislative framework by providing NGC with direct financial incentives to meet network demands while minimising the extent and duration of interruptions to the supply of energy from its network.

Purpose of this document

This document sets out a financial incentive scheme for NGC which Ofgem aims to put in place from 1st January 2005. While the present focus is on developing incentive arrangements for NGC, in due course it will be appropriate to consider developing similar arrangements for transmission companies in Scotland in order that consumers across Great Britain can benefit from any new arrangements.

Overview of the scheme

The scheme proposed for NGC is based around rewarding/penalising NGC in accordance with its annual performance against a target level of energy unsupplied from the grid. The target is based on NGC's average performance since 1991/92 (i.e. the average amount of energy unsupplied from the grid). Depending on the actual level of energy unsupplied from the grid in any given year, NGC will be rewarded on a sliding scale an amount up to 1.0 per cent of its transmission revenue requirement (in the event that all demands for energy are met) or penalised on a sliding scale an amount up to

1.5 per cent of its revenue (in the event that there is approximately 600MWh or more of unsupplied energy in a given year).

Energy unsupplied from the grid as a result of certain, narrowly-defined events (such as extreme weather, or events involving 3 customers or less) would be excluded from the incentive scheme.

These initial proposals for the introduction of a transmission network reliability incentive scheme for NGC seek to strike an appropriate balance between providing NGC a reasonable balance of risk and reward, while protecting customers' interests by agreeing challenging targets against which NGC's performance will be assessed.

Interim arrangements

The development and introduction of transmission network reliability incentive schemes would complement the work that Ofgem has undertaken in recent years to reform transmission access and to incentivise network operators by strengthening the incentives on NGC to maintain/improve the level of system reliability and resilience.

However, no incentive scheme can guarantee against network failures. The introduction of incentive schemes would also not result in compensation being paid to customers experiencing a transmission-related interruption. These are interim arrangements and will be reviewed as part of the work to put new transmission price controls in place.

Complementing existing arrangements

This scheme will strengthen the incentives on NGC to maintain and improve upon an already high standard of system performance, but will not preclude the use of the powers under the Electricity Act and the Transmission Licence. Thus, the incentive scheme will complement, rather than displace, existing arrangements.

The introduction of transmission network reliability incentive schemes will create a more consistent approach to strengthening the incentives on all network operators across Great Britain to maintain and improve the reliability and overall performance of their network assets in meeting the demands of customers.

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1. Introduction

Purpose

- 1.1. The purpose of this document is to initiate a consultation process on the introduction of new regulatory incentives for electricity transmission licensees, designed to encourage licensees to maintain and improve network reliability and continuity of supply to consumers.
- 1.2. There are currently three transmission licensees in Great Britain:
 - ◆ National Grid Company plc (NGC) — operates in England and Wales;
 - ◆ SP Transmission Limited (SPTL) — operates in the South of Scotland; and
 - ◆ Scottish Hydro Electric Transmission Limited (SHETL) — operates in the North of Scotland.
- 1.3. The statement published by Ofgem on 25 June 2004 on the transmission failures in London and Birmingham¹ included a conclusion that it would be appropriate to introduce new incentive arrangements for NGC to maintain and improve the reliability of supplies from its transmission network. This document is an important part of the process for establishing new incentive arrangements for NGC.
- 1.4. In taking this work forward, it will also be appropriate to consider not only how the incentive arrangements should apply to NGC, but also transmission companies in Scotland, in order that consumers across Great Britain can benefit from any new arrangements. However, the proposed scheme presented in this consultation document relates only to NGC, with arrangements for transmission companies in Scotland to be considered further in due course. Therefore, the primary focus of this paper is the England and Wales transmission system.

¹ Ofgem 2004, *Statement by the Gas and Electricity Markets Authority, following an investigation into compliance by National Grid Company plc with its obligations under section 9(2)(a) of the Electricity Act 1989 and Special Licence Condition AA4.1 of its Electricity Transmission Licence in relation to a transmission failure in London and in relation to a transmission failure in Birmingham*, June, (http://www.ofgem.gov.uk/temp/ofgem/cache/cmsattach/7601_14404_NGCStatement.pdf).

Related areas of work

- 1.5. As noted above this work follows from the investigation into electricity transmission failures in London and Birmingham in 2003.
- 1.6. This exercise forms a component of Ofgem's ongoing work on security of supplies across both the competitive and monopoly areas of energy markets within Great Britain.
- 1.7. Ofgem has been strengthening the incentives for all network licensees to maintain and improve the quality of service they provide. For instance:
 - ◆ in March 2004², the Gas and Electricity Markets Authority (the Authority) directed a modification to the Connection and Use of System Code (CUSC) that strengthens the incentives on NGC by requiring it to pay compensation in the event that a generator is temporarily physically disconnected from the transmission system;
 - ◆ the June 2004 initial proposals for the electricity distribution price control reviews strengthen incentives on the distribution companies to maintain and improve quality of service;
 - ◆ in August 2004 an initial consultation paper was published on the Quality of Service for Gas Distribution Networks; and
 - ◆ in 2005 Ofgem will start work on the transmission price control reviews. This will provide the opportunity to develop and extend the arrangements that will be put in place as a result of this review.

Structure of the document

- 1.8. The remainder of this consultation paper is structured as follows:
 - ◆ Chapter 2 describes the performance of the transmission licensees and the regulatory framework within which the licensees operate;

² A copy of the Authority's decision letter can be accessed via the following link:
<http://www.nationalgrid.com/uk/indinfo/cusc/admin/scripts/uploads/CAP048D.pdf>.
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- ◆ Chapter 3 briefly outlines some of the key issues taken into consideration in the formulation of transmission network reliability incentive schemes;
- ◆ Chapter 4 explains how the regulatory framework could be improved by introducing new incentives on the electricity transmission licensees to maintain and improve network reliability. The focus is on incentivising NGC in its operation of the England and Wales transmission system;
- ◆ Appendix 1 describes current methods used by NGC for measuring energy unsupplied (the basic output measure for the proposed incentive scheme);
- ◆ Appendix 2 provides a case study as to how the proposed new NGC incentive scheme (outlined in Chapter 4) would have rewarded/penalised NGC had it been in place when the London and Birmingham transmission failures occurred in 2003; and
- ◆ Appendix 3 sets out a draft impact assessment pursuant to section 5A of the Utilities Act 2000 (as amended).

Consultation responses

- 1.9. If you would like to comment on the issues raised in this paper please respond by 5th November 2004 to the address below (via email if possible). Responses will be made available in the Ofgem library and on the Ofgem website and so any confidential material should be included in a separate annex.

Email: ayesha.uvais@ofgem.gov.uk

Or write to:

Ms Ayesha Uvais
Ofgem
9 Millbank
London SW1P 3GE
Fax: 020 7901 7478

- 1.10. If you would like to discuss any of the issues raised in this paper please contact

Andrew Walker on 020 7901 7008.

Timetable

- 1.11. It is intended to publish final proposals in November 2004. These will include any proposed new licence condition(s) for NGC and would initiate the statutory consultation on the licence modification process pursuant to section 11 of the Electricity Act 1989 (the Act) as amended.
- 1.12. It is envisaged that the new licence condition(s) would take effect for NGC from 1st January 2005. If NGC was to reject the licence modification it would be necessary for Ofgem to consider making a licence modification reference to the Competition Commission.
- 1.13. As set out earlier, further work will be required to finalise arrangements for Scotland because of the complexities of having a separate system operator and transmission owners. It is envisaged that this work should be completed by April 2005 (to coincide with the BETTA 'go-live' date).

2. Background and context

- 2.1. This chapter outlines the legislative and regulatory framework within which transmission licensees operate. It also describes the performance of all transmission system operators in Great Britain with respect to transmission network resilience and reliability.

Regulatory and legislative framework

- 2.2. The following sections describe the legislative and regulatory framework within which the operators of the electricity transmission systems in Great Britain operate. The discussion focuses on the statutory principal objective and general duties of the Authority and the relevant statutory duties and licence obligations related to the licensees' network reliability (or security of supply) obligations.

Electricity Act 1989

- 2.3. The principal objective of the Authority in carrying out its statutory functions is to protect the interests of consumers in relation to electricity conveyed by distribution systems, wherever appropriate, by promoting effective competition between persons engaged in commercial activities connected with the generation, transmission, distribution or supply of electricity.
- 2.4. The Authority has general duties which include having regard to 'the need to secure that all reasonable demands for electricity are met' and that licence holders are able to finance their licence obligations. There is also a duty upon Ofgem to secure a diverse and viable long-term energy supply, and a prospective duty to contribute to the achievement of sustainable development.
- 2.5. Given these statutory duties, the Authority places the highest importance on all issues associated with security of supply. Ofgem promotes security of supply by:
- ◆ ensuring there is sufficient investment in the regulated networks through price controls;
 - ◆ setting incentive schemes and quality of service targets for network licensees to encourage network reliability and continuity in supplies to consumers;

- ◆ encouraging competition in wholesale and supply markets; and
 - ◆ monitoring the gas and electricity markets for signs of anticompetitive behaviour.
- 2.6. The Act also provides the Authority with the power to investigate whether a licensee has breached the conditions of its licence and if necessary to take enforcement action, including the levying of financial penalties (up to 10 per cent of the relevant company's UK turnover).
- 2.7. In relation to the application of the Act to transmission licensees, Section 9(2)(a) of the Act places an obligation on these licensees to 'develop and maintain an efficient, co-ordinated and economical system of electricity transmission'.

Transmission Licence

- 2.8. The following sections explain the different obligations upon transmission licensees relating to the operation of the transmission system, and network reliability and security of supply, based on the Transmission Licence Standard Conditions in effect from 1 September 2004 and also the changes to these conditions that will take effect from the BETTA go-live date.
- 2.9. The standard conditions determine, among other things, the degree of resilience that must be built in to the transmission system so that the system is robust against credible equipment failures and the need to remove equipment from service for maintenance. Typically, the main system must be able to withstand the unplanned loss of an overhead line double circuit (two overhead lines on the same transmission towers) or a single underground cable circuit, although smaller demand groups are permitted to be dependent on a single circuit when circuit outages are required.

