September 2000

The transmission price control review of the National Grid Company from 2001

Transmission asset owner

Final proposals

Executive summary

This document sets out final proposals for a new price control to apply from 1 April 2001 to the transmission business of The National Grid Company plc (NGC). It is anticipated that this price control will expire at the end of March 2006.

These proposals are the culmination of a process which has lasted 11 months and has involved three consultation papers and a number of individual meetings with NGC and other interested parties. Ofgem has received advice from two firms of consultants – Arthur Andersen and PB Power in respect of operating and capital expenditure respectively - whose final reports have been placed in Ofgem's library. The proposals have been considered by Ofgem's board of senior business advisers, its Management Committee and the Management Board of Ofgem. The table below summarises the key elements of the final proposals and compares them with the draft proposals.

Item	NGC	Draft proposals	Final proposals
Controllable operating expenditure*	£1,047 million	£944-1,004 million	£1,020 million
Capital expenditure**	£1,540 million	£1,186 million	£1,320 million
Cost of capital (real pre-tax)		5½%-6¼%	6¼%
NPV of allowed revenues		£3,614-3,744 million	£3,842 million
Effective P_0 cut***		0-6%	0%
X***		3%	1.5%

Notes: all figures in 1999/000 prices throughout this document, except where otherwise stated.
* the costs of business rates and licence fees will be subject to a pass-through (see Chapter 2)
** capital expenditure subject to correction mechanism (see Chapter 3)
*** P_0 and X factors adjusted from figures published in June (see Chapter 6)

Ofgem has decided, following consultation, to separate the price control into two controls covering NGC's role as transmission asset owner (TO) and system operator (SO). Ofgem is proposing that the new price control should apply to the revenues of the TO part of the business only. SO activities that are presently included in the scope of the price control will, from 1 April 2001, be subject to separate incentive arrangements, in respect of which draft proposals are being published today. This will involve the transfer of costs estimated at around £40 million per annum included in the table above from the TO price control to the SO incentive schemes. This transfer will not directly impact on the level of NGC's revenues but, by improving inventives on NGC, it is expected to reduce the overall costs of transmission and system operation.

NGC has been asked to indicate to Ofgem by 27 October whether or not it accepts the proposals set out in this document.

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Foreword

This document sets out Ofgem's conclusions from its review of the price control that applies to the transmission business of the National Grid Company plc (NGC). The document sets out proposals for a new price control to apply from 1 April 2001 for five years and follows the publication of draft proposals by Ofgem in June 2000.

Following the introduction of the New Electricity Trading Arrangements (NETA), which is expected to take place before implementation of the new price control, the activities of the transmission business will involve two distinct roles: its role as transmission asset owner (TO) and its role as system operator (SO). These different activities of the transmission business are explained in Chapter 1 below. The existing transmission business price control applies to revenues earned from all of the TO activities and some of the SO activities. In order to reflect NGC's new responsibilities following the introduction of NETA, Ofgem is proposing that the new RPI-X price control will apply only to the revenues of the TO business. The revenues of the SO part of the business will be regulated through a separate price control. Ofgem is today publishing "The transmission price control review of the National Grid Company from 2001: System Operation. Initial Proposals".

In order to aid comparison with Ofgem's draft proposals, published in June, these proposals are set out as if the new price control had the same scope as the existing transmission business price control (covering all TO and some SO revenues). The document then sets out separately the adjustments arising from the reduction in the scope of the control, and certain further adjustments arising from the impact of NETA.

The price control should allow NGC to finance the costs attributable to, and efficiently incurred by, the TO, including an appropriate return on its regulatory asset base. In formulating these proposals Ofgem has considered a business plan questionnaire (BPQ) completed by NGC, reports from consultants appointed by Ofgem to assess the efficiency of NGC's cost projections, the views of Ofgem's senior business advisers, and responses to the three consultation documents published as part of this review.

The remainder of this document is structured as follows:

- Chapter 1: discusses the licensed activities of NGC's business, the form, structure, scope and duration of the next price control, the transmission access arrangements and the system operator incentives;

- Chapter 2: sets out Ofgem's views on NGC's future operating costs in the light of the BPQ, the efficiency study which Arthur Andersen have conducted, NGC's comments on Arthur Andersen's study and the responses to the draft proposals. It also explains the separation of future operating costs between the TO and the SO;

- Chapter 3: sets out Ofgem's views on NGC's future capital expenditure, both load related and non-load related, in the light of the BPQ, the capital expenditure study which PB Power have conducted, NGC's comments on PB Power's report and the responses to the draft proposals. It also discusses the separation of future capital expenditure between the TO and the SO;

- Chapter 4: describes Ofgem's proposals for improving incentives on NGC;

- Chapter 5: sets out the method which Ofgem has used in assessing NGC's cost of capital and Ofgem's approach to financial modelling;

- Chapter 6: outlines Ofgem's method for the calculation of NGC's allowed revenues for the next price control period; and

- Chapter 7: contains Ofgem's proposals for introducing a financial ring-fence into NGC's transmission licence.

Rationale for this review

The operations of NGC are central to the operation of the electricity supply industry in England and Wales and to the related trading arrangements. NGC's quality of service affects almost all users of the system. Transmission charges account for about 5 per cent of a typical domestic bill and slightly more for industrial and commercial customers although NGC's performance in running the transmission business can have a significant impact on the costs of generation to final customers.

NGC is the monopoly provider of most transmission services in England and Wales. In order to protect customers, it remains appropriate to regulate NGC's charges. To incentivise NGC to be efficient, a price control remains the most appropriate method of regulation for those of NGC's activities which are not subject to separate revenue incentives.

In 1999/2000 NGC's price controlled revenue was approximately £870 million. The direct cost to Ofgem of conducting the present review has been approximately £0.8 million (including a provision of around £0.5 million for consultancy services).

NGC has been asked to indicate by 27 October whether the proposals contained in this document are acceptable.

Ofgem
September 2000

1. Price control review of the National Grid Company (NGC)

Objectives of the price control review

1.1 The objective of this price control review is to protect the interests of consumers by:

(i) ensuring that NGC can finance the licensed activities of its TO business, given efficiency and economy on NGC's part;

(ii) enabling quality of service to be maintained and appropriate new investment to be financed;

(iii) ensuring that the prices charged to NGC's customers are no higher than necessary to fulfil objectives (i) and (ii); and

(iv) providing incentives to ensure that NGC maintains an appropriate balance between the quality of its services, efficient capital investment, efficient operating expenditure and efficient financial management.

1.2 In setting the next price control, Ofgem has considered the effects of future developments, including:

- **New Electricity Trading Arrangements (NETA)**: the introduction of NETA, which will significantly affect the way NGC discharges its functions, is scheduled to take place before the new TO control;
- **review of the transmission access regime**: Ofgem is planning to review the way access to the transmission system is sold following the introduction of NETA;
- **division of SO and TO functions**: for regulatory purposes, these functions will be separated within NGC's transmission business on implementation of NETA; and
- **developments in transmission and ancillary services**: there may be technical changes in these areas over the period of the next price control.

1.3 In general, NGC's customers, principally electricity suppliers and generators, may be expected to recover their costs from final customers. Given that NGC monopolises high-voltage transmission in England and Wales, it is important for final customers that NGC is

as efficient as possible. Table 1.1 shows the levels of operating expenditure, depreciation and the return on capital in NGC's RPI-X revenue in 1998/99.

Table 1.1: Transmission business RPI-X-controlled costs and revenues (1998/99)

	1998/99 (£m)	Share of transmission revenues (%)
Operating expenditure	320	35
Current cost depreciation	294	32
Return on capital	235	25
Total RPI-X revenue	**849**	**92**
Post-1990 connections revenues	76	8
TOTAL	**925**	**100**

Source: NGC submissions to Ofgem

1.4 On average, NGC's RPI-X controlled revenue represents 5 per cent of final electricity prices to domestic customers and slightly more for industrial and commercial customers. A 25 per cent difference in operating expenditure over one year could change electricity prices to final consumers by about 0.4 per cent. In 1996, NGC's return on capital was estimated at 7 per cent for the purpose of setting the present price control. A variation of 1 percentage point in this cost of capital would affect allowed revenue by around £40 million per annum, leading to a variation in prices to final customers of about 0.2 per cent.

NGC's revenues

1.5 NGC's electricity transmission business has three principal sources of revenue:

- transmission network use-of-system (TNUoS) and connection charges;
- transmission services use-of-system (TSUoS) charges; and
- the incentive mechanisms relating to the costs of losses and energy uplift recovered from customers through the Pool.

1.6 These charges were described in Chapter One of the initial thoughts consultation document (published in March 2000). This price control review process concerns the first of the three revenue streams: income from NGC's TNUoS and pre-Vesting connection charges. In addition, as part of this review Ofgem has considered the costs of post-Vesting connections. NGC's TSUoS charges and their associated incentive schemes through which NGC recovers certain costs of system operation are regulated separately and are

being reviewed separately. Throughout this review process, Ofgem has considered the interactions between the TSUoS incentives schemes and the price controlled revenue, to ensure consistency of approach. In particular, Ofgem has reviewed the division between the scope of the transmission business price control and the scope of the other incentive arrangements. This is explained further in the following paragraphs.

Scope of price control

1.7 Previous consultation documents have addressed the scope of the price control. All the respondents to the initial thoughts and draft proposals consultation documents who expressed a view on the scope of the control considered that the price control should remunerate those activities which would be allocated to the TO following the separation of the SO and the TO for regulatory purposes. Ofgem considers that the SO should be remunerated through the successor to the transmission services incentives arrangements. Most respondents who commented on this issue agreed with this view. Ofgem's final proposals are based on the separation of the costs of the TO from those of the SO. This issue is discussed further in the next section and in Chapters 2, 3, 5 and 6 below.

1.8 The draft proposals indicated that incentives on NGC should be strengthened by linking its revenues to the outputs it achieves. The issues surrounding linking NGC's revenues to the outputs which it achieves are discussed further in Chapter 4.

The separation of the SO and TO for regulatory purposes and the impact of NETA

1.9 The structure of the National Grid Group in January 2000 is shown in Appendix 3. Following the introduction of NETA, and coinciding with the start of the new price control period on 1 April 2001, Ofgem is to regulate the two functions of NGC's transmission business, the SO and the TO, separately, and is in the process of setting separate price controls for each. As indicated in the draft proposals, the TO is to be regulated by means of a price control, following the same format as the current price control of the transmission business. As part of the process of separating the functions of the TO and the SO, it has become apparent that the appropriate division between the two broadly coincides with the current division between the activities remunerated through the price control and those activities remunerated through separate incentives mechanisms. However, there are some activities presently falling within the scope of the price control which will in future be part of NGC's role as SO. In order to separate the

price controls applying to these functions properly in the future, it is necessary to consider separately the projected operating costs, capital expenditure and regulatory asset base of activities falling within the scope of the existing price control. Ofgem refers to the SO costs covered by the existing price control as the "internal SO costs". This separation is discussed in Chapters 2, 3 and 5.

1.10 The TO will own and maintain the high-voltage transmission network in England and Wales, and will carry out investment where this is judged appropriate. The SO will undertake the short-term activities necessary to operate the high-voltage transmission network in England and Wales safely and efficiently. The introduction of NETA will have significant implications for the operations of the SO and a minor impact on the activities of the TO. The SO will be expanded to incorporate a larger System Management function responsible for the day-to-day operation of the system and a Trading function. The TO will incur extra expenditure as a result of NETA, as discussed in Chapter 2.

Type of price control

1.11 At present NGC's transmission business is subject to an RPI-X price control, under which allowed revenue is fixed at regular reviews. RPI-X controls are widely used in the UK for the regulation of network monopolies. This form of regulation has proven effective in providing clear targets for companies and has led to significant price reductions and quality improvements for customers to date.

1.12 The advantages and benefits of RPI-X controls in the regulation of network monopolies in the electricity industry may be demonstrated through the achievements of NGC and of the PES distribution businesses. The operating costs of NGC's transmission business have fallen by 30 per cent since 1990, and the operating costs of the distribution businesses, which are subject to a similar price control, have been reduced by about one-quarter between 1994/95 and 1997/98. At the same time, NGC's customers have generally benefited from high quality of supply – for example, there were no transmission related voltage or frequency excursions and only five transmission related loss of supply incidents in 1998/99. Ofgem is proposing that the TO business should continue to be subject to an RPI-X control.

European cross-border tariffs

1.13 The European Commission is leading work to develop a system of payments for cross-border electricity flows within Europe. In the first instance these will not apply to the UK, and their impact has not been considered as part of this price control review. If the UK subsequently participates in these arrangements, Ofgem will need to consider at that time what the implications will be for transmission operators within Great Britain.

2. Operating expenditure

Overall approach

2.1 NGC's transmission business expenditure can be broken down into capital costs and operating costs. Capital costs cover spending on assets, such as transformers and switchgear, the benefits of which can be expected to last several years. Operating costs cover the day-to-day costs of running the network, such as repairs and maintenance, planning, control, overhead costs and business rates. The appropriate allowance for capital expenditure in the period of the next price control is the subject of the next Chapter. Operating costs are discussed in this Chapter.

2.2 The draft proposals set out Ofgem's overall approach to the analysis of operating expenditure. NGC submitted its response to Ofgem's business plan questionnaire (BPQ) in January 2000, which set out NGC's projections for operating expenditure between 1998/99 and 2005/06. Ofgem has employed Arthur Andersen as consultants to examine the transmission business operating costs in 1998/99 and 1999/00 and NGC's forecasts of operating costs over the period from 2000/01 to 2005/06. NGC's forecasts and Arthur Andersen's subsequent analysis did not take into account the impact on operating costs attributable to the introduction of NETA. These additional costs were addressed in a later study by Arthur Andersen. Ofgem's consultants submitted a draft report to Ofgem in April 2000 and a final report in July 2000.

2.3 The draft proposals document considered the projected operating expenditure of NGC's regulated transmission business as a whole. As mentioned in Chapter 1 above, Ofgem now intends to regulate the revenues of the TO part of the transmission business only by means of an RPI-X price control. This Chapter sets out Ofgem's views in relation to the operating expenditure requirements of the whole transmission business, then discusses the separation of operating expenditure between the TO and the SO. This results in an operating cost allowance for the portion of that expenditure relating to the TO only.

