

Transmission Investment for Renewable Generation

Second Consultation

May 2004 98/04

Summary

This document is the second stage of Ofgem's consultation on the funding of additional investment for the reinforcement of electricity transmission networks, as more renewable generation is planned and connected.

Increases in renewable generation connection applications are now arising in response to the obligations the government has put in place on electricity suppliers under the Renewables Obligation Order 2002 and the Renewables Obligation (Scotland) Order 2002, as part of its objective of securing ten per cent of electricity generated from renewable sources by 2010.

These actual and expected increases in renewable generation require investment in electricity transmission networks which was not allowed for under the current price control review for the three transmission companies in GB – National Grid Company (NGC), Scottish Power Transmission Limited (SPTL) and Scottish Hydro Electricity Transmission Limited (SHETL).

In October 2003 Ofgem published an initial consultation that invited views on the appropriate mechanism for funding transmission investment for renewable generation. The October consultation set out three options - taking no action before the next transmission price control reviews, re-opening the current price controls or adding an adjustment mechanism to the existing price controls.

This consultation paper puts forward the view that it will be appropriate to develop an adjustment mechanism to supplement the existing price control arrangements. It also sets out three options for calculating this adjustment mechanism - a lump sum allowance to the existing electricity price controls, establishing a revenue driver to assist in dealing with some of the uncertainties associated with this investment or cost pass through arrangements. Ofgem's initial view is that a cost pass through approach would not be an appropriate way forward.

This document sets out Ofgem's proposed arrangements for dealing with any additional transmission investment requirements, covering the period until the implementation of the next main transmission price control reviews in 2007/08. In making an assessment of the efficient level of transmission investment, Ofgem, in its role to protect the interests of consumers, will need to make careful judgements and tradeoffs regarding a number of important factors. For example, judgement is required of the risk of stranded transmission assets because of over investment; the risk of large transmission related

constraint payments if insufficient investment is undertaken; and the risk of renewable generation developments not being able to connect within an efficient timeframe.

In establishing an adjustment mechanism, it will be important to promote efficient and timely investment, while at the same time protecting customers from the consequences of unnecessary transmission expenditure and to establish output measures to ensure that licensees deliver real network improvements in line with allowances for additional revenue. It will also be important to deal with the uncertainty associated with this investment, perhaps by the use of revenue drivers and incentives for efficient risk sharing and alignment of the interest of consumers and transmission owners.

Such arrangements will ensure that allowed revenues are only provided where investment has been undertaken, while also ensuring that costs are minimised in the event of any planning delays or necessary design variations to reinforcement proposals. Measures will also be introduced to ensure that any double counting (through future price control reviews or other work programmes for example) are appropriately taken into account using claw back provisions.

To implement the proposed adjustment mechanism, Ofgem will review the plans of licensees for new transmission network investment and other relevant information. This review will take into account the projections of the level of renewable generation likely to be connected to distribution and transmission networks over the medium to long-term, the need for new transmission investment to efficiently meet the anticipated additional renewable generation and the cost of the proposed upgrades to the transmission networks. Ofgem proposes to utilise independent consultancy advice for this review.

This consultation also considers associated issues such as investment cost recovery from users of the transmission networks. In the longer-term changes may be required to charging arrangements to better reflect the costs and benefits that generators, both transmission and distribution connected, bring to the transmission network.

Responses to this paper should be received by 11 June 2004. Ofgem aims to publish draft proposals in July 2004.

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1. Introduction

Purpose

- 1.1. This consultation paper sets out an approach for the funding of electricity transmission investment as the level of renewable generation increases for the years 2004/05 to 2006/07 and invites views on these issues.

Rationale

- 1.2. Electricity transmission is a monopoly activity and therefore the interests of consumers are protected by price controls and associated incentive mechanisms. These arrangements also provide for the funding of an appropriate level of capital expenditure in the transmission networks.
- 1.3. There are three transmission companies (transmission licensees) : the National Grid Company (NGC) which operates in England and Wales; Scottish Power Transmission Limited (SPTL) which operates in the South of Scotland; and Scottish Hydro Electricity Transmission Limited (SHETL) which operates in the North of Scotland.
- 1.4. At the last electricity transmission price control reviews (undertaken in 1999 for SPTL and SHETL and in 2000 for NGC) there was significant uncertainty regarding the likely level and pattern of emerging renewable generation and so it was not practicable to make allowances in the price controls or establish incentive arrangements for the associated investment. Since these price control reviews there has been an increase in the demand for access to the transmission and distribution networks by renewable generators. The increase in demand for access principally results from the obligations on electricity suppliers under the Renewables Obligation Order 2002 and the Renewables Obligation (Scotland) Order 2002 to supply an increasing proportion of electricity from renewable generation.
- 1.5. The government has a target for renewable generation to provide 10 per cent of UK electricity in 2010 with a further aspiration to double this share by 2020. It is important that the regulatory system does not create any unnecessary obstacles

to government policy. However, the statutory guidance the government has provided to Ofgem on social and environmental matters¹ makes it clear that initiatives designed to promote wider environmental objectives that would have a significant financial impact are matters for government and not Ofgem. Therefore, this consultation paper focuses on establishing a framework to provide for an efficient level of investment, given the likely pattern of renewable generation. It does not seek to provide additional subsidies for renewable generation.

- 1.6. The financial incentives provided by Renewables Obligation Certificates (ROCs) are creating demand for renewable generation and the market has reacted by bringing forward proposals for new renewable generation stations. A large proportion of these proposed new developments are for wind powered generation in Scotland, connecting to either the distribution or transmission networks. It is likely that significant additional investment in transmission networks will be necessary to allow the efficient connection and operation of this anticipated additional generation capacity.
- 1.7. If the funding of transmission investment is not addressed before the next main price control reviews, there is a risk that the transmission companies may not invest as quickly as would be economically efficient and that this could delay requests for connection prior to the next price control reviews. It will also be necessary to coordinate investment across all three transmission licensees and so it is appropriate to consider the funding issues simultaneously, rather than as part of the work to modify Scottish transmission price controls in 2004 as part of the BETTA process, or the proposed work to be undertaken in 2005, to extend NGC's price control until the end of 2006 /07.
- 1.8. In light of these factors, Ofgem has decided to address the funding of transmission investment for renewable generation now, rather than wait until the next price control reviews. A regulatory impact assessment will be published for this project alongside Ofgem's further proposals in July 2004.

¹ Utilities Act 2000 sections 10 and 14

Previous documents and correspondence

- 1.9. In April 2003, Ofgem wrote to SHETL and SPTL explaining that certain costs associated with the connection of renewable generation to transmission networks in 2003/04 would be taken into account at future price control reviews. All three transmission licensees have stressed the importance of making firm decisions on transmission investment for renewable generation as soon as possible. Nevertheless they have asked that similar comfort is provided for 2004/05, until firm decisions are reached in respect of these matters.
- 1.10. In October 2003, Ofgem published an initial consultation on funding of transmission investment for renewable generation. The consultation set out three options:
- take no action before the next price control reviews (the work associated with these reviews will not be completed before the end of 2006)
 - re-open the price controls, or
 - add an adjustment mechanism to the existing controls to deal with renewable related expenditure.
- 1.11. The October consultation suggested that waiting for the next price control review might unduly delay investment and that a full reopening of price controls might require a relatively lengthy process and could undermine current efficiency targets and incentive arrangements. On this basis, it suggested that adding an adjustment mechanism to the price controls might be the best way forward. Having carefully considered the views of respondents, this document sets out Ofgem's proposal to proceed on this basis.

Structure of the document

- 1.12. This document includes the following chapters:
- chapters 1 and 2 provide an introduction and background
 - chapter 3 summarises the broad options for dealing with transmission investment for renewable generation discussed in the October consultation,

summarises the views of respondents and sets out conclusions on these matters

- chapter 4 discusses the form of the adjustment mechanism and related issues
- chapter 5 discusses the method and process for determining the efficient amount of investment
- chapter 6 discusses issues relating to the contractual and charging arrangements for connection to and use of the transmission networks
- chapter 7 sets out Ofgem's views and a way forward, and
- appendix 1 provides information from the transmission licensees setting out their views on the level of transmission investment for renewable generation necessary for the period between now and the next price control reviews.

Consultation Responses

- 1.13. If you would like to comment on the issues raised in this document, please respond by 11 June 2004. Written responses should be addressed to:

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- 1.14. Electronic responses should be sent as an MS Word document or as an email message. Responses to this document will be placed in the Ofgem library and therefore any confidential material should be included as a separate annex.

- 1.15. If you would like to discuss the issues raised in this document please contact Jonas Törnquist on the above telephone number.

Timetable

- 1.16. Ofgem will develop further proposals to be published in July 2004. It is envisaged that final proposals will be published during autumn 2004 together with a statutory consultation on any licence modifications required to put these arrangements in to effect. If a licensee were to reject the proposed licence modifications, Ofgem would need to consider referring these matters to the Competition Commission.

2. Background

Statutory Framework

- 2.1. Ofgem is the Office of the Gas and Electricity Markets, which supports the Gas and Electricity Markets Authority. The Authority's powers and functions in relation to the regulation of the electricity industry are set out in the Electricity Act 1989 (as amended).
- 2.2. The Authority's principal objective in carrying out its functions under the Electricity Act is 'to protect the interests of consumers [both existing and future] ...wherever appropriate by promoting effective competition...'. The Electricity Act requires that in doing so the Authority must also have regard to:
- the need to secure that all reasonable demands for electricity are met
 - the need to secure that licence holders are able to finance their licensable activities, and
 - the interests of the disabled , chronically sick, those of pensionable age, those with low incomes and those residing in rural areas.
- 2.3. Subject to the above, the Authority is also required to carry out its functions in a manner which is best calculated to:
- promote efficiency and economy on the part of persons authorised by licences or exemptions to carry out licensable activities
 - protect the public from dangers arising from licensable activities, and
 - secure a diverse and viable long-term energy supply
- The Authority is also required to have regard to the effect on the environment of licensable activities and to any social and environmental guidance issued by the Secretary of State.
- 2.4. The Electricity Act provides the framework for the licensing regime relating to the generation, transmission, supply and distribution of electricity.

