Connection and Use of System Code Proposed Amendment CAP047: "Introduction of a competitive process for the provision of mandatory frequency response"

Impact assessment

August 2004

Summary

Introduction

This document sets out, for consultation, Ofgem's Impact Assessment (IA) on Connection and Use of System Code (CUSC) Proposed Amendment CAP047: "Introduction of a competitive process for the provision of mandatory frequency response".

Background

National Grid Company (NGC), a subsidiary of National Grid Transco, contracts for and uses frequency response in its role as System Operator (SO) for the England and Wales electricity market.[1] NGC uses frequency response to balance the continuously changing frequency on its high voltage transmission system. System frequency is determined and controlled by the balance between total demand and total generation on the system.

NGC has a duty under the Electricity Safety, Quality and Continuity Regulations 2002[2] to control the frequency of the system to within $\pm 1\%$ of the nominal system frequency of 50 Hz. NGC must therefore ensure that sufficient generation and/or demand-side response is held in a position where it is ready to provide frequency response to manage all credible frequency change contingencies. All licensed generators[3] are obliged under the Grid Code[4] to provide the service of mandatory frequency response. Appendix 1 provides an overview of NGC's role as SO and the frequency response service.

The original Amendment Proposal CAP047 was raised by Innogy plc and was submitted for consideration at the CUSC Amendments Panel (the Panel) meeting on 21 March 2003. At the meeting, the Panel determined that the Balancing Services Standing Group (BSSG) should act as a Working Group to consider the Proposed Amendment. The BSSG discussed the original Amendment Proposal and identified Alternative Amendment A which they considered better facilitated the Applicable CUSC

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[1] The British Electricity Trading and Transmission Arrangements (BETTA) are planned to be introduced in April 2005. As a result of the Energy Act receiving Royal Assent on 22 July 2004 upon implementation of BETTA NGC will also be the SO for Scotland.
[2] See http://www.legislation.hmso.gov.uk/si/si2002/20022665.htm
[3] Some generators hold derogations that relieve them of this obligation.
[4] The Grid Code sets out the operating procedures and principles governing NGC's relationships with all users of its transmission system (generators, suppliers, non embedded customers).

Objectives[5] compared to the original Amendment Proposal. On 4 July 2003, as part of the Amendment Process, NGC issued a consultation document on Proposed Amendment CAP047. In response to the industry consultation on Proposed Amendment CAP047, NGC proposed Alternative Amendment B.

Section 6 of the Sustainable Energy Act 2003 amends the Utilities Act 2000 (Utilities Act) to include section 5A into that Act. Section 5A requires the Gas and Electricity Markets Authority[6] (the Authority) to carry out IAs for all decisions where it appears to the Authority that the proposal is "important". Ofgem has carefully considered the requirements of section 5A of the Utilities Act and has decided that it is appropriate for an IA to be undertaken for CUSC Proposed Amendment CAP047 as its implementation could have a significant impact on licensees or on persons engaged in commercial activities connected with licensable activities. The proposal would, if implemented, introduce a competitive process for the provision of mandatory frequency response services to NGC and this could have an impact on the costs and quality of the service provided. Ofgem considers the impact of the proposal to be important because frequency response is a very important tool that NGC uses to keep the system in balance and maintain security of supply.

Options

The intention of Proposed Amendment CAP047 is to introduce a competitive process into the provision of mandatory frequency response. In NGC's report to the Authority in relation to Proposed Amendment CAP047, three options were identified for doing so:

- **Original Amendment Proposal.** Generators would be free to submit holding prices on a monthly basis for each of the mandatory frequency response services;

- **Alternative Amendment A.** This proposal was broadly similar to the original amendment proposal except that NGC would not be required to publish further requirements about the service, as this information is

[5] The applicable CUSC Objectives are:
(a) the efficient discharge by the licensee of the obligations imposed upon it under the Act and by this licence; and
(b) facilitating effective competition in the generation and supply of electricity, and (so far as consistent therewith) facilitating such competition in the sale, distribution and purchase of electricity.

already available to service providers and default rules would apply where no prices were submitted;

- **Alternative Amendment B.** Service providers would be able to alter holding prices, although this would be subject to a maximum cap of 1.25 and 1.5 times the existing Mandatory Service Agreements[7] (MSAs) price in year 1 and year 2 respectively.

As Alternative Amendment A is broadly similar to the original Amendment Proposal Ofgem considers that the difference in the costs and benefits between the two is likely to be minimal. Ofgem's initial view is that Alternative Amendment A has some benefits over the original Amendment Proposal as it would prevent duplication in NGC reporting and would provide default prices, arguably making the arrangements more robust. Ofgem therefore considers it appropriate to consider the costs and benefits of Alternative Amendments A and B in this IA.

Introduction of a competitive process for mandatory frequency response

Ofgem's principle objective is to protect the interests of consumers where appropriate by promoting competition. Ofgem therefore supports in principle, a move towards a market-based approach for mandatory frequency response Holding Payments. Before introducing competition into the provision of this service, Ofgem needs to be satisfied that the specific characteristics of the service are capable of developing and sustaining competition. This involves assessing whether the conditions for competition to develop already exist or are likely to develop relatively quickly (if for example the time it takes for additional supply to develop is very short).

If these conditions are met, effective competition will, over time, protect customers interests by promoting innovation and efficiency and providing a high quality service at competitive prices.

The potential for effective competition in the mandatory frequency response market will depend on a range of factors including: the number of companies who are able to supply the service to NGC and the time it takes for companies to develop the capability

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[6] Ofgem is the office of the Authority. The terms Ofgem and the Authority are used interchangeably in this document.

[7] These are supplemental to the CUSC and contain site specific terms for provision to NGC of mandatory ancillary services.

to provide the service. Ofgem's initial assessment suggests that there is likely to be sufficient liquidity and available response to provide effective competition.

In considering the proposed amendment, NGC has raised concerns about the potential scope for manipulation and/or abuse of market power if competition is introduced. Ofgem notes these concerns but considers that they could be effectively dealt with, if necessary, through the use of Ofgem's powers under competition law and/or its sectoral regulatory powers.

NGC estimates that the procurement costs for frequency response would increase by £45m over two years for Alternative Amendment A and £35m over two years for Alternative Amendment B. As the current prices are effectively regulated, it is possible that the current level of prices is below the level required to allow providers to recover their costs and a return on their assets used in providing the service. Having looked at the available evidence, Ofgem considers that the increase in procurement costs for frequency response under either amendment are likely to be significantly less than the amount NGC estimates. As competition is likely to stimulate innovation and new entry, it could also lead to prices decreasing over a longer period.