Condition C16: Procurement and use of balancing services

- 2.10. Condition C16 of the Transmission Licence only applies to NGC. It took effect on 1 September 2004 (until that time the same obligations had applied to NGC, but under Special Licence Condition AA4 of its previous Transmission Licence), and reinforces section 9(2)(a) of the Electricity Act 1989 by requiring NGC to

'operate the licensee's transmission system in an efficient, economic and co-ordinated manner'.

- 2.11. From the BETTA go-live date (anticipated to be 1 April 2005), the wording of the condition will be amended and will require NGC to 'co-ordinate and direct the flow of electricity onto and over the GB transmission system in an efficient, economic and co-ordinated manner'.

Condition C17: Transmission system security standard and quality of service

- 2.12. Condition C17 of the Transmission Licence only applies to NGC. It also took effect from 1 September 2004 (prior to that time, the same obligations had applied to NGC under Special Licence Condition AA2 of its previous Transmission Licence) and requires the licensee to 'at all times plan, develop and operate the licensee's transmission system in accordance with "NGC Transmission System Security and Quality of Supply Standard" Issue 2 (dated November 2000) together with the Grid Code or such other standard of planning and operation as the Authority may approve from time to time and with which the licensee may be required to comply (following consultation (where appropriate) with any authorised electricity operator liable to be materially affected thereby)'.
- 2.13. From the BETTA go-live date the wording of the condition will be amended to reflect NGC's new role as Great Britain System Operator (GBSO). The wording will be amended to 'the licensee shall at all times: (a) plan, develop and operate the licensee's transmission system; and (b) co-ordinate and direct the flow of electricity onto and over the GB transmission system, in accordance with the GB Security and Quality of Supply Standard version 1, together with the STC, the Grid Code or such other standard of planning and operation as the Authority may approve from time to time and with which the licensee may be required to comply (following consultation (where appropriate) with any authorised electricity operator liable to be materially affected thereby)'.

Condition D3: Transmission system security standard and quality of service

- 2.14. Condition D3 of the Transmission Licence only applies to Scottish Power and Scottish Hydro. It took effect from 1 September 2004 (prior to that time, the same obligations had applied to both licensees under Special Licence Condition AA2 of the previous Transmission Licence). The condition varies for the two licensees.
- 2.15. For Scottish Power, the condition requires the licensee to:
- ◆ '(a) plan and develop the licensee's transmission system in accordance with the document number TDM 13/1,001 and entitled Security of Supply (Issue 2 dated October 1985) (incorporating Engineering Recommendation P2/5 (October 1978 revision) of the Electricity Council Chief Engineers' Conference) and the planning document numbered NSP 366 entitled Security of the 400kV and 275kV Systems in Scotland (each such document being as submitted by or on behalf of the licensee to the Authority on or before the date of grant of this licence or such later date as the Authority shall agree) as appropriate to the purpose under consideration and the licensee's grid code or such other standard of planning as the licensee may, following consultation with any authorised electricity operator liable to be materially affected thereby and with the approval of the Authority may adopt from time to time; and
 - ◆ (b) operate the licensee's transmission system in accordance with the document entitled Grid Control Instruction (system) BISSEB Operational Standards of Security of Supply dated 30 March 1981) and (each such document being as submitted by or on behalf of the licensee to the Authority on or before the date of grant of this licence), as appropriate to the purpose under consideration and the licensee's grid code or such other standard of operation as the licensee may, following consultation with any authorised electricity operator liable to be materially affected thereby and with the approval of the Authority may adopt from time to time'.

2.16. For Scottish Hydro, the condition requires the licensee to:

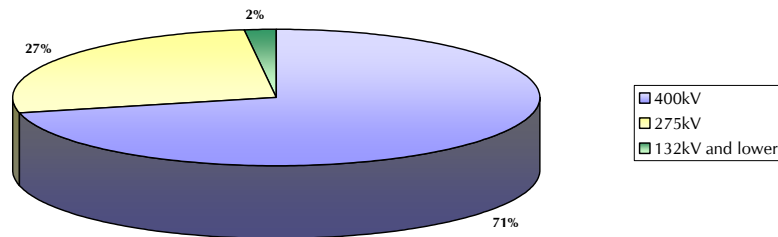
- ◆ '(a) plan and develop the licensee's transmission system in accordance with the document NSHEB Planning Document TM9001 (Transmission Planning Standard of Security) (such document being as submitted by or on behalf of the licensee to the Authority on or before the date of grant of this licence or such later date as the Authority shall agree) as appropriate to the purpose under consideration and the licensee's grid code or such other standard of planning as the licensee may, following consultation with any authorised electricity operator liable to be materially affected thereby and with the approval of the Authority may adopt from time to time; and
- ◆ (b) operate the licensee's transmission system in accordance with the document entitled NSHEB System Operation Memorandum No 3 (as submitted by or on behalf of the licensee to the Authority on or before the date of grant of this licence), as appropriate to the purpose under consideration and the licensee's grid code or such other standard of operation as the licensee may, following consultation with any authorised electricity operator liable to be materially affected thereby and with the approval of the Authority may adopt from time to time'.

2.17. From the BETTA go-live date the wording of these conditions will be amended consistently to require both transmission licensees to 'at all times plan and develop the licensee's transmission system in accordance with the GB Security and Quality of Supply Standard version 1, together with the STC or such other standard of planning and operation as the Authority may approve from time to time and with which the licensee may be required to comply (following consultation (where appropriate) with any authorised electricity operator liable to be materially affected thereby) and shall, in so doing, take into account the system operator's obligations under standard condition C17 (Transmission system security standard and quality of service) to co-ordinate and direct the flow of electricity onto and over the GB transmission system'.

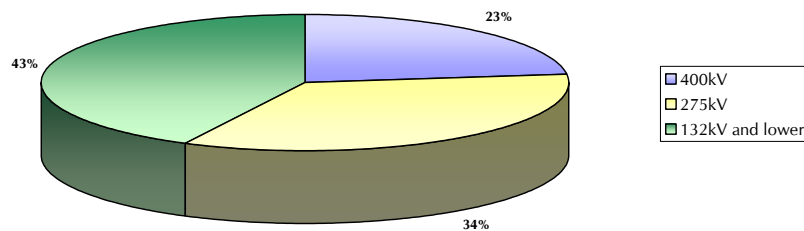
Transmission system reliability and performance

- 2.18. The following sections present evidence on the resilience and reliability of the three electricity transmission systems in Great Britain operated by NGC, SPTL and SHETL.
- 2.19. Data on the reliability/performance of the transmission system in Scotland are not strictly comparable to the data presented for England and Wales (NGC). This is because NGC almost only operates 275kV and 400kV circuits, whereas the Scottish transmission system operators operate a much higher proportion of lower voltage circuits (132kV and below), and in the case of SHETL, it only operates 275kV or lower voltage circuits (Figure 1).

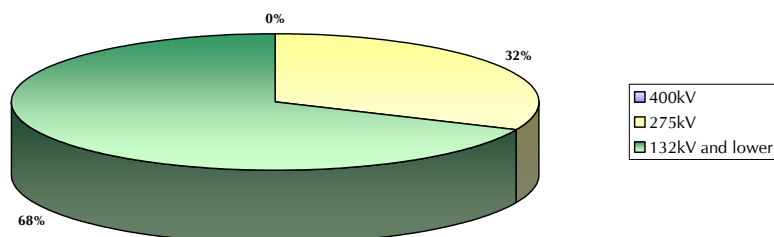
FIGURE 1
Transmission system by circuit type - National Grid Company



Transmission system by circuit type - Scottish Power



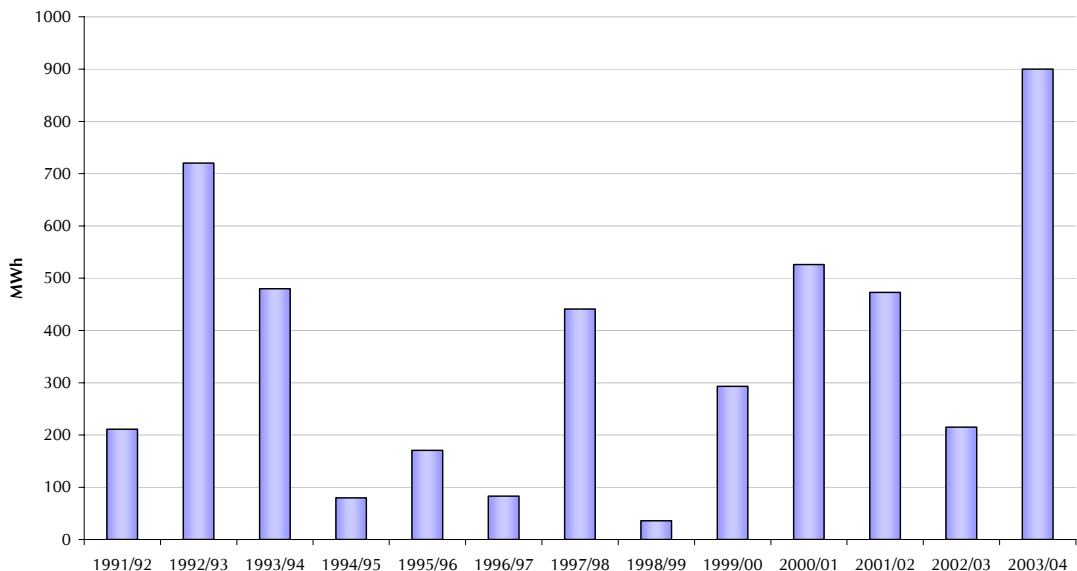
Transmission system by circuit type - Scottish Hydro



NGC

- 2.20. Ofgem monitors the performance of electricity networks. NGC is required (by Condition C17 of its Transmission Licence) to report electricity transmission system performance in terms of availability, system security and quality of service, and to review system performance against criteria agreed with Ofgem.
- 2.21. One way of measuring transmission network reliability is to determine the proportion of actual electricity requirements supplied. NGC's figures³ show that the network is extremely reliable, with between 99.9997 per cent and 99.9999 per cent of energy requirements supplied in any given year since 1991/92. This level of reliability is determined by the level of energy unsupplied from the grid. According to NGC's figures, estimated energy unsupplied as a result of transmission system failures was 900MWh in 2003/04 (arising from 10 separate incidents on the transmission system). This marked the highest volume of energy unsupplied in any given year over the period 1991/92 to 2003/04, but remains a small percentage of total system throughput (Figure 2).