- 2.5. Under section 9(2) of the Electricity Act, holders of transmission licences are obliged to develop and maintain an efficient, co-ordinated and economical system of electricity transmission and to facilitate competition in the supply and generation of electricity.

Price controls

- 2.6. The rationale section of chapter 1 explains how this project relates to the electricity transmission price controls and price control review process. Set out below is an explanation of some of the objectives of a price control review that may also be relevant to the assessment of transmission investment for renewable generation.
- 2.7. The transmission and distribution price controls are typically reviewed every five years. At the price control review transmission licensees provide forecasts of capital and operating expenditure over the price control period, based on expected developments on the network and forecast generation connections, disconnections and demand growth. Ofgem reviews these plans, consults and discusses these forecasts with transmission licensees and then makes proposals. These proposals set out Ofgem's views on the revenues required by each transmission licensee to finance efficient levels of capital and operating expenditure for the next five years. Finally amendments are made to each transmission company's licence, to specify the amount of revenues the companies are allowed to recover.
- 2.8. The price control provides strong incentives for transmission licensees to reduce costs. There are a number of measures in place at present, including planning standards and quality reporting indicators, to ensure that quality of supply is not jeopardised. Over time Ofgem is considering the development of a wider range of output measures to improve incentives for efficiency and quality.
- 2.9. In electricity transmission, limited progress has been made in respect of improving incentives and to the extent that it is practicable the intention is to further enhance incentives in the future. The aim of these incentives could include:

- establishing output measures to assist in judging whether capital expenditure is efficient
- where appropriate embedding output measures into the price control as a revenue driver or as part of an incentive scheme so that the level of allowed revenue automatically adjusts for changes in the output
- developing incentives that encourage licensees to invest in a timely way to meet the needs of their customers, and
- linking the structure of charges to the overall incentive regime so that system users face cost reflective charges and, where appropriate, charges indicate the likely pattern of future demand on the network.

Developing network monopoly price controls

- 2.10. Ofgem has reviewed the way in which network monopoly price controls work in order to identify areas for improvements, both in general terms and specifically for the electricity distribution price control reviews. In June 2003, Ofgem published its initial conclusions².
- 2.11. The June 2003 document noted that although Ofgem has a common set of objectives, the best ways of achieving them may vary across the sectors it regulates. While it is important that the arrangements in place across electricity transmission and distribution are broadly consistent, this does not necessarily mean that the regulatory frameworks will be the same, as there are a number of important differences between the distribution and transmission systems.
- 2.12. The June 2003 document noted that in setting price controls and incentives it would be necessary to ensure that an appropriate balance is achieved between the incentives towards efficiency and the delivery of outputs and other requirements placed on companies.
- 2.13. Under the existing arrangements, where companies have been exposed to substantial new costs between reviews, these have tended to be dealt with on a

² 'Developing network monopoly price controls: Initial conclusions' – Ofgem, June 2003

case by case basis. In certain instances Ofgem has written to companies to assure them that the costs efficiently incurred will be recognised in setting the next price control. The review considered whether such an approach remains appropriate or whether there would be advantages in introducing more formal arrangements for dealing with new cost obligations between reviews. The paper suggested that this could take a number of forms including the Ofwat approach³ or the arrangements under the System Operator (SO) incentive scheme for electricity transmission, where there are formal arrangements for dealing with income adjusting events⁴.

Electricity distribution price control review

2.14. Ofgem has published a policy document and two consultations on the electricity distribution price control review⁵. A particular consideration for the distribution price controls is the expected but uncertain increase in distributed generation. The cost of investment for distributed generation is to be funded by a mixture of cost pass through and a revenue driver. These arrangements have been designed to take advantage of the desirable characteristics of revenue drivers – incentivising efficiency and flexibility to fund changing patterns of demand – while at the same time dealing with uncertainty by allowing a significant element of cost pass through.

2.15. These arrangements should allow distribution companies to:

- earn a rate of return which is more than their allowed cost of capital for other investments – but which is not excessive
- be protected against the risk of a significant number of projects providing very low returns, and

³ Section B of the Water Undertaker and Sewerage undertaker Licence allows licensed water suppliers to apply to the Authority for a re- assessment of allowed revenue following a material change of circumstances.

⁴ 'Income adjusting events under NGC's 2002/03 system operator incentive scheme: A consultation document' – Ofgem, May 2003.

⁵ 'Electricity distribution price control review: An initial consultation', Ofgem, July 2003

'Electricity distribution price control review: Update paper', Ofgem October 2003

'Electricity distribution price control review: Second consultation', Ofgem, December 2003

'Electricity distribution price control review: Policy document', Ofgem, March 2004

- face limited risks of returns below the cost of capital on the overall investment in generation connections.

2.16. Ofgem noted that given the potential for higher variability of distributed generation connections, and to encourage DNOs to change behaviour and be proactive, it is appropriate to allow for 80 per cent pass through of costs.

Developments in the gas market

2.17. Ofgem has put in place price controls and SO incentive arrangements for Transco for the period 2002 – 2007⁶. In respect of entry capacity, Transco's price control provides funding for an agreed annual baseline output level of entry capacity at each existing entry terminal on the (gas) National Transmission System (NTS).

2.18. Transco is also subject to an entry capacity investment incentive scheme which allows it to earn higher rates of return on obligated incremental entry capacity offered for sale above its agreed baseline output measures.

NGC's System Operator Incentives

2.19. Following the introduction of the New Electricity Trading Arrangements (NETA), NGC has two roles - transmission asset ownership and maintenance (TO) and system operation (SO).

2.20. The TO maintains the high voltage transmission network in England and Wales and carries out investment where this is judged appropriate. The SO undertakes the short-term activities necessary to operate the high voltage transmission network in England and Wales safely, economically and efficiently. The current price control only applies to the TO revenue activities. SO revenue and activities are subject to separate SO incentive arrangements.

2.21. In establishing NGC's SO incentive schemes, Ofgem sets target levels of costs. If actual costs are below this target then NGC keeps a proportion of the reduction in costs as an incentive payment. If costs are above target, NGC bears a

⁶ 'Review of Transco's price control from 2002 – Final proposals', Ofgem, September 2001.

proportion of the costs in excess of the target. NGC's overall gains or losses are limited by a cap on payments and a floor on losses.

Income adjusting events

- 2.22. NGC's SO incentive scheme contains provisions for Income Adjusting Events (IAE). The IAE provisions are intended to provide protection for both NGC and customers in the event that an incident results in costs or savings which were not envisaged at the time that the SO incentive parameters were defined.
- 2.23. NGC, or any other BSC Party, can give notice to Ofgem that they consider an IAE to have occurred where they consider that the costs and/or expenses caused or saved by the IAE have affected NGC's incentivised balancing costs by more than £2 million⁷.
- 2.24. Following a proposal for an IAE, Ofgem determines the impact of the IAE and adjusts the SO price control accordingly. In making this determination, Ofgem consults with NGC and other appropriate parties.

Enhanced SO incentive scheme

- 2.25. Ofgem has previously suggested that in the longer term an enhanced incentive scheme could be developed for transmission networks. Under an enhanced scheme NGC could have improved financial incentives to respond to signals from market participants indicating the need for additional transmission capacity. These matters will be considered as part of the next main transmission price control review.

The development of offshore wind generation

- 2.26. In November 2002 the DTI published 'A strategic framework for offshore wind industries'. This document consulted on the proposed arrangements for offshore wind generation development leases. In July 2003 the DTI launched the second round of tenders for offshore wind generation in the Thames Estuary, Greater Wash and the North West. The DTI considers that up to 6 GW of offshore wind generation could be built as a result of these initiatives. The

Energy Bill contains provisions to allow the Secretary of State to modify the licensing regime for the purposes of facilitating offshore transmission and offshore distribution.

- 2.27. The development of offshore wind generation is likely to have implications for transmission system investment, although the extent and timing of the demand for additional investment is not yet fully clear. Ofgem and the DTI are working on these issues and further consultations should take place later in 2004/05.

BETTA

- 2.28 Ofgem will shortly publish a consultation paper on the work being carried out to roll forward the price controls for SHETL and SPTL to 31 March 2007, and to modify the price controls of all three transmission licensees, SHETL, SPTL and NGC to apply under the British Electricity Trading and Transmission Arrangements (BETTA). The planned go-live date for BETTA is 1 April 2005. The paper covers the following areas of work:

- the roll-forward price controls to apply to SP Transmission and SHETL from 1 April 2005 until BETTA go-live, should BETTA be deferred for any reason
- the adjustments to the price controls for BETTA, covering SP Transmission and SHETL price controls for 2005/6 and 2006/7, and NGC's TO and SO internal cost controls for 2005/6, and
- Transmission owner incentives under BETTA.

- 2.29 Ofgem has also started work on the roll forward of NGC's TO and SO internal cost controls for 2006/7.

- 2.30 Since the transmission infrastructure related to renewable generation spans all three transmission licensees the development of adjustments to the price controls to allow for this expenditure is being coordinated separately from the above price control work. Ofgem's conclusions on this expenditure will be additional to any adjustments for BETTA and will form part of its final roll

⁷ The £2 million threshold does not apply if the IAE is a security period as defined in special condition

forward price control proposals for all three transmission licensees. However, measures to ensure that no double counting takes place will be developed, perhaps through the use of claw back provisions.

3. The October Consultation

- 3.1. This chapter summarises the options put forward by Ofgem in October 2003 on how to fund transmission investment to accommodate increased renewable generation, respondents' views and sets out Ofgem's latest thinking on these matters.