Main impacts

The main areas Ofgem considers are likely to be impacted by the introduction of a competitive process for the provision of mandatory frequency response and which are considered in the cost benefit analysis are:

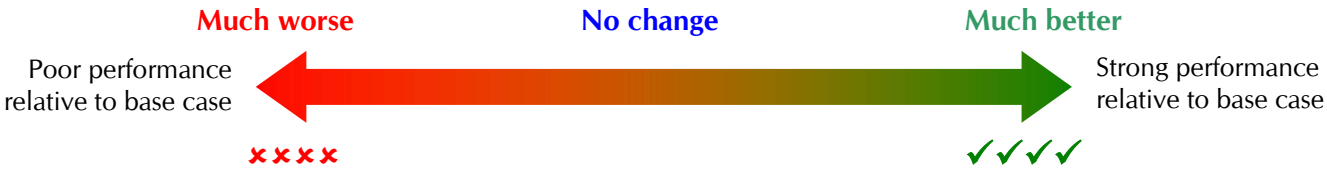
- economy and efficiency;
- security of supply;
- consumers; and
- the environment.

Cost benefit analysis

Ofgem's detailed views on the costs and benefits of the two amendments compared with the current arrangements (the base case) are set out in chapter 5. Ofgem's initial assessment of the two amendments is summarised in the table below.

The qualitative assessment presented in this section is expressed as a rating that compares the performance of the option (in respect of a particular issue) against the performance of the base case. The spectrum of ratings used in the qualitative assessments is illustrated below.

Interpretation of qualitative assessment



Summary of Ofgem's estimated costs and benefits of Alternative Amendment A and Alternative Amendment B relative to the base case

	Alternative A	Alternative B
Promoting economy and efficiency		
♦ efficient investment signals	✓✓✓	✓✓
♦ efficient system operation decisions	✓✓✓	✓✓
♦ implementation & admin costs	✖✖ (£2m)	✖ (£500k)
Security of supply		
♦ long-term security of supply	✓✓✓	✓✓
♦ short-term security of supply	✓✓	✓
Impact on consumers		
♦ long-term	✓✓	✓
♦ short-term	✖✖	✖
Effect on environment	✓	✓
Total relative to current arrangements	£2m	£500k

Conclusions

Ofgem estimates that there are likely to be some increases in implementation and administration costs associated with either amendment. Ofgem's initial conclusion is that Alternative Amendment A (and to a lesser extent Alternative Amendment B) would provide benefits for efficient investment signals, efficient system operation balancing decisions and for security of supply. Ofgem has carefully considered NGC's estimates of procurement costs and recognises the potential for these costs to increase in the short

term. However, in the long-term, Ofgem considers that procurement costs will be set competitively and there should be significant benefits to customers in terms of increased security of supply. Ofgem also considers that Alternative Amendment A and Alternative Amendment B could have some minor environmental benefits.

On balance, Ofgem considers that the benefits of the Alternative Amendment A outweigh the costs (or negative impacts) of its implementation. Ofgem has carefully considered Alternative Amendment B and is of the view that the benefits of this alternative are less than Alternative Amendment A and do not outweigh the costs to the same extent. Therefore the analysis set out in this document has led to Ofgem's initial view that Alternative Amendment A should be implemented. This initial view is without prejudice to Ofgem's final consideration of whether to direct the implementation of Alternative Amendment A, which will need to include a consideration of whether the proposed amendment or alternative amendments better facilitate achievement of the CUSC applicable objectives and is consistent with Ofgem's principle objective and general duties taking into account, among other things, the responses received to this IA.

Way forward

Ofgem welcomes views on this IA, to be received by close of business on 17 September 2004. Once respondents' views on the IA have been carefully considered, Ofgem intends to make a decision on whether to accept or reject CUSC Amendment Proposal CAP047 by 1 October 2004.

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1. Introduction

Purpose of this document

1.1. The purpose of this document is to consult upon Ofgem's IA on CUSC Proposed Amendment CAP047: "Introduction of a competitive process for the provision of mandatory frequency response".

Background

1.2. The CUSC is a multilateral contract between NGC and Users which NGC is obliged to have in place by its transmission licence.[8] The CUSC sets out the terms and conditions for connection to, and use of, the transmission system, mandatory balancing services and the rules for commercial balancing services. These terms and conditions include payment methods, metering, modifications to a connection site, amendment procedures and dispute resolution.

1.3. The Amendment Process is set out in Section 8 of the CUSC and requires NGC to establish and maintain a CUSC Amendments Panel (the Panel). An Amendment Proposal can be proposed by a CUSC party, energywatch, a BSC Party or in certain circumstances the Panel. Ofgem cannot propose an Amendment to the CUSC. The Amendment Proposal is then assessed by the Panel. In most circumstances, a Working Group will be established, or an existing Standing Group used to assist the Panel in evaluating whether an Amendment Proposal better facilitates achievement of the Applicable CUSC Objectives. NGC prepares and submits an Amendment Report with a recommendation to the Authority as to whether the Amendment should be made. This report is sent to Ofgem who may direct NGC to implement the Proposal if it considers that the Amendment Proposal better facilitates achievement of the Applicable CUSC Objectives and is consistent with Ofgem's principle objective and general duties. NGC is responsible for implementing (or

[8] Condition C7F. Connection and Use of system Code.

supervising the implementation of) approved amendments to its systems and processes (but not to users' systems or processes).

1.4. The original Amendment Proposal CAP047 was raised by Innogy plc (the "Proposer") and was submitted for consideration at the Panel meeting on 21 March 2003. At the meeting, the Panel determined that the BSSG should act as the Working Group to consider the Proposed Amendment. The BSSG discussed the original Amendment Proposal and identified Alternative Amendment A which they considered better facilitated the Applicable CUSC Objectives compared to the original Amendment Proposal. On 4 July 2003, as part of the Amendment Process, NGC issued a consultation document on Proposed Amendment CAP047. The Amendment Report for Proposed Amendment CAP047 was submitted to the Authority for decision on 3 September 2003 and it can be found on NGC's website.[9]

1.5. Section 6 of the Sustainable Energy Act 2003 amends the Utilities Act by inserting into it section 5A. Section 5A places a duty on the Authority to carry out IAs. In all cases where the Authority is proposing to undertake an action for the purposes of, or in connection with, the carrying out of its functions under Parts I of the Gas or Electricity Acts and it appears to the Authority that the proposal is "important", the Authority must carry out and publish an IA, or publish a statement setting out the reasons why it considers that it is unnecessary for it to carry out an IA. Ofgem has published a consultation document providing draft guidance on IAs.[10]

1.6. Ofgem has carefully considered the requirements under section 5A of the Utilities Act and has decided that it is appropriate for an IA to be undertaken for CUSC Proposed Amendment CAP047 as its implementation could have a significant impact on licensees or on persons engaged in commercial activities connected with licensable activities. The proposal would, if implemented, introduce a competitive process for the provision of mandatory frequency response services to NGC and this could have an impact on the costs and quality of the service provided. Ofgem considers the impact of the proposal to be

[9] NGC's website address: www.nationalgrid.com/uk/

important because frequency response is a very important tool that NGC uses to keep the system in balance and maintain security of supply.

Structure of this document

1.7. This document is structured as follows:

- Chapter 2 describes the different options that have been put forward;
- Chapter 3 sets out the issues associated with the proposed introduction of a competitive process for mandatory frequency response;
- Chapter 4 describes the main impacts of introducing a competitive process for mandatory frequency response;
- Chapter 5 evaluates the potential costs and benefits associated with the options;
- Chapter 6 sets out Ofgem's initial conclusions; and
- Appendix 1 provides an overview of NGC's role as SO and the frequency response service.