FIGURE 2: Energy unsupplied - National Grid Company

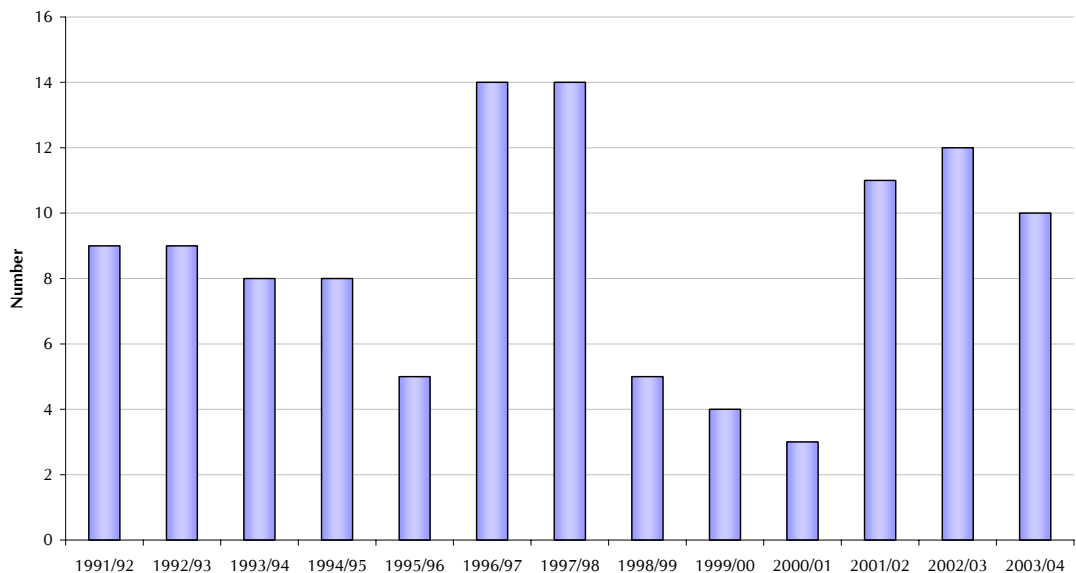


- 2.22. The high level of system reliability is reflected in the low number of incidents on the transmission system involving a loss of supplies. Since 1991/92, there has been an average of less than 9 incidents per year involving the loss of supply on

³ National Grid Company plc 2004, *Report to the Director of the Office of Gas & Electricity Markets 2003/2004*.

the transmission system. This average has remained relatively constant over that period (Figure 3).

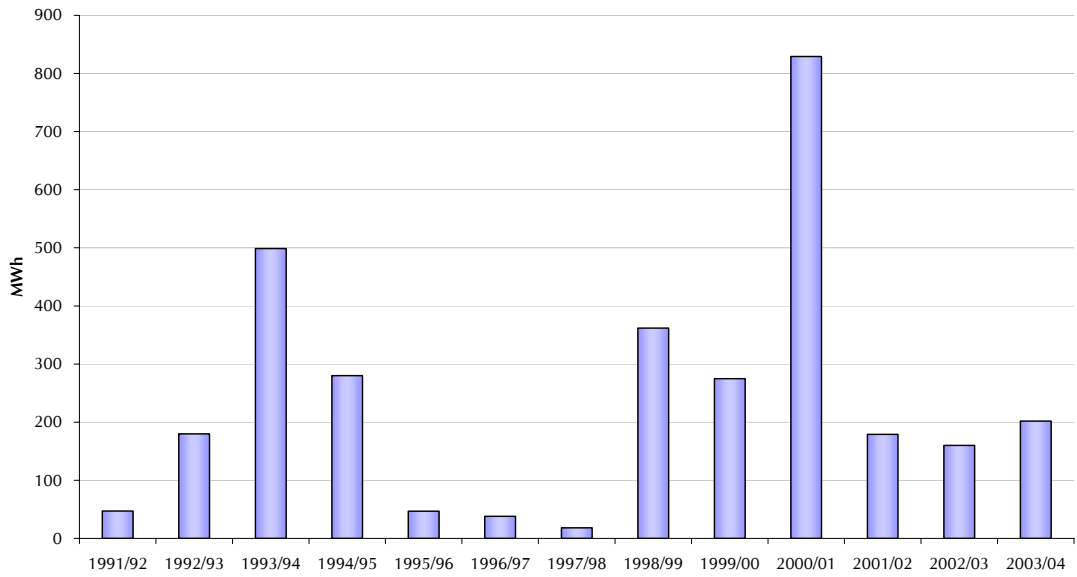
FIGURE 3: Loss of supply incidents on the transmission network - National Grid Company



SPTL

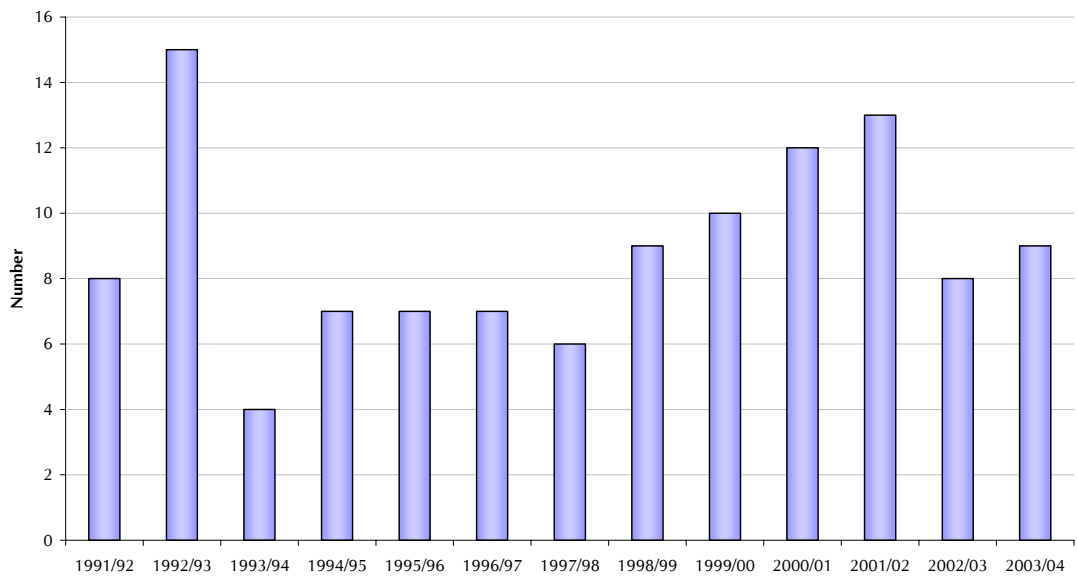
- 2.23. Similar to the requirement upon NGC, SPTL is obliged (by Condition D3 of its Transmission Licence) to report to the Authority on the performance (security, availability and quality) of the electricity transmission system.
- 2.24. Figure 4 shows the level of energy unsupplied — on that part of the Scottish grid owned and operated by SPTL — as a result of transmission system failures. Estimated energy unsupplied peaked at 829MWh in 2000/01 (arising from 12 separate incidents on the transmission system). This marked the highest volume of energy unsupplied in any given year over the period 1991/92 to 2003/04, but in the three years since this peak the amount of energy unsupplied from the grid has amounted to less than 200MWh per annum (Figure 4).

FIGURE 4: Energy unsupplied - Scottish Power



2.25. The number of incidents involving a loss of supplies on the transmission system operated by SPTL is shown in Figure 5. Since the mid 1990s, there has been a small increase in the average number of incidents per annum.

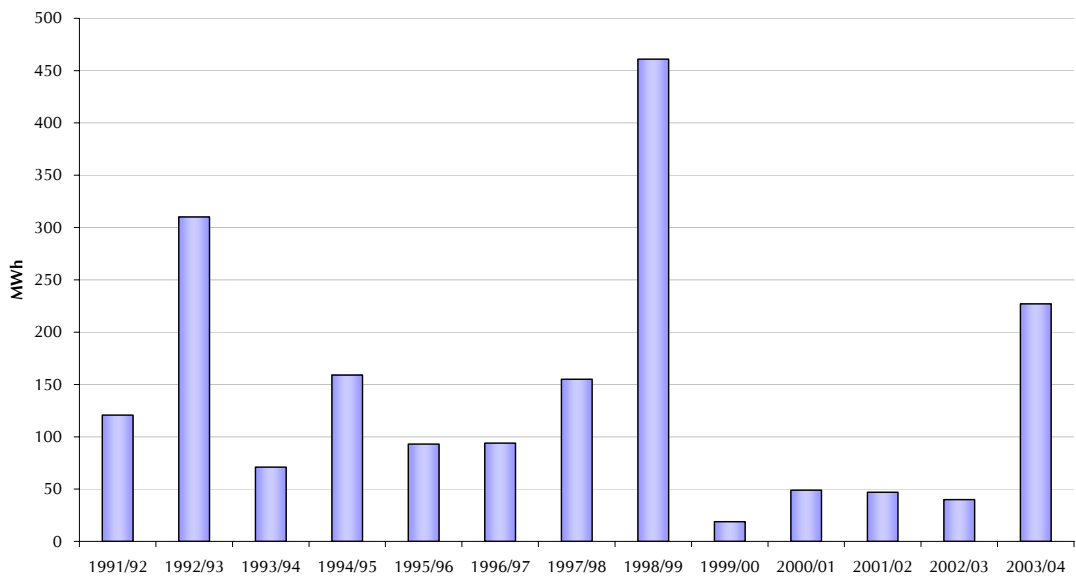
FIGURE 5: Loss of supply incidents on the transmission network - Scottish Power