Options and issues

- 3.2. In October 2003, Ofgem consulted on how to address the funding of transmission investment to accommodate the growth in renewable generation and identified three broad approaches:
- take no action before the next price control reviews (the work associated with these reviews will not be completed before the end of 2006)
 - re-open all three price controls, or
 - add an additional mechanism to the existing controls to deal with renewable expenditure.
- 3.3. Ofgem sought views on:
- the appropriate principles and objectives to apply in addressing the issue of the recovery of the costs of transmission investment for renewable generation
 - the transmission licensees' investment forecasts and the assumptions underpinning them, and
 - the potential approaches to adjusting the transmission licensees' allowed revenues during the current price controls to allow funding of this investment. In particular:
 - which of the three generic approaches outlined in paragraph 3.2 would be most appropriate

- if an additional mechanism is to be introduced, whether it is appropriate to reach an early judgement on transmission investment for renewables or spend more time and develop more sophisticated incentive mechanisms, and
 - any other approaches or mechanisms that respondents considered might be appropriate.
- 3.4. Ofgem received 18 responses to the consultation, including the three transmission licensees, renewable generators and trade associations. This section provides a summary of respondents' views. All responses are available from Ofgem's website at www.ofgem.gov.uk.

Principles and objectives

Respondents' views

- 3.5. A number of respondents including two of the transmission licensees commented on the appropriate principles to apply in addressing cost recovery and efficient investment. They noted that:
- in seeking to facilitate competition in the supply and generation of electricity the licensees do not want their networks to constrain the amount of renewable generation that can be accommodated in Scotland
 - transmission licensees would have to develop the network in an efficient and optimal manner such that the impact on prices paid by users is justified and the overall environmental impact of the network is acceptable
 - waiting for actual changes in the use of the transmission system before undertaking investment may not be the most efficient approach because of the time lag in establishing network capacity which may result in congestion or restricted access for renewable or other generators
 - one transmission licensee considered that it was difficult to demonstrate the need for reinforcements in the case of renewable generators because

there was no effective process that could be followed by generators to demonstrate their commitment to the investment costs,

- one respondent considered that the transmission licensees should be sufficiently incentivised to facilitate access to their networks by renewable generators, and
- another respondent considered that the suggestions in the consultation might create incentives for over investment.

Ofgem's views

3.6. Ofgem notes respondents' views and considers that it is appropriate to provide transmission licensees with incentives to efficiently invest in transmission reinforcement as renewable generation increases. To a large extent, where possible, Ofgem considers that investment for renewable generation should be treated along side the current transmission company licence requirements. All three transmission companies are obliged under their licences:

- to offer terms to any authorised electricity operator requesting use of its system and to any market participant seeking access to its transmission system
- to ensure that their use of system and connection charges are non-discriminatory, and, in respect of use of system charges do not restrict, prevent or distort competition in generation, supply, transmission or distribution, and
- to ensure that charges for connections post-Vesting (30 March 1990) are set at a level that enables them to recover an appropriate proportion of the cost incurred and a reasonable rate of return on the capital represented by those costs.

Ofgem will take these ongoing obligations into consideration in developing an appropriate funding mechanism to address the anticipated substantial increase in renewable generation connection requests between 2004 and the next price control reviews.

The transmission licensees' investment cost forecasts

Respondents' views

- 3.7. Of those respondents who supported the investment cost forecasts, they considered that:
- the assessment of potential connection opportunities seems to be supported by current activities, and
 - transmission licensees are able to accurately forecast the required financial investments for the different scenarios of renewable generation required.
- 3.8. A number of respondents questioned the investment cost forecasts, assumptions and the cost benefit analysis contained within the Transmission Investment Working Group (TIWG) report, set out in the October consultation. They noted that:
- any assessment of the increase in export requirement from Scotland to England and Wales should take account of the low load factor of the renewable capacity and the probability of all Scottish renewable capacity running simultaneously
 - the assumption that up to 1320MW would be imported through the Norwegian interconnector has a substantial impact on projected North-South flows. Since the publication of the TIWG report, the Norwegian interconnector project has been abandoned and the report lacks any analysis of this outcome
 - the cost estimates should reflect possible early closure of the nuclear power stations that are experiencing technical problems, and
 - the aggregate investment cost is estimated to be around £250/kW. This is over ten times the investment costs assumed for additional capacity in NGC's current price control.

Ofgem's views

- 3.9. Ofgem notes respondents' views on the TIWG report. The TIWG report considered the level and cost of investment required to reinforce the transmission network to meet the government's targets for renewable generation. Further analysis will have to be undertaken to determine the appropriate economic level and cost of transmission investment, based on actual and predicted levels of demand.
- 3.10. Chapter five details the criteria that Ofgem could use to determine the efficient level of transmission investment required to accommodate the likely levels of renewable generation. This will be broadly based on information provided by relevant parties and related transmission investment studies. Ofgem has also appointed independent consultants to evaluate the transmission reinforcement proposals and to assist Ofgem with its review of the likely level and cost of investment required prior to the price control reviews and thereafter.

Adjusting price controls

Respondents' views

- 3.11. The three transmission licensees agreed that it was inappropriate to re-open the current price controls, and that an adjustment mechanism should be adopted. They considered that Ofgem should determine the efficient level of investment required to accommodate renewable generation.
- 3.12. In order to address the uncertainties associated with the funding of transmission investment, one network operator suggested a post investment appraisal to allow possible adjustment to allowed revenues. Another transmission licensee proposed a sharing arrangement which could be introduced in the event that expenditure outturns differed from projections.
- 3.13. One network operator considered that transmission investment for renewables should be treated as a distinct project with clear, ring-fenced funding designed to cover the whole project from start to finish.

- 3.14. The majority of other respondents considered that it would be appropriate to adjust the price controls, while four respondents supported relying on existing mechanisms. Nine of the 11 respondents in support of adjusting the price controls said that a simple adjustment mechanism was appropriate.
- 3.15. Some respondents noted that there were advantages of relying on the existing mechanisms. In particular:
- any ad hoc and unscheduled adjustments to regulation will undermine confidence in the electricity sector, as investors will no longer be able to trust the stability of the regulatory regime, and
 - in the absence of a compelling case for a price control amendment, the costs could be logged up until the next price control. The letters of comfort provided to the Scottish transmission licensees earlier this year appear to provide a suitable mechanism to achieve this.
- 3.16. Of those respondents who commented on the appropriate adjustment mechanism it was noted that:
- a sophisticated recovery mechanism could take too long to develop
 - a similar mechanism, as set out in NGC's licence, could be used to cater for changes in the number of connections to the Scottish transmission licensees' licences
 - a partial reopening of the price controls should be considered along the lines used in the water industry by Ofwat⁸ or a modified Ofwat approach
 - a simple hybrid incentive mechanism, similar to that proposed by Ofgem for incentivising electricity distributors for the connection of distributed generation, should be introduced, and
 - the individual components of costs across the three transmission licensees could be benchmarked.

⁸ Section B of the Water Undertaker and Sewerage undertaker Licence allows licensed water suppliers to apply to the Authority for a re- assessment of allowed revenue following a material change of circumstances

- 3.17. In the longer-term one respondent was of the view that serious consideration should be given to a more fundamental review of the price control mechanism so that realistic solutions are available to ensure that renewable generation can be dealt with more systematically in the future.

Ofgem's views

Rely on existing mechanisms

- 3.18. If the funding of transmission investment is not addressed before the next main price control reviews there is a risk that transmission licensees will not invest as quickly as would be economically efficient. This would not represent an appropriate outcome.

Re-open the price controls

- 3.19. Re-opening the price controls would involve a wide ranging review of all the licensees activities, costs and revenues. This would create regulatory uncertainty and would be disproportionate given that transmission investment for renewable generation can be dealt with by an adjustment mechanism that could work alongside the main price controls.

Add an additional mechanism

- 3.20. Ofgem intends to establish an additional mechanism that could work alongside the main price controls. The options range from simple interim solutions to more sophisticated approaches that seek to encompass the full range of longer-term objectives for price control regulation. It is unlikely that a more sophisticated approach could be implemented to the timetable for this review.
- 3.21. Consequently, Ofgem considers that it is appropriate to implement a relatively simple short-term mechanism until the next price control review and develop a more enduring solution from then onwards.
- 3.22. A simple adjustment mechanism would have some positive incentive advantages and ensure that some investment is undertaken, although in the interim, incentives may not be as strong as they could be under a more sophisticated mechanism.

Other Issues

Ensuring efficient investment incentives

Respondents' views

3.23. Some respondents raised concerns that the funding of transmission investment for renewable generation should not undermine efficiency obligations. In particular they stated that:

- it is important that efficiency incentives are at the heart of any new mechanism
- it might be prudent for the Authority in conjunction with the transmission licensees to set a renewable generation capacity level/threshold to trigger investment
- it may be appropriate to contemplate differential rates of return to create incentives for different levels of investment and perceived risks
- the transmission licensees must be able to generate returns on infrastructure investments that are specifically required to accommodate additional renewable generation
- emphasis should be on reinforcement that does not rely on any one individual scheme going ahead, but where there are several schemes, any of which would require the reinforcement
- transmission charging should encourage efficient siting of renewable generation so the capacity of the existing system is effectively utilised before new investment to avoid creating incentives for over investment and/ or stranded assets, and
- the onus should be on transmission licensees to prove the case for investment.

3.24. Other respondents supported renewable generation expenditure. They stated that the incentives on transmission licensees should facilitate access to networks

by renewable generators. These respondents also expressed concern that uncertainty about cost recovery could reduce the incentives on the transmission licensees to facilitate additional renewable connections.

3.25. Respondents also suggested that if renewable generation is to meet government targets, there must be a mechanism for the transmission licensees to invest in reinforcement without an individual developer needing to secure the transmission investment.

3.26. One respondent considered that the reinforcement proposals and any changes to the regulatory framework would result in inefficient investments because:

- a strategic environmental assessment of the reinforcement proposals is necessary before the case for grid reinforcements can be proven
- 3-6 GW of redundant grid assets already exist in the UK in the South West and South Wales which are more than sufficient to accommodate renewables
- locating renewables in Scotland to serve a load that is primarily located in England requires significant additional costs in infrastructure reinforcement and losses, and
- onshore wind has a load factor of approximately 30 per cent. To deliver this average load factor, the grid has to be able to transmit the maximum output, and hence a low level of utilisation for an expensive asset and an unacceptably poor investment of consumers' money.