Views invited

1.8. The analysis presented in this document provides estimates of the costs and benefits based on high-level assumptions. Ofgem invites views on both the assumptions and estimates that have been made.

1.9. Ofgem has requested NGC to update some of the data provided in the Amendment Report and to provide some additional data which had not previously been included. Ofgem's analysis in this document includes, where relevant, this additional data provided by NGC. Ofgem would therefore welcome any views from respondents to the IA consultation on any updated and

[10] 'Draft guidance on impact assessments.' July 2004.

additional data which was not contained in the Amendment Report upon which market participants have not yet had the opportunity to comment.

1.10. Ofgem would welcome views on this IA, to be received by close of business 17 September 2004. All responses will normally be published on Ofgem's website and held in the Research and Information Centre. However, if respondents do not wish their response to be made public then they should clearly mark their response as confidential. Ofgem prefers to receive responses in an electronic form so they can be placed easily on the Ofgem website.

1.11. Responses should be addressed to:

Kyran Hanks

Director, Wholesale Markets,

Office of Gas and Electricity Markets

9 Millbank

London

SW1P 3GE

1.12. Electronic responses should be sent to adam.higginson@ofgem.gov.uk

1.13. Ofgem has committed from January 2005 to aim to set a minimum consultation period of 6 weeks for IAs and where the period is shorter to explain why. Until this time, Ofgem's intention is to provide more than the current 28 day period where possible. With respect to this IA, Ofgem is unable to consult for longer than 28 days as a decision is required by the Authority on CUSC Proposed Amendment CAP047 by 1 October 2004.

1.14. Ofgem recognises that the Amendment Report has been with us for decision for sometime, however given internal resource constraints due to other higher priority work recently being taken forward within the office, coupled with the complex nature of this assessment, this IA has unfortunately been delayed.

1.15. If you wish to discuss any aspect of this paper, Adam Higginson (telephone 020 7901 7432) would be pleased to help.

Way forward

1.16. Ofgem will carefully consider responses received to this IA on CUSC Proposed Amendment CAP047 to help inform the Authority's final decision. The initial view in this IA is without prejudice to Ofgem's final consideration of whether to direct the implementation of Alternative Amendment A, which will need to take into account, among other things, the responses received to this IA. Ofgem intends to make a decision on CUSC Proposed Amendment CAP047 by the 1 October 2004.

2. Options

2.1. This chapter outlines the options for introducing a competitive market for mandatory frequency response as contained in the Amendment Report for Proposed Amendment CAP047.

Original Amendment Proposal

2.2. The Proposer suggested that the current arrangements in the CUSC for the provision of mandatory frequency response services do not enable parties to actively compete in the provision of the service and circumstances can emerge where service providers cannot fully recover their costs. The Proposer considered that removing the link to the cost reflective charging principle with respect to the Holding Payment would encourage further competition in the provision of frequency response but would also give confidence that costs can be fully recovered, thus enhancing security of supply. The Proposer considered that the original Amendment Proposal would better facilitate achievement of Applicable CUSC Objective (b): facilitating effective competition in the generation and supply of electricity, and (so far as consistent therewith) facilitating such competition in the sale, distribution and purchase of electricity.

2.3. The original Amendment Proposal seeks to introduce more flexibility in the way that service providers can submit prices for the Holding Payments. It has the following features:

- generators would be allowed to submit holding prices on a monthly basis for each of the mandatory frequency response services (Primary Response, Secondary Response and High Frequency response) by Balancing Mechanism Unit. These prices must be submitted by the 15th business day in each month;

- NGC would be required to publish market data describing prices and volumes of frequency response services procured in previous months as well as data on submitted prices for each service by Balancing Mechanism Unit and a forecast of future requirements;

- the cost reflective charging principles would not apply to holding prices;
- the prices from the previous month will automatically apply if a User does not submit new prices. The price will be deemed to be zero in the event that the User has not previously submitted any price; and
- NGC should only instruct service providers with a deemed price of zero to provide frequency response where no other source of frequency response is available to meet the total system requirement at the time of instruction.

Alternative Amendment A

2.4. The BSSG discussed the Proposed Amendment and identified Alternative Amendment A which they considered to better facilitate achievement of the Applicable CUSC Objectives compared to the original Amendment Proposal. Alternative Amendment A is broadly similar to the original Amendment Proposal but differs in the following respects:

- NGC would not be required to publish further requirements about the service, as this information is already available to service providers through the Weekly Operational Planning Report and Demand forecasts;
- where no prices were submitted the deemed price for each service would be that which applied prior to the implementation of Alternative Amendment A as specified in the existing MSAs; and
- where there is no previous price available, for example in the case of a newly commissioned generator and no prices are submitted, prices should default to zero.

2.5. As Alternative Amendment A is broadly similar to the original Amendment Proposal Ofgem considers that the difference in the costs and benefits between the two is likely to be minimal. Ofgem's initial view is that Alternative Amendment A has some benefits over the original Amendment Proposal as it would prevent duplication in NGC reporting and would provide default prices in the event service providers do not submit holding prices which would make the

proposed arrangements more robust. Therefore the costs and benefits associated with the original Amendment Proposal are not considered in this IA.

Alternative Amendment B

2.6. In response to the industry consultation on Proposed Amendment CAP047, NGC proposed Alternative Amendment B. NGC considers that Alternative Amendment B would better facilitate achievement of the Applicable CUSC Objectives by enabling a move towards the smooth introduction of Frequency Response markets. NGC considers that adoption of Alternative Amendment B would allow some price-based competition to develop whilst ensuring that prices are not manipulated by service providers in order to avoid being called to provide Frequency Response or to unduly increase the overall cost of provision of the Frequency Response service.

2.7. Alternative Amendment B differs from Alternative Amendment A in the following respects:

- Alternative Amendment B, unlike the original Amendment Proposal and Alternative Amendment A, proposes to retain the cost-reflective charging principle;
- service providers would be able to alter holding prices, although this would be subject to a maximum cap of 1.25 and 1.5 times the existing MSA cost-reflective price in year 1 and year 2 respectively. This arrangement would be subject to review by NGC at the end of the two year period and therefore the price caps would not be automatically removed after two years; and
- monitoring and claw-back arrangements would be included with the intention of encouraging accurate service delivery. In the interim, measures would be introduced which result in holding prices defaulting to the MSA price should participants under deliver against contracted levels more than a predefined number of times.

2.8. As Alternative Amendment B differs significantly from Alternative Amendment A by retaining the cost-reflective charging principle and introducing price caps for

holding prices, Ofgem has considered the costs and benefits of this option within this IA.