SHETL

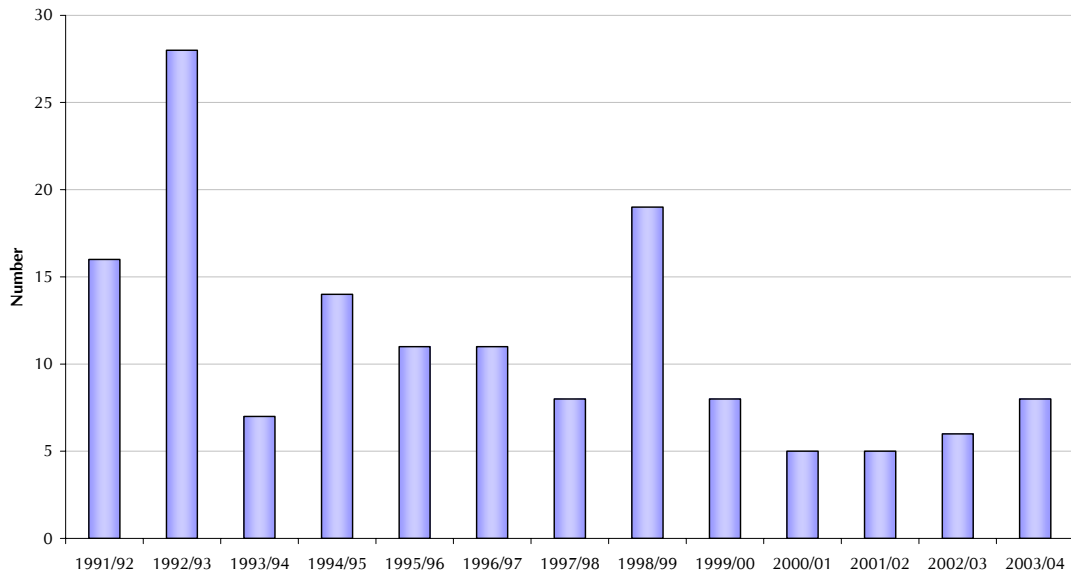
- 2.26. SHETL is also required by Condition D3 of its Transmission Licence to report to the Authority on the performance (security, availability and quality) of the electricity transmission system.
- 2.27. Figure 6 shows the equivalent data for that part of the Scottish grid owned and operated by SHETL. Estimated energy unsupplied peaked at just over 450MWh in 1998/99, but most years saw less than 200MWh of energy unsupplied.

FIGURE 6: Energy unsupplied - Scottish Hydro



- 2.28. The average number of incidents on SHETL's network has been falling since 1991/92, as demonstrated in Figure 7 below.

FIGURE 7: Loss of supply incidents on the transmission network - Scottish Hydro



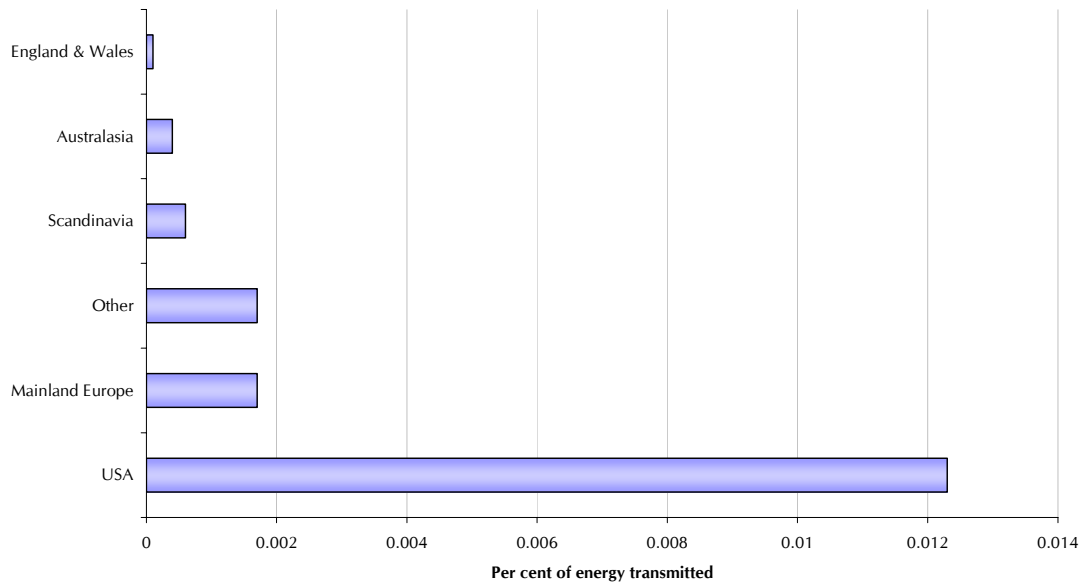
International comparisons

- 2.29. In its evidence⁴ to a Trade and Industry Committee hearing into network resilience, NGC cited an independent international benchmarking study into international transmission system performance involving 20 participants using data from 2001⁵. Figure 8 shows results from the study which demonstrate that NGC had one of the lowest levels of unsupplied energy in the world in 2001.
- 2.30. Some caution should be used in comparing results across countries given the high degree of variability in the characteristics of transmission systems, including physical differences (such as voltage and level of resilience) and differences in the regulatory and legislative frameworks under which companies operate.
- 2.31. Taking this into account, based on NGC's ratio of energy unsupplied (0.0001 per cent in 2001), it appears that, *prima facie*, the risk of loss of supply due to a fault on its system was about four times lower than the nearest comparator (the Australasian average of 0.0004 per cent) and nearly twenty times lower than the European average (0.0017 per cent).

⁴ NGT 2003, Trade and Industry Committee Inquiry into the Resilience of the Electricity Transmission Network — Written Evidence of National Grid Transco, <http://www.publications.parliament.uk/pa/cm200304/cmselect/cmtrdind/69/69we08.htm>.

⁵ International Comparison of Transmission System Operations (ICTSO) 2001. Electricity transmission network reliability incentive schemes — consultation document Office of Gas and Electricity Markets

FIGURE 8: Energy unsupplied



2.32. Despite NGC experiencing a downturn in performance in 2003/04, its ratio of energy unsupplied (0.0003 per cent in 2003/04) remains low by international standards.

Impact on consumers

2.33. Although the number of incidents on the transmission network that cause interruptions in supplies to consumers is relatively low, the impact on consumers can be severe. Interruptions arising from problems on the transmission network can cause the loss of electricity supplies over a relatively large area, causing very significant disruption to commercial and transport activities, as well as considerable inconvenience and difficulty for individual consumers.

2.34. The management of a transmission licensee can influence the number and duration of transmission interruptions, through both decisions on capital expenditure and operating practices. In these circumstances it is appropriate to consider how best to incentivise licensees to maintain and improve performance in respect of these matters. These issues are considered further in the following chapters.

3. Key issues

- 3.1. This chapter discusses some the factors important to the development of an incentive scheme such as network reliability, the economic value of unsupplied energy and whether there are certain events outside the control of NGC's management that should be excluded from the scheme.

Network reliability

- 3.2. The main impetus for the development and introduction of transmission network reliability incentive schemes is to strengthen the incentives on network owners/operators to maintain and improve the reliability and continuity of supplies on the transmission network, and to minimise disruption to customers.
- 3.3. However, in doing so, it must be recognised that no system of electricity transmission can guarantee 100 per cent reliability. There will always be some minimum level of disruption on transmission systems due to any number of possible causes, including weather-related faults, equipment failures, human error or third-party events.
- 3.4. Thus, no transmission system owner/operator can completely eliminate the risks of failure, and it would not be efficient or economic to seek to do so. Consequently, incentive schemes designed to maintain/improve the reliability of transmission networks will never result in a complete avoidance of unplanned outages on these networks, and thus must strike an appropriate balance between a reasonable/normal level of unsupplied energy on the transmission network, and incentivising network operators to avoid such events and maintain/improve the reliability of their networks.
- 3.5. This implies a need to try and balance the financial rewards/penalties to which network operators are exposed, with the risks and costs facing customers. Nevertheless, the scheme proposed in this consultation paper should not be regarded as an attempt to quantify the value of lost load or the true economic cost to consumers of a supply interruption — this would involve a more detailed and complex exercise which is beyond the scope of these interim arrangements.

Economic incentives

- 3.6. A refined scheme of economic incentives would involve rewarding/penalising the licensee in accordance with an estimate of the value (cost) of energy unsupplied from the transmission system which reflects the time and location of an interruption, and the type of customers affected.
- 3.7. However, a significant amount of work would need to be undertaken in consultation with industry and other interested parties to develop such an incentive, and this is not feasible in implementing a scheme for transmission companies in Great Britain in the immediate term.
- 3.8. In order to introduce (in early 2005) additional financial incentives on NGC, SPTL and SHETL to minimise loss of supply incidents on the Great Britain transmission system, Ofgem is proposing a relatively straightforward incentive scheme that exposes a fixed proportion of the licensee's transmission network revenue restriction to rewards and penalties based on the extent to which the licensee complies with annual targets related to the amount of energy unsupplied from the grid. Further details are discussed in the following chapter.

Transmission access

- 3.9. An issue related to the use of economic incentives is the extent to which customers have the right to expect the delivery of electricity supplies from the transmission system.
- 3.10. In February 2003, an amendment was made to the CUSC surrounding the definition of transmission access (and an associated charging methodology), which was aimed at clarifying what rights generators have for access capacity to the transmission system. This was an incremental development in defining the rights of access to the transmission system. This work was further expanded through the introduction of compensation arrangements for generators.
- 3.11. However, demand-side customers are not entitled to automatic compensation if they do not receive electricity for reasons related to a supply interruption on the transmission network.