Ofgem's views

3.27. Appropriate incentives should be in place to ensure transmission investment is undertaken efficiently. As detailed in chapter five, Ofgem and its consultants will evaluate licensees investment plans and the extent of potential spare capacity in the network in order to determine the efficient level of transmission investment required to accommodate renewable generation.

- 3.28. An initial regulatory impact assessment will be published in July that will set out the costs and benefits of proposals for investment. This will take into account Ofgem's principal objectives and wider statutory duties.
- 3.29. Ofgem notes concerns that the location of renewable generation in Scotland (rather than in the South West of England and South Wales, where spare capacity exists) is inefficient. Provided that charging arrangements provide appropriate signals then generators will face incentives to build capacity where networks need little or no reinforcement.

Cost recovery

Respondents' views

- 3.30. A number of respondents opposed zonal use of system charging for the recovery of costs for the relevant investments. In particular they noted that:
- the investment costs should be spread evenly across GB as the required investment is driven by a need to meet a GB wide environmental target (and will benefit GB as a whole)
 - it would be inequitable if existing generators in Scotland were faced with a sharp increase in transmission charges because they happen to be located where increased renewable generation requires transmission reinforcement, and
 - it is inappropriate to apply zonal transmission charges to renewables as the renewable generation resource cannot be located close to demand and demand cannot be moved closer to renewable resources.
- 3.31. One respondent considered that the structure of use of system charging for each individual connection at the time the connection is agreed should be fixed. Another respondent proposed that the costs should be charged on a 'passed through' basis to customers. Such an approach would also align the GB transmission arrangements with EU developments.
- 3.32. One respondent, considering the impact of recovering costs through use of system charges, noted that proposals set out in the October consultation will

result in all transmission users being exposed to increased costs to facilitate large amounts of speculative renewable generation.

Ofgem's views

- 3.33. Ofgem notes respondents' concerns about zonal use of system charging. However, zonal charging appropriately allocates the costs incurred of generating at different points on the system. This arrangement is intended to provide incentives for generators to locate closer to demand as the costs incurred from reinforcing transmission infrastructure are lower. Transmission charges levied on generators should, where practicable, reflect the efficient investment costs which the transmission licensees have incurred.
- 3.34. All generators should be treated on a consistent basis. This promotes equitable treatment across all generators and encourages efficiency.
- 3.35. Renewable generators can respond to price signals and there are a range of locations across GB where it is possible to build and operate renewable generation.

4. Adjusting the price controls

- 4.1. The present price control arrangements have provided incentives on the transmission licensees to reduce costs and increase efficiency.
- 4.2. In developing an adjustment mechanism to supplement the existing price controls it will be important to try to ensure transmission licensees have an incentive to invest in an efficient and timely manner and protect customers from excessively high prices. It will be important to establish output measures to ensure that licensees deliver real network improvements in line with allowances for additional revenue. Where practicable it will also be important to deal with the uncertainty associated with this investment, perhaps by providing incentives for efficient risk sharing and alignment of consumer and transmission owner interests.
- 4.3. Such arrangements could ensure that allowed revenues are only provided where investment has been undertaken, taking into account planning delays. It could also ensure that costs are minimised in the case of any significant planning hurdles that for example might require additional and expensive underground cables.
- 4.4. Measures will also be introduced to ensure that any double counting through, for example, future price control reviews or other work programmes are appropriately taken into account, perhaps through the use of claw back provisions.
- 4.5. The proposed adjustment mechanism will address the funding of transmission investment to accommodate renewable generation between 2004/05 and 2006/07. At the next price control review the level of transmission investment in relation to renewable generation will be considered as part of the general transmission investment requirements. Therefore, it is important that any adjustment proposals will be compatible with the main price controls and incentive arrangements.
- 4.6. Developing the adjustment mechanism will provide an opportunity to understand more about the future challenges that the development of renewable generation is likely to create for transmission network investment, incentives,

access and charging arrangements. Therefore, the outcome of this work should inform policy development in the future.

4.7. The adjustment mechanism could take the following forms:

- **a lump sum allowance similar to existing price controls** - this could be determined from the forecast level of efficient investment and the associated financing arrangements. Where practicable a set of outputs would be identified (for example increases in network capacity)
- **a revenue driver** that would provide licensees with predetermined increases in revenue as new investment resulted in an increased demand for network capacity or as additional generation connected to the network, or
- **cost pass through**, perhaps with a periodic review which would provide Ofgem with an opportunity to decide whether investment had been efficiently incurred.

4.8. Each of these options are discussed in more detail below.

A lump sum allowance

4.9. A lump sum allowance could be set in a similar way to existing price controls. Ofgem could assess each licensee's forecasts of investment and allow the recovery of the financing costs (depreciation and return) for this investment. Where practicable the outputs (perhaps in terms of network capacity or the connection of additional generation) would be identified alongside the likely level of investment. These would assist in judging whether actual investment had been efficiently incurred.

4.10. At the next main price control reviews (to be completed in 2006 for implementation in 2007/08) it would seem appropriate to consider adding investment in relation to renewable generation to the licensee's regulatory asset values and for this investment to be funded through the main price controls. In doing so it would be necessary to assess whether the actual level of spending incurred represented an efficient level of investment and to consider how long licensees should retain the benefits of any efficiency gains.

4.11. This approach would retain the efficiency incentives of price cap regulation as the licensees would be allowed to retain efficiency savings for a prescribed level of outputs. It would also provide funding for a specified investment scheme(s) in a clear and transparent way. However, it would allow licensees only limited flexibility to adjust investment plans in the light of any new information that might emerge over the next few years. Given the present uncertainties about the level and pattern of renewable generation and the uncertainties relating to the licensees abilities to obtain planning consents for investment, this approach could result in a significant disadvantage for transmission licensees and customers.

Revenue Drivers

4.12. The second option would be to fund investment by a revenue driver that would provide licensees with predetermined increases in revenue as new investment increased network capacity or additional generation connected to the network.

4.13. The advantages of revenue drivers include:

- that they only provide additional revenue if a licensee is able to deliver an increase in the relevant output and
- they can automatically adjust revenue levels to reflect changes in investment plans or requirements

4.14. The disadvantages of revenue drivers include:

- it is not always straightforward to identify appropriate outputs
- if the revenue drivers are not calibrated appropriately, they can distort incentives, and
- given that transmission investment schemes can take several years to complete the use of revenue drivers might put a short-term strain on a licensees cash flows.

4.15. A simple revenue driver could be similar to that built into NGC's existing price control (NGC receives approximately £23/kW for generation connections above

a baseline agreed at the last price control review). However, there is a difficulty with this simple approach as transmission investment can be lumpy with different schemes having different unit costs.

- 4.16. In order to get around difficulties with lumpy investment the revenue driver could be differentiated by location, increments in capacity or increments in generation connections. However this makes the calculation of revenue drivers more complicated and tends to reduce the flexibility to deal with changing circumstances.
- 4.17. It would also be necessary to consider whether the development of a revenue driver would be consistent with the arrangements that will apply in Scotland after the implementation of BETTA, with separate transmission asset owners and NGC acting as GB wide system operator.

Cost Pass Through

- 4.18. The level of investment could be determined annually and the transmission licensees could be allowed to recover these costs and a rate of return. The costs and the amount of investment would be factored into the allowed revenues at the start of each year.
- 4.19. This form of regulation can be considered to have weaker efficiency incentives than price controls.
- 4.20. This option may be preferable because of the uncertainty about the costs, level and pattern of renewable generation that may require access to the transmission system. It would be flexible to changes in requests for access to the transmission networks by renewable generators.
- 4.21. Incentives could be enhanced by a periodic review by Ofgem to test whether investment has been efficient. However, this approach would tend to increase uncertainty for licence holders and might have an adverse affect on the incentives for licensees to expand network capacity.

Related Issues

- 4.22. Whatever the form of the adjustment mechanism it will be appropriate to try and encourage efficient investment by transmission licensees. For instance, where practicable, some form of benchmarking could be employed in assessing costs in order to promote incentives for efficiency. In practice this may be difficult, given differences between licensees and individual investment schemes. These matters are discussed further in chapter five.
- 4.23. It would be possible to derive a hybrid set of arrangements, combining two or three of the options described above. For instance, in electricity distribution the costs of investment for distributed generation is to be funded by a mixture of cost pass through and a revenue driver. These arrangements have been designed to take advantage of the desirable characteristics of revenue drivers – incentivising efficiency and flexibility to fund changing patterns of demand – while at the same time dealing with uncertainty by allowing a significant element of cost pass through. It is important to bear in mind that there are significant differences in the circumstances facing distribution and transmission licensees. Where transmission is concerned there is less uncertainty about investment requirements given that there is only a three year period until the next main price control review is implemented and that licensees have brought forward specific investment schemes for this period. There is also a need to coordinate investment proposals across licensees. These factors tend to mitigate against an approach based on cost pass through arrangements.
- 4.24. The advantages and disadvantages of the various arrangements are summarised in figure 4.1 below.

Table 4.1: Options for the Adjustment Mechanism

Option	Incentives for cost reduction	Regulatory burden	Flexibility (changes in requests for access)	Potential for excess profits	Possible perverse incentives	Incentives to connect maximum volumes
Lump sum	High	Low	Low	High	High	Low
Lump sum with outputs	High	Medium	Medium	Medium	Low	Medium
Revenue driver	High	Depends on design	High	Medium	Depends on design	Depends on design
Cost pass through	Very low	Medium	High	Low	High	High
Cost pass through with efficiency review	Low	High	High	Low	Medium	Medium

4.25. Another important issue relates to the changes for transmission licensees that will flow from the implementation of BETTA. From the introduction of BETTA in April 2005, NGC will have responsibility for coordinating transmission network system operation across all three GB networks. Any adjustment mechanism for the price controls needs to be robust to these changes.