3. Introduction of a competitive process for mandatory frequency response

Introduction

3.1. CUSC Amendment Proposal CAP047 seeks to introduce a competitive process into the provision of mandatory frequency response. The Proposer and some respondents to NGC's consultation suggest that under the current system in some circumstances generators are not fully recovering their costs. No actual evidence is given in the Amendment Report of cost under recovery. However, some respondents outlined the reasons why they consider that under recovery is occurring. They suggested that NGC does see certain indirect costs when setting Holding Payments. Costs cited included Balancing Mechanism actions that are no longer available to the service provider, the costs that exist in associated arrangements such as fuel contracts, risks inherent in the service for some technologies, the damage caused to plant when providing the service and the capital costs of providing the capability.

3.2. NGC considers that the principle of cost reflectivity suggests that service providers should cover their costs. NGC considers that the current frequency response prices meet this principle and provides for a moderate reward. NGC highlights that if a service provider considered that they were making a loss service providers have the right to request that prices relating to the Holding Payment are amended on a bi-monthly basis and that a Dispute Resolution Procedure is contained in CUSC in the event of disagreement. Therefore it is NGC's view that service providers should not be making a loss, as if one can be reasonably demonstrated there is the potential to amend the holding prices accordingly.

3.3. As no direct evidence is provided by any party of under recovering of costs it is difficult for Ofgem to come to a view that costs are being under recovered. If service providers are not fully recovering their costs they could be cross subsidising these costs through higher generation prices or potentially though Balancing Mechanism Bids and Offers. From an economic perspective, cross-

subsidies can create inefficiencies and can prevent market participants receiving correct signals about the value of different services.

3.4. Ofgem considers that it is important that service providers are able to signal the terms on which they are willing to provide mandatory frequency response and that the SO accepts or rejects these terms based on their operational requirements and in accordance with their statutory and licence obligations. In this respect, it is important that a two-sided competitive market is established for mandatory frequency response services between market participants and NGC that would provide appropriate commercial incentives to invest and to operate efficiently.

3.5. Ofgem's principle objective is to protect the interests of consumers where appropriate by promoting competition. Ofgem therefore supports in principle, a move towards a market-based approach for mandatory frequency response Holding Payments. Before introducing competition into the provision of this service, Ofgem needs to be satisfied that the specific characteristics of the service are capable of developing and sustaining competition. This involves assessing whether the conditions for competition to develop already exist or are likely to develop relatively quickly (if for example the time it takes for additional supply to develop is very short). If these conditions are met, effective competition will, over time, protect customers' interests by promoting innovation and efficiency and providing a high quality service at competitive prices.

3.6. In this chapter, Ofgem considers the potential for introducing effective competition into the mandatory frequency response market, whether the proposed arrangements would be likely to confer market power on any particular market participants and what the likely impact of introducing competition would be on the procurement costs of frequency response.

Potential for effective competition in frequency response market

3.7. The potential for effective competition in the proposed mandatory frequency response market will depend partly upon the amount of liquidity and the amount of available response. Ofgem considers that there is likely to be sufficient liquidity provided by the current level of market concentration and enough available response to provide effective competition in setting holding prices. The reasons for this are discussed below.

Market liquidity

3.8. The BSSG discussed liquidity associated with frequency response provision. NGC provided analysis about the number of market participants and their market share (based on actual payments made during 2002/03) which resulted in a Hirschmann-Herfindal Index (HHI)[11] of approximately 1400. NGC has provided Ofgem with updated analysis based on actual payments made during 2003/04 which resulted in a HHI of approximately 1338. According to Office of Fair Trading guidelines a market with a HHI greater than 1800 is considered "highly concentrated", whilst a market with a HHI between 1000 and 1800 is considered "concentrated".

3.9. Ofgem considers that there is the potential for there to be effective competition in a mandatory frequency response market as evidenced by the HHI of 1338 for 2003/04. Ofgem agrees with the majority of the BSSG that there should be sufficient liquidity provided by the current level of market concentration. In addition, for the reasons discussed below, Ofgem considers that there could be more additional response available from a variety of providers such as non-conventional sources of generation which would add to available supply and liquidity in the mandatory frequency response market.

[11] The Hirschmann- Herfindahl index is used as a measure for competitiveness in a market. It is the sum of

Availability of response

3.10. NGC's requirement for holding frequency response is dependent upon the level of demand at the time and the largest potential generation or demand loss. Total system demand and typical requirements for England and Wales are shown in Table 3.1. Both scenarios assume 1320MW as the largest generation loss, and 1120MW demand loss. It should be noted however that the deterministic requirement has a floor of 550MW of response required irrespective of demand level. This is known as the minimum dynamic level.

Table 3.1 - Total system demand and requirement for frequency response in England and Wales

	Demand	**Primary Response**	**Secondary response**	**High Response**
Summer Minimum	20GW	1259MW	1265MW	1086MW
Winter peak	55GW	550MW	822MW	731MW

Source: NGC

3.11. Table 3.2 shows the response capability by fuel type in England and Wales.

Table 3.2 - Frequency response capability in England and Wales by fuel type

Fuel type	**Primary Volume**	**Secondary Volume**	**High Volume**
Coal	2730MW	1862MW	2767MW
Gas	1684MW	1165MW	1880MW
Oil	287MW	142MW	411MW
Hydro	216MW	139MW	162MW
Nuclear	82MW	82MW	88MW
Total	4999MW	3390MW	5308MW

Source: NGC

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the squares of the market shares of all companies in the market. The range of the index is therefore 0 (completely competitive) to 10,000 (monopoly).

3.12. Ofgem considers that the total amount of response capability is likely to be higher than shown in Table 3.2. Table 3.2 does not include the frequency response services provided under the commercial ancillary service agreements which include demand side providers and other non-conventional potential providers of frequency response such as wind generators as discussed in chapter 4. In addition Table 3.2 does not include derogated plant. NGC provided analysis in the Amendment Report which suggests that 9.5GW of plant is derogated against the Grid Code requirement to provide mandatory frequency response. Potentially some derogated plant could invest in the capability to provide frequency response. However, Ofgem recognises that it may be prohibitively expensive to re-engineer derogated plant such that it could provide frequency response.

3.13. Tables 3.1 and 3.2 show that there is a large margin of total response capability above NGC's requirement for frequency response. Based on its analysis NGC considers that at a simplistic level there would be sufficient contracted capability to meet the demand for response services at any one time. However, NGC considers that other issues would need to be taken into account which would have the potential to erode levels of response that are available for delivery such as generators' Final Physical Notification level and plant experiencing technical difficulties.

Final Physical Notification levels

3.14. NGC suggests in the Amendment Report that much of the response capability will be unusable at any point in time depending on the Final Physical Notification of each genset. NGC estimates that "accessible" response capability totals less than 150% of its requirement for more than half the year. Accessible means that it is available without incurring any further Balancing Mechanism costs over and above the historic Bid/Offer Acceptance costs.

3.15. Ofgem agrees that at any time there is likely to be a certain amount of response that is not immediately accessible for provision of Frequency Response service. Ofgem considers that Alternative Amendment A, and Alternative Amendment B to a lesser extent, should create incentives for service providers to compete to provide the frequency response service to receive potential rewards in the form

of value based holding prices. Ofgem considers that this could provide an incentive for service providers to change their operating level or place attractive Bids and Offers in the Balancing Mechanism to make their response capability more accessible to NGC.