- 3.12. The position is different in the gas industry. Customers of the national transmission system (NTS) are offered the option of special interruptible terms and cheaper prices. Ofgem is seeking to reform and improve these arrangements by introducing market based signals and ensuring compensation is in line with underlying economic costs.
- 3.13. As a result, the introduction of transmission network reliability incentive schemes will incentivise the three transmission licensees in a manner broadly consistent with demand-side customers being financially firm in relation to the transmission system — that is, under either scenario, the licensee may be financially penalised for not meeting demands for electricity from the transmission system. However, Ofgem recognises that the schemes will not result in compensation being paid to customers that are affected by supply interruptions from the transmission systems.
- 3.14. The next transmission price control review will provide the opportunity to consider whether transmission entry and exit capacity should be tradable and whether it should be sold on a short and longer term basis. If necessary, incentives for transmission network reliability could be modified to reflect these or other developments.

Consistency with distribution incentives

- 3.15. The Information and Incentives Project (IIP) applies only to DNOs and works to improve the level of service that DNOs provide by linking certain quality of service measures to the revenue that they recover from customers.
- 3.16. DNOs have agreed to an incentive scheme that allows for financial rewards or penalties depending on the quality of supply performance in three key areas:
- ◆ the number of interruptions to supply (power cuts);
 - ◆ the duration of interruptions to supply; and
 - ◆ the quality of telephone response.
- 3.17. Although the IIP may be relevant in the case of a supply interruption arising on a distribution network, it does not apply in the case of a supply interruption on the transmission network.

3.18. However, in formulating reliability incentive schemes for transmission networks, Ofgem has taken into consideration some of the core principles upon which the IIP is based, including:

- ◆ focusing on outputs that matter to consumers;
- ◆ recognising that network operators are able to influence these outputs, either by reducing the frequency or length of interruptions;
- ◆ providing material incentives for the management of the companies, while not creating undue risks or increases in its cost of capital, which would ultimately lead to higher prices for consumers; and
- ◆ penalising relatively poor performance and rewarding relative improvements in performance.

Excludable events

3.19. An important consideration in the development of loss of supply incentive schemes for transmission companies is whether to exclude from the schemes supply interruptions that are caused by events beyond the licensee's control (such as extreme weather). This would impact upon the setting of targets under the scheme and the assessment of the licensee's performance against such targets.

3.20. As discussed above, under the IIP for DNOs, licensees are incentivised to avoid/minimise supply interruptions from their networks via a system of financial rewards and penalties. However, supply interruptions on distribution networks that are caused by exceptional events are excluded from the IIP scheme provided that DNOs can show that they have taken appropriate steps to mitigate the chances of the event occurring and its impact. This is because the IIP scheme aims to incentivise the DNOs for events that are within their control rather than those that are outside their control.

3.21. Similarly, it might be argued that supply interruptions on the transmission system that result from extreme events should be excluded from the incentive scheme because the occurrence of such interruptions is beyond the control of the licensee.

3.22. The following sections discuss the type of events that Ofgem proposes be excluded from the transmission incentive scheme for NGC. It will be for consideration whether similar events should be excluded for the Scottish licensees in developing equivalent incentive schemes in due course.

Extreme weather

3.23. There is a case to be made for excluding from the scope of the incentive schemes supply interruptions that have occurred as a result of extreme weather. However, given the increased resilience expected from transmission networks (compared to distribution networks), the definition of extreme weather used under the IIP scheme for DNOs is not an appropriate definition for the purposes of the transmission incentive schemes.

3.24. Analysis undertaken recently by NGC and submitted to Ofgem concluded that the occurrence of multiple faults is a credible and relatively unambiguous indicator of adverse weather.

3.25. NGC states that 'we believe that the system is operating in a distressed state when faults per day exceed 50, and a major loss of supply event, caused by severe weather conditions, is more likely. We believe that setting the threshold at 50 faults per day or over is entirely commensurate with the very few events of severe weather that have occurred in the last twenty years'.

3.26. The data show that there have only been eight incidences since 1984/85 where more than 50 faults occurred on the England and Wales transmission network, and these were all related to extreme weather events. In the light of this Ofgem proposes to exclude from NGC's incentive scheme energy unsupplied from the grid which correlates with more than 50 faults being recorded on the transmission system in any one day as a result of extreme weather.

Connection assets

3.27. Physical assets on transmission networks can be broadly categorised as either:

- ◆ infrastructure — those assets that form part of the core transmission system and are shared (or potentially shareable) by users (i.e. more than one user has access to the asset); or

- ◆ connection assets — those assets that connect a user’s private assets (e.g. power station, factory, etc) to the core transmission system (i.e. to the infrastructure) and are not shared (or potentially shareable) by users (i.e. only one user has access to the asset for their sole use).

3.28. Ofgem’s decision in December 2003 to modify NGC’s Connection Charging Methodology resulted in the implementation of “PLUGS” which signified a change to connection boundaries and associated charging. This led to a definition of shallow connections and meant that any asset that is shared or potentially sharable is charged for via use of system rather than connection charges as of 1 April 2004. This change was made for all connections (both supply side and demand side) and thus made a clear distinction between transmission and connection assets. It was designed also to encourage competition/contestability in the provision and maintenance of connection assets.

3.29. Customers of the transmission network are able to choose the type of connection arrangement that best suits their needs as there are clearly defined sole-use assets associated with that connection. Consequently, this gives rise to connections of a differing quality and resilience being in place across the transmission networks, with some customers choosing a lower standard of connection at a lower cost. There is a case to exclude supply interruptions involving lower cost connections from the scope of an incentive scheme for two main reasons:

- ◆ financially penalising the transmission licensee for interruptions involving a lower standard of connection asset could result in a cross-subsidy type arrangement whereby users that have chosen low-cost connection arrangements are being effectively cross-subsidised by those that have chosen higher-cost connection arrangements; and
- ◆ if licensees are financially liable under the incentive scheme for interruptions to connection assets of a lower standard, then the licensee would have little incentive to allow a user with a low-cost connection arrangement to connect to the transmission system, which implies potentially adverse consequences for the extent of competition and contestability in connections.

- 3.30. NGC currently separately identifies events that have affected three customers or less as part of its reporting (in accordance with Condition C17 of its Transmission Licence) on the quality, availability and reliability of supplies from the transmission system. NGC states that this category of interruption effectively captures incidents that affect only large industrial and commercial users with direct connections to the transmission system that are of a lower standard than is usually provided (as a result of the customer exercising choice in the type of connection provided).
- 3.31. Consequently, Ofgem proposes to use the category of events affecting '3 customers or less' as a proxy measure of events involving a lower standard of connection.
- 3.32. In the longer term, there is an argument for excluding all outages on a transmission network that involve connection assets from a transmission network reliability incentive scheme. This is because the construction, operation and/or maintenance of connection assets are governed by bilateral connection agreements entered into by a customer and NGC. In the longer term, there may be scope for the two parties to agree some form of compensation under the terms and conditions of the connection agreement in the event that the customer is involuntarily disconnected from the transmission system. If this situation were to eventuate, then the transmission licensee could find itself financially liable twice (under both the incentive scheme and under its bilateral arrangement with the customer) for an interruption involving connection assets if such compensation arrangements happened to be in place.
- 3.33. However, within the context of developing a set of interim arrangements for NGC, the exclusion of all incidents involving connection assets should be viewed as a longer-term issue that will require further consideration by Ofgem in due course.

Shortage of generation

- 3.34. Supply interruptions from the transmission system may occur because of a fault on the physical network assets, or it may result from a shortage in available generation. A shortage of generation may occur for any number of reasons,

including unplanned plant outages, a delay in plant returning from planned maintenance, and a higher level of demand than anticipated/forecast.

- 3.35. There are existing incentives on the transmission system operator to balance supply and demand on the transmission system. Condition C16 of the Transmission Licence sets out the licensee's obligations with respect to operating the transmission system and its procurement and use of balancing services.
- 3.36. NGC buys short-term reserve from generators and large customers as part of its role as SO. This reserve can be called upon, often at short notice, to allow it to keep the system balanced when, for example, there are sudden spikes in demand or a sudden loss of a large generator due to mechanical breakdown. The costs incurred by NGC in procuring its reserve requirements form a component of the balancing costs that NGC has incentives to reduce under its SO incentive scheme.
- 3.37. NGC is not required to contract in advance to ensure that there is sufficient generation capacity to meet peak demand. Market participants are responsible for ensuring that generation capacity is sufficient to meet peak demand. It would not be efficient or economic for NGC to duplicate this by acting, in effect, as the provider/buyer of last resort. Consequently, it would not be appropriate to reward/penalise NGC on the basis of supply interruptions arising from a lack of generation capacity.

Commercial disconnection

- 3.38. The CUSC sets out a range of circumstances under which NGC may disconnect a user's equipment from the transmission network for commercial reasons.
- 3.39. Section 5.3 of the CUSC relates to Generic Events of Default and Disconnection and states that NGC may (subject to certain procedures and conditions) de-energise and then disconnect the users equipment if the user fails to pay any amount owing to NGC in relation to the CUSC or any Bilateral Agreement. This section also enables NGC to de-energise and disconnect if a user becomes insolvent or enters into administration.
- 3.40. Section 5.4 relates to Site Specific Default and Disconnection and deals with any breach of any of the provisions of a relevant bilateral agreement or the CUSC in

relation to a particular connection or use of the GB Transmission System. If this breach can reasonably be expected to cause a material adverse affect on the business or condition of NGC or other users then NGC may (following certain conditions and procedures) de-energise and then disconnect the user. There are also provisions under this section for de-energisation and disconnection if there is a substantial probability that the user will default in the payment of any sums due to NGC in the subsequent 12 months.