4.26. It will be important to consider the interactions with charging and access arrangements. An efficient level of transmission investment is likely to lead to a network where there remains a residual level of network constraints. In these circumstances the charging and other arrangements should provide transmission licensees and generators with incentives to ensure that access is rationed in an efficient and non-discriminatory manner. Further, if charging and access arrangements can be designed so as to provide strong signals as to the likely pattern of demand across the network, then these signals will promote efficient investment across the transmission network. These matters are discussed further in chapter six.

Way Forward and Views Invited

- 4.27. As noted at the start of this chapter in developing an adjustment mechanism to supplement the existing price controls it will be important to try to ensure that transmission licensees have an incentive to invest in an efficient and timely manner and protect customers from excessively high prices. It is not straightforward to design and implement regulatory arrangements that promote efficiency and protect the interests of consumers because there are uncertainties about the level and pattern of renewable generation, it takes a relatively long time to complete transmission investment projects and there are uncertainties created by requirements on licensees to seek planning consents for network reinforcement.
- 4.28. Clearly there are advantages in supplementing a basic approach to setting price controls with output measures and revenue drivers where practicable. Given the relatively poor incentive properties associated with cost pass through arrangements and the other issues described in paragraph 4.18 it is unlikely that a cost pass through arrangement would provide the best way forward. Views are invited on any aspect of the issues raised in this chapter and in particular on whether:
- the revenue deriving from the adjustment mechanism should be based on the funding costs of projections of investment over the period 2004/05 to 2006/07
 - outputs should be identified to assist in establishing whether licensees have delivered investment that is fit for purpose, and any suggestions as to what sort of outputs would be most appropriate (for example the capacity of the network or level of additional capacity connected to the network)
 - there is a mechanism that could be adopted that would deal with the uncertainties created by the requirements on licensees to obtain planning consents for new investment
 - the cost of capital should be consistent with that used in setting the main price controls, and

- it would be appropriate to identify revenue drivers to determine the level of revenue that a licensee would be entitled to in each year.

5. Determining the efficient level of investment

- 5.1. As noted in chapter 1 the emerging pattern of renewable generation developments, primarily in Scotland, suggests that it may be necessary to provide for the funding of additional transmission investment.
- 5.2. To assist in determining the form of, and to calibrate, the price control adjustment mechanism, it will be necessary to assess the efficient level of transmission investment required in relation to the likely levels of renewable generation. The approach to assessing investment is discussed below.
- 5.3. The transmission licensees have already provided information on transmission investment schemes that they consider necessary to connect about 6GW of renewable generation within Scotland. The schemes are grouped together in three phases, each of approximately 2GW. These phases have been designed to be complementary. This consultation focuses on phase one. Conclusions in relation to phase one should provide a robust basis for deciding on an approach to phases two and three.

Method

- 5.4. Ofgem will review the plans of licensees for new transmission system investment and other relevant information. At a high level, the review will need to take into account:
 - projections of the level of conventional and renewable generation connecting/ disconnecting to distribution and transmission networks in Scotland over the medium to long-term
 - the need for new transmission investment to efficiently meet the anticipated additional renewable generation (this will be affected by the likely pattern of conventional and renewable generation, network flows and constraints, investment planning standards and the ability of licensees to find innovative technical solutions to expanding network capacity), and
 - the cost of the proposed upgrades to the transmission system.

5.5. These three factors are subject to uncertainties of varying levels and it will be appropriate to consider sensitivity and/or scenario analysis. As transmission investment has relatively long lead times and licensees have to obtain planning consents for network reinforcement it may be necessary to strike a balance between building only on demand (thereby incurring constraint costs) and building in advance of it being certain that demand will materialise (risking over investment and higher prices for consumers).

The Level of Renewable Generation

5.6. At present, there is significant uncertainty about the level of renewable developments. There are a relatively large number of onshore wind energy schemes proposed for Scotland. However, it is unlikely that all these schemes will be built and it is also likely that additional proposals will be made in the future.

5.7. To determine the likely level of renewable generation, Ofgem will need to consider information such as:

- forecasts made by licensees and others of renewable generation development across Scotland
- the plans of renewable generation developers
- applications for network connections
- offers of network connections
- plant that is under construction, and
- the economics of renewable energy development in Scotland given the obligations on suppliers under the Renewables Obligation Order 2002 and the Renewable Obligation (Scotland) Order 2002 to supply an increasing percentage of electricity from renewable generation and assuming broadly cost-reflective transmission charging arrangements.

Evaluation of the transmission reinforcement proposals

- 5.8. Once an assessment has been undertaken of the likely level of additional renewable generation, the licensees' plans for reinforcement work will need to be investigated.
- 5.9. The basic test for whether transmission upgrades are economic will involve assessing the expected difference in the annual costs of constraints that are likely to occur with and without the network upgrade (assuming broadly cost reflective transmission charging) against the annual cost of financing and maintaining the transmission system upgrades.
- 5.10. The analysis of the robustness of the licensees' proposals for upgrade plans will need to be reviewed in this light. Likely issues and information that would be required for this analysis include:
- modelling of the transmission system based on the intermittent nature of renewable generators, seasonal variations in output, constraints on the grid and assumptions about the operation of conventional generation
 - the likely scenarios and constraint costs for a number of years into the future, identifying appropriate trade offs where appropriate, and
 - assessing if there are any practicable ways of increasing transmission network capacity using less capital intensive solutions.

Evaluation of the costs of upgrade proposals

- 5.11. To review the costs of actual upgrade projects, detailed analysis and knowledge will be required in relation to the following:
- comparison and benchmarking of standard costs based on knowledge of UK and international transmission system development and design
 - an evaluation of the regional variations to transmission upgrade costs
 - considering how long it will take to complete appropriate schemes, including the scope for planning delays, and

- the prevailing market conditions and whether market prices are likely to rise or fall in the future.

Renewable versus non renewable investment requirements

- 5.12. Separating the costs of transmission reinforcement to accommodate renewable generation from that of general system reinforcement or replacement may be difficult because there is a risk of double counting investment already allowed for in existing price controls. There may also be issues of cost allocation and attribution, particularly if the adjustment mechanism provides for different incentives to those under the existing price controls. It would not be appropriate for transmission licensees to recover additional revenue because of double counting and Ofgem will take steps (both now and in the future) to ensure that this is not the case, including making adjustments to the transmission price controls, using some form of claw back arrangement.

Process

- 5.13. Independent consultants have been invited to support Ofgem's evaluation of the transmission reinforcement proposals that transmission licensees have suggested are necessary as a consequence of renewable generation connections. The consultants will support Ofgem in assessing the capital expenditure proposals provided by the transmission licensees.
- 5.14. The consultants' work will be based on detailed information provided by the transmission licensees and will:
- test the validity, quality and accuracy of the estimates of the forecast generation connections to the transmission and distribution networks primarily in Scotland
 - evaluate the robustness of the design solutions proposed by the transmission licensees
 - review the design of the proposed reinforcements schemes, including quantifying the additional transmission capacity that would be provided

testing the sensitivity of the designs; assessing reasonable level of costs for works identified; and assessing the timetable and associated risks

- quantify the level and volume of transmission constraints that would occur if works were not carried out, if work goes ahead, and while work is being carried out, and
- evaluate whether the proposals for the initial phase of reinforcement are consistent with proposals for future phases of reinforcement.

5.15. The costs of the proposed transmission system upgrades will be assessed using a range of criteria including:

- understanding and challenging the underlying assumptions used by the transmission licensees in forecasting their expenditure
- identifying and ascertaining the reasons for any significant variations in expected and likely future costs from the transmission licensees' forecasts, and
- evaluating costs estimates and identify any factors that relate to the individual circumstances of any of the transmission licensees.

5.16. A report explaining Ofgem and the consultants' evaluation of the reinforcement proposals and the results of the above analysis will be published in June or July 2004. Licensees will be invited to comment on the reports prior to publication.

Views invited

5.17. Views are invited on any of the issues raised in this chapter and in particular on:

- what are the best approaches and sources of information on the likely level and pattern of renewable generation
- the assumptions that should be made about the operation of existing conventional plant in particular in Scotland
- assessing whether transmission upgrades are economic on the basis of assessing the expected difference in the annual costs of constraints that are likely to occur

with and without the network upgrade (assuming broadly cost reflective transmission charging) against the annual cost of financing and maintaining the transmission system upgrades, and

- the best approach to assess the expected costs of reinforcement schemes.

6. Contractual and charging arrangements

- 6.1. Chapters four and five of this document focus on the funding of transmission investment in relation to renewable generation. This chapter considers how these costs would be recovered from users of the transmission networks.
- 6.2. The chapter includes:
- a brief description of the contractual and charging arrangements for access to NGC's, SHETL's and SPTL's transmission networks, progress on reform of these arrangements in England and Wales, and the implications of the proposed introduction of BETTA, and
 - a discussion of some of the changes to charging arrangements that it might be appropriate to consider in the future.

Contractual arrangements

- 6.3. Under the terms of its transmission licence, NGC is required to have in place and maintain a Connection and Use of System Code (CUSC).⁹ The CUSC is the contractual framework governing connection to and use of NGC's transmission system.
- 6.4. The arrangements differ in Scotland where parties connected to and using the transmission system enter into bilateral connection and use of system contracts with the relevant transmission licensee.
- 6.5. The CUSC and/or bilateral contracts oblige the parties connected to and using the transmission system to pay connection and use of system charges as calculated by the transmission licensees' charging methodologies.
- 6.6. The transmission licensees are obliged to offer terms to any authorised electricity operator requesting use of its system and to any market participant seeking access to its transmission system¹⁰. The Authority resolves disputes if there is a

⁹ Condition C7F.

¹⁰ SLC C7D and D8B

failure to agree terms in respect of a new agreement or changes to an existing agreement¹¹.