2.4 The draft proposals set out the areas of NGC's operating expenditure which Ofgem considered contentious. Of these, this Chapter covers:

- **staff costs**: these account for around one-third of NGC's controllable operating costs throughout the next price control. Ofgem's consultants considered that there could be significant savings in addition to those projected in NGC's

response to Ofgem's BPQ. These savings were attributable to staff numbers, pay levels, organisational shape, severance costs and the costs of the HR and finance functions;

- **research and development**: Ofgem's consultants questioned whether it was appropriate to include a large part of NGC's forecasts of research and development expenditure in the allowance for operating costs. They considered that a mechanism whereby NGC would report on its research and development expenditure to Ofgem periodically with the cost being recovered ex-post might be more appropriate. They also considered that NGC had not fully demonstrated where the benefits of completed research projects were reflected in its forecasts of the costs of the transmission business activity;

- **insurance**: Ofgem's consultants felt that consideration should be given to excluding the cost of insuring against low probability events, such as terrorism, from NGC's allowed operating costs, and that it might be appropriate to allow NGC to recover costs arising from a terrorist incident through a subsequent price control settlement, as appropriate. This would remove the immediate need for NGC's customers to pay for insurance against low probability events, such as terrorism;

- **Energis charges**: NGG's associated undertaking, the telecoms company Energis, currently pays around £4 million per year to NGC for the use of NGC's transmission assets upon which 2,725 km of fibre-optic cable is installed (the so-called Infrastructure Services Licence (ISL) fee). This revenue is treated as excluded revenue, and by taking account of this revenue at the price control review, correspondingly less revenue needs to be raised from use of system charges . The basis on which the current charge was calculated was set in 1993 and confirmed at the last price control review in 1996. However, at the last price control review OFFER stated that it might wish to review the level of the ISL fee at some time in the future. Consequently, in their draft report, Ofgem's consultants calculated a market-based ISL fee of £3,000/km, using a method consistent with that which Ofgem had applied to calculate the ISL fee for Thus, ScottishPower's telecoms affiliate during last year's review of ScottishPower's price control; and

- **business rates**: in the draft proposals, Ofgem said that it was minded to include an allowance for the outcome of the review of business rates, as was done during the PES distribution reviews. NGC had submitted its BPQ before the government's plans for the review of business rates had been finalised. Accordingly, Ofgem has examined NGC's projections to ensure that they correspond with the outcome of the review of business rates, and is satisfied that this is the case. Ofgem intends that any variation between its forecast of NGC's business rates and their outturn level should be a pass-through element within the price control (see Appendix 1).

Consultants' efficiency study

2.5 The draft proposals document contained details of the draft report of the study, commissioned by Ofgem and undertaken by Arthur Andersen, to assess the operating cost efficiency of NGC's transmission business. The draft report projected efficient operating costs at £907 million over the next price control period. Ofgem considered the draft report and NGC's comments on the draft report in formulating its draft proposals, which were based on forecast efficient cash operating expenditure of between £944 million and £1,004 million over the next price control period. Following the submission of comments on the draft report by NGC and further work by Ofgem's consultants, the final report of the efficiency study was submitted to Ofgem at the end of July, and has been placed in Ofgem's library and on its website (www.ofgem.gov.uk). The final report contained projections for efficient cash operating costs of between £964 million and £1,027 million over the next price control period, depending on the assumptions on efficient staff costs and the funding of research and development. NGC has submitted further comments on the final report of the efficiency study, which it placed on its website. Based on its consultants' draft and final reports, on NGC's comments on those reports and on responses to its consultation documents, Ofgem has estimated efficient operating costs over the next price control period at £1,020 million. The projections for operating expenditure over the price control period by NGC, Ofgem and Ofgem's consultants are contained in Table 2.1 below.

Table 2.1: Forecasts for NGC's ECOC over the next price control period (£m)

	2001/02	2002/03	2003/04	2004/05	2005/06	Total
NGC BPQ submission (1/00)	220.9	212.8	207.6	203.9	201.3	1,046.5
Consultants' draft report (4/00)	195.4	185.9	178.7	174.7	172.5	907.2
Draft proposals high case (6/00)	212.9	205.4	198.7	194.6	192.3	1,003.9
Draft proposals low case (6/00)	205.7	194.6	185.3	180.0	177.9	943.5
Consultants' final report Scenario 1 (7/00)	208.7	198.4	190.0	185.2	181.6	963.9
Consultants' final report Scenario 2 (7/00)	216.9	206.2	197.1	191.9	188.2	1,000.3
Consultants' final report Scenario 3 (7/00)	218.5	210.8	203.4	199.2	195.3	1,027.2
Final proposals (9/00)	221.1	209.9	200.2	196.0	192.2	1,019.5

Ofgem's assessment

2.6 Respondents to the draft proposals consultation were broadly supportive of the approach to be adopted in estimating NGC's allowed revenues over the period of the next price control. NGC argued, however, that greater emphasis should be placed on its overall performance in reducing controllable operating costs compared to other electricity companies. Ofgem's consultants have benchmarked NGC against comparator companies both on its overall performance and on components of operating expenditure.

NGC's overall performance relative to other electricity network companies

2.7 In its responses to the draft proposals and to the final report of the efficiency study, NGC has argued that its performance since privatisation compares favourably with other network utilities, including the three most efficient public electricity supplier (PES) distribution businesses, known as the "frontier" PESs. Both NGC and Ofgem's consultants considered a variety of measures and comparators in considering NGC's overall performance relative to other electricity network companies.

2.8 NGC has argued that its operating cost performance is comparable with that of the frontier PESs and that, comparing to operating cost performance since 1991/92 rather than 1990/91, NGC has outperformed the frontier PESs. NGC used a measure of controllable operating costs to support this argument, and showed real controllable operating cost reductions of 46 per cent for NGC between 1990/91 and 1998/99, and for the frontier PESs on average, of 50 per cent over the same period. It also showed real controllable operating cost reductions of 54 per cent for NGC between 1991/92 and 1998/99 and for the frontier PESs of 46 per cent over the same period. NGC's reason for using 1991/92 as the base for comparison rather than 1990/91 was that NGC incurred significant

restructuring costs in both 1990/91 and 1991/92 post-privatisation whereas the PESs already existed as separate corporate entities.

2.9 Ofgem's consultants also considered the relative performance of NGC and the frontier PESs and based their comparisons on the same data, which was provided by NGC. The consultants do not accept the view that 1991/92 is a more appropriate starting point in the comparison of costs trends between NGC and the PESs. By beginning the analysis after the significant increase in costs in 1990/91, the consultants considered that NGC has presented its cost reduction performance an unduly favourable light. NGC attributed the increase to restructuring costs, in particular the need to create a new commercial charging function. Consequently, Ofgem's consultants considered that these costs may be regarded as one-off expenditures and so their exclusion from subsequent years' costs may not form part of efficiency gains.

2.10 Ofgem's consultants' analysis demonstrated that the average controllable operating cost reduction of the three frontier PESs slightly exceeded that of NGC between 1990/91 and 1997/98 (the last year for which actual data was available for the analysis). The compound annual reduction for NGC was 8.1 per cent compared to 8.7 per cent for the frontier PESs over the period 1990/1 to 1997/8.

2.11 Because of the difficulty in determining the impact of the post-privatisation restructuring undertaken by NGC on the comparison of NGC and PES performance, Ofgem's consultants also considered the relative performance of NGC and the frontier PESs over the period when a marked acceleration in operating cost reductions was discernible after privatisation. For NGC this trend started in 1992/93 after returning to the same levels of operating costs as those prior to the increases in 1990/91. For the PESs, the acceleration started later in 1994/95. The compound rate of operating cost reduction for NGC over the period 1992/93 to 1997/98 was 12.3 per cent. Over the period 1994/95 to 1997/98 the frontier PESs achieved a higher compound annual reduction of 13.8 per cent. Hence, according to the consultants, over an appropriately comparable period, the frontier PESs outperformed NGC by a significant margin.

2.12 After 1997/98, NGC also presented a comparison of the price control settlement for the frontier PESs and NGC's BPQ response cost profile. NGC argued that this resulted in a reduction in its operating costs of 59 per cent between 1991/92 and 2004/05, and a reduction of 47 per cent for the frontier PESs over the same period. NGC further

compared this profile with that presented by Ofgem and concluded that it implied that NGC would significantly outperform the frontier PESs. Ofgem's consultants did not consider this a valid comparison since it combines regulatory account operating costs before 1998 with Ofgem's projections of efficient operating costs after 1998 and PES price controls (which cover capital expenditure and operating expenditure).

2.13 NGC further supports its assertion that its performance is efficient in comparison with other utility network companies by means of an international benchmarking exercise which covers 20 transmission utilities, the "ITOMs" study. It cites the fact that NGC has been identified as a "best performer" in this exercise. Ofgem's consultants note that the activities covered by the ITOMs exercise account for only 21 per cent of the controllable operating costs of the TO. Although the consultants accept that the study supports NGC's cost projections in the specific areas covered by the analysis, they believe that the results are of limited use in guiding projections for the transmission business as a whole.

2.14 Ofgem's consultants also examined the compound cost savings rates in the water and sewerage, electricity distribution and gas transportation industries, drawing on research conducted by ORR and Ofwat in their recent price control reviews. The results of their analysis are summarised in Table 2.2 below.

Table 2.2: Relative declines in operating expenditure since privatisation

Industry/Company	Compound annual cost savings in real unit operating expenditure since privatisation
NGC	6.8%
PES distribution (all)	6.0%
PES distribution (top 6)	7.7%
Water	3.7%
Sewerage	4.1%
British Gas/Transco	7.5%

Source: Office of the Rail Regulator

2.15 Commenting on the table, Ofgem's consultants considered that:

- in broad terms, the nature of the business for these sectors is comparable. Therefore they did not expect variation in input prices or capital substitution effects to create fundamental differences in unit costs;
- the figure for water and sewerage probably understates efficiency improvements due to additional expenditure on quality improvements; and

- the figure for gas probably overstates efficiency gains due to a large increase in volumes, which has the effect of boosting performance due to economies of scale.

2.16 Ofgem considers that the exchange of views between its consultants and NGC has demonstrated that it is possible to derive a variety of answers from benchmarking NGC, depending on the period over which the comparison is made and the precise variable compared. The lack of a direct comparator for NGC adds to the difficulties in relying on benchmarking. However, Ofgem is of the view that NGC has not demonstrated that controllable operating cost reductions of around 3.5 per cent per annum, on which Ofgem has based its final proposals, are unattainable. Table 2.2 above indicates that this is a lower reduction than NGC or the PES distribution businesses have achieved since privatisation.

Components of operating expenditure

2.17 Based on respondents' views, on the final report of the efficiency study and on NGC's comments on the final report, Ofgem has projected a level of efficient operating costs of £1,020 million. In the draft proposals, Ofgem raised a number of areas of operating expenditure on which it welcomed views, including:

- staff costs;
- research and development;
- insurance; and
- Energis charges.

2.18 This section summarises Ofgem's conclusions on each of those areas in turn.

Staff costs

2.19 Staff costs, which are approximately one-third of NGC's controllable operating costs, account for a substantial proportion of the savings identified in the efficiency study conducted by Ofgem's consultants. NGC's BPQ submission contained staff costs of between £82 million and £86 million per annum for the next price control period. In their final report, Ofgem's consultants estimated a range for the efficient level of cash staff costs.

Pay

2.20 Ofgem's consultants forecast three potential scenarios for base salary levels in the transmission business:

- in Scenario 1, Ofgem's consultants aligned base salaries to a market lower quartile derived from a benchmarking study commissioned by NGC from Hay Consultants in 1998/99 and 1999/00 and inflated base salaries using a real wage growth factor of 2.3 per cent thereafter[1];

- in Scenario 2, Ofgem's consultants re-aligned the base salaries of all job groups with average salaries above the market median (again, derived from the Hay benchmarking study) in 1998/99 and 1999/00 to the median, and increased those base salaries by a real wage growth factor of 2.3 per cent thereafter. For those job groups with average pay below the median, average actual salaries were applied in 1998/99 and 1999/00 and were inflated using the real wage growth factor of 2 per cent, as assumed by NGC, thereafter. This is the growth rate applied by NGC in projecting wage costs in the BPQ; and

- in Scenario 3, Ofgem's consultants made no change to the pay levels assumed by NGC in the BPQ. This is based on actual average salaries in 1998/99 and 1999/00, inflated at a wage growth factor of 2 per cent thereafter.

Organisational shape

2.21 Ofgem's consultants combined the pay analysis set out above with an investigation of the transmission business's organisational shape. As with pay, Ofgem's consultants considered organisational shape in three scenarios:

- in Scenarios 1 and 2, Ofgem's consultants determined a revised organisational shape on the basis of a review of the shape and balance of the transmission business with PB Power. Scenarios 1 and 2 assume that this shape will be achieved by the transmission business by 2004, followed by a 2 per cent per year reduction in all job groups thereafter. In determining the revised organisational shape achieved in 2004, Ofgem's consultants made amendments to the Network Services and Project Management operating units only. All other operating units

are unchanged from NGC's BPQ submission, though the 2 per cent per year reduction in all job groups after 2004 relates to all operating units;

- in Scenario 3 Ofgem's consultants assumed that the organisational shape for 2006 submitted by NGC in its BPQ is achieved by 2004 and the accelerated rate of change required to reach this level by 2004 is carried on at the same level between 2004 and 2006.

Severance

2.22 In accordance with standard accounting practices, NGC provides for severance liabilities when these are identified, utilising the provision when these are paid. As Ofgem's consultants focused on cash operating costs, all charges to the profit and loss account made to set up this provision were removed. In addition, Ofgem's consultants formulated the following scenarios for the treatment of severance:

- in Scenarios 1 and 2 severance cost is estimated at twice the annual base salary cost using an assumption of pay corresponding to Scenarios 1 and 2 as described above.

- in Scenario 3 severance cost is estimated at two and a half times the annual salary cost, using an assumption of pay corresponding to Scenario 3 as described above.

HR and Finance

2.23 Ofgem's consultants have forecast efficient costs for the HR and finance functions by comparing the transmission business to the 75th percentile (i.e. the lower end of the top quartile in terms of performance) (Scenarios 1 and 2) and the median (Scenario 3) of the respective sample groups. The scenarios both assume that the Transmission Business reaches the efficient level by 2001/2

Summary of staff cost adjustments

2.24 For the next price control period, the final report forecasts efficient staff costs £9.7 million (Scenario 3), £27.8 million (Scenario 2) or £64.2 million (Scenario 1) lower than NGC's BPQ submission.