- 3.41. Section 5.5 relates to Balancing Services Use of System Charges: Events of Default. This section of the CUSC allows provision for NGC to de-energise and disconnect (subject to certain procedures and conditions) a user's equipment, should they fail to provide or maintain the requisite amount of security cover or fail to pay any sum payable in respect of the Balancing Services Use of System Charge to NGC.
- 3.42. Ofgem proposes to exclude from the transmission incentive scheme any energy unsupplied as a result of a user (or users) being de-energised and disconnected in accordance with sections 5.3-5.5 of the CUSC.

User requested disconnection

- 3.43. A user may request to be disconnected from the transmission system for a number of reasons, including health and safety reasons, or potential damage to the user's equipment in the event that the user is not disconnected. This would be defined as a verbal request that falls under operational liaison covered by Operating Code OC7 of the Grid Code and logged by the receiving Control engineer.
- 3.44. Ofgem proposes to exclude from the transmission incentive scheme any energy unsupplied as a result of a user (or users) requesting disconnection in accordance with OC7 of the Grid Code.
- 3.45. In addition, Ofgem proposes to exclude any energy unsupplied as a result of the operation of a user's protection equipment that disconnects the user from the NGC grid supply point (GSP). Ofgem also proposes to exclude any energy unsupplied as a result of the emergency de-energisation by a user as defined in section 5.2.2 of the CUSC.

4. Proposed incentive scheme for NGC

- 4.1. This chapter sets out proposed incentive arrangements for NGC to encourage it to maintain/improve the reliability of its transmission system with respect to the continuity of supplies to consumers. It also identifies a number of key issues on which the views of respondents are sought. As noted in Chapter 1, incentive arrangements for transmission companies in Scotland will be considered in due course.

Objectives

- 4.2. As discussed in the previous chapter, the current regulatory and legislative framework obliges NGC to develop, maintain and operate an efficient, economic and coordinated system of electricity transmission. Implicit within these obligations (and explicit within others) is an expectation that NGC will operate the transmission system in accordance with certain standards of service quality, meeting all reasonable demands for electricity.
- 4.3. The introduction of an incentive scheme within NGC's transmission licence would complement existing arrangements by providing direct financial incentives for NGC to meet customer demands while minimising the extent and duration of interruptions to the supply of power from its network. This would be consistent with NGC's statutory and licence obligations, and is also consistent with Ofgem's principal objective to protect the interests of consumers.

Structure and targets

- 4.4. The proposed scheme involves a performance incentive which takes into account the cumulative amount of energy unsupplied from the transmission system throughout the course of the year.
- 4.5. The scheme utilises annual targets based on megawatt hours (MWh) unsupplied, as this captures both the scale/quantum of the demand lost on the system (MW), and the time taken by NGC to restore supplies to the grid (reflected in the MWh lost). This is also consistent with data reported by NGC in accordance with its Transmission Licence (see Appendix 1).

- 4.6. The scheme sets an annual target for NGC in relation to the total amount of energy unsupplied from the transmission network in any given year.
- 4.7. There are a number of ways in which this target might be set. For instance, one might consider international benchmarks as a means of determining the desired level of service quality and performance by NGC. However, based on the evidence presented in Chapter 2, NGC's performance is relatively strong by international standards and so it is not clear that setting targets on this basis would incentivise NGC to maintain and/or further improve performance.
- 4.8. Similarly, benchmarking NGC's performance against that of the distribution network operators (DNOs) within the UK (recognising the fundamental differences in the types of networks) only reinforces NGC's solid performance in network reliability. Transmission faults in England and Wales accounted for only 1.4 per cent of customers interrupted on distribution and transmission networks in 2001/02, and around 0.5 per cent of customer minutes lost, with the remaining interruptions occurring on distribution networks.
- 4.9. The most appropriate and practicable approach is to establish targets by reference to NGC's historical performance (as reported by NGC in accordance with its Transmission Licence — see Appendix 1). However, before deriving NGC's average performance, we first need to remove from the dataset any data that relate to events that will be excluded under the incentive scheme.
- 4.10. Of all excludable events detailed in Chapter 3, only two types of events are currently potentially included in the dataset — extreme weather events, and events that affect 3 customers or less.

Extreme weather exclusions

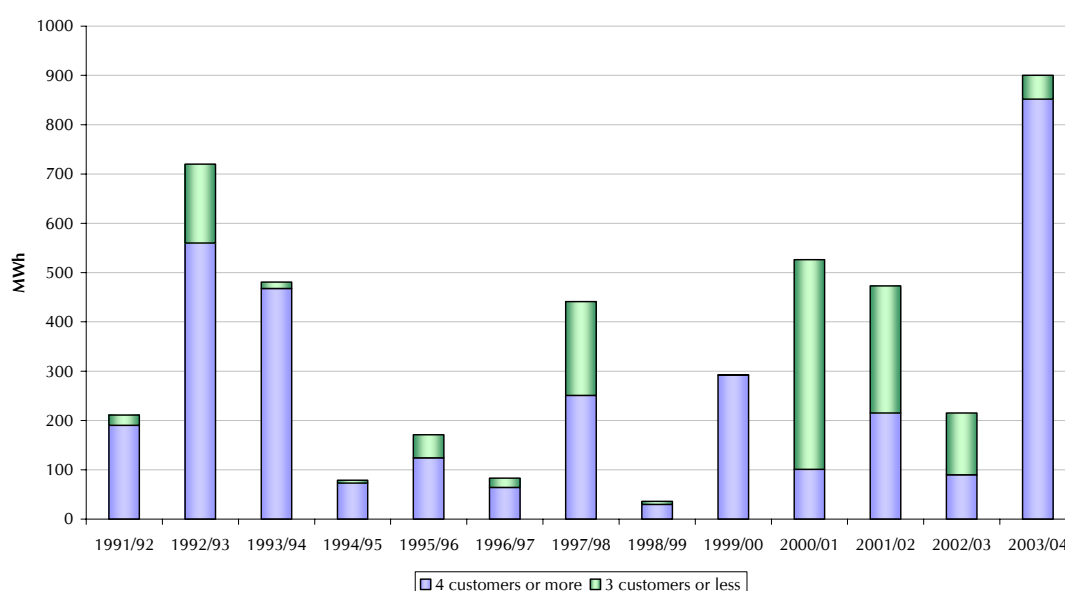
- 4.11. As discussed in the previous chapter it is proposed to exclude from NGC's incentive scheme energy unsupplied from the grid which correlates with more than 50 faults being recorded on the transmission system in any one day as a result of extreme weather.
- 4.12. There have only been eight such events since 1984/85, of which only one falls within the same timeframe as the dataset that is used to set NGC's incentive scheme targets — an event that occurred on 27th February 2001 due to strong

winds and heavy snow in northern England. However, this event did not result in a loss of supplies, and so does not impact on the average level of unsupplied energy.

Connection assets exclusions

4.13. It is also proposed to exclude interruptions affecting 3 customers or less (as a measure of incidents involving low cost connections). Figure 9 reproduces the data shown in Figure 2 (see Chapter 2) in a disaggregated form, which allows separate identification of events involving 3 customers or less.

FIGURE 9: Energy unsupplied - National Grid Company, by incident type



4.14. Based on the data presented in Figure 9, the average amount of energy unsupplied from the England and Wales transmission system between 1991/92 and 2003/04 was:

- ◆ 255MWh per year (for interruptions to 4 or more customers); and
- ◆ 101MWh per year (for interruptions to 3 or less customers).

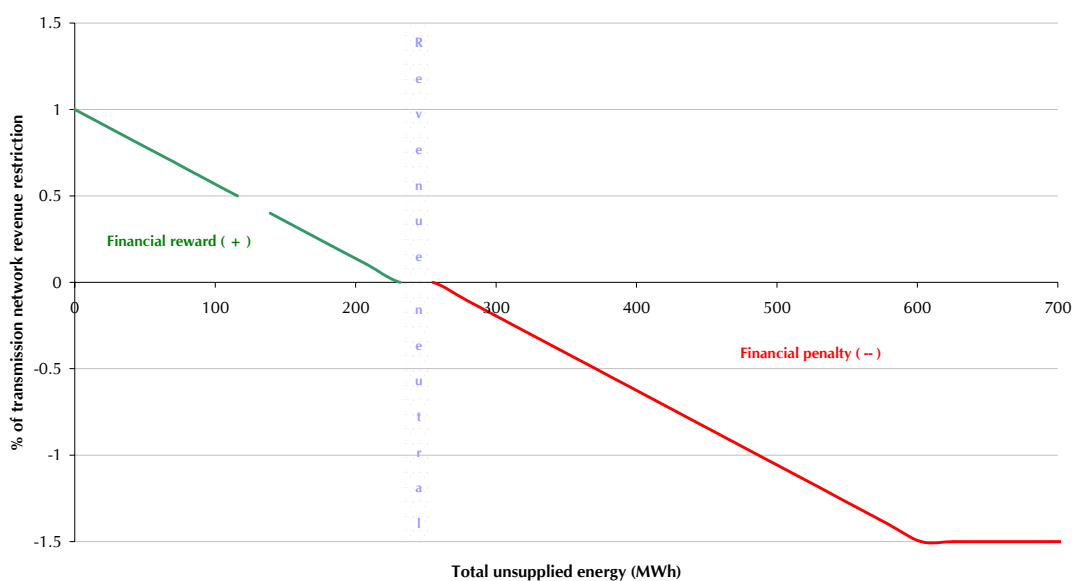
Setting the targets and associated incentives

4.15. Excluding extreme weather and connections-related outages, the average amount of energy unsupplied from the England and Wales transmission system for all remaining interruptions over the period was 255MWh per year.

4.16. Under the proposed incentive scheme, NGC would be neither rewarded nor penalised for maintaining an annual level of system performance that is equal to (or 10 per cent less than) the average amount of energy unsupplied since 1991/92 — falling within this dead-band (230MWh-255MWh) would result in revenue neutrality for NGC in terms of the incentive scheme. However, NGC would be penalised for an annual level of energy unsupplied from the grid which exceeds 255MWh, and conversely it would be rewarded for an annual level of energy unsupplied from the grid which is less than 230MWh.