Charging arrangements

- 6.7. Transmission licensees recover price control revenues through two main categories of charges - connection charges and use of system charges levied on generators, suppliers and customers. The price controls place a cap on the revenues the transmission licensees can earn from these charges.
- 6.8. Connection charges are designed to reflect the costs of connecting particular users to the transmission system while use of system charges are designed to reflect the costs of providing the transmission system.
- 6.9. There are a number of licence obligations on the transmission licensees when setting charges for connection and use of system. For example:
- connection charges should be set at a level that enables licensees to recover an appropriate proportion of the costs incurred and a reasonable rate of return on the capital represented by those costs
 - there should be no discrimination in charges for the use of and connection to the transmission system, and
 - the transmission licensees' charges for use of the transmission system should not restrict, distort or prevent competition in the generation, transmission, distribution and supply of electricity.

NGC's charges

Use of system

- 6.10. NGC's transmission network use of system (TNUoS) charges are designed to provide efficient signals to users that reflect the incremental costs of accommodating them. These charges are split 27:73 between generation and demand.

¹¹ SLC C7E and D8C.

- 6.11. NGC's TNUoS charges are defined on a zonal basis and depend on the balance of generation and demand at different points on the system. For example, generators' TNUoS charges are higher the further away they are from centres of demand, while generators in zones where there is a large amount of demand and little generation receive TNUoS payments. These arrangements are designed to provide an incentive to locate closer to demand as doing so requires less investment in transmission infrastructure.
- 6.12. At present the large majority of generation capacity is connected to the transmission networks. Generators connected to distribution systems are exempt from NGC's TNUoS charges if they export less than 100MW, although some of these generators may rely on the connections between transmission and distribution networks to be able to export output to centres of demand. It is not clear that these arrangements provide for cost-reflective charging and may distort the investment decisions of generators and network operators. Ofgem will start a review of these arrangements next year, with a view to establishing charging arrangements that provide appropriate economic signals.

Connection charges

- 6.13. The costs of connecting a user to the transmission network include the costs of the connection assets and the costs of system reinforcement to accommodate the additional generation or demand. It is necessary to define the boundary between charges that should apply to a user for connecting to the system (connection charges) and charges that reflect the costs of providing the transmission system to all users and therefore, which should be recovered from use of system charges.
- 6.14. NGC's connection charging methodology is based on a shallow connection approach, where connection charges represent the costs of connection that can solely be attributed to a single user. Transmission system reinforcement costs that result from new connections and the costs of shared connection assets are recovered through use of system charges. From April 2004¹² post vesting assets

¹² [Ofgem issued its decision not to veto CCM-M-07 \(Change to Connection Boundary & associated removal of Land Charges & Type B Termination Charges and Change to Calculation of Site Specific Maintenance Charges\) and UoSCM-M-10 \(Proposal to amend the methodology for calculation of locational TNUoS](#)

(those assets acquired post 31 March 1990) that were treated as connection assets will now be incorporated as infrastructure assets, under a shallow connection charging policy.

- 6.15. The move to shallower connection charges was intended to promote competition in the provision of new connections and in the wholesale market by ensuring that all generators can access the transmission network on comparable commercial terms.
- 6.16. If shallow connection charges are to provide effective economic signals then use of system charges need to provide appropriate locational signals in order to promote an efficient pattern of generation and demand.

SPTL and SHETL's transmission charges

- 6.17. At present SPTL and SHETL each set transmission charges in their respective authorised areas. These charges do not vary by location. SHETL's use of system charging structure is broadly similar to that of SPTL, except that SHETL levies an entry charge on generators that connected to its system after 1 April 2002.
- 6.18. The SHETL entry charge shares reinforcement costs caused by new generation across all new generator connections. Generators connected to SHETL's transmission system before April 2002 (that paid deep connection charges) are not liable to pay the entry charge.
- 6.19. Distribution-connected generators that have net flows onto the transmission systems are liable for SPTL's and SHETL's transmission charges but generators who are contracted to sell electricity under the terms of the Scottish Renewables Obligation ('SRO generators') are currently exempt from SPTL and SHETL's transmission's use of system charges.

tariffs) on 19 December 2003. These documents are available from the NGC charging website at http://www.nationalgrid.com/uk/indinfo/charging/mn_modifications.html

Review of the England and Wales contractual and charging arrangements

- 6.20. Ofgem has published a number of consultations¹³ on how the contractual and charging arrangements for transmission services might be developed towards a structure consistent with the new arrangements in place for the wholesale trading and transmission of electricity. These consultations included a suggestion that it would be appropriate to explore whether it would be possible to develop longer-term firm access rights which could provide price certainty for developers. Ofgem also suggested that access rights might be tradable between generators. If it were practicable, such a system could provide flexibility and certainty for developers while allowing prices to signal the need for new transmission capacity.
- 6.21. NGC has considered the development of longer-term access rights but concluded that this is difficult within current regulatory structures and periodic revenue setting. It considered that implementation of a long-term charging regime would not be straightforward. NGC considered that if necessary and appropriate, these matters could be reconsidered after the implementation of BETTA.

Contractual and charging arrangements under BETTA

- 6.22. Ofgem and the DTI are proposing to reform wholesale electricity trading and transmission arrangements as part of the BETTA project. One of the aims of BETTA is to promote the creation of a single competitive wholesale market across GB. To facilitate the achievement of this aim it is proposed to introduce a single set of arrangements for transmission connection to and use of any

¹³ Office of Gas and Electricity Markets, NGC System Operator Incentives, Transmission Access and Losses Under NETA – A Consultation Document, December 1999.
Office of Gas and Electricity Markets, Transmission Access and Losses under NETA – Consultation Document, May 2001.
Office of Gas and Electricity Markets, *Transmission Access and Losses under NETA – Revised Proposals*, February 2002.

transmission system in GB. NGC has consulted on extending its locational use of system charges across GB.

- 6.23. The Energy Bill which introduces BETTA received its first and second readings in the House of Lords on 27 November 2003 and 11 December 2003 and its third reading on 20 April 2004 respectively. The Government intends to implement BETTA in April 2005.
- 6.24. In August 2003, Ofgem/DTI published a two part consultation on transmission charging arrangements under BETTA.¹⁴ Part 1 of the August 2003 consultation proposed that the GB system operator (NGC) should be responsible for charging for connection and use of system for transmission across all of GB. Part 2 of the document was a separate consultation by DTI, which discussed whether the Secretary of State should, in certain circumstances, have the power to cap transmission charges to generators.
- 6.25. In December 2003, Ofgem/DTI published conclusions on Part 1¹⁵, which confirmed the proposals set out in the August 2003 document.
- 6.26. On 2 March 2004, the DTI published its conclusions on Part 2¹⁶ of the August 2003 consultation. It is Ofgem's understanding that as part of these conclusions, the Secretary of State intends to take powers to introduce a cap and a percentage discount on transmission charges for some renewable generators located in peripheral regions.
- 6.27. If the government chooses to exercise these powers it would represent a move away from the principles of cost-reflective charging. Transmission licensees would find it more difficult to justify the reinforcement investment necessary to allow these generators firm access to the transmission network as economic. In these circumstances there is a significant probability that the access of these generators to the transmission networks would have to be rationed or restricted in some way.

¹⁴ 'Transmission charging and the GB wholesale electricity market', Ofgem, August 2003

¹⁵ 'Transmission charging and the GB wholesale electricity market Ofgem/DTI conclusions on Part 1: Changes to transmission licences to implement GB transmission charges under BETTA, Ofgem/ DTI, December 2003

¹⁶ 'Transmission charging and the GB wholesale electricity market DTI conclusion on Part 2: Transmission charging, in the context of the Government's policy objectives for growth in renewables, DTI, March 2004

6.28. Ofgem is consulting on how generators connected at 132kV in Scotland should be treated after the implementation of BETTA. In Scotland 132kV is treated as transmission and in England and Wales it is treated as distribution. Ofgem is seeking to put interim arrangements in place in order to try and ensure the equitable treatment of generators in Scotland. As discussed above, in the longer-term Ofgem is seeking to review the treatment of generators connected to distribution networks to ensure that these generators make an appropriate contribution toward the cost of operating transmission networks.

Impact of expenditure on transmission charges

6.29. As discussed above, the transmission licensees recover allowed investment through TNUoS charges in England and Wales and through infrastructure charges in Scotland. Expenditure on infrastructure investment in relation to new renewable capacity will also be recovered through these charges. At this stage it is difficult to predict the precise impact of transmission investment for renewable generation on these charges. However, it is likely to increase generator charges in Scotland and demand charges on a wider basis.

Views invited

6.30. There are a number of issues to consider regarding the contractual and charging arrangements over the longer-term including:

- what changes, if any, might be appropriate to NGC's charging methodologies to take account of the increasing levels of renewable generation
- whether generators that trigger significant investment in the transmission system should be required to commit to longer-term access arrangements to reduce the chance of assets being stranded
- should access rights be allocated on a first come first served basis or whether all generators should be treated consistently

- whether transmission entry and exit rights could be tradable and whether this would assist generators and network operators in efficiently resolving tradeoffs between network constraints and investment, and
- how to ensure that distribution connected generators which are exporting energy and or increasing flows on transmission networks, make an appropriate contribution toward the cost of transmission networks.

7. Way forward

- 7.1. This chapter summarises the way forward, key issues for consultation and the proposed timetable for this project.

Ofgem's views

- 7.2. The most pragmatic approach is to implement an adjustment mechanism to supplement the existing price controls with a view to financing transmission investment for renewable generation for the period 2004/05 to 2006/07. In developing these arrangements it will be important that the solution should be compatible with longer-term objectives to develop appropriate incentives for efficient and timely investment in transmission networks, and, to protect consumers from excessively high prices.
- 7.3. Any allowances for additional revenue should be associated with output measures, in order to assist in judging whether spending has been efficiently incurred and, if practicable, appropriate revenue drivers. Adjustments to the regulatory asset values underlying the main price controls will be made at future price control reviews.