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[1] Ofgem's consultants assumed a wage growth factor of 2.3% for Scenarios 1 and 2 in line with economic forecasts.

2.25 Of the respondents to the draft proposals, only NGC and one other commented in detail on the level of staff costs. In summary, NGC supported linking salaries to the market median, but disputed the organisational shape used by Ofgem's consultants in the low scenario. On Finance, HR and Severance, NGC made a number of points on the application of the benchmarking studies, some of which Ofgem's consultants took into account in formulating their final proposals. After careful consideration, Ofgem's view is that it is appropriate to benchmark NGC against scenario 2 as proposed by AA.

2.26 Accordingly, the final proposals on operating expenditure are based on the median of the range of comparator companies in pay, and the costs of the HR and Finance functions. On organisational shape, Ofgem considers that the shape and balance of the transmission business developed by its consultants is appropriate. On severance, it appears unreasonable to expect customers to pay for excessively generous severance terms and so Ofgem has adopted the lower forecast of severance costs.

Research and development

2.27 The draft proposals suggested that it might be appropriate to allow NGC to recover the efficient costs associated with research and development projects only once the benefits of such projects to customers had been demonstrated. Accordingly, the forecast for efficient operating expenditure in Ofgem's low scenario did not include around £7 million per year of the research and development expenditure in NGC's BPQ. The high scenario included NGC's BPQ forecast for research and development in full.

2.28 Since the publication of the draft proposals document, NGC has provided to Ofgem and Ofgem's consultants information on its research and development programme. Ofgem understands that NGC undertakes three kinds of research and development projects:

- projects "designed to deliver a product against a clear target";
- projects which address emerging health, safety and environmental issues; and
- other projects, which are aimed at "establishing technical understanding".

2.29 All of the respondents to the draft proposals document considered that it would be appropriate to include an allowance for NGC's expenditure on research and development. Ofgem's final proposals are based on an allowance for NGC's research and development which includes funding for projects "designed to deliver a product against a

clear target" and the projects which address emerging health, safety and environmental issues. No allowance has been made, however, for projects aimed at "establishing technical understanding", as Ofgem considers it appropriate that such projects be funded through savings resulting from further research and development projects in operating costs. This results in a reduction of £0.6 million per year over five years compared to NGC's BPQ forecast of around £8 million per year in the next price control period.

Insurance

2.30 NGC spends £1.3 million per year on insurance against terrorism. The draft proposals document argued that it might be appropriate to remove the costs of insurance against relatively low probability events such as terrorism from efficient costs. The costs of such events would be remunerated through the price control, as they occurred. This would mean that NGC's customers would no longer have to pay the margin on insurance policies.

2.31 However, most respondents who commented on this issue opposed this treatment of insurance costs. Most felt that this might cause significant volatility in prices in the event of a catastrophic event. Many argued that insurance against such risks is standard business practice. One respondent expressed concern at the inclusion by NGC of self-assessed costs for self-insurance, particularly where NGC controls the risks it claims to be insuring against. However, Ofgem understands that the costs for insurance against low probability events, such as terrorism, forecast in the BPQ were not self-assessed, but based on actual quotations for insurance of this nature. Accordingly, Ofgem has included an allowance for all insurance costs in its estimation of efficient cash operating costs over the period of the next price control.

Energis charges

2.32 NGC levied a charge on Energis for the use of transmission assets (the ISL fee) of £3.6 million in 1999/00. The allowed revenues contained in the draft proposals proposed a increase to £9.1 million, based on a market based method, consistent with that used for the Scottish companies during the Scottish transmission price control reviews. Most respondents to the initial thoughts and draft proposals consultation documents supported this approach. NGC argued that the ISL fee had been determined in consultation with OFFER in 1993 and to revisit it would be inconsistent. However, at the last price control review, OFFER stated explicitly that it might be appropriate to revisit the level of the ISL

fee. In addition, NGC argued that it would be appropriate to include an allowance for wayleaves in the calculation of the ISL fee. This would have the effect of reducing the fee by £450 per km of fibre.

2.33 The present level of the fee was calculated when the technology used was new and when the income which NGC and Energis could expect to receive from its application was uncertain. Ofgem considers that an increase in the ISL fee to a market based rate, consistent with that used for Scottish Power and its telecoms subsidiary and taking into account new information received from NGC, is appropriate. Ofgem's consultants have calculated the efficient value for the ISL fee, based on 2,725 km of fibre, at £6.2 million per year over the period of the next price control. Should it transpire that such a fee is not appropriate, Ofgem may revisit it at the next price control review. While some respondents to the draft proposals favoured reducing NGC's regulatory value to take account of the gains which shareholders have made from NGC's investment in Energis, Ofgem considered that this would be inappropriate (see Chapter 5).

TO/SO division of responsibilities

2.34 This section discusses the separation of the projected operating costs, between the TO and the SO before taking into account the effects of the introduction of NETA, as this is the basis on which NGC's operating cost submissions were made. The implications of the introduction of NETA for the TO's efficient cash operating costs (ECOC) are discussed below. The capital expenditure and the regulatory asset base are discussed in Chapters 3 and 5 respectively.

2.35 NGC projected separately the operating costs attributable to the SO and the TO. Ofgem's consultants have reviewed NGC's projections, and have derived two scenarios for cost projections for the SO business based on the scenarios 2 and 3 in their final report on the efficiency study for the split of costs between the TO and the SO. In order to determine the split of costs between the TO and the SO, Ofgem's consultants have:

- reviewed the allocation of central costs between the TO and the SO as projected by NGC and amended this where an alternative allocation method was considered to be more appropriate;
- separated the Transmission Business attributable operating costs between the TO and the SO and determined on allocation of cost adjustments to arrive at an

estimate of efficient operating costs for each of the two functions. Ofgem and NGC have agreed that the SO should be a "thin" function, and that the activities in the regulated transmission business which are SO functions should comprise those of the System Management operating unit, plus a small number of staff from the Commercial and Systems Strategy operating unit;

- considered at a high level the cost base of the Ancillary Services Business (ASB), which is not, at present, part of the regulated transmission business and determined any cost adjustments and allocations which should be made to establish the ECOC of this business unit, following the principles used when adjusting operating costs for the transmission business; and

- combined the ECOC of the SO function from the transmission business with the ECOC of the ASB, in order to determine the total ECOC for the SO.

Impact of NETA

2.36 Ofgem's consultants have suggested that there are likely to be additional operating costs for the TO as a consequence of NETA in two areas:

- information systems costs associated with amendments to TNUoS charging of £0.3 million in 2001/02; and

- incremental operational telecoms costs of £0.5 million per year over the period of the next price control.

2.37 Ofgem also notes that NGC has claimed that there are likely to be additional costs as a consequence of the introduction of new transmission access arrangements and the impact of NETA on constraints, which are not the subject of these proposals. Efficiently incurred costs may be recovered under the SO control.

Projections for operating costs in the period of the next price control

2.38 Ofgem has estimated efficient operating costs over the next price control period, taking into account the impact of the TO/SO division of responsibilities and NETA. Ofgem has based its calculation of the allowed revenues on those estimates, which are set out in Table 2.3.

Table 2.3: Forecasts of NGC's controllable operating costs 2001/02-2005/06 (£ million)

Source	2001/02	2002/03	2003/04	2004/05	2005/06	Total
NGC BPQ	221	213	208	204	201	1,047
Draft proposals high case	213	205	199	195	193	1,004
Draft proposals low case	206	195	185	180	178	944
Final proposals (whole transmission business pre-NETA)	221	210	200	196	192	1,020
SO operating costs	(35)	(35)	(34)	(34)	(35)	(173)
Incremental NETA costs	1	1	1	1	1	3
Final proposals (after SO and NETA adjustments)	187	175	166	162	158	849

3. Capital expenditure

3.1 The draft proposals considered NGC's forecasts for capital expenditure in the forthcoming price control period, the reasons for the levels of expenditure and whether the proposed revised projections would be sufficient for NGC to carry out its statutory and licence obligations. Ofgem projected a total expenditure of £1,291 million, a reduction of £249 million from NGC's forecast of £1,540 million. The draft proposals contained an error by using Ofgem's LRE projection as £431 million, whereas the description of LRE given earlier in the chapter set out a projection of total LRE of £535 million. This error was also contained in the draft proposals price control calculations.

3.2 Ofgem sought views on three main issues:

- whether its projection of capital expenditure for the forthcoming period was appropriate;
- whether the price control should include a mechanism to correct for uncertainties in the levels of new generation connections; and
- whether such a mechanism should apply only outside a 3 to 7 GW range, within which a single capital expenditure allowance would apply.

3.3 The final proposals take account of the views expressed by NGC and other respondents to the draft proposals.

Responses to the draft proposals document

3.4 Of the 12 responses received by Ofgem, eight (from NGC and seven other organisations within the electricity industry) made comments on the capital expenditure projections in the draft proposals. Ofgem's proposal to introduce a correction mechanism for expenditure on new generation connections received most comment. In general, respondents supported the introduction of a mechanism to recognise the uncertainty over the levels of new generation connections. One respondent agreed that low growth in new connections was likely. There were a number of comments on the operation of the mechanism. These were that the mechanism should be transparent; that it should recognise that costs may be incurred ahead of the actual connection; and that there could be a large change to the capital expenditure allowance for small changes to the amount of

new generation connected at the edge of the deadband. Conversely, one respondent said a best estimate should be incorporated in the price control and that any major underspend not gained through increased efficiency should be clawed back at the next review.

3.5 Other views expressed were that NGC's level of future investments should be viewed against its outputs. Quality of supply factors such as frequency and voltage excursions should be used as output measures but using comparisons against operating limits rather than statutory limits.

3.6 NGC made several comments on Ofgem's draft capital expenditure proposals. While NGC commented favourably on the review of expenditure in the present period and on the analysis of their non-load related expenditure (NLRE), it brought out three areas of concern. These were on the level of new generation connections and the associated capital expenditure; the phasing of load related expenditure (LRE); and the disallowance of the expenditure for system protection and system monitoring projects. On the expenditure associated with new generation connections, NGC considered that around 10 GW of generation connections might occur, but if only 5 GW were to enter the costs would be higher than those projected by Ofgem. NGC also said that a year-on-year adjustment against an agreed background assumption should be made and that it saw no benefit in adopting a deadband in the mechanism. On the phasing of expenditure, NGC said the Ofgem proposals reflected PB Power's view on the timing of a component of the London infrastructure work. NGC said that due to the advanced nature of the scheme the proposed expenditure should reflect the expenditure already committed. On the projects for system protection against extreme incidents and system monitoring, NGC said the expenditure should be included within Ofgem's projections. This topic is discussed further in the LRE section below.

Capital expenditure from 2001/02 to 2005/06

Load related expenditure

3.7 LRE is driven by connection of new generation and load, reinforcement of the existing transmission system to accommodate these new connections, reinforcement where generation is retired and by general load growth. As load growth is relatively stable, the number and location of new generators causes the greatest uncertainty in forecasting capital expenditure. The draft proposals set out a base assumption of 5 GW of new

generation with an associated total LRE of £535 million. In addition it set out a correction factor of £30 million per GW from the base assumption but with a deadband of 3 GW to 7 GW where no correction would be made. The draft proposals made reductions from NGC's 2001 forecast of gross LRE of £741 million to £535 million.

Correction mechanism

3.8 NGC has made further submissions on: the expenditure needed to accommodate 5 GW of new generation; the correction factor; the use of the deadband; and the method of implementation of the correction mechanism. NGC re-modelled the likely new generation that would constitute the 5 GW base assumption. It concluded that the associated level of expenditure would mean a total LRE of £585 million. NGC says that the appropriate correction factor would be £23 million per GW.

3.9 In the light of responses to the draft proposals, Ofgem has modified the correction mechanism to remove the need for an assumed deadband, with its attendant disadvantages. To implement the mechanism, a correction term will be included within the main price control revenue formula. As this formula provides a year-on-year revenue stream, the correction mechanism would also operate year-on-year. To achieve this, a year-on-year background assumption of new generation connections would be sought from NGC. To ensure transparency and to recognise that expenditure will be made in advance of the actual connection, signed connection and use of system agreements would be used as a means of determining when connections are made against the background assumption. Such a mechanism will address a number of comments made by respondents. It will:

- reduce the effects of uncertainty;
- be transparent;
- operate on a year-on-year basis; and
- remove the sensitivities around the edges of the deadband.

Phasing of expenditure

3.10 NGC considered that the adjustments to the phasing of expenditure, particularly part of the London infrastructure project, should be reversed as NGC has committed itself to this

expenditure. In reviewing capital expenditure at a price control review, Ofgem seeks to ensure expenditure is incurred efficiently to meet statutory and licence conditions. This applies to the timing as well as the magnitude of the expenditure. Ofgem is not convinced that the timing of expenditure suggested by NGC will be necessary for NGC to meet its obligations, and accordingly has not re-phased its projections.

System protection and system monitoring projects

3.11 NGC's forecast for the forthcoming period included two projects, one to protect the system against extreme incidents and one to monitor power quality on the transmission system. The first project is designed to protect the transmission system against highly unlikely incidents beyond those covered by the security standards. Both frequency and voltage incidents would be catered for. Although Ofgem supports the aim of the project, Ofgem considers that the documentation submitted by NGC in support of the project does not provide sufficient justification of the levels of expenditure, nor does it provide evidence that the scheme has been developed to a level where implementation would be possible in the forthcoming control period. However, should NGC be able to deliver this project during the period, Ofgem would expect to include an amount appropriate for efficiently spent capital expenditure in the additions to regulatory value at the time of the next review.

3.12 The second project, which deals with system monitoring, proposes to monitor power quality characteristics on the transmission system. Ofgem considers there is insufficient justification of the costs of the scheme in relation to the benefits. Accordingly Ofgem has not included an allowance for this scheme in its capital expenditure projections.

Non load related expenditure

3.13 The draft proposals noted that a modelling process adopted by Ofgem's engineering consultants, PB Power, provided reasonable correlation with NGC's own forecasts, except for switchgear and overhead lines, where reduced expenditure was indicated. Ofgem agreed with PB power's view that a reduction of 7.5 per cent in the NGC forecast for the asset replacement element of NLRE was appropriate. No representations have been made to Ofgem on this reduction. Ofgem has made an adjustment to this projection since the draft proposals to remove non-operational capital expenditure which has already been allowed within operating expenditure projections.