Technical difficulties

3.16. Of the total response capability in Table 3.2 a certain amount of this plant will be experiencing technical issues. NGC suggests that 5GW of plant is experiencing longer term technical difficulties in relation to the provision of this service, and a further 5GW on a short term basis. The 5GW of long term technical plant exclusions are generally related to issues identified and still outstanding from commissioning. The costs associated with making the excluded plant Grid Code compliant may be relatively low if the problem is due to minor plant problems or commercial issues. Of the 5 GW of short-term excluded plant most are returned within weeks, although some have been outstanding for more than a year.

3.17. Ofgem considers that Alternative Amendment A and Alternative Amendment B to a lesser extent would provide incentives to plant experiencing short to medium term technical issues to rectify the problem to enable them to participate in the mandatory frequency response market. Therefore Ofgem considers that it is likely that plant experiencing technical difficulties would be likely to be made available in most circumstances.

Conclusions on availability of response

3.18. Ofgem considers that NGC's analysis underestimates the amount of response available for a number of reasons. Ofgem considers that NGC does not take into account non-conventional sources of generation and the demand side. Ofgem considers that Alternative Amendment A and Alternative Amendment B to a lesser extent would create incentives for service providers to change their operating level or place Bids and Offers in the Balancing Mechanism to make their response capability more accessible to NGC. In addition, Ofgem considers that Alternative Amendment A and Alternative Amendment B to a lesser extent would provide incentives for plant currently experiencing technical difficulties to

return this plant in the short-term. Therefore, Ofgem considers that there is likely to be more response capability than NGC estimates and response is more likely to be accessible and available for delivery than NGC suggests which would add to market liquidity and assist in providing effective competition.

Market abuse

3.19. In considering the proposed amendment, NGC has raised concerns about the potential scope for manipulation and/or abuse of market power if competition is introduced. Ofgem notes these concerns but considers that they could be effectively dealt with, if necessary, through the use of Ofgem's powers under the Competition Act 1998[12]. Ofgem has powers concurrent with the Office of Fair Trading (OFT), for example, to investigate and fine companies under the Act if abuse is found to occur. In addition, Part 4 of the Enterprise Act 2002 empowers the OFT to make market investigation references to the Competition Commission in appropriate circumstances. This power is exercisable with a number of industry Regulators, including the Authority.

3.20. Ofgem considers that with the development of the mandatory frequency response markets, the powers available under the Competition Act will provide sufficient protection in relation to the holding prices submitted by service providers. Further, Ofgem notes that if, following a change in market conditions, it became apparent that additional regulatory safeguards were required, it would be open to Ofgem to raise appropriate licence amendments to address this.

[12] For more information on the application of the Competition Act 1998 in the energy sector see the revisions to Ofgem's guidelines which Ofgem published for consultation on 2 August 2004. Copies of the consultation document 'Competition Act 1998 – Application in the Energy Sector' are available from the Ofgem website. In addition, the OFT and the sector regulators have developed guidelines to explain how they will apply the Act and copies of these guidelines can be found on the OFT website at www.oft.gov.uk

Impact of introducing competition on procurement costs

NGC's estimate of procurement costs

3.21. The costs NGC incurred in procuring frequency response for 2002/03 and 2003/04 and NGC's estimate of the increase in procurement costs compared with 2002/03 costs associated with the Alternative Amendment A and Alternative Amendment B are provided in Table 3.3.

Table 3.3 - Annual costs of frequency response for 2002/03 and 2003/04 and NGC's estimated increase in procurement costs in year 1 and year 2

Year	Holding payment	Response Payment	Commercial service	Associated BM Bids and Offers	Total costs
Annual costs					
2002/03	£25.9m	£8m	£24.2m	£14.0m	£72.1m
2003/04	£24.7m[13]	-£2.3m	£26m	£11.5m	£56.2m
Alternative Amendment A					
Year 1 cost increase	+£13.7m	£0m	+£9.2m	+£4.1m	+£27m
Year 2 cost increase	+£9.2m	£0m	+£6.1m	+£2.7m	+£18m
Total cost increase	+£22.9m	£0m	+£15.3m	+£6.8m	+£45m
Alternative Amendment B					
Year 1 cost increase	+£8.3m	£0m	+£5.6m	+£7.1m	+£21m
Year 2 cost increase	+£5.6m	£0m	+£3.7m	+£4.7m	+£14m
Total cost increase	+£13.9m	£0m	+£9.3m	+£11.8m	+£35m

Source: NGC

[13] This total does not account for the British Grid System Agreement payments.

3.22. The assumptions made by NGC to support the estimated increase in procurement costs for Alternative Amendment A were:

- 1st Year implementation sees higher submitted prices than 2nd year due to service providers caution and mitigating risk associated in the provision of this service. It is assumed as the competitive nature of this market 'settles in', then price submissions will gradually decrease in year 2 as service providers look to gain market share through competitive pricing;
- almost all mandatory frequency response providers would increase their prices by 50-100%. This assumption was based on previous experience of instances where market arrangements had been introduced for the procurement of Balancing Services;
- NGC has managed a fairly limited re-allocation of response holding;
- there would be a modest increase in both the Balancing Mechanism volumes on response actions as plant is re-loaded to avoid the higher prices, complete with subsequent price rises as generators pay more attention to the Balancing Mechanism prices of responsive plant. Consequently Balancing Mechanism costs of response would also rise but by less than those associated with Ancillary contracts;
- cost increases are also expected across NGC's range of commercial services due to increased visibility of those costs associated with the mandatory frequency response service. Commercial services costs will rise consistently year on year reflecting the percentage increase associated with submitted mandatory frequency response holding prices; and
- the Response Energy Payment costs will remain as a cost reflective payment mechanism and therefore there would be no cost increase.

3.23. The above estimate is only for England and Wales and does not include Scotland. On 18 December 2003, Ofgem issued a GB consultation for CUSC Amendment Proposal CAP047 on this issue requesting responses by 15 January 2004, six responses were received. This GB consultation and the responses are available on the Ofgem website. NGC provided a response in which it

suggested that the assumptions that underpinned the England and Wales analysis would also apply to Scotland. NGC estimates that the inclusion of Scotland will increase frequency response procurement costs under Alternative Amendment A by an additional £5m over two years in comparison to the base case.

3.24. The additional assumption made by NGC to support the estimated increase in procurement costs for Alternative Amendment B was that service providers submit prices in line with the 2nd year cap of 1.50, for example, 50% increase on 2002/2003 prices and volumes.

Other market participants' estimate of procurement costs

3.25. The view among BSSG members was divided as to the cost impact of Alternative Amendment A. Several members believed that the proposed market would result in a decrease in the overall costs associated with the provision of the service. This was based on the view that there would be sufficient competition in the provision of the service and that Alternative Amendment A would provide generators with an extra degree of freedom to optimise the balance between the Holding Payments and the associated Balancing Mechanism Bids and Offers. An alternative view was given that it was difficult to envisage costs reducing from the current levels when the current levels are cost-reflective and the BSSG agreed that the costs of mandatory frequency response (when considered in isolation) would probably increase. In summary, the majority of the BSSG agreed that the overall costs of the provision of frequency response would decrease under Alternative Amendment A. The remaining minority contended that no evidence had been provided to support this assertion.