Next steps

- 7.4. Draft proposals will be published in July 2004 and final proposals and any necessary licence modifications in autumn 2004.
- 7.5. Developing draft and final proposals will provide an opportunity to understand more about the future challenges that the development of renewable generation is likely to create for transmission network investment, incentives, access and charging arrangements. The outcome of this work should inform policy development in the future.
- 7.6. In the longer-term, Ofgem will also consider changes to the contractual and charging framework, to improve the economic signals to transmission licensees and users of the transmission systems (including distribution connected generators).

Views invited

- 7.7. Ofgem would welcome views on any of the issues raised in this consultation and in particular whether:
- the revenue deriving from the adjustment mechanism should be based on the funding costs of projections of investment over the period 2004/05 to 2006/07
 - outputs should be identified to assist in establishing whether licensees have delivered investment that is fit for purpose, and any suggestions as to what sort of outputs would be most appropriate (for example the capacity of the network or level of additional capacity connected to the network)
 - there is a mechanism that could be adopted that would deal with the uncertainties created by the requirements on licensees to obtain planning consents for new investment
 - the cost of capital should be consistent with that used in setting the main price controls, and
 - it would be appropriate to identify revenue drivers to determine the level of revenue that a licensee would be entitled to in each year.
- 7.8. Views are also welcome on:
- what are the best approaches and sources of information on the likely level and pattern of renewable generation in Scotland
 - the assumptions that should be made about the operation of existing conventional plant in Scotland
 - assessing whether transmission upgrades are economic on the basis of assessing the expected difference in the annual costs of constraints that are likely to occur with and without the network upgrade (assuming broadly cost reflective transmission charging) against the annual cost of financing and maintaining the transmission system upgrades
 - the best approach to assessing the expected costs of reinforcement schemes

- what changes if any might be appropriate to NGC's charging methods to take account of the increasing levels of renewable generation
- whether generators that trigger significant investment in the transmission system should be required to commit to longer-term access arrangements to reduce the chance of assets being stranded
- should access rights be allocated on a first come first served basis or whether all generators should be treated consistently
- whether transmission access rights could be tradable and whether this would assist generators and network operators in efficiently resolving tradeoffs between network constraints and investment, and
- how to ensure that distribution connected generators exporting energy and or increasing flows on transmission networks make an appropriate contribution toward the cost of transmission networks.

Appendix 1 – Required investment

TIWG investment forecasts

- 1.1 The government's target that ten per cent of electricity supplies within the UK should be generated from renewable sources by 2010 could require up to 10GW of additional renewable generation capacity.
- 1.2 To provide an indication of the sums that might be involved, the 2003 TIWG report concluded on the costs of reinforcement associated with the provision of access to 2 GW, 4 GW and 6 GW of additional renewable capacity in Scotland (half in SHETL's area and half in SPTL's area). These three cases, referred to as Stages 1 to 3, were used to estimate required infrastructure investment for each of the transmission licensees. Under the Stage 1 (2 GW) case, it was concluded that the required investment costs would be £190m for SHETL, £160m for SPTL and £170m for NGC. The report also suggested that construction of the reinforced system would take between three and five years so that, even were the transmission licensees to consider that such a level of investment needed to be undertaken immediately, the bulk of the expenditure might be expected to occur in the next price control period i.e. beyond the timescales considered in this document.
- 1.3 The report also identified the costs associated with network development that would accommodate up to 6GW of wind generation in England and Wales and 2GW in Scotland by 2010, which could be as high as £1,125m.

Further developments

- 1.4 Following the October consultation, all three transmission companies have provided further information to Ofgem on the potential costs of network reinforcement to accommodate renewable generation projects. The revised forecasts, as set out below, are based on higher levels of committed renewable generation since the TIWG report was published.

SHETL's investment forecasts

Level of Renewable Generation Activity

- 1.5 Following the announcement of the Government targets for renewable energy, SHETL has received a considerable volume of connection applications from renewable generators. The table below outlines the latest position.

Renewable Generation	Number of Schemes	Installed Capacity (MW)
Already Connected	36	170
Being Built	21	575
Quote Accepted	20	828
Sub Total	77	1573
Conditional acceptance	9	228
Quotes Issued	14	1110
In Applications Process	35	742
In Funded Feasibility Study	30	835
Overall Total	165	4448

- 1.6 The connection activity is high and is being sustained, consequently these numbers could vary (upwards) considerably in the short to medium term. This puts more pressure on the transmission system and strengthens the need to reinforce the network.

System Limitations

- 1.7 Due to the technical characteristics of the SHETL transmission system there are power flow constraint boundaries within the system and these are indicated in the company's Seven Year Statement (SYS) of transmission capacity. These boundaries indicate the main 'pinch points' on the SHETL network and reflect where transmission constraints are likely to occur.

Northwest Constraint

- 1.8 This constraint boundary reflects maximum power flow, under planning standards, across the 275kV system between Beauly – Foyers – Blackhillock, the 132kV transmission system between Beauly – Fort Augustus – Errochty – Bonnybridge, the 132kV system between Beauly – Inverness – Nairn – Elgin – Keith and the 132kV system between Beauly – Boat of Garten – Keith.

North-South Constraint

- 1.9 This boundary includes the 275kV and 132kV system between Kintore – Persley – Tealing and Fort Augustus – Errochty – Bonnybridge respectively.
- 1.10 The power flow constraints across these boundaries will limit future connection of new generation. In addition to the connection limitation, significant constraint payments could be made to the generators under the proposed BETTA access arrangements.

Beaully-Denny Reinforcement

- 1.11 In general, the need to reinforce the transmission system is driven by growth either in connected load or generation capacity, whereby the security of the network would otherwise move out with the licence standards.
- 1.12 The requirement for transmission system reinforcement is based on the SHETL's licence Planning and Security Standards, cost benefit analysis and SHETL's 'shallow' transmission connection policy.
- 1.13 In SHETL the growth of renewable generation connection and scheme offer acceptance has resulted in a need to carry out further detailed studies to ascertain the impact on the transmission network in order to maintain the security of the grid system.
- 1.14 The trigger point for transmission system reinforcement is linked with specific amount of generation that will be either connected to or uses the transmission system. The location of the contracted generation will cause a significant increase in the north to south power flows. This will affect both the north-west and north-south constraint boundaries and the common factor in both these constraint boundaries is the Beaully – Fort Augustus – Errochty – Bonnybridge circuits.
- 1.15 The study analysis shows that the preferred option from a technical and economic viewpoint is to reinforce the existing transmission network by a double circuit tower line, to 400kV construction, along a similar route to the existing 132kV circuit from Beaully to Bonnybridge.

- 1.16 The new circuit would connect into the existing substations along this route at Fort Augustus, Errochty and Braco in order to secure existing demand and harvest the renewable generation applications received in these areas.
- 1.17 The studies also show that there will be need to provide voltage support at Beauly by installing SVC. This will ensure compliance with SHETL's licence standards.
- 1.18 SHETL have been making substantial progress with this major project and have already identified a preferred route and obtained initial quotations from contractors for the work. At current rates, without undergrounding or Public Inquiry, the cost is now estimated at £240m, reflecting increases in material and labour costs since the initial estimates. Costs will ultimately be driven by escalation factors such as indexation of materials and labour, and any requirements of the S37 consent, in particular deviations to the route or undergrounding.
- 1.19 This key reinforcement project provides a robust and flexible arrangement to build on for future transmission upgrades to accommodate further renewable generation.
- 1.20 Assuming that clearance is given in late 2004, the expected profile of expenditure would be as follows:

2005/6 - £80m, 2006/7 - £100m, 2007/8 £60m

Further Work

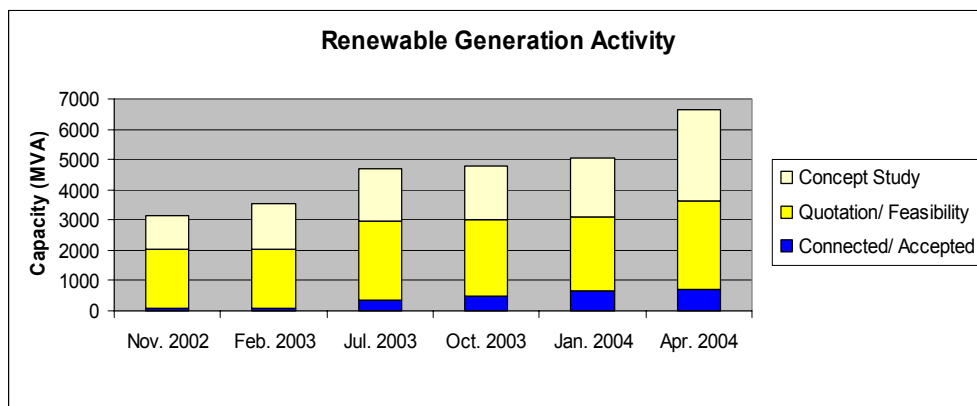
- 1.21 Given the level of generation that has accepted both firm and conditional offers for connection, SHETL is now actively considering further reinforcements to complete the initial phase of investment for renewable generation. These amount to some £80m and include reinforcement in the Sloy area, additional conductor on the Beauly – Dounreay circuit and reconductoring between Beauly and Keith. Feasibility studies are also under way for connections to the island groups, and expenditure will be incurred during 2004/2005 on these studies.

SPTL's investment forecasts

Overview of the RETS proposals for the period 2004 to 2008

Renewable Generating Activity in SPTL Area

- 1.22 There is presently a significant level of renewable generation connection activity in the SPTL area. The chart below highlights that the total capacity of new connections at the various stages in the connection process is now in excess of 6500MVA and that the rate at which this figure is growing is high.



- 1.23 The current level of renewable generation activity within the SPTL area is detailed in the table below.