Total capital expenditure projections

3.14 Ofgem projects that the total capital expenditure requirements in the forthcoming period, based on the assumption of 5 GW of new connection, will be £1,320 million. This assessment includes the adjustments described above. This is shown against NGC's forecasts in the table of LRE and NLRE below (Table 3.1).

Table 3.1 : Comparison of LRE and NLRE in the period 2001/02 to 2005/06 (1999/00 £ million)

	Load Related	Non Load Related	Total
NGC 2001 Forecast	741	799	1,540
Ofgem Projection	585	735	1,320

TO/SO division of responsibilities

3.15 This section discusses the separation of the projected capital expenditure, which has been assessed on a pre-NETA basis. As described in Chapter 3, NGC has provided a separation of its capital expenditure attributable to the SO and the TO. Only about 3 per cent of the total amount forecast is attributable to the SO function. The majority of this relates to the replacement of systems required to manage and operate the transmission system. The remaining expenditure is for replacing computer hardware.

3.16 Ofgem's consultants have reviewed the functional split of the capital expenditure scheme into TO and SO, as proposed by NGC, and the level of the forecast costs. Ofgem broadly agrees with NGC's separation method. The projected SO operational capital expenditure is given as an adjustment in Table 3.2 below.

Impact of NETA

3.17 NGC says that additional capital investment for reducing transmission constraint costs will be needed as a result of the introduction of NETA. It says that while constraint volumes are not forecast to change significantly, the price of constraints could rise. However, NGC also says there is a wide range of uncertainty surrounding these constraint prices. NGC is presently incentivised to reduce the costs of constraints through the transmission services incentive schemes. An allowance for constraint reduction capital expenditure has previously been made as part of these incentives. It therefore seems appropriate for the SO to be incentivised in the same manner. Any capital expenditure required for constraint reduction is considered as part of the SO incentives review.

Projections for capital expenditure in the period of the next price control

3.18 Ofgem has estimated efficient capital expenditure over the next price control period, taking into account the impact of the TO/SO division of responsibilities and NETA. Ofgem has based its calculation of the allowed revenues on those estimates, which are set out in Table 3.2.

Table 3.2: NGC's capital expenditure forecasts and Ofgem proposals 2001/02-2005/06 (£ million)

Source	2001/02	2002/03	2003/04	2004/05	2005/06	Total
NGC BPQ	352	352	327	279	233	1,540
Draft proposals	275	270	254	251	240	1,291[1]
Final proposals (excl. TO/SO, NETA)	305	291	263	236	225	1,320
Effect of TO/SO split (operational) [2]	(15)	(12)	(3)	(2)	(3)	(35)
Effect of NETA	0	0	0	0	0	0
Final proposals (inc. TO/SO, NETA)	290	279	260	233	222	1,284

1. Based on LRE of £535 million. The draft proposals were based on a five-year total of £1,186 million, reflecting £431 million of LRE – see paragraph 3.1 above.
2. Only SO operational capital expenditure is shown. SO non-operational capital expenditure is excluded as part of non-operational expenditure – see paragraph 3.13 above. Total SO capital expenditure is assessed as £42 million.

3.19 Ofgem considers that this proposal allows NGC sufficient revenue to meet its statutory and licence obligations. These include obligations that derive not only from these proposals but also from the wider range of obligations, such as safety and the environment, that NGC has to meet. In accepting these proposals, NGC accepts that it can discharge all its duties in a suitable way and that it will not claim at a later date that insufficient allowances were made.

3.20 As stated in other network operator price control proposals, these proposals are based on the present legislative requirements. NGC may be at risk from changes to present requirements during the period of the control. Ofgem is therefore prepared to give the same undertaking to NGC as was given to the distribution companies at the end of last year's review. If, during or following a public inquiry for which the result is not yet known, or as a result of a change in the law, NGC considers it must undertake unforeseen additional expenditure during the price control period, Ofgem would adjust the price control to allow pass through of those costs which it considered reasonable, subject to consultation at the time.

4. Output measures

4.1 The draft proposals discussed Ofgem's view on providing NGC with incentives for the quality and levels of service it delivers. Two sets of output measures were described which could be used to incentivise the two principal aspects of NGC's transmission business:

- measures related to meeting demand for the use of the transmission system, which fall on the TO; and
- measures related to the operation of the transmission system, which fall on the SO.

4.2 On the TO measures, Ofgem proposed to measure NGC's demand related outputs and to incentivise NGC against its performance in delivering access rights which are part of the new transmission access regime that is developed. For the SO measures, Ofgem considered that it did not seem appropriate for the price control to incentivise NGC as the price control is intended to apply to the TO rather than the SO. SO measures and incentives are being taken forward separately.

Views on the draft proposals

4.3 Ofgem invited views on the draft proposals as follows:

- the appropriateness of measuring NGC's TO business output by reference to the level of access rights to be provided under revised transmission access arrangements; and
- if the new access regime is not in place by 1 April 2001, whether a transitional arrangement involving some form of revenue driver should be adopted or whether Ofgem should wait until the introduction of new transmission access arrangements before introducing output-based incentive arrangements.

4.4 Eight responses were received, including NGC's. Views varied with some respondents agreeing that a capacity measure based on the proposed transmission access regime would be suitable while others had reservations about the proposed regime and the benefits an output measure based on it would bring. However, there was general

agreement that an interim measure, such as a simple MW measure, should not be adopted.

Demand related outputs

4.5 Ofgem remains of the view that NGC's performance in delivering appropriate capability on the transmission system should be the measure against which it is incentivised. The proposed price control will allow NGC to develop the network capability through the period to meet the requirements made of it. Any transmission access regime will need to take account of the present capabilities of the system and the likely changes to the capabilities the price control will bring. At Ofgem's request, NGC has estimated the likely changes to a number of transmission system capabilities, based on the level of capital expenditure set out in the draft proposals. These are:

- the maximum load capability and maximum generation capability of grid exit points and grid entry points respectively;
- the transfer capability across the boundaries defined in NGC's Seven Year Statement; and
- the maximum system demand that could be accommodated.

4.6 NGC's summary of its response to these questions is shown in Appendix 5. This is based on NGC's view of the most likely scenario of new generation to meet Ofgem draft proposals base case assumption that 5 GW of new generation will connect in the next period. Actual developments during the period may differ from the assumptions made by NGC. Ofgem expects NGC to invest efficiently to meet the actual requirements and not to make investments simply to meet projections made at this time. To allow Ofgem to make comparisons of the capabilities resulting from actual developments in the future against present estimates, NGC has also provided a complete set of data similar in form to that given in the Seven Year Statement.

4.7 In developing a new transmission access regime, Ofgem proposes to use the information set out in Appendix 5 (together with the more detailed information provided to Ofgem by NGC) as the basis for determining the level of transmission access rights NGC would be expected to make available.

5. Cost of capital and other financial issues

Introduction

5.1 The initial thoughts and draft proposals documents set out a framework for the analysis and assessment of financial issues as part of NGC's price control review. This chapter estimates the cost of capital for NGC's transmission business and examines matters relating to asset valuation and financial modelling.

The weighted average cost of capital (WACC)

5.2 The level of return that is required by the financial markets is called the cost of capital. The cost of capital is usually calculated as a weighted average of the cost of debt and equity finance. In the draft proposals, Ofgem estimated a range for the real, pre-tax cost of capital for NGC of between 5 ½ and 6 ¼ per cent (see table 5.1). NGC has argued throughout this review that its cost of capital was higher than this: it considers that its cost of capital is at least as high as the PES distribution and Scottish transmission businesses, which all accepted price controls based on a 6.5 per cent cost of capital in 1999.

Table 5.1: Ofgem's estimates for NGC's cost of capital in its draft proposals (June 2000)

Component	Low case	High case
Cost of debt		
Risk-free rate	2.5	2.75
Debt risk premium	1.7	1.7
Cost of debt	4.2	4.45
Cost of equity		
Risk-free rate	2.5	2.75
Equity risk premium	3.5	3.5
Asset beta	0.3	0.4
Equity beta	1.0	1.0
Post-tax cost of equity	6.0	6.25
Taxation adjustment	1.429	1.429
Pre-tax cost of equity	8.6	8.9
WACC		
Gearing	0.7	0.6
Pre-tax WACC	5.5	6.25

5.3 Since the estimation of the cost of capital involves a significant amount of judgement, it is appropriate to consider relevant evidence from as many sources as possible, including other regulators. Since the publication of the draft proposals, the Competition Commission has reported on the references of the price controls of two water only companies, which were published in September 2000[2]. The references were not primarily concerned with the cost of capital.

5.4 As the Commission noted, it is difficult to apply estimates of the cost of capital from one industry to another. Ofgem notes that the Competition Commission has reduced its estimate of the risk-free rate from 3.5-3.8 per cent in the MMC's reports on the Cellnet and Vodafone reference in 1998 to a range of 2.75-3.25 per cent, based on current and recent yields and including an allowance to reflect institutional factors. The Commission's range was nevertheless higher than the range in Ofgem's draft proposals of 2.5-2.75 per cent. The Commission also used an estimate for the equity risk premium of 4.0 per cent, which is higher than Ofgem's estimate of 3.5 per cent, although Ofgem's estimate is within the range of 3.5 to 5.0 per cent used by the MMC in its report on Cellnet and Vodafone and referred to by the Competition Commission. The Commission, like Ofgem, considers that there is uncertainty over the value to be assumed for the inputs necessary to estimate the cost of capital and judgement is required when interpreting relevant evidence.

5.5 In reaching its final view, Ofgem has considered all relevant evidence, including the recent reports from the Commission. Ofgem has examined NGC's financial ratios, and its projections indicate that the ratios are likely to be robust even at higher levels of gearing (see below). Evidence from financial markets available since June 2000 has not suggested that Ofgem should revise the set of assumptions contained in its draft proposals. In particular, current observed yields on index-linked gilts with five or more years to maturity continue to fall below Ofgem's range for the risk-free rate. Ofgem has also noted that NGC plays an important and central role in maintaining the quality and security of electricity supply and that transmission charges are a relatively small element of the final bill for most customers. In the light of these factors the regulatory system provides NGC with a high degree of protection. Taking all these factors into consideration, Ofgem has assumed a cost of capital of 6¼ per cent, at the top of the range it estimated in the draft

[2] Mid-Kent Water plc – a report on the references under sections 12 and 14 of the Water Industry Act 1991, Monopolies and Mergers Commission (2000) and Sutton and East Surrey Water plc – a report on the references under sections 12 and 14 of the Water Industry Act 1991, Monopolies and Mergers Commission (2000)

proposals. The remainder of this section discusses in greater detail Ofgem's method for estimating NGC's cost of capital.

Gearing

5.6 Companies can be financed by both debt and equity. The proportion of debt to debt plus equity is referred to as gearing. In calculating a WACC it is necessary to make an assumption about gearing. Gearing also influences the cost of both debt and equity finance. The initial thoughts and draft proposals documents explained that it would be appropriate to assume that NGC has reasonably efficient levels of gearing to encourage financial efficiency and protect the interests of customers.

5.7 Specialist credit rating agencies assign rating grades to individual debt issues by assessing the degree of credit risk. These ratings are reviewed on a regular basis. Those rating categories that represent the lowest risk are classified as investment grade, indicating suitability for a wide range of investors. Ratings representing higher risk are classified as speculative, indicating suitability only for limited types of investor. In consequence, there is a marked difference in the ease of access to, and cost of, debt finance for speculative grade issuers.

5.8 The draft proposals document suggested that a level of gearing of between 60 and 70 per cent would be consistent with NGC maintaining a reasonably efficient capital structure and an investment grade credit rating for its debt. Nevertheless, this approach was designed to encourage financial efficiency rather than prescribe any particular capital structure. Provided NGC complies with the licence obligations in the proposed ring-fence to maintain an issuer investment grade credit rating, it is free to arrange its finances to target whatever level of gearing it deems appropriate. Therefore, it is not necessarily of concern if NGC deviates from this level of gearing. NGC did not suggest that a 60 to 70 per cent level of gearing is unsustainable, though it argued that such a level of gearing would reduce its credit rating to the minimum investment grade and result in a higher cost of both debt and equity. In response to the draft proposals document, NGC made no new substantive points regarding the level of gearing. Based on current conditions in the financial markets, on the responses to the consultation, on public statements by rating agencies, and on its analysis of NGC's financial ratios, Ofgem considers that it will be appropriate to assume a range of 60 to 70 per cent for the level of gearing in calculating

the cost of capital. Ofgem considers that this would be consistent with a credit rating well above the minimum level for investment grade.

The cost of debt finance

5.9 The cost of debt finance can be thought of as having two components, a risk-free component and a company specific risk premium.

Risk-free rate

5.10 Although the risk-free rate is not directly observable, it is possible to derive an estimate from the return available on UK Government index-linked and conventional gilts. The draft proposals contained a range of 2.5 to 2.75 per cent for the risk-free rate, based on the yields on index-linked gilts (ILGs) over the past three years. Respondents to the draft proposals document broadly supported this approach, though some argued that a number of institutional factors have depressed the yield on ILGs. For example, it has been suggested that the Government's minimum funding requirements for pension funds have created an artificially high level of demand for ILGs at a time when the government has been making relatively few debt issues due to its current budget surpluses. Other factors may include a reduction in the premium for unanticipated inflation reflecting a widespread expectation that government economic policies in the western world will continue to place priority on monitoring levels of inflation. Ofgem noted in its draft proposals that such effects appear to be small, and are difficult to estimate with any degree of precision, since this would involve estimating the market's expectations for inflation twenty years ahead. Nevertheless, Ofgem's range of 2.5 to 2.75 per cent was above observed yields on index-linked gilts of five or more years' maturity, thereby including some allowance for this effect.

5.11 This approach is consistent with recent regulatory practice, for example ORR's December 1999 determination of Railtrack's track access charges, confirmed in July 2000, Ofgem's 1999 review of the PES distribution businesses and Ofwat's December 1999 proposals in its periodic review. Some respondents suggested using longer-term averages to estimate the risk-free rate, consistent with longer term averages of returns on ILGs. NGC has argued for a greater focus on longer-term averages. Ofgem considers that the longer the present relatively low yields on index-linked and conventional gilts persist the more persuasive becomes the argument that these lower yields are not simply a feature of short term market conditions. Using a five year average places undue weight on yields at a

time when these were higher than at present, and would be inconsistent with recent regulatory practice.