4.17. Figure 10 proposes a scale of financial penalties and rewards in accordance with the dead-band range of 230MWh-255MWh per year. For an accumulated amount of unsupplied energy that is less than 230MWh per year, NGC will be rewarded on a sliding scale to a maximum amount equivalent to + 1.0 per cent of its transmission network revenue restriction (in the event that there is 0MWh of energy unsupplied in a year). Conversely, for an accumulated amount of unsupplied energy that is greater than 255MWh per year, NGC will be penalised on a sliding scale to a maximum amount equivalent to -1.5 per cent of its transmission network revenue restriction (in the event that there is approximately 600MWh or more of unsupplied energy in a given year).

FIGURE 10: Financial incentive structure



4.18. Ofgem has taken into consideration the IIP scheme to which DNOs are current subject in deciding on a reasonable and appropriate level of NGC’s transmission revenue to expose to the incentive scheme. Under the IIP scheme (which was

introduced on 1st April 2002), DNOs have about 1 per cent of their revenue subject to incentive arrangements, which gradually increases to about 3 per cent per annum for the period of the next distribution price control (2005/06 to 2009/10). The figures are related to customer research undertaken to determine the willingness of customers to pay for improved system quality, and the quantum of such payments.

- 4.19. As discussed above, the proposed incentive scheme for NGC would subject 1.0 to 1.5 per cent of revenue to incentives. NGC's current transmission network revenue restriction under the price control is around £900m, which implies that a maximum of £13.5 million (or 1.5 per cent) of its revenue would be exposed to the loss of supply incentive scheme on an annual basis in relation to the amount of total unsupplied energy (MWh) from the transmission network. This will provide NGC's management with a clear and direct financial incentive to maintain/improve its performance with respect to system reliability.
- 4.20. Nevertheless, it is important that this does not expose NGC to any undue risks. The licensee would need to experience a loss of supply greater than 487MWh in a year in order to expose more than 1.0 per cent of its revenue to a financial penalty. From the data in Figure 9, it is evident that NGC has only experienced two years in the past thirteen where more than 487MWh has been unsupplied from the grid.
- 4.21. Table 1 summarises the targets (and associated penalties/rewards) — it shows two periods of the scheme in the event that NGC's current price control is extended to 2007.

Table1: Summary of scheme structure and targets

	Range of MWh lost	Range of incentive
Period 1: 1/1/05 to 31/3/06 (125% of annual targets)^a ...		
Financial reward (+)	0 - 287MWh	0 to 1.25% of revenue
Revenue neutrality	288-319MWh	—
Financial penalty (-)	320MWh +	0 to 1.875% of revenue
Period 2: 1/4/06 to 31/3/07 (100% of annual targets)^b ...		
Financial reward (+)	0 - 229MWh	0 to 1.0% of revenue
Revenue neutrality	230 - 255Wh	—
Financial penalty (-)	256MWh +	0 to 1.5% of revenue

^a Targets and associated rewards/penalties have been scaled up due to the longer duration of Period 1 of the scheme. ^b Period 2 of the scheme is dependent upon the extension of NGC's current price control to 2007.

4.22. Finally, it is important to note that it would be possible to derive a £/MWh figure for the accumulated amount of energy unsupplied from the transmission network in any given year based on the level of MWh lost and the associated level of financial reward or penalty. However, this should not be regarded as Ofgem's estimate of (or proxy for) the value of the energy unsupplied from the grid (i.e. the value of lost load). Any such estimate would vary according to the time and location of an interruption, and the type of customers affected. An attempt to quantify the value of lost load or the true economic cost to customers of a supply interruption would involve a more detailed and complex exercise, which is beyond the scope of these interim arrangements.

Implementation and duration

4.23. The loss of supply incentive scheme bears direct relevance to NGC's TO activities (the construction, maintenance and operation of the high-voltage transmission lines and associated equipment in England and Wales in an economic, efficient and co-ordinated manner) and so it will be a TO incentive scheme. It is intended to implement these arrangements from 1st January 2005, and they would adjust NGC's transmission price control revenue.

- 4.24. The incentive scheme includes a sunset clause such that it will operate for the remaining period of NGC's current price control. Thus, the scheme will run from 1st January 2005 until 31st March 2006. Ofgem is currently in the process of consulting on an extension to NGC's current price control to 31st March 2007.
- 4.25. For the period of the scheme that runs until 31st March 2006, the actual targets will amount to 125 per cent of the annual targets, given that the duration of this period of the scheme will be 15 months.
- 4.26. As part of the development of NGC's next price control — which will run from either 2006 or 2007 until 2012 — the loss of supply incentive scheme will be reviewed and refined/amended as required.

Key issues for consultation

- 4.27. Views are invited on any aspect of the issues discussed in this paper and in particular on:
- ◆ the **structure** of the proposed incentive scheme, including:
 - ◆ the method for setting rewards and penalties under the scheme;
 - ◆ the actual quantum of the rewards and penalties (including the use of revenue-neutral dead-bands);
 - ◆ how the annual **targets** have been set, including:
 - ◆ the method for setting targets under the scheme;
 - ◆ the actual quantum of the targets (including the use of dead-bands);
 - ◆ the **scope** of the scheme, including:
 - ◆ the types of events that should be excluded from the scheme and the impact that this will have on the setting of targets and the assessment of NGC's performance. In particular whether any force majeure type events (e.g. an outage caused by an act of terrorism) should be excluded; and

- ◆ arrangements for **Scotland**, including when similar schemes should be introduced for the Scottish transmission companies and how such schemes might be structured.

Appendix 1 Measuring energy unsupplied on the England and Wales transmission system

Condition C17 of the Transmission Licence

- 1.1 As noted in Chapter 4, the data upon which NGC's performance will be assessed are that which NGC reports to Ofgem in accordance with its obligations under Condition C17 of its Transmission Licence. NGC is required by Condition C17 to report electricity transmission system performance in terms of availability, system security and quality of service.
- 1.2 NGC monitors performance in the area of system security by reporting supply interruptions and estimates of energy unsupplied together with an indication whether losses of supply are within or outside the requirements of the National Grid Security and Quality of Supply Standard.
- 1.3 An incident is defined as any system event which results in a single or multiple loss of supply. All transmission system related incidents resulting in a loss of supplies are reported individually giving information concerning the nature and cause of the incident, its location, duration, and an estimate of energy unsupplied.
- 1.4 Performance is monitored by total estimated energy unsupplied from the National Grid System for each incident and the average incident duration.

NGC's methodology for estimating energy unsupplied

- 1.5 Energy unsupplied (or lost energy) cannot be metered or measured directly. It must be estimated from other information related to the event, including:
 - ◆ the number of NGC Grid Supply Points (GSPs) affected;
 - ◆ the complexity of both NGC's and its customers' network configuration in the event's locality; and
 - ◆ the event's duration.

- 1.6 The estimate is also particularly dependent upon the process of demand restoration, which is a co-ordinated effort between the control rooms of NGC and its customers’.
- 1.7 The volume of lost energy (measured in MWh) is derived from the difference between two estimated quantities:
- ◆ the energy that would have been supplied had the event not occurred; and
 - ◆ the energy made available and/or actually supplied by NGC for the period of the event.
- 1.8 In practice, these quantities are themselves dependent upon the event in question. Consequently, NGC applies certain simplifications to facilitate the calculation, consistent with the integrity of the base information and the complexity of the event.
- 1.9 There are two dimensions relevant to the estimation of lost energy — demand lost (measured in MW) and duration of the event (measured in hours or fractions thereof). It is the product of these dimensions that yields the lost energy supplied (MWh). The section below describes in detail the assumptions used by NGC that underpin these two dimensions.

Estimation of duration

- 1.10 Only unsupplied energy during the period of the event is estimated. The period (duration) of the event is defined as the time between the start and end times. Specifically:
- ◆ the start time of the event is taken as the time of the NGC circuit event and equipment operation trip that caused the loss of supply, usually measured to the nearest minute; and
 - ◆ the end time of the event is, and subject to the particular circumstances, taken as the time, usually measured to the nearest minute, that supplies are restored to NGC’s customers by one of the following:

- ◆ customer demand is actually and directly restored by NGC, in the absence of DNO intervention. This could be through the operation of automated protection equipment such as a Delayed Auto Reclose (DAR), which attempts to restore supplies to an affected circuit after a brief time interval. Alternatively, reconfiguring NGC's own network, or bringing an alternative transformer back into service, can restore supplies to the affected GSP; or
- ◆ NGC advises that supplies are available for restoration at the affected GSP for the customer to restore any demand under their control. Where multiple GSPs and/or demand blocks are lost and restored in stages, the end time is taken as the time that the final GSP is restored. NGC does not have operational control over the customer's network and there are circumstances where customers (or some of the customers' end users) delay or postpone restoration after the time that NGC advises that supplies are available. This may be due to a customer's operational necessity or choice. Operational necessity may be due to: a customer's need to reconfigure or restore their system in the event of weather damage; defects in their equipment which further impedes restoration; the need to advise major users; ensure safe operational restoration, etc. Customer delay associated with recovering and restarting processes is also included in operational necessity. Alternatively, a customer may choose to delay restoration of supplies from NGC due to other factors entirely within their control; or
- ◆ when advised by NGC's customer that supplies have been restored. On some occasions, NGC is unable to restore the affected GSP due to a permanent fault, and supplies are otherwise restored by customer action. On such occasions, the end time is taken as the time advised by the customer that all supplies have been restored. Such action will normally be achieved in operational liaison with NGC.

- 1.11 Finally, the uncertainty in duration of the event can be estimated to within one minute if the data is obtained from NGC's own systems.

Estimation of lost demand

- 1.12 The demand lost is the magnitude of the demand at the start time and is assumed to be constant throughout the period of the lost energy, i.e. a flat profile. According to NGC, this approximation introduces a modest (less than 5 per cent) uncertainty in the estimated cumulative energy within the annual reporting period. NGC estimates the intrinsic uncertainty of the base data for the demand measured at any GSP to be better than 0.5 per cent.
- 1.13 Estimation of lost energy also takes into account any demand maintained or restored during the course of the event; that is between the start time and the end time.