3.26. There was no consensus between respondents to NGC's consultation on the estimated impact on procurements costs of Alternative Amendment A. Some respondents did not anticipate any increase in procurement costs and some considered that they would actually decrease. In contrast some respondents anticipated an increase in cost for the provision of frequency response services.

3.27. Three respondents to Ofgem's GB consultation suggested that inclusion of Scotland into the market would further increase competition in frequency

response and lead to a further reduction in the overall cost of providing mandatory frequency response.

3.28. Alternative Amendment B was proposed by NGC as a response to the industry consultation on Proposed Amendment CAP047. Therefore the BSSG did not comment on what they estimated the impact of Alternative Amendment B would be on procurement costs. Despite its availability for comment, no respondents to NGC's consultation offered views on the estimated impact on procurement costs of Alternative Amendment B.

Ofgem's views on procurement costs

3.29. A number of assumptions are contained in the Amendment Report to support NGC's and other market participants' estimates of the impact of introducing a competitive process for mandatory frequency response on procurement costs. In this section, Ofgem considers these assumptions and provides its own views on the impact of Alternative Amendment A and Alternative Amendment B on each area of procurement costs (Holding Payments, Response Energy Payments, associated Balancing Mechanism Bids and Offers and commercial services).

Holding Payments

3.30. The likelihood of an increase in the costs of Holding Payments will be influenced by the amount of effective competition in the proposed mandatory frequency response market and whether the introduction of competition stimulates additional supply and/or innovation. As discussed above, Ofgem considers that there is likely to be sufficient response available and sufficient market liquidity to provide effective competition.

3.31. Ofgem accepts that Alternative Amendment A may result in some price increases in holding prices submitted by service providers above current levels, particularly in the short-term and there may be some price exploration. In addition, if parties have currently not been fully recovering their costs it is likely that service providers would seek to increase holding prices to levels that at least fully cover all their costs. However, Ofgem considers that there should be sufficient response available, and likely to come forward, to facilitate

competition in the market and put competitive pressure on holding prices over the longer term. In addition, Ofgem is confident that it currently has sufficient tools available to it (e.g. Competition Act 1998, Enterprise Act 2002, ability to raise collective licence modifications) to prohibit any abuse of a dominant position.

3.32. Under Alternative Amendment B, Ofgem considers that it is likely that in most circumstances Holding Payment bids would not increase to the level of the proposed price caps because there is likely to be sufficient competition and available response. However, it is likely that in some circumstances the price caps would apply. This would have the effect of reducing the estimated increase in Holding Payment procurement costs compared with Alternative A.

3.33. Ofgem estimates that the impact of Alternative Amendment A and Alternative Amendment B on Holding Payment procurement costs will be substantially lower than NGC estimates.

Response Energy Payments

3.34. Ofgem agrees with NGC that the Response Energy Payment costs are not likely to be affected by Alternative Amendment A or Alternative Amendment B as the cost reflective charging principles would continue to apply and there would be no change to the way in which response energy payments are calculated.

Associated Balancing Mechanism Bids and Offers

3.35. As discussed above, Ofgem does not consider that the increase in holding prices is likely to be as significant as NGC's estimate. Therefore Ofgem does not agree that the amount of Balancing Mechanism actions NGC would need to take to avoid higher prices is likely to increase significantly. In addition, Ofgem considers that Alternative Amendment A and Alternative Amendment B to a lesser extent would create incentives for service providers to change their operating level or place attractive Bids and Offers in the Balancing Mechanism to make their response capability more accessible to NGC rather than increasing the Balancing Mechanism prices of responsive plant.

3.36. One respondent to the consultation undertaken by NGC suggested that currently service providers either accept an overall loss or require a cross subsidy from the Balancing Mechanism. In contrast NGC recognises that opportunistic, or value-based, pricing occurs in the Balancing Mechanism, however, NGC do not regard it as a cross-subsidy. Ofgem considers that the value based arrangements proposed by Alternative Amendment A should mean that the need for service providers to recover costs through other actions, such as inflated Bids and Offers within the Balancing Mechanism, is reduced. This should remove any potential cross-subsidy which may currently exist between Balancing Mechanism actions and Holding Payments for frequency response and thus produce downward pressure on the cost of Bids and Offers associated with mandatory frequency response.

3.37. For the reasons set out above Ofgem considers that the procurement costs of Bids and Offers associated with frequency response are not likely to increase under Alternative Amendment A or Alternative Amendment B. Furthermore, if the market is competitive and costs do increase, this would suggest that the current level of 'regulated' prices is too low and would not be sustainable over the medium term. If the current prices do not allow service providers to recover costs, then they are likely, over time, to increase the prices that are paid to them or withdraw the service.

Commercial services

3.38. Ofgem recognises that if mandatory service payments become visible then there could be an incentive for commercial providers to try to negotiate higher prices. However, there is no analysis available that shows that commercial services are currently significantly less costly than mandatory frequency response services. In addition, Ofgem considers that there will be sufficient mandatory frequency response capability, and the potential for more response service providers to enter the market, to provide competition to commercial providers, and further that NGC has sufficient incentives on it to procure the most economic and efficient provider. Therefore, Ofgem does not agree with NGC that the costs would necessarily increase across NGC's range of commercial response services. Ofgem considers that the same arguments apply for Alternative Amendment B.

3.39. Ofgem considers that the procurement costs for commercial frequency response services are not likely to increase as a result of implementing Alternative Amendment A or Alternative Amendment B.

Summary of Ofgem's views on procurement costs

3.40. For the reasons outlined above, Ofgem considers that the increase in procurement costs for frequency response under Alternative Amendment A and Alternative Amendment B are likely to be significantly less than the amount NGC estimates. If costs do increase and the market is competitive, this would suggest that the existing prices are too low and do not allow providers to recover their costs. If this is the case, procurement costs would have to rise under the current arrangements or the service providers would seek to withdraw the service.

3.41. Ofgem accepts that some price exploration could be experienced under the market arrangements proposed by Alternative Amendment A and Alternative Amendment B in the short-term. This has been seen in other balancing services where market arrangements have been introduced (e.g. standing reserve). This is, however, part of the normal market process and if the market is competitive movements in price are likely to stimulate a competitive response.

3.42. Furthermore, there are safeguards in place as Ofgem's powers available under the Competition Act would act as a significant deterrent against any potential abuse of market power. In the medium term, Ofgem considers that increased competition and more efficient provision of the service is likely to result in competitive pressure being exerted on holding prices.

3.43. Ofgem would welcome views on the assumptions made by Ofgem, NGC and other market participants in regard to the estimated impact of Alternative Amendment A and Alternative Amendment B on procurement costs.