5.12 At present, yields on ILGs with five or more years to maturity are in the range 1.8 to 2.7 per cent, with an average of 2.1 per cent. The averages of such bonds over the past year and two years are also 2.1 per cent. The average over the past three years is 2.4 per cent. As indicated above, Ofgem considers a range of 2.5-2.75 per cent an appropriate estimate for the risk-free rate.

Debt risk premium

5.13 The debt risk premium reflects the additional return required by the providers of debt finance to hold corporate rather than Government debt and can be estimated as a premium over the real risk-free rate. It will depend on a number of company specific factors including the company's level of gearing and its overall financial position, the size and liquidity of the debt issue and its maturity, and wider economic factors. These matters are assessed by credit rating agencies. Ofgem's final proposals estimate the average premium on NGC's debt at around 170 basis points, or 1.7 percentage points.

5.14 Combining these estimates suggests a real cost of debt finance of 4.2 to 4.45 per cent, consistent with the calculations set out in the draft proposals and with NGC's estimate of its real cost of new debt finance of 4.4 per cent at 60 per cent gearing.

The cost of equity finance

5.15 The initial thoughts and draft proposals documents set out estimates for the cost of equity finance based on the capital asset pricing model (CAPM) and the dividend growth model (DGM). CAPM provides a framework to estimate the return required by financial markets for investing in a particular company given its risk. It derives an estimate for the cost of equity finance by adding an estimate of the real risk-free rate to an estimate of the appropriate equity risk premium (ERP). Estimating the real risk-free rate is discussed in the section on the cost of debt finance.

Equity risk premium

5.16 In estimating the appropriate ERP two factors are taken into consideration, the ERP for the market as a whole and the riskiness of the company relative to the market. The appropriate method of estimating the ERP for the market as a whole has been the subject

of considerable debate. This has mainly focused on whether the ERP should be based on observing historic returns, surveying investors' expectations or combining estimates of dividend yields and of real dividend growth.

5.17 The draft proposals quoted various estimates for the ERP based on the present expectations of City institutions and investors. This evidence suggests a range for the ERP of between 2 and 5 per cent with an average value of 3.5 per cent. Some respondents have continued to suggest an ERP of between 3.5 per cent and 5 per cent, consistent with estimates used by the MMC in its 1998 report on Cellnet and Vodafone. As investment decisions are made on the basis of expectations of the future it seems appropriate to focus attention on present market evidence rather than averages of historic returns. This approach also avoids the practical difficulties associated with judging the period and method for calculating historic averages of returns. The ERP of 3.5 per cent used in Ofgem's draft proposals compares to an estimate of 4.0 per cent used by the Competition Commission in its two recent reports on water only companies. However, as argued above, it is consistent with the range of 3.5 to 5.0 per cent used in previous MMC reports and referred to in the two recent Competition Commission reports. The Commission also notes that the longer that equity valuations remain high, the more confidence it is possible to have that the ERP is lower than the historical average, and, accordingly, Ofgem considers that its estimate should be at the low end of the Commission's implied range. Accordingly, Ofgem's final proposals are based on an equity risk premium of 3.5 per cent.

Equity beta

5.18 The beta coefficient aims to provide an indication of the specific riskiness of a company relative to the market. The coefficient has been used to predict the extent to which a company's share price would tend to change in response to changes in the level of the overall market and to measure a company's non-diversifiable risk relative to equities generally. The draft proposals used an assumption of 1.0 for the NGC's equity beta (i.e. giving it an equity risk comparable to the market as a whole), consistent with the beta adopted for the PES distribution businesses in their price control reviews last year.

5.19 Some respondents to the draft proposals said that 60 to 70 per cent gearing might lead to equity beta values for NGC's transmission business of greater than 1. This would imply that there is more risk associated with a transmission business that is able to retain

investment grade status for debt than for a typical investment in equities. This seems unlikely, given the stable nature of electricity demand, the supportive regulatory framework and the monopoly nature of the business. Ofgem considers that an estimate of 1.0 for equity beta therefore remains valid. It may be argued, indeed, that this is relatively generous, given the LBS estimate of NGG's equity beta of 0.56, and the recent declines in the equity betas of many "old economy" companies.

Dividend growth model

5.20 In its submission in response to the initial thoughts consultation document, NGC argued that CAPM does not provide a credible estimate for the cost of equity. It argued that many "old economy" companies (i.e. those not in the media, IT or telecoms sectors) were finding it more and more difficult to raise equity, implying a higher cost of equity. However, the betas for many "old economy" stocks had declined significantly since 1997, implying a low cost of equity. On the basis of this dichotomy, NGC submitted that it would be inappropriate for Ofgem to apply CAPM to determine its cost of equity. As it considered that methods such as the Arbitrage Pricing Theory (APT) are not widely used or understood in the UK, it recommended the use of the DGM. In its draft proposals document, Ofgem proposed to investigate further the implications of analysis based on the DGM.

5.21 According to the DGM, the value of a share is assumed to be the discounted sum to infinity of all future dividends. From this, it can be shown that the post-tax cost of equity will be equal to the sum of the dividend yield and a growth assumption. As neither of these is directly observable for NGC's UK electricity business, it is necessary to find proxies in order to apply the DGM to NGC. In response to the initial thoughts consultation document, NGC argued that, based on its application of the DGM (submitted to Ofgem in a study by OXERA), its post-tax cost of equity should be 9-10 per cent. OXERA had used a sample of "old economy" companies to calculate the dividend yield and IBES 3-year forecasts to calculate the growth assumption. However, Ofgem argued that:

- OXERA's sample of "old economy" companies was unrepresentative and therefore unsuitable for the estimation of an appropriate return on equity for NGC; and

- instead of using only 3-year forecasts to calculate the assumption of dividend growth in perpetuity, a long-run growth assumption should be used beyond the period of the forecasts.

5.22 Ofgem stated that it would examine the application of the DGM by City analysts and fund managers and by regulators abroad. Ofgem has concluded that:

- CAPM appears to be more widely used in the City than the DGM;
- worldwide, CAPM seems to be used more widely by regulators than the DGM although the DGM is used by many American regulators;
- most American regulators who use DGM, including the Federal Energy Regulatory Commission (FERC), use a two-stage model to determine the return on equity. FERC uses a combination of IBES forecasts for the short term assumption and economic growth forecasts for the long-term;
- Ofgem's discussions with equity analysts and fund managers indicate that a two-stage DGM is used most widely in the City; and
- the lack of a consensus on the proxies which should be used for the growth and dividend yield assumptions, and the range of estimates which can be derived, undermine the usefulness of the DGM.

5.23 The Competition Commission, in its recent report on two water only companies, did not use the DGM, stating that the DGM required assumptions on future dividends, which themselves were likely to be dependent on the price control set. The Commission felt that this circularity undermined the usefulness of the DGM for estimating the cost of capital to be used in setting the price controls of regulated companies. Ofgem considers that it is appropriate to examine all available evidence in assessing a cost of capital, and accordingly Ofgem has estimated NGC's cost of equity using a number of different proxies for the dividend yield and growth rate (see Appendix 4). This is not intended to be a definitive list of such proxies: it is merely intended to show the lack of consensus on which proxies should be used, and the large divergence in estimates for the cost of equity which result. The average post-tax cost of equity given by the 22 scenarios considered is 5.7 per cent, or 6.1 per cent if scenarios with negative growth rates are ignored. The results from the scenarios in which a two-stage DGM is used are more concentrated than

the scenarios in which a one-stage DGM is used. They range from 4.7 per cent to 6.8 per cent, with an average of 5.7 per cent, slightly below that derived from Ofgem's use of CAPM (see table 5.1 above). None of this analysis suggests that Ofgem's range of 6.0 to 6.25 per cent for the post-tax cost of equity is inappropriate.

Valuation of assets

5.24 Throughout this price control review, there has been support for retaining the methodology used to calculate NGC's regulatory value. At the last transmission price control review the capital invested in NGC's transmission business was considered in two parts, the initial capital at flotation and investment made since then. As noted in Chapter 1, NGC's post-Vesting connections are remunerated outside the RPI-X control. While some respondents favoured reducing NGC's regulatory value to take account of the gains which shareholders have made from NGC's investment in Energis, Ofgem considered that this was inappropriate and also likely to increase investors' perceptions of regulatory risk which might in turn lead to a higher cost of equity. Accordingly, it made no adjustment to NGC's regulatory value to take account of this.

5.25 In the draft proposals Ofgem published an opening regulatory value of £4,456 million for 2001/02. NGC made a number of comments on the valuation of additions during previous years. Ofgem has taken account of these comments and adjusted the opening value in 2001/02 to £4,590 million. The table below explains the calculation of the opening asset value.

Table 5.2 NGC's regulatory value since Vesting (£m)

	90/91	91/92	92/93	93/94	94/95	95/96
Opening value(Real)	4,243.7	4,323.9	4,466.7	4,665.6	4,734.3	4,687.8
FCM depreciation (Real)	-212.2	-219.5	-228.6	-239.2	-246.9	-251.9
Capex (Real)	292.4	362.2	427.5	307.9	200.5	202.7
Closing value (Real)	4,323.9	4466.7	4,665.6	4,734.3	4,687.8	4,638.6
Average RAV	4,283.8	4,395.3	4,566.1	4,699.9	4,711.1	4,663.2

	96/97	97/98	98/99	99/00	00/01
Opening value(Real)	4,638.6	4,577.9	4,489.7	4,524.4	4,518.1
FCM depreciation (Real)	-257.0	-261.9	-266.3	-273.8	-280.5
Capex (Real)	196.3	173.7	301.0	267.5	352.6
Closing value (Real)	4,577.9	4,489.7	4,524.4	4,518.1	4,590.2
Average RAV	4,608.3	4,533.8	4,507.0	4,521.2	4,554.1

5.26 Since the price control will apply to NGC's TO business only, it is necessary to remove from the regulatory value the value of assets from the SO business. NGC has provided a breakdown of the items which it considers should be allocated to the SO:

- **land and buildings**: this category principally comprises the control centre at Wokingham;
- **plant and equipment**: the largest item in this category is the energy management system (NGC's key operational system for real-time control), monitoring facilities and the provision of data into the commercial systems. Also included is the communications switched infrastructure;
- **assets under construction**: this covers the replacement of the energy management system and "Global" which includes fire protection equipment; and
- **portable and freestanding**: the three components in this category are computing equipment, engineering equipment and facilities equipment.

5.27 It has not been possible to specify the exact regulatory value of the SO assets. This is because many of the assets are small in size, and their age for the purpose of regulatory depreciation is not easily available. NGC has suggested the use of current cost net book value as a proxy for the regulatory asset value. Ofgem considers that this may be inappropriate. Ofgem prefers to determine the proportion of the regulatory value relating to the SO assets by reference to the proportion of the net book value of the SO assets to the net book value of the assets of the transmission business as a whole. The total regulatory value of assets to be removed from the overall transmission business regulatory value (in order to arrive at the regulatory value for the TO only) is £73.3 million.

5.28 Ofgem has made no adjustment to the asset lives of the TO business (20 years for pre-Vesting assets and 40 years for post-Vesting assets), as it considers that such lives should not be revisited, since they are an approximation and an incentive to NGC to extend asset lives where appropriate. This has increased the depreciation charge for the TO and SO combined in the first year of the next control by £2 million compared to the depreciation charge for NGC's transmission business as a whole. However, over the life of the assets, there will be no adverse impact on consumers, as the cost of the assets will be depreciated over fewer years. The value of NGC's regulatory asset base between the last

financial year and the end of the next price control period, taking into account the impact of the division of responsibilities between the TO and SO, is set out in table 5.3.

Table 5.3a: Regulatory value of NGC's transmission business (£m)

	99/00	00/01	'01/02	02/03	03/04	04/05	05/06
Opening regulatory value	4,524.4	4,518.1	4,590.2	4,606.1	4,600.6	4,559.3	4,484.0
Depreciation	-273.8	-280.5	-289.3	-296.9	-304.2	-310.8	-316.7
Capital expenditure	267.5	352.6	305.2	291.4	262.9	235.5	224.6
Closing regulatory value	4,524.4	4,590.2	4,606.1	4,600.6	4,559.3	4,484.0	4,391.9

Table 5.3b Regulatory value of the transmission asset owner (£m)

	99/00	00/01	'01/02	02/03	03/04	04/05	05/06
Opening regulatory value	4,524.4	4,518.1	4,516.9	4,522.2	4,509.4	4,470.1	4,397.9
Depreciation	(273.8)	(280.5)	(284.9)	(292.2)	(299.2)	(305.7)	(311.5)
Capital expenditure	267.5	352.6	290.2	279.4	259.9	233.5	221.6
Closing regulatory value	4,518.1	4,590.2	4,522.2	4,509.4	4,470.1	4,397.9	4,308.1

Financial modelling

5.29 Chapter 7 sets out proposals for a set of licence conditions to implement a regulatory ring-fence around the transmission business. These conditions will include a requirement that NGC maintain an investment grade credit rating. In assessing the impact of these price control proposals on the overall financial position of NGC, Ofgem has focused on assessing whether they will be consistent with NGC maintaining such a rating.

5.30 In general, transmission and distribution businesses have strong business profiles, reflecting limited business risk. They are therefore able to sustain lower interest coverage and higher gearing, compared to businesses that operate in a more competitive environment with greater cash flow volatility. Ofgem's consultations support the view that if, throughout the period of the revised price control, NGC remains above the minimum interest coverage and below the maximum gearing indicators set out in Table 5.4 it would be expected to sustain a solid investment grade rating.

Table 5.4: Ofgem's financial indicators

Indicator	Level
EBIT interest coverage	Min 1.5 x
EBITDA interest coverage	Min 2.25 x
FFO interest coverage	Min 2 x
FFO to total debt	Min 12%
Gearing (D/D + E)	Max 65%

5.31 Ofgem has therefore had regard to the level and trends of the financial indicators in Table 5.4. In its financial modelling of NGC, Ofgem has looked at a variety of scenarios, using actual data, forecasts provided by NGC and data consistent with the assumptions underlying this price control review. Ofgem has had to make assumptions about the dividends which NGC would pay were it a quoted company. Ofgem has assumed that dividends were equal to 35 per cent of the average regulatory value (i.e. that part of the regulatory value not funded by debt), multiplied by the post-tax cost of equity less NGC's electricity demand growth assumption of 0.5 per cent per annum.