Status	No. of Developments	Capacity (MVA)
Connected Wind Farms	8	184
Offers Accepted/ Construction in Progress	8	530
Offers in Preparation/ Issued	15	1393
Feasibility Studies	14	1509
Sub-total	45	3616
Concept Enquiries	61	3017
TOTAL	106	6633

1.24 The majority of prospective renewable generation capacity is from onshore wind developments.

RETS Stage 1 Proposals for the Period 2004 to 2008

1.25 An overview of the proposals to deliver RETS Stage 1 i.e. to provide the infrastructure reinforcements necessary to accommodate 2000MW of renewable generation in Scotland, is detailed below. The proposals also include the provision of connection infrastructure in South West Scotland which will form part of the subsequent RETS development. For planning and programming purposes the proposals have been split into 5 discrete projects.

West Coast Interconnector Voltage Uprating

1.26 The capacity of the electrical interconnection between Scotland and England is presently limited in the summer to between 2000MW and 2200MW by the

thermal rating of the east coast interconnectors and in the winter to between 2200MW and 2300MW by transient stability considerations¹⁷.

- 1.27 Application of licence planning standards with a background of 1534MW of contracted renewable generation projects in Scotland forecast to be connected by winter 2005, requires an interconnection capability of approximately 3100MW.
- 1.28 To overcome the existing transient stability limit, and a thermal restriction on the 275kV west coast interconnector circuit, it is necessary to increase the capacity and reduce the impedance of the west coast interconnector circuits.
- 1.29 It is proposed to achieve this by uprating the west coast circuit currently operating at 275kV to 400kV operation. The overhead line between Strathaven and Harker is of 400kV construction. Works will be required at Gretna, Elvanfoot, Coalburn, Linnmill and Strathaven. These works will be co-ordinated with works to be carried out by National Grid Transco (NGT) at Harker.

East Coast Interconnector Thermal Uprating and Borders Reconfiguration

- 1.30 In order to deliver the interconnection capacity required between Scotland and England, it is proposed to re-conductor the circuits between Eccles and Stella West with conductors of higher capacity. These works will be co-ordinated with NGT who own approximately 90% of the overhead line.
- 1.31 In order to prevent the 132kV Borders network overloading for an east coast Interconnector double circuit fault it is necessary to split the network. In order to reconfigure the network two short lengths of wood pole overhead line are required at Hawick with associated 132kV switchgear modifications.

SHETL Transfer Capability from the Highlands

- 1.32 In order to relieve overloads caused by new renewable generation projects in the north of Scotland, Scottish Hydro-Electric Transmission Ltd (SHETL)

¹⁷ Capacities are for transfers from Scotland to England.

propose to rebuild the Errochty-Braco-Bonnybridge 132kV circuit to 400kV double circuit construction, with one circuit operating at 275kV. It is proposed that this route be terminated at a new substation in the SPTL area near Denny. These works will be co-ordinated with the works of SHETL.

- 1.33 Two further upgrades are required to accommodate the additional flows through the SPTL network: -
- i) The 275kV switchgear and connections require to be replaced at Easterhouse and Clyde's Mill substations.
 - ii) The 275kV circuit between Windyhill and Neilston will be uprated to 400kV operation by reconfiguring the network and the provision of a transformer at Neilston.

SHETL Reinforcement near Sloy

- 1.34 In order to accommodate the volume of renewable generation on the Mull of Kintyre and the south west of SHETL's operating area, it is proposed to provide a reinforcement from the SHETL network in the Sloy area to the SPTL network. These works will be co-ordinated with the works of SHETL.

South West Scotland Connection Infrastructure (RETS Stage 2 Advanced Works)

- 1.35 South West Scotland has been identified in a report commissioned by the Scottish Executive as having a connectable wind resource of approximately 2.3GW¹⁸ for development outwith the most environmentally sensitive areas. However, the electricity supply infrastructure is limited to a single circuit 132kV overhead line with a capacity of 106MVA. There is no capacity for the connection of any further renewable generation.
- 1.36 It is proposed to establish a new 400kV overhead line from Kilmarnock South to the north of Kendoon to provide the capacity required by renewable generators. The overhead line and associated works at Kilmarnock South and Kendoon will provide significant connection capacity for renewable generation.

¹⁸ 'An Assessment of the Potential Renewable Energy Resource in Scotland', a study carried out by Scottish Hydro-Electric

1.37 In keeping with the RETS approach strategy of providing incremental reinforcement to accommodate the development of renewables future system needs, with a minimum of stranded assets, the new overhead line supports the later phases is in line with the RETS development Stage 2 proposals. As such the new line could provide the first section of a new interconnector from Kilmarnock South to Harker.

SPTL Capital Expenditure and Incidence

Total (£m)	2004/ 05 (£m)	2005/ 06 (£m)	2006/ 07 (£m)	2007/ 08 (£m)	2008/ 09 (£m)
225.0	7	64	72	60	22

1.38 The detailed construction programme and associated incidence of expenditure will be co-ordinated by the three transmission licensees.

NGC's investment forecasts

Overview of the Transmission Reinforcements Required to Accommodate Renewable Generation in Scotland

1.39 This note provides an overview of the works and associated Capex requirements to deliver infrastructure reinforcements to accommodate the contracted and predicted renewable generation in Scotland to 2007/08.

1.40 NGT's assessment of the need for infrastructure reinforcements is based on confidential information provided by the Scottish transmission licensees, which details the level and commitment of renewable generation in Scotland. I.e.

- 1534MW of connected and 'under construction' projects by winter 2005,
- 2.3GW to 4.6GW of renewable generation by 2007/08.

plc, Scottish Power plc, the Department of Trade and Industry, the Scottish Office, Scottish Enterprise and Highlands and Islands Enterprise, with support from the Convention of Scottish Local Authorities, December 1993.

1.41 For planning and programming purposes the proposals have been split into discrete projects as follows: -

Interconnector Circuits

1.42 The current 'interconnector' capability is limited in the summer to between 2.0GW and 2.2GW by the thermal rating of the east coast circuits and in winter to between 2.2GW and 2.3GW by transient stability considerations. 1.5GW of renewable generation in Scotland has either been built or is currently under construction. To satisfy the requirements of the NGT Security and Quality of Supply Standard (SQSS), this penetration of renewable generation would require an 'interconnector' capability of 3.1 GW.

1.43 This capability could be achieved by the following NGC network reinforcements:

West Coast Circuits:

- Uprate the second circuit to 400kV operation
- Construct an additional 400kV bay at Harker substation
- Reconductor both circuits with heavier conductors
- Installation of reactive compensation at Harker/Blyth

East Coast Circuits

- Reconductor both circuits with heavier conductors.

1.44 The heavier conductors identified above provide greater thermal capacity, increased stability levels through lower impedance and reduce power losses.

1.45 To accommodate power flows arising from the penetration of renewable generation towards the 4GW level, an additional 400kV overhead line would be required between Scotland and England. The NGT works would comprise:

The third overhead line

- At Harker 400kV 'indoor' substation, extend the substation building and construct 2 new 400kV bays,
- Construct approximately 9kms of new overhead line.

The Heysham Ring

1.46 There is presently limited surplus Transmission Capacity in the circuits forming the 'Heysham ring'. Over 500MW of off-shore Wind farms have contracted to

connect to the Heysham/Stanah group between 2005 and 2007. As a result there is no surplus capacity available to accommodate increased power flows from additional generation in Scotland.

1.47 The renewable generation currently under construction in Scotland against the contracted generation background in England would require the Heysham/Stanah/Penwortham circuits and the Harker/Heysham/Penwortham circuits to be re-strung with heavier conductors.

The North East Ring

1.48 A 275kV double circuit currently supports the north east. For 1.5GW renewable generation in Scotland and with the 'interconnector' circuits reconducted to provide a capacity of 3.1GW, a 400kV link would be required from the East Coast interconnector to the main 400kV network in the north east to satisfy the SQSS voltage and stability requirements. The NGC works would comprise:

Blyth to Hawthorne Pit Works

- Establish new 400kV substations at Blyth, Stella West, South Shields, Tynemouth and West Boldon
- Uprate the existing Blyth – Hartlepool circuit to 400kV and reconnect to Hawthorne Pit and the new 400kV substations listed above.
- Reconfigure the existing 275kV circuits in the vicinity of Blyth, Stella West and Hartlepool.

1.49 To support the post fault voltage profile and stability performance arising from increased power flows arising from the penetration of renewable generation towards the 4GW level, it may also be necessary to:

- Install reactive compensation at Harker and Blyth substations.

NGT's Capital Expenditure and Incidence

Apr-Aug 04	Aug-Mar 05	05/06	06/07	07/08	08/09	09/10
£2m-£4m	£8m-£10M	£48M	£79M	£77M	£69M	£31M

Notes: 1) Cost of re-conductoring the interconnector circuits to Scottish border only.

2) Excludes costs associated with the third interconnector circuit.

Summary

1.50 As outlined above, the companies have estimated what they consider (allowing for reasonable assumptions on the volume and location of new generation) to be a reasonable level of capital expenditure in the years 2004/5, 2005/6, and 2006/7. These costs are summarised in the Table 1.1.

Table 1.1: Estimated infrastructure expenditure related to renewables over the next 3 years

Company	Year		
	2004/5	2005/6	2006/7
SHETL	n/a	£80m	£100m
SPTL	£7m	£64 m	£72m
NGC	£10m	£48m	£79m
Total	£17m	£192m	£251m

Source: NGC, SPTL, SHETL

- 1.51 These figures suggest that a total of £17m could be invested in advance of the next price control periods. This figure rises to £209m if a decision is taken to extend by one year the existing price controls for the Scottish transmission businesses.
- 1.52 To put these figures in context we can compare the estimated infrastructure expenditure in relation to renewables with the estimated capital expenditure for the three transmission licensees in 2004/05 which are £17m and £277m respectively. In 2005/06 NGC's estimated capital expenditure is £222m compared with the estimated additional expenditure of £48m in relation to renewables. If the price controls for the Scottish transmission licensees are rolled forward for a year this funding gap would widen significantly. The total estimated capital expenditure for all three transmission licensees in 2005/06 is likely to be about £265m compared with an estimated £144m of additional expenditure for the Scottish transmission companies in infrastructure investment for renewables.