4. Main impacts

4.1. This chapter outlines the main areas Ofgem considers are likely to be impacted upon by the introduction of a competitive process for the provision of mandatory frequency response. These impacts, which are considered in turn below, include:

- economy and efficiency;
- security of supply;
- consumers;
- the environment.

Economy and efficiency

4.2. Ofgem considers that an economic and efficient mandatory frequency response market has the following features:

- it provides important signals to current and potential service providers about the value of the service – this allows them to invest and innovate in response to these signals;
- it assists NGC, the monopoly SO, in procuring these services cost effectively and in making economic and efficient operating decisions; and
- it has reasonable and proportionate implementation and administration costs.

4.3. Each of these features is discussed below.

Efficient investment signals

4.4. Ofgem will need to consider whether introducing a competitive process for mandatory frequency response Holding Payments would provide service providers with better signals for investment in the provision of the service. Some generating units are experiencing technical difficulties and are not currently

providing frequency response and some generators are derogated from the obligation to provide mandatory frequency response. Ofgem will need to consider if changing the mandatory frequency response arrangements would provide efficient signals to generating units that could potentially provide frequency response to invest in the capability to provide the service. Ofgem will also need to consider if the proposed arrangements would provide efficient signals to companies commissioning new generation plant to invest in the capability to provide mandatory frequency response rather than seeking derogation from the requirement. The remuneration of the mandatory frequency response service could potentially also have an impact on the overall investment decision to commission a new generation plant and Ofgem will need to consider the impact of the proposed arrangements on investment signals to potential new entrants including Combined Heat and Power (CHP) and renewables as discussed later in this chapter.

4.5. Ofgem will also need to consider whether reforming the mandatory frequency response arrangements is likely to have an impact on the network investment signals to network owners.

Efficient system operation decisions

4.6. In order to balance the system in an economic, efficient and coordinated manner, as it is required to do under its Transmission Licence, NGC needs to consider the most efficient mechanism by which to deliver its obligations. Ofgem will need to consider whether reforming the mandatory frequency response arrangements would provide a more efficient mechanism for enabling NGC to deliver its obligations in regards to system balancing.

Implementation & administration costs

4.7. Ofgem will need to consider the implementation and administration costs associated with the options are proportionate to the potential benefits of introducing a competitive market in mandatory frequency response Holding Payments. This could include both one-off costs associated with developing and implementing the systems required to operate the reformed mandatory

frequency response arrangements, and ongoing administration costs to the SO and potentially service providers.

Security of supply

4.8. Many customers (particularly small domestic, small industrial and commercial customers) place value on being able to consume gas and electricity without interruption. As for other products, there is a balance to be struck between the value placed on this continuity of supply and the costs involved in delivering such continuity.

4.9. The combination of the limited demand-side substitutability, especially between time periods, and the limitations on economic storage results in considerable value being placed on the continuous supply of electricity from the national networks.

4.10. Issues relating to security of supply generally relate to one or more of three, distinct aspects of market balancing:

- long-term security – ensuring that there is an appropriate level of transmission and distribution network capacity to deliver energy to customers and that there is adequate generation capacity to meet demand, taking into account the likely demand-side response over time;
- short-term security – ensuring that, given the available network and generation capacity, demand and supply are balanced when and where required; and
- supply quality – ensuring that electricity supplies meet the required technical and safety standards that are in force.

4.11. Well functioning markets should provide signals to both the supply side and demand side participants to maintain an efficient level of overall security which should allow customers (or suppliers acting on their behalf) to choose the level of security that, taking into account the costs involved, best meets their requirements. An efficient level of provision will be realised when the incremental costs correspond to the amount that electricity customers would be

willing to pay for additional security (i.e. for changed probabilities of supply failures).

Long-term

4.12. In order to enable NGC to balance the system in the short-term, sufficient incentives must exist to ensure that generators provide sufficient capability to deliver frequency response. As such, when considering the provision of frequency response in relation to security of supply it is necessary to consider both the current, short-term ability of NGC to balance the system and the need to ensure that this ability is not undermined over the long-term.

4.13. An element of security of supply relates to the diversity of provision. By exposing the true value of a service and enabling competitive supply, participants face incentives to innovate and to provide services from a diverse range of assets and, where appropriate, supply routes. It appears that this element of security of supply could apply to the provision of frequency response, and that provision could, where it is economic, be provided by a wide range of generation types and technologies.

Short-term

4.14. As described above, short-term security includes the need to keep frequency on the networks within certain parameters on a real-time basis. One of the tools available to NGC to deliver this form of security is frequency response. Ofgem will need to consider if reforming the mandatory frequency response arrangements would impact upon NGC's ability to manage the transmission system in an efficient, economic and coordinated manner by affecting the amount of frequency response capability available to NGC in the short-term.

Impact on consumers

4.15. When assessing options for reforming the mandatory frequency response arrangements, it is important to consider its impact on consumers. NGC's procurement costs for frequency response are included in Balancing Services

Use of System (BSUoS) charges[14] to generators and suppliers and these costs are ultimately paid for by consumers. Therefore issues related to the procurement costs need to be carefully viewed in the context of the principal objective of the Authority to protect the interests of consumers, including future consumers, wherever appropriate by promoting effective competition.[15] Ofgem needs to consider the impact on consumers in terms of any estimated increased procurement costs. Ofgem also needs to consider the impact on consumers of any short and long-term security of supply issues. However, in making this assessment it is important to recognise that even if costs to customers rise in the short term, this may still be in their interests. If the current prices paid to service providers are too low and do not allow them to cover their costs, then prices will have to rise in the future or the service could be withdrawn. This would not be in customers' interests. Alternatively, the introduction of competition could see prices rise in the short term but fall in the medium term as new supply and innovation brings down prices. In this case the total cost to customers over a number of years is lower following the introduction of competition even though prices rise initially.

4.16. Ofgem also needs to consider the impact on consumers of any short and long-term security of supply issues. If current prices are too low then generators may not maintain their assets and service reliability may fall in later years – again this might not be in customers' interests.

Environmental Impact

4.17. It is important to consider if the reform of the mandatory frequency response arrangements is likely to impact upon the environment. In particular, Ofgem

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[14] The costs incurred by NGC in balancing the system (both in terms of energy and the network) are recovered from system users through Balancing Services Use of System (BSUoS) Charges. BSUoS Charges include the following:

- the costs incurred in the Balancing Mechanism;
- Balancing Services contract costs;
- payments or receipts related to NGC's incentive scheme; and
- internal costs of NGC in its role as System Operator (salaries, facilities, etc.).

All these costs are summed in each Settlement Period to give a total BSUoS Charge for the period. The total charge is then divided by the total system energy volume for that half hour to give a £/MWh charge. Each user's charge (generators and suppliers) is then calculated by multiplying their own BM unit metered volume by the £/MWh charge.

will need to give appropriate consideration to Combined Heat & Power (CHP) plant and renewables.