5.32 NGC's present financial structure is not consistent with the assumptions about efficient financing set out in this document. In order to reconcile this assumption to the forecast balance sheets of NGC at 31 March 2001, a stylised adjustment has been made to change the amount of debt in issue at that time.

5.33 Table 5.5 sets out the ratios for 2005/06, the last year of the proposed control, based on the final proposals set out in this document. Ofgem has also examined the position beyond 2006. Overall, these results appear to be comfortably within the limits shown in Table 5.4 and indicate that NGC should be able to maintain a credit rating significantly above investment grade.

5.34 Ofgem is required by Section 3 of the Electricity Act 1989 to exercise its functions in a way that is best calculated to secure that licence holders such as NGC are able to finance the carrying on of their authorised activities. Given the strength of these financial ratios it could be argued that it would be possible for Ofgem to propose more significant reductions in revenue during the next price control period while still fulfilling its duties under Section 3 of the Electricity Act. However, Ofgem considers that it is also beneficial to achieve a high degree of consistency between regulatory reviews, since this could reduce perceptions of regulatory risk that may increase the cost of capital for regulated companies. Ofgem has therefore decided that it is appropriate to set price controls based on the net present value approach described in the draft proposals document which has been used by Ofgem, its predecessors, the Competition Commission and other regulators during previous price control reviews of NGC and other companies.

Table 5.5: Ofgem's projections of NGC's financial ratios

Indicator	2005/06	Av. ½-05/06	Av. 06/07-09/10	Ofgem level
EBITDA Interest coverage (operating profit + depreciation) / interest	4.0	4.0	4.1	Min 2.25
EBIT Interest coverage (Earnings before interest and tax PBIT)/Interest	2.8	2.9	2.8	Min 1.5
FFO interest coverage (FFO + Interest)/Interest	3.4	3.4	3.6	Min 2
FFO/TO total debt (FFO / Net debt)	16.9%	15.5%	18.4%	Min 12%
Gearing Net debt /(Net debt + Equity shareholders funds)*	60.0%	60.0%	60.0%	Max 65%

(net debt + equity shareholders funds) is assumed to be equal to the regulatory value.
FFO is funds from operations

6. Price control calculations

Introduction

6.1 It is important to be transparent about the way in which price controls are calculated. This Chapter explains how Ofgem has derived the final proposals for NGC's transmission business over the next five years, incorporating the analysis set out earlier in this document. Setting RPI-X price controls requires an estimate of the revenue that would be sufficient to finance an efficient business. The principles governing the calculation of the controls are set out in Chapter 1, while commentary on individual cost components can be found in Chapter 2 (operating costs), Chapter 3 (capital expenditure) and Chapter 5 (financial issues). Consistent with the principles set out in the draft proposals document, it will be important to balance incentives for cost reduction with those for quality of performance.

6.2 This Chapter explains how Ofgem has derived the transmission business price control proposals for NGC over the next five years, incorporating the analysis set out earlier in this paper. Over time, transmission prices may be considered the sum of:

- the allowed operating costs;
- an allowance for the depreciation of the regulatory asset base; and
- a return on the appropriate regulatory asset base.

6.3 The focus of this Chapter is the determination of the total revenue requirement for NGC over the next review period. There is then the question of how to sculpt that revenue over that period, thus generating annual price reductions. The price level in the first year of the next price control period is referred to as P_0. The subsequent annual reduction in prices is referred to as X. The balance between P_0 and X is considered below.

Deriving a range for the price controls

6.4 Ofgem has derived forecasts for:

- efficient operating expenditure;
- efficient capital expenditure;

- hence a path of regulatory asset values; and
- the cost of capital to use as the appropriate return.

These can been combined to form ranges for the path of prices over the next five years for NGC. The resulting revenue for the next price control period is set out in Appendix 6.

Operating expenditure

6.5 Based on the methodology outlined in Chapter 2, Ofgem has estimated NGC's controllable operating expenditure as £1,020 million over five years. Based on NGC's BPQ submission and other information, Ofgem has estimated other operating costs (including business rates and the transmission licence fee) of around £100 million per year over the next price control period. Ofgem proposes that any variation between the outturn levels of licence fees and business rates and Ofgem's estimates should be a cost pass-through item (see Chapter 2 above). It is proposed that this should operate symmetrically, so that revenues would be reduced should the outturns be below Ofgem's assumptions. See Appendix 1 for further details of the pass-through mechanism.

Capital expenditure

6.6 In respect of capital expenditure, a base projection of £1,320 million over five years has been made as explained in Chapter 3. Ofgem believes this to be achievable by NGC using the best techniques presently available, without detriment to short or medium term system performance. It is based on new generation connections of 5 GW over the price control period. As explained in Chapter 3, Ofgem proposes that revenues may be increased or reduced to reflect allowed additional capital expenditure of £23 million for each GW of new generation connections over or under the 5 GW predicted by Ofgem.

Regulatory value

6.7 As explained in Chapter 5, Ofgem has calculated an opening regulatory value at 1 April 2001 of £4,590 million. Taking account of predicted capital expenditure of £1,320 million and depreciation profiles described in Chapter 5, this falls to £4,392 million at the end of 2005/06.

Cost of capital

6.8 In respect of the cost of capital, Ofgem has assumed a pre-tax real weighted average cost of capital of 6¼ per cent, consistent with the discussion set out in Chapter 5.

Allocating P_0 and X

6.9 NGC has argued that the X factor of 3 per cent contained in the draft proposals (which was the same as that accepted by the PES distribution businesses in the price control review in 1999) did not take into account the smaller proportion of NGC's costs which are deemed controllable relative to its price controlled income. According to NGC, an X of 3 per cent for operating costs as a whole translates into required efficiency gains of 12 per cent per annum for controllable operating costs. NGC considers that if an X of 3 per cent applies to distribution business, consistent treatment would imply an X of 1.3 per cent for NGC.

6.10 Ofgem has taken account of the arguments as well as the desirability of avoiding any sharp peaks or troughs in the profile of NGC's revenues. Taking these factors into consideration, it seems reasonable to set an X of 1.5 per cent.

Other factors affecting calculation of P_0 and X

6.11 In order to illustrate the impact of these proposals, it is useful to calculate the initial reduction in revenues: the P_0 cut. To do this, it is necessary to reconcile the new path of revenues with the 2000/01 revenues arising out of the existing price control. Ofgem's draft proposals presented P_0 adjustments relative to revenues of £856 million in 2000/01 (consistent with revenues in 1999/00 of £870 million adjusted by RPI-4). NGC has argued that it is more appropriate to compare proposed allowed revenues for 2001/02 with the maximum allowed revenues for 2000/01 implied by its licence condition 4A, ignoring the impact of previous over- or under-recoveries. The numbers below are presented on this basis.

Impact of NETA and the SO/TO division of responsibilities

6.12 The impact of NETA is forecast to be to increase the TO's operating costs over the period of the price control by £2.8 million. This is equivalent to a reduction in the P_0 cut of less than 0.1 per cent. The impact of the SO/TO division of responsibilities will be to reduce the costs of the TO by around £40 million per annum. This is equivalent to an increase

in the P_0 cut of 5 per cent. However, these costs are included in the calculation of a separate SO price control, on which Ofgem is publishing initial proposals today. This adjustment therefore involves no net reduction in NGC's revenues.

The final proposals for the transmission business

6.13 On the basis of all the information available to Ofgem, and taking into account the considerations described above, Ofgem has framed its final proposals on the basis that NGC will have an X of 1.5 per cent for each of the years 2002/03 to 2005/06. Ofgem proposes that revenues in 2001/02 should be £758 million, taking account of the removal of SO-related costs and the impact of NETA. Excluding these adjustments, revenues would be £800 million, equivalent to a P_0 cut of 0 per cent between the 2000/01 allowed revenues of £800 million and the 2001/02 allowed revenues. The calculation of these proposals is set out in Appendix 6.

7. Ring-fencing

Introduction

7.1 In its draft proposals, Ofgem indicated its intention to propose modifications to NGC's Transmission Licence so as to introduce financial ring-fencing conditions. Chapter 7 of the draft proposals set out the principles which the proposed modifications would embody, and discussed certain potential areas of difficulty in applying them. It indicated that it would be necessary to consider whether transitional reliefs should be granted in respect of certain pre-existing arrangements to which NGC is party.

7.2 Respondents to the draft proposals expressed support for Ofgem's policy to standardise financial ring-fencing conditions across all monopoly gas and electricity network licensees. There was general agreement that it was appropriate to introduce such conditions into NGC's Transmission licence. Those PESs who responded to the consultation repeated or referred to the views they had expressed in response to Ofgem's earlier consultation on the standard conditions of electricity distribution licences to be issued under the Utilities Act 2000. In particular, concerns were expressed in relation to certain elements of the proposed conditions that differ from those now applying to PESs and BG Transco. Ofgem has already responded to these concerns in its decision document published in April 2000 and continues to hold discussions with the industry's expert group on the practical aspects of implementation. DTI has asked Ofgem to consult further on the standard licence conditions to be implemented under the Utilities Act. This consultation is expected to take place in October.

7.3 NGC supported the intention underlying Ofgem's proposals. It noted that the proposed conditions have already been extensively consulted on in the context of electricity distribution licences, and considered there was no obvious reason to require additional safeguards in relation to transmission customers. In relation to transitional issues, NGC argued that Ofgem would need to strike the appropriate balance between securing benefits to customers and avoiding excessive costs from altering existing arrangements.

7.4 In the light of these responses, and for the reasons set out in the draft proposals, Ofgem will seek NGC's agreement to licence modifications to give effect to the financial ring-fencing conditions on the basis outlined in the draft proposals. It is intended that the new conditions should take effect on and from 1 April 2000. The relevant conditions will be

closely modelled on the corresponding draft standard electricity distribution licence conditions published in Ofgem's April 2000 decision document which will be subject to further consultation in October.

7.5 In the draft proposals document, Ofgem indicated that it was in discussion with NGC regarding a number of existing arrangements affecting NGC that would not comply with the proposed ring-fence requirements. In particular, NGC carries on certain activities, including the provision of project management and network services to other electricity utility and telecommunications operators in the UK and elsewhere, and the provision of lease finance to Energis for the major part of its optical fibre network, which, in aggregate, might exceed the limits proposed for *de minimis* activities. Moreover, NGC is party to certain agreements governing indebtedness and banking arrangements, the terms of which would infringe the prohibition on cross-default provisions. It also has made and received outstanding loans to and from affiliates on terms that may not comply with the proposed licence requirement that such loans be on an arm's length basis and normal commercial terms, or the requirement that an affiliate to whom NGC makes such a loan must have, or its obligations must be guaranteed by a person having, an investment grade credit rating.

7.6 NGC has indicated to Ofgem that it considers that the fact that the company provides project management and network services to other electrical utility operators is beneficial to the customers of its transmission business. The conduct of these activities enables the company to keep at its disposal greater resources of the kind required to maintain, repair and reinforce its own network infrastructure, at no incremental cost. This provides an additional safeguard of system security, facilitating a more rapid response to widespread system failure, in a cost efficient manner. Ofgem considers that this argument may have some merit. Accordingly, revenues arising from these activities, although excluded for price control purposes, will not be taken into account in calculating compliance with the *de minimis* thresholds.

7.7 These considerations do not apply to NGC's activities in the provision of similar services to Energis and other telecommunications network operators. Accordingly, it would be appropriate that revenues from and investments in such activities be taken into account for these purposes. NGC has indicated that it intends to transfer these activities to an affiliate of the company in which it has no investment. NGC will, however, initially

continue to provide certain manpower services to that affiliate, to which attributable costs will be recharged.

7.8 NGC's investment in fibre-optic cable leased to Energis, and the revenues deriving from the related lease payments, would similarly fall to be taken into account under the *de minimis* limits. As a result, NGC may be unable to comply with these limits. Ofgem is satisfied that it would not be practicable to restructure these arrangements in a cost-effective manner. Accordingly, Ofgem has indicated to NGC that it will require NGC to obtain a full and effective counter-indemnity in respect of Energis's obligations under the lease arrangements from an affiliate having, and agreeing at all relevant times to maintain, an investment grade credit rating. On this basis, the investment in, and revenues deriving from, the leased fibre would not need to be taken into account in assessing compliance with the *de minimis* limits.

7.9 Ofgem has indicated to NGC that it expects the company to take such steps as it considers appropriate to bring existing financing arrangements, including intra-group loans and pooled bank accounts, into compliance with the proposed new licence conditions. Ofgem considers this to be important in order to safeguard the financial resources of NGC, and to prevent inappropriate cross-subsidy.

7.10 Ofgem will give further consideration, however, to one particular area of potential non-compliance, relating to a cross-default obligation arising under an agreement between NGC and the European Investment Bank. It would appear that a number of PESs are parties to similar agreements which might cause difficulties for them in achieving compliance with the equivalent prohibition in electricity distribution licences. Loans provided by the European Investment Bank represent a cost-effective source of finance for operators of infrastructure assets. It is desirable to ensure that this source of finance remains available to energy network operators. However, the structure under which such loans have historically been made available would prevent compliance with the cross-default provisions of the financial ring-fence. Ofgem considers that it would be difficult to grant derogations in order to prevent such breaches, as the existence of any cross-default obligation referable to an affiliate outside the ring-fence exposes the ring-fenced activities to the risk of failure elsewhere in the group. This would undermine a principal purpose of the ring-fence. Accordingly, Ofgem intends to explore whether alternative structures, perhaps coupled with a more flexible lending policy, might obviate these difficulties.

7.11 The financial ring-fence conditions set out in Chapter 7 of the draft proposals are necessary in order to ensure that NGC will be able to continue to finance its licensed activities. Ofgem will therefore propose licence modifications in order to include these conditions in NGC's licence. However, Ofgem recognises that there are circumstances where these conditions could prevent NGC from carrying on activities, or structure its operations, in a way which, on balance, is beneficial to customers. Ofgem has therefore discussed with NGC how to avoid such effects while at the same time providing safeguards to ensure that it will be able to continue to finance its licensed activities. Having taken account of these considerations, Ofgem is proposing to grant derogations from the ring-fence conditions in the areas described in this Chapter.