Information issues in estimating lost demand and event duration

- 1.14 Demand is normally restored in discrete blocks. However, the restored demand profile may effectively be masked from NGC's own GSP-located metering systems due to the following influences:
- ◆ nature of customer load and customers' network reaction (e.g. an automatic process shutting down and awaiting manual restart or an automatic response from voltage control equipment within the network); or
 - ◆ DNO restoration strategies to maximise the number of customers reconnected (e.g. temporary demand regrouping, temporary interconnection, voltage reduction, generation support), all of which are not apparent to NGC; or
 - ◆ restoration management of major users (e.g. Network Rail, London Underground, steelworks and continuous process interruption effects).
- 1.15 Consequently, in some circumstances, NGC requires information from the DNO in order to assess the demand profile. Operational information is exchanged

during the management of the event (under the obligations of the Grid Code) and NGC is reliant on the quality and accuracy of information provided in these circumstances.

- 1.16 Sometimes, dependent upon the nature of the event, NGC can infer an approximation to the restored demand profile using information from its own systems. However, this is a complex process containing a number of assumptions regarding the nature of the restored demand.
- 1.17 Under favourable system conditions at the time of the event, this process may provide a 'sanity check' of the DNO's reported data but does not substitute for the information provided by the DNO.

Appendix 2 Case study — London and Birmingham

2.1 As outlined in Chapter 1, the introduction of a reliability incentive scheme for NGC follows the decision by the Authority in the light of the London and Birmingham transmission failures. The statement published by Ofgem on 25th June 2004 on the transmission failures in London and Birmingham included a recommendation that it would be appropriate to introduce new incentive arrangements for NGC to maintain and improve the reliability of supplies from its transmission network. The Authority concluded that:

“Such a scheme would strengthen the incentives on NGC to maintain a high standard of system performance, for example, NGC would be penalised automatically for any blackout of the kind seen in London and Birmingham.”⁶

2.2 This appendix aims to test the London and Birmingham incidents against the proposed incentive structure outlined in this consultation document.

2.3 Based on the data reported by NGC in accordance with Condition C17 of its Transmission Licence, the London transmission failure that occurred on 28th August 2003 resulted in the loss of almost 434MWh of supplies to areas of South London and Kent, while the Birmingham transmission failure that occurred on 5th September 2003 involved a loss of some 84MWh.

2.4 These incidents contributed to a cumulative loss of supplies totalling 900MWh in 2003/04, the highest level of energy unsupplied from the national grid for over a decade. Therefore, had the incentive scheme that is proposed in this document been in place for the financial year 2003/04, NGC would have been penalised the equivalent of around £13.5 million (or approximately 1.5 per cent of its transmission revenue restriction) under the scheme.

⁶ Ofgem 2004, *Statement by the Gas and Electricity Markets Authority, following an investigation into compliance by National Grid Company plc with its obligations under section 9(2)(a) of the Electricity Act 1989 and Special Licence Condition AA4.1 of its Electricity Transmission Licence in relation to a transmission failure in London and in relation to a transmission failure in Birmingham*, June, (http://www.ofgem.gov.uk/temp/ofgem/cache/cmsattach/7601_14404_NGCStatement.pdf).

- 2.5 Had the London and Birmingham incidents constituted the only loss of supply incidents on NGC's transmission system last year, then the total amount of MWh unsupplied from the grid would have been 518MWh. Therefore, if the incentive scheme proposed here were in place for the financial year 2003/04, NGC would have been penalised the equivalent of around £10 million (or approximately 1.1 per cent of its transmission revenue requirement) under the scheme.
- 2.6 Consequently, based on the proposed scheme outlined in this consultation document, NGC would be penalised automatically in future for any blackout of the kind seen in London and Birmingham.

Appendix 3 Impact assessment

Introduction

- 3.1 Ofgem is required to carry out impact assessments (IAs) under section 5A of the Utilities Act 2000, as amended by the Sustainable Energy Act 2003. Section 5A requires that the Ofgem carries out IAs:
- ◆ whenever it proposes to do anything for the purposes of, or in connection with, the carrying out of any function exercisable by it under or by virtue of Part 1 of either the Electricity Act or the Gas Act; and
 - ◆ in respect of any of its proposals that appear to it to be important.
- 3.2 Section 5A defines a proposal as important if it is likely to lead to one or more of the following:
- ◆ involve a major change in the activities carried out by the Authority;
 - ◆ have a significant impact on persons engaging in the generation, transmission, distribution or supply of electricity or gas;
 - ◆ have a significant impact on persons engaged in commercial activities connected with the generation, transmission, distribution or supply of electricity;
 - ◆ have a significant impact on the general public of Great Britain or part of Great Britain; and
 - ◆ have significant effects on the environment.
- 3.3 The incentive arrangements discussed in this paper have the potential to have an impact on both transmission licensees (through adjustments to the level of price control revenue) and consumers (through influencing the number and duration of transmission interruptions). In the light of these factors it has been decided to carry out an IA.

- 3.4 Where practicable the costs and benefits of the new incentive arrangements will be quantified and taken in to account in deciding the most appropriate way forward.
- 3.5 This IA and review have been undertaken consistent with Ofgem's statutory duties. It considers a base case (i.e. retain the existing arrangements) against the proposal for new incentive arrangements.
- 3.6 Final proposals on these incentive arrangements will be published in November 2004. These will take into account respondents' views on this consultation paper, including comments on the draft IA.

Objectives

- 3.7 It is important for transmission networks to be developed, maintained and operated in an efficient and co-ordinated manner to protect the interests of consumers. This includes having incentives on each transmission licensee to maintain and improve the reliability of its network. Following an investigation in to the transmission failures in London and Birmingham in 2003 the Authority concluded that the introduction of new network reliability incentive arrangements for NGC would complement the existing regulatory framework. This consultation sets out proposals for interim arrangements to be put in place for the period 2005 to 2007. The next main transmission price control review will commence in 2005 and will provide the opportunity of putting longer term arrangements in place for the period 2007 to 2012.

Overview of key issues

Transmission system reliability

- 3.8 As noted in Chapter 2, a way of measuring transmission network reliability is to determine the proportion of actual electricity requirements supplied. NGC's figures show that its network is very reliable, with between 99.9997 per cent and 99.9999 per cent of energy requirements supplied in any given year. This level of reliability has remained broadly constant over the last decade and appears to compare well against international benchmarks.

Scope to influence licensees behaviour

- 3.9 The present regulatory and legislative framework obliges NGC to develop, maintain and operate an efficient, economic and coordinated system of electricity transmission. Implicit within these obligations is an expectation that NGC will operate the transmission system at a high standard and invest so to meet all reasonable demands for electricity. The introduction of an incentive scheme complement existing arrangements by providing financial incentives ensure the licensee retains its focus on minimising the number of interruptions.

Costs and benefits

- 3.10 Although the number of incidents on the transmission network that cause interruptions in supplies to consumers is relatively low, the impact on consumers can be severe. Interruptions arising from problems on the transmission network can cause the loss of electricity supplies over a relatively large area, causing very significant disruption to commercial and transport activities, as well as considerable inconvenience and difficulty for individual consumers. The management of a transmission licensee can influence the number and duration of transmission interruptions, through both decisions on capital expenditure and operating practices. In these circumstances it is appropriate to consider how best to incentivise licensees to maintain and improve performance in respect of these matters.
- 3.11 Assuming it acts in a reasonably efficient way the new incentive arrangements should not lead to significant additional costs for NGC. If NGC is able to improve its performance then it should be able to achieve a marginal increase in its revenue and profits. Consumers will benefit either from lower transmission charges (up to 1½ per cent) or an improved quality of service (but with transmission charges up to 1 per cent higher). Overall transmission charges represent less than 10 per cent of a typical final bill.

Options

- 3.12 An alternative to the proposed incentive scheme would be to continue with the present regulatory arrangements. This is the base case against which the new incentive arrangements are assessed.

Environmental impacts

- 3.13 A transmission interruption may cause relatively widespread economic disruption with the scope to adversely impact on the operation of transport networks and cause the inefficient use of alternative energy sources. Nevertheless, the present level of transmission network reliability is relatively high. On this basis improved incentives for network reliability would be likely to have a relatively small but positive impact on the environment.

Security of supply

- 3.14 The incentive arrangements are designed to improve network reliability and security of supply. However, they would not guarantee network reliability and it is very likely that there will continue to be a number of incidents each year on NGC's transmission network that cause interruptions in the supplies to consumers.

Risks and unintended consequences

- 3.15 The size of the incentive payments are capped at 1 per cent of regulated revenue and the penalties at 1½ per cent of regulated revenue. On this basis the scope for unintended consequences — such as increasing risk and so the cost of capital, causing large changes in the structure of charges or distorting NGC's behaviour — should be very limited.

Competition

- 3.16 While suppliers would generally have a strong preference for secure networks that provide a high quality of service to final consumers the network reliability incentive scheme is unlikely to have any significant impact on competition in electricity supply. The scheme would not apply to electricity generators. The arrangements that apply in the circumstances where a generator is unable to export because of a problem with NGC's network were discussed earlier in this paper.

Distributional effects

- 3.17 The relatively small changes in transmission licensee revenue would not be expected to have any significant distributional implications across groups of consumers. The proposals do not encompass arrangements for providing compensation to individual consumers.

Review and compliance

- 3.18 The intention has been to design a relatively simple set of interim incentive arrangements. Incidents that are exempt from the scheme are clearly defined (for instance adverse weather that causes more than 50 trips in a 24 hour period) are clearly defined. On this basis these arrangements should not create a significant administrative burden.

Conclusion

- 3.19 An interim incentive scheme for network reliability should sharpen NGC's management focus on maintaining or improving network reliability without having any significant adverse consequences.