4.18. The Energy White Paper[16] reaffirmed the Government's commitment to meeting its obligations under the Kyoto protocol to reduce the emission of greenhouse gases by 12.5% on 1990 levels and a domestic target to reduce CO2 by 20%. The White Paper also set out a long-term ambition for a 60 per cent reduction in the UK's carbon dioxide emissions by 2050[17] and for the reduction in emissions to be on course in 2020 to achieve this goal. In order to achieve these targets, in the UK Climate Change Programme the Government has set a target for 10 per cent of electricity supplied in the UK to be generated from renewable sources by 2010 and for there to be 10 GW of CHP installed by the same date. The Energy White Paper also set an aspiration of 20 percent renewable generation by 2020. The government has put in place a number of policies to achieve these targets including the Renewables Obligation.

4.19. Historically, the intermittent nature of renewable energy, in particular the active power of wind farms, has posed difficulties in utilising the technology for system balancing purposes. However, more recent wind generation technology has a latent capability to provide frequency response by controlling the electrical power output in relation to the maximum energy that can be extracted from the wind. This has the benefit of providing more certainty as to the physical capability of wind derived sources of energy. In addition to there being scope to utilise wind energy sources, it is also possible for large CHP plant to provide frequency response services.

4.20. The transmission licensees (NGC, Scottish Hydro-electric Transmission and SP Transmission) have been in discussion with potential wind farm developers since 2001 with regard to the development of the England and Wales and Scottish Grid Codes to clarify the requirements for renewable and other new generation. As part of this process the transmission licensees published a consultation

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[15] Gas Act 1986 s4AA and Electricity Act 1989 s3A.
[16] 'Our energy future – creating a low carbon economy', DTI (February 2003).
[17] Including the policies contained in the UK climate change programme, the Energy White Paper forecast that 2020 emissions would be around 135 MtC (18% below 1990 emissions) and sets out the Government's aim for 2020 emissions to be 15-25 MtC below this target.

document[18] in June 2004 which included proposals to change Grid Code Connection Conditions to include a requirement for provision of Primary, Secondary and High Frequency response capability on wind farms using the transmission system on or after 1 January 2006 irrespective of their completion date. The transmission licensees are due to submit their final proposals to Ofgem for decision by 20 August 2004. Therefore as the mandatory frequency response arrangements could potentially in the future apply to wind farms Ofgem needs to consider the potential impact of reforming these arrangements on wind farms in particular.

[18] Grid Code Changes to Incorporate New Generation Technologies and DC Inter-connectors (Generic Provisions)" available on NGC's website.

5. Costs and benefits

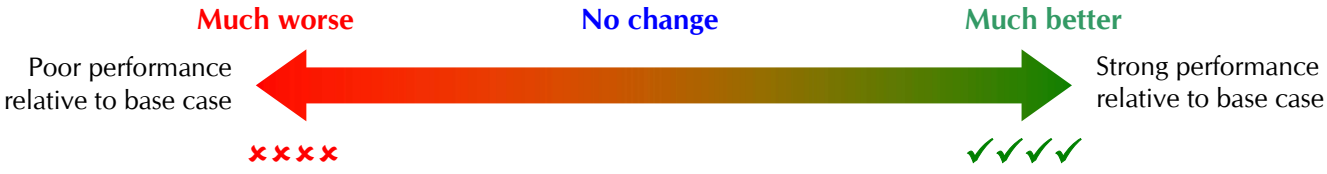
Introduction

5.1. This chapter attempts to evaluate the costs and benefits for Alternative Amendment A and Alternative Amendment B in comparison to the current arrangements.

5.2. Ofgem has assessed these options qualitatively, and where possible, quantitatively. However, the costs and benefits of the key issues are generally difficult to quantify, since they depend upon the inevitably uncertain evolution of the relevant market. Ofgem has therefore only attempted to quantify the costs and benefits associated with the implementation and administration costs. Ofgem has set out the assumptions that it has made in assessing both the costs and the benefits associated with Alternative Amendment A and Alternative Amendment B and invites respondents' views on these assumptions in addition to the qualitative analysis and initial conclusions set out in this chapter.

5.3. The qualitative assessment presented in this chapter is expressed as a rating that compares the performance of the option (in respect of a particular issue) against the performance of the base case. The spectrum of ratings used in the qualitative assessments in the remainder of this chapter is illustrated in Figure 5.1.

Figure 5.1: Interpretation of qualitative assessment



5.4. Ofgem has used the current arrangements as a base case for assessing cost and benefits of different options for the mandatory frequency response arrangements and consequently there is no evaluation of the costs and benefits of this option.

Costs

Implementation and administration costs

5.5. NGC has undertaken some preliminary work looking at the implementation costs associated with Proposed Amendment CAP047. NGC stressed that any figures presented here are indicative and intended only to give an idea of the scale of work required. Further work is progressing to firm up on these costs and more accurate information is expected to be available towards the end of the year.

5.6. NGC suggests that both Alternative Amendment A and Alternative Amendment B require changes to systems and processes governing the submission of frequency response holding prices. At present frequency response prices change on average once every three years and the associated systems and processes are manually intensive. Under Proposed Amendment CAP047 the prices have the ability to change on a monthly basis and therefore a more robust, automated mechanism is envisaged. Additionally both Alternative Amendment A and Alternative Amendment B require publication of further information relating to mandatory frequency response, and therefore changes will be required to facilitate this.

Alternative Amendment A

5.7. NGC suggests that the cost of developing the original Amendment Proposal or Alternative Amendment A differs greatly from Alternative Amendment B. NGC suggests that Alternative Amendment A requires significant changes to the real time despatch algorithm that is used to optimise the holding of response by the control room. The current algorithm optimises response holding with reference to the prevailing Bid/Offer prices in the Balancing Mechanism. Under the current arrangements there is no significant variation in the holding prices across different service providers and they are generally lower than Bid/Offer prices. If Alternative Amendment A were implemented then there would be no limit to

the holding price that service providers could submit[19] and NGC suggests that there is likely to be significant price variation across different service providers. NGC suggests that this creates issues relating to the real time optimisation of frequency response to ensure efficient balancing in real time. Therefore NGC suggests that significant changes to the despatch algorithm would be required to ensure that they can continue to operate the system in an economic and efficient manner.

5.8. Based on limited analysis, NGC estimates that the implementation and ongoing administration costs would be no greater than £2m for the original Amendment Proposal or the Alternative Amendment A.

5.9. Ofgem notes that NGC's estimate of the implementation and administration costs associated with Alternative Amendment A is only an initial estimate based on limited analysis. Ofgem questions whether it is necessary for NGC to incorporate frequency response scheduling in existing balancing tools to avoid the expected high prices when scheduling response as Ofgem does not consider that it is likely that holding prices will significantly increase. Ofgem would welcome views from market participants on the requirement for NGC to incorporate frequency response scheduling in existing balancing tools.

5.10. Ofgem expects that the implementation and administration costs are likely to be significantly less than NGC estimate. Ofgem considers that the implementation and administration costs associated with Alternative Amendment A are likely to be proportionate to the potential benefits of introducing a competitive market in mandatory frequency response Holding Payments.

Alternative Amendment B

5.11. Under Alternative Amendment