Appendix 1 Form of licence amendments

Introduction

1.1 The new licence condition will be based on the existing NGC licence condition 4A Part 1. At present the formula is:

$$Mdt = [1 + (RPI_t - X_g)/100] * P_{t-1} - D_t - K_t.$$

1.2 There will be two additional components, U_t and A_t, defined below, which will be incorporated so that the new formula will be:

$$Mdt = [1 + (RPI_t - X_g)/100] * P_{t-1} - D_t + A_t - K_t. + U_t$$

1.3 Changes to the three principal components, and the definition of the new components, are set out below.

Formula for P_t

1.4 P_{t-1} will have a fixed value for 2001/02 equal to the value of transmission network revenue in 2000/01. For the period of the next price control, it shall be calculated according to the following formula:

$$P_{t-1} = P_{t-2} * [1 + 0.01 * (RPI_{t-1} - X_g)]$$

1.5 X_g will be set equal to 1.5.

Formula for D_t

1.6 D_t is a correction factor applied to transmission network revenue, and is equal to the value of user maintenance in relevant year t.

Formula for K_t

1.7 K_t will roll over in to the new control and will continue to be calculated as now.

Formula for G_t

1.8 A_t will be calculated according to the following formula:

$$G_t = G_{t-1} + [At * GW_{t-1}]$$

Where:

G_t is the new connections revenue adjustment in year t

A_t is defined in the following formula

$$A_t = ce_t * [R_t + Dep_t]$$

R_t is NGC's cost of capital (6.25 per cent)

Dep_t is NGC's cost of depreciation (2.5 per cent)

$GWout_{t+1}$ is the outturn level of new generator connections in year t+1 defined as the station capacity in GW with Commissioning Programme Commencement Dates within year t+1 on 1 January in year t-1

$GWfor_{t+1}$ is the forecast level of new generator connections commissioning in year t+1 defined as the station capacity in GW in accordance with the forecast below:

Year (t+1)	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**
Gwfor	0.6	1.1	1.7	1.1	0.5

Formula of U_t

1.9 U_t will be calculated according to the following formula:

$$U_t = Rate_{t-1} + L_{t-1}$$

Where:

$Rate_t$ is the difference between the actual level of business rates incurred by NGC in year t-1 and Ofgem's assumptions, set out below (£m, in outturn prices):

Year	**2001/02**	**2002/03**	**2003/04**	**2004/05**	**2005/06**
$Rate_t$	100.2	99.4	96.5	98.3	102.7

L_t is the difference between the actual level of NGC's licence fee incurred by NGC in year t-1 and Ofgem's assumptions, set out below (£m, in outturn prices):

Year	**2001/02**	**2002/03**	**2003/04**	**2004/05**	**2005/06**
L_t	7.6	7.8	8.0	8.1	8.3

Appendix 2 Summary of responses to draft proposals document

Respondent	Subject	Comment
Respondent 7	Benchmarking	Benchmarking of overall operating expenditure (with PESs, Scottish transmission) most appropriate way of determining efficient costs.
Respondent 2	Capital expenditure	Supports PB Power view that low number of connections likely.
Respondent 4	Capital expenditure	Support correction mechanism.
Respondent 5	Capital expenditure	More appropriate to exclude connections expenditure. Treatment of quality of supply needs further consideration. Statutory output measures should not be used, as breaches are rare: operating limits instead should be used.
Respondent 6	Capital expenditure	Prefer an annual deadband mechanism, rather than over the price control period.
Respondent 7	Capital expenditure	Defence and security a defensible investment and appropriate expenditure should be allowed
Respondent 8	Capital expenditure	Welcome correction mechanism. Should be referred to DTI/Ofgem embedded generation working group.
Respondent 10	Capital expenditure	Appropriate to take central forecast of capital expenditure to balance risks of over- and underspend.
Respondent 11	Capital expenditure	Correction mechanism should be adjusted
Respondent 12	Central cost allocation	Time-based allocation better than "four metrics"
Respondent 5	Cost of capital	Almost one third of NGC's revenues derive from assets covered by connection agreements, reducing the risks associated with NGC's investments in these assets.
Respondent 7	Cost of capital	NGC's business risks same as or higher than Scottish transmission. Gearing inconsistent with PESs and Scottish transmission. MSDW say that gearing should be consistent. Many commentators question sustainability of low ILG yields. Cost of equity should not be calculated using CAPM: DGM should be used.
Respondent 10	Cost of capital	Ofgem not justified in assuming lower cost of capital for NGC than for PESs and Scottish transmission. Long term averages for risk-free rate should be considered. Decline in betas could reflect volatility of new economy companies. Optimal gearing is lower than 70%.
Respondent 11	Cost of capital	Risk-free rate should focus on longer term averages and possible market imperfections. Ofgem should take into account Competition Commission findings on Mid-Kent Water. Corporate bond spreads have widened.

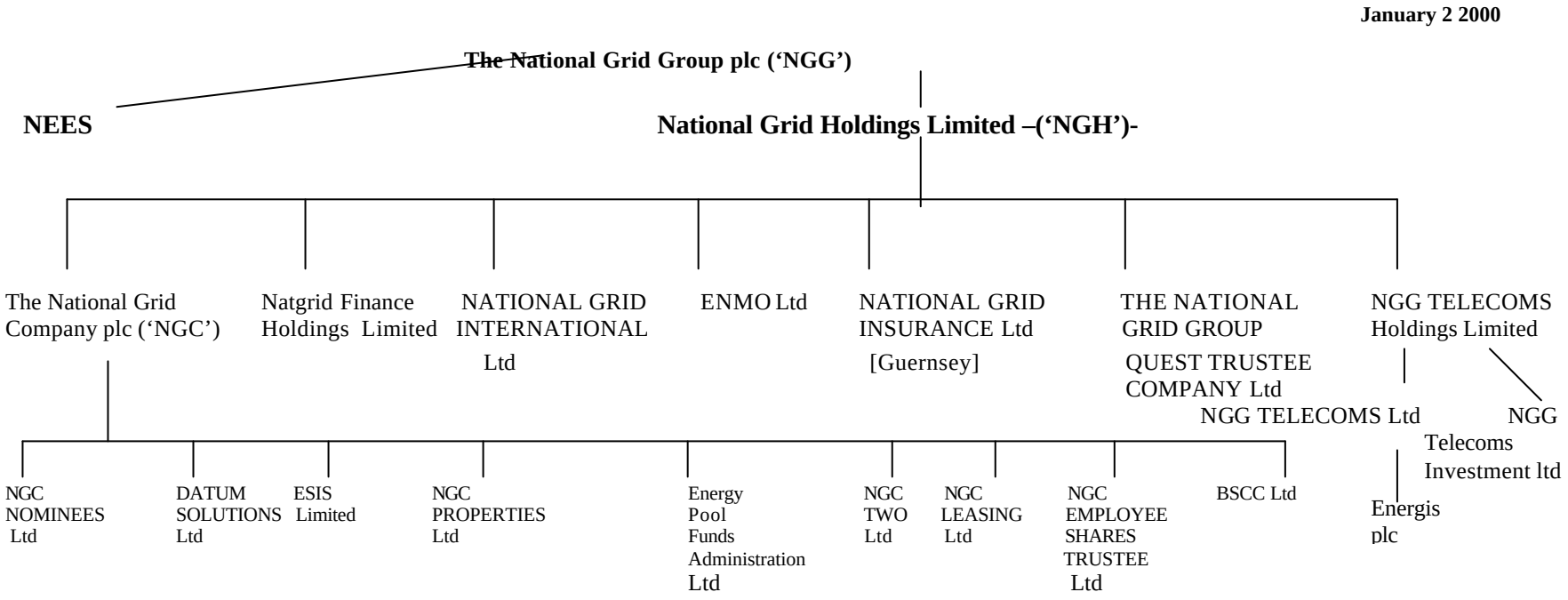
Respondent	Subject	Comment
Respondent 4	Energis	Support "market based" fee
Respondent 6	Energis	Appropriate level of rental charge should be apportioned between regulated and unregulated business.
Respondent 7	Energis	ISL fee too high. AA's proposals rewrite history. AA's proposals seem inconsistent with Scottish companies. AA's draft proposals excluded wayleaves and assumed a greater length of fibre.
Respondent 10	Energis	Appropriate charge close to NGC's £1400/km
Respondent 8	Financial issues	Regulatory risk can be significant.
Respondent 2	Form of control	Five years very long, given uncertainty in the industry.
Respondent 4	Form of control	Ofgem should consider rolling out current control by one year to allow NETA to happen.
Respondent 5	Form of control	Welcome RPI-X as second best for competition
Respondent 9	Form of control	If productivity growth is 2%, RPI-2 is equal to RPI-4
Respondent 13	Form of control	Support RPI-X and five year control, with reservations about the changes which may arise. P0 should be avoided or minimised as it can be a distorting factor. May be appropriate to have a mid-period review.
Respondent 12	Form of control	Ofgem should consider opex and capex together. Ofgem should add actual capital expenditure incurred into the regulatory asset base. Difficult to distinguish between deliberate misforecast and genuine error.
Respondent 3	Insurance	AA's treatment of insurance costs wrong: common practice amongst companies to insure against catastrophic losses.
Respondent 5	Insurance	Support AA's approach to insurance costs.
Respondent 6	Insurance	AA's treatment of insurance inappropriate.
Respondent 8	Insurance	AA's treatment of insurance inappropriate, as it would introduce significant volatility into prices.
Respondent 10	Insurance	AA's treatment of insurance will increase regulatory risk
Respondent 11	Insurance	Insurance costs should be allowed as incurred.
Respondent 12	Insurance	Insurance costs should be allowed
Respondent 11	Interconnector	Interconnector charges should be included in use of system charges
Respondent 13	Organisational shape	No justification for AA's assertion of a more pyramid-based structure.
Respondent 4	Output measures	Inappropriate to introduce output measures as already covered by statutory obligations.
Respondent 5	Output measures	Welcome clarification of effects of new incentives regime. Would not support the use of a revenue

Respondent	Subject	Comment
		driver as the basis for an interim arrangement.
Respondent 6	Output measures	Outcome of transmission access debate should be awaited.
Respondent 9	Output measures	Access rights are a matter of transmission constraints, not simply the thermal capacity of the line. This incentivisation idea should be forgotten.
Respondent 10	Output measures	Unconvinced with appropriateness of access regime. Consideration of output measures should wait until new access regime in place.
Respondent 11	Output measures	Should be an incentive on NGC to invest. Ofgem should focus incentives on parts of the network where capacity is a problem.
Respondent 12	Output measures	No transitional arrangements. More detail on output measures required.
Respondent 13	Output measures	NGC's performance already to a high standard. Output measures inappropriate.
Respondent 11	Rates	Ofgem should include estimate of rates on best available evidence.
Respondent 4	Reactive power	Should be comment on ring-fencing reactive power assets.
Respondent 13	Research and development	Ofgem's view of R&D unduly narrow and short-term. Costs should be allowed as incurred.
Respondent 6	Research and development	NGC should be given fixed allowance for R&D, and required to demonstrate that R&D was relevant to the interests of customers.
Respondent 7	Research and development	Serious reservations about AA's treatment of R&D. Regulatory risk involved means that shareholders would not support it.
Respondent 8	Research and development	AA's treatment of R&D inappropriate.
Respondent 11	Research and development	Reasonable to expect some funding for R&D. Not every project will deliver benefits. Company should only be penalised where decision to undertake a project was badly made. Under RPI-X company has an incentive to spend well.
Respondent 2	Ring-fencing	Should include reactive power assets
Respondent 5	Ring-fencing	Should include reactive compensation and connection assets
Respondent 6	Ring-fencing	Broadly concur with proposals. Should be ring-fencing between TO and SO.
Respondent 8	Ring-fencing	PES comments on Utilities Act should be taken into account.
Respondent 11	Ring-fencing	New ring-fence goes further than BG's, e.g. requirement that affiliates retain investment grade credit ratings. Regulatory risk increased by inconsistency.

Respondent	Subject	Comment
Respondent 13	Staff costs	Levels of savings proposed unrealistic given NGC's past performance and diminishing returns.
Respondent 7	Staff costs	NGC surprised at reliance on PB Power's advice, which it has not seen. AA/PB Power shape internally inconsistent and disjointed. On HR and Finance, AA rely on Saratoga study. AA have misapplied the external consultants' report. On Finance, AA have denied NGC ability to comment on AA's benchmarking database. This is inconsistent with open regulation.
Respondent 5	TO/SO split	Concerned that no separate licences proposed.
Respondent 6	TO/SO split	Should be separate licences. SO's costs should be should be recovered under SO incentive schemes.

Appendix 3 Structure of National Grid Group (NGG)

3.1 This Appendix contains a diagram of the structure of the National Grid Group.



Appendix 4 Application of the dividend growth model

4.1 This appendix lists the scenarios which Ofgem has derived for the application of the dividend growth model to NGC. As NGC's regulated business is not separately listed, and therefore pays no dividend and has no share price, it is necessary to use proxies to estimate the two components of the dividend growth model (the dividend yield and the dividend growth rate). Ofgem has developed a number of scenarios, based on the wide range of possible proxies. For each scenario, the proxy variables are listed in the following order: dividend yield, short run growth and long run growth.

- Scenario 1: the yield on the FTSE-100; the long-run growth of the economy; the long-run growth rate of the economy;
- Scenario 2: the yield on the FTSE-All Share; the long-run growth of the economy; the long-run growth rate of the economy;
- Scenario 3: average yield of OXERA sample; IBES forecasts for OXERA sample; IBES forecasts for OXERA sample;
- Scenario 4: average yield of OXERA sample; IBES forecasts for OXERA sample; long-run growth rate of the economy;
- Scenario 5: weighted average yield of Ofgem utilities sample; weighted IBES forecasts for Ofgem utilities sample; weighted IBES forecasts for Ofgem utilities sample;
- Scenario 6: weighted average yield of Ofgem utilities sample; weighted IBES forecasts for Ofgem utilities sample; long-run growth rate of the economy;
- Scenario 7: average yield of Ofgem utilities sample; IBES forecasts for Ofgem utilities sample; IBES forecasts for Ofgem utilities sample;
- Scenario 8: average yield of Ofgem utilities sample; IBES forecasts for Ofgem utilities sample; long-run growth rate of the economy;

- Scenario 9: weighted average yield of Ofgem energy sample; weighted IBES forecasts for Ofgem energy sample; weighted IBES forecasts for Ofgem energy sample;
- Scenario 10: weighted average yield of Ofgem energy sample; weighted IBES forecasts for Ofgem energy sample; long-run growth rate of the economy;
- Scenario 11: average yield of Ofgem energy sample; IBES forecasts for Ofgem energy sample; IBES forecasts for Ofgem energy sample;
- Scenario 12: average yield of Ofgem energy sample; IBES forecasts for Ofgem energy sample; long-run growth rate of the economy;
- Scenario 13: weighted average yield of Ofgem electricity sample; weighted IBES forecasts for Ofgem electricity sample; weighted IBES forecasts for Ofgem electricity sample;
- Scenario 14: weighted average yield of Ofgem electricity sample; weighted IBES forecasts for Ofgem electricity sample; long-run growth rate of the economy;
- Scenario 15: weighted average yield of Ofgem electricity sample; weighted IBES forecasts for Ofgem electricity sample; long-run growth rate of electricity demand;
- Scenario 16: average yield of Ofgem electricity sample; IBES forecasts for Ofgem electricity sample; IBES forecasts for Ofgem electricity sample;
- Scenario 17: average yield of Ofgem electricity sample; IBES forecasts for Ofgem electricity sample; long-run growth rate of the economy;
- Scenario 18: average yield of Ofgem electricity sample; IBES forecasts for Ofgem electricity sample; long-run growth rate of electricity demand;
- Scenario 19: weighted average yield of Ofgem price-controlled sample; weighted IBES forecasts for Ofgem price-controlled sample; weighted IBES forecasts for Ofgem price-controlled sample;

- Scenario 20: weighted average yield of Ofgem price-controlled sample; weighted IBES forecasts for Ofgem price-controlled sample; long-run growth rate of the economy;

- Scenario 21: average yield of Ofgem price-controlled sample; IBES forecasts for Ofgem price-controlled sample; IBES forecasts for Ofgem price-controlled sample;

- Scenario 22: average yield of Ofgem price-controlled sample; IBES forecasts for Ofgem price-controlled sample; long-run growth rate of the economy.

Scenario	Current yield	Short-run growth	Long-run growth	Post-tax cost of equity
1	2.1	2.0	2.0	4.1
2	2.2	2.0	2.0	4.2
3	4.5	4.8	4.8	9.3
4	4.5	4.8	2.0	6.8
5	3.0	3.7	3.7	6.7
6	3.0	3.7	2.0	5.2
7	4.2	-2.5	-2.5	1.6
8	4.2	-2.5	2.0	5.7
9	3.1	6.0	6.0	9.1
10	3.1	6.0	2.0	5.5
11	3.6	1.3	1.3	4.9
12	3.6	1.3	2.0	5.5
13	4.1	3.4	3.4	7.5
14	4.1	3.4	2.0	6.3
15	4.1	3.4	0.5	5.0
16	4.2	0.9	0.9	5.1
17	4.2	0.9	2.0	6.1
18	4.2	0.9	0.5	4.7
19	4.2	3.0	3.0	7.2
20	4.2	3.0	2.0	6.3
21	4.4	-2.5	-2.5	1.9
22	4.4	-2.5	2.0	5.9

OXERA's sample included around 60 "old economy" stocks. Ofgem argued that this sample was unrepresentative.
Ofgem's utility sample consists of: Kelda, Hyder, Thames, Severn Trent, United Utilities, Anglian Water, Centrica, BG Group, British Energy, NGG, PowerGen, Viridian, Scottish and Southern, Scottish Power, Railtrack, BAA and BT.
Ofgem's energy sample consists of: Centrica, BG Group, British Energy, NGG, PowerGen, Viridian, Scottish and Southern, Scottish Power.
Ofgem's electricity sample consists of : British Energy, NGG, PowerGen, Viridian, Scottish and Southern, Scottish Power.
Ofgem's price-controlled companies sample consists of Kelda, Hyder, Thames, Severn Trent, United Utilities, Anglian Water, BG Group, NGG, PowerGen, Viridian, Scottish and Southern, Scottish Power, Railtrack, BAA and BT.
Where the sample has been weighted, it has been weighted by market capitalisation as at 4th August 2000.

Appendix 5 NGC's summary response on network capabilities

NGC Transmission Capacity for the forthcoming Price Control

5.1 In order to describe the outputs from the Transmission Owner function of NGC which are expected to be delivered from the capital investment programme in the forthcoming price control, a set of measures have been produced. These measures could be used, for example, to determine the capacity that will be made available in future transmission capacity auctions.

5.2 As the transmission system has many entry and exit points, and these interact to use the transmission capacity at particular pinch points on the main network infrastructure in different ways, a full description of transmission capacity can only be provided by a complex network description. We have provided such a description to Ofgem as a data set.

5.3 The data set describes the capacity that would be provided by the transmission system after establishing a set of reinforcements to accommodate a reference scenario with 5 GW of new generation connections in addition to those currently under construction. The data set also includes a full description of the reference scenario including expected generation and demand developments. As this scenario reflects just one of many possible ways the transmission system could be used and would need to be developed, it differs from that provided in the Seven Year Statement (which reflects the network needed to accommodate those parties who have entered contracts with us).

5.4 To illustrate and summarise the capacity provided by this set of reinforcements a number of calculations have been undertaken. These are based on conditions that are described in our security standards and largely refer to average generation conditions at the time of peak demand with all network circuits in-service. On this basis, the maximum entry and exit capacities at individual customer connection points have been calculated and the capability across the system pinch points have been determined using the system boundaries described in our Seven Year Statement.

5.5 These results depend on the particular generation and demand scenario chosen and so would need to be recalculated for other scenarios. In particular, the boundary capabilities would vary if demand conditions representing other times of the year were used or if generation developments were changed from those assumed. Nevertheless, the measures provide an illustration of the capacity available on the transmission system and a base-line from which any future changes to reflect updated scenarios or alternative network reinforcements can be assessed.

Exit Point Capacities

5.6 The maximum exit capacity at each existing Grid Supply Point, and those that are expected to be established during the forthcoming price control period, have been calculated using a number of simplifying assumptions. These values represent the maximum power that may be supported at each point individually, such that security is provided in accordance with the P2/5 security standard. It reflects the capacity and connection arrangements of our supergrid transformers and equipment at supply points but excludes the ability to support additional load by using embedded generation or inter-supply point connections at low voltage (as these are not part of NGC's system).

5.7 The following table shows the total of the individual exit capacities from NGC's system:

	2001/2		2003/4		2005/6
Total maximum exit capacities (MVA)	58600		60300		61250

5.8 These values exceed the simultaneous peak demand expected on the transmission system for two reasons. Firstly, the capacity at each supply point must be sufficient to accommodate the local peak demand which may be considerably larger than that which occurs at time of the system simultaneous maximum. Secondly, there will be some additional capacity due to the fact that transformers and other transmission equipment are purchased in standard sizes.

5.9 The ability of the transmission system to meet a simultaneous peak demand is illustrated in the following table. It is calculated using the generation and

transmission network in the reference scenario and uniformly scaling the demand and generation until an overload or unacceptable voltage occurs:

	2001/2		2003/4		2005/6
Maximum simultaneous demand capability (MW)	56100		54500		55300
Forecast simultaneous maximum demand (MW)	51900		52100		52900

5.10 The margin for accommodating peak demands higher than forecast in the reference scenario falls from 8% at the beginning of the review to 5% at the end. This reflects some tightening of system margins but shows the network remains robust against likely variations in winter peak demand.

Entry Point Capacities

5.11 The capacity of individual entry points has been calculated to reflect the maximum generation that may be accommodated in accordance with PLM-SP-1, the security standard for generation connections. It is based on the ratings of the transmission circuits at the connection substation. It makes no allowance for power flows that may arise from other generators or loads and therefore not all of this capacity will be available solely for generation.

5.12 In practice, almost all of NGC's existing substations, including those for marshalling circuits and connecting demand, could be used to connect additional generation to the transmission system. For the purpose of illustrating the capacity that exists or would be established over the price control period, however, only those substations that have generation at some point in the reference scenario have been included. While it is possible that some substations could be re-configured when the associated power station closes, such possible reductions in entry capacity have not been shown until such re-configuration plans are confirmed.

	2001/2		2003/4		2005/6
Total generation in reference scenario (MW)	65300		63500		65000
Total maximum circuit capacity at entry points* (MVA)	179900		185050		192150

* Circuit capacity is needed for both generation and system through flows.

5.13 The increase in capacity from 2001/2 to 2005/6 reflects the reinforcements that would be required to accommodate the new plant in the reference scenario. As noted above, the total circuit capacity at entry points is very much larger than the installed generation capacity or peak demand. This reflects the very large capacities that are available at some existing substations where a number of circuits are marshalled together. It also reflects the high thermal ratings of individual high voltage transmission circuits but, in the absence of load flow studies, does not show voltage and other power sharing limitations that would occur in practice. For this reason, the ability of the transmission system to accept patterns of generation and demand is better assessed from the boundary capabilities given below.

System Boundary Capabilities

5.14 The following table calculates the capability of the network infrastructure to support transfers across various inter-regional boundaries. The boundaries chosen are the same as those set out in our Seven Year Statement. The capability represents the maximum transfer that can be accommodated and secured in accordance with the security standards specifying thermal and voltage performance (PLM-SP-2 and PLM-ST-9). They are calculated by proportionally increasing the generation and decreasing the demand in the exporting region and reducing the generation and increasing the demand in the importing region until an overload or unacceptable voltage occurs.

Boundary:	2001/02			2003/04			2005/06	
	Required Transfer (MW)	Boundary Capability (MW)		Required Transfer (MW)	Boundary Capability (MW)		Required Transfer (MW)	Boundary Capability (MW)
1: Upper North	2000	*1900		2850	4150		2850	4150
2: North to Midlands	8050	8750		9450	9600		9900	10650
3: Midlands to South	7550	9550		9450	10800		8800	11000
4: South Coast	5050	5350		5500	5600		4950	5050
5: NE & Yorkshire	6450	8900		7850	9050		7750	9900
6: Sth & Sth West	4400	5100		5200	5200		4800	4900
7: South West	1750	1750		1750	1850		1200	1400
8: London	7700	8750		7800	8150		8000	9250
9: Thames Estuary	6000	8000		5050	7050		5700	8050
10: NE/ Yorks/ Trent	10250	13750		12550	14300		11550	13300
11 West Midlands	4800	5250		5150	5450		5400	5500

* We have a direction from Ofgem for this area of the transmission system prior to completion of the new Yorkshire line and associated reinforcements.

5.15 The 'Required Transfer' column represents the capability that, for the particular peak demand scenario, must be supported in order to meet the security standards. The 'Boundary Capability' column then shows the maximum capability before overloading or unacceptable voltages occur.

5.16 It is important to note that the calculation of boundary capability depends on the strength of the transmission network (across the boundary and locally to it) and the disposition of generation and demand either side of a boundary. As the disposition of generation and demand changes from year to year, throughout the year and indeed over the course of a day, the boundary capabilities will also change. It is for this reason that some boundary capabilities decrease over time in the table above. It is also for this reason that reinforcements may be required to accommodate new dispositions of generation and demand, even though the boundary transfers do not change significantly.

5.17 Given the close proximity of some boundaries, certain reinforcements will increase the capability on more than one boundary, so as problems are resolved in one particular area, this may give an increase above the minimum required capacity on another boundary. Also as transmission equipment is purchased in standard sizes, there will generally be more capability available than the absolute minimum needed in any one year.

5.18 At off-peak times, system transfers may be larger than those calculated for the time of peak demand. During the summer, boundary capabilities will also fall due to the need to take circuits out of service for essential maintenance and construction work. For these reasons, additional calculations and scenario assumptions are required to describe the capability throughout the year.

Appendix 6 Price control calculations

6.1 As explained in Chapter 6, Ofgem has calculated NGC's price controlled revenues based on the operating and capital expenditure forecasts and cost of capital assumptions outlined in Chapters 2, 3 and 5, consistent with the scope of the price control assumed in the draft proposals document (i.e. including certain SO costs and excluding costs efficiently incurred by the TO in the delivery of NETA). See Table A6.1.

6.2 Ofgem has also calculated the revenues of the TO only, including the costs efficiently incurred by the TO in the delivery of NETA. These are set out in Table A6.2.

Table A6.1: NGC's price controlled revenues including certain SO costs before the delivery of NETA (P_0 cut = 0, X = 1.5)

	2001/02	2002/03	2003/04	2004/05	2005/06	Total
Opening asset values	4,590	4,606	4,601	4,559	4,484	
Depreciation	-289	-297	-304	-311	-317	-1,518
Capex	305	291	263	236	225	1,320
Closing values	4,606	4,601	4,559	4,484	4,392	
Controllable operating costs	221	210	200	196	192	1,020
Operating costs	324	310	296	288	294	1,512
Depreciation allowance	289	297	304	311	317	1,518
Return	287	288	286	283	277	1,421
Total	901	895	886	881	884	4,451
PV of totals	874	817	762	713	676	3,842
Price control revenues	800	788	776	765	753	3,882
Excluded revenues	103	107	112	120	126	568
Total revenues	903	895	889	885	879	4,450
PV of totals*	876	818	764	716	669	3,842

*discounted at 6.25 per cent cost of capital

Table A6.2: NGC's price controlled revenues excluding all SO costs and including costs efficiently incurred in the delivery of NETA (P_0 cut = 5, X = 1.5)

	2001/02	2002/03	2003/04	2004/05	2005/06	Total
Opening asset values	4,517	4,522	4,509	4,470	4,398	
Depreciation	-285	-292	-299	-306	-312	-1,493
Capex	290	279	260	234	222	1,285
Closing values	4,522	4,509	4,470	4,398	4,308	
Controllable operating costs	187	175	166	162	158	849
Operating costs	290	276	262	254	260	1,342
Depreciation allowance	285	292	299	306	312	1,493
Return	282	282	281	277	272	1,395
Total	858	850	842	837	843	4,230
PV of totals	832	776	723	677	642	3,651
Price control revenues	758	747	736	724	714	3,678
Excluded revenues	100	105	109	116	121	550
Total revenues	858	852	844	840	835	4,229
PV of totals*	833	778	725	680	635	3,651

*discounted at 6.25 per cent cost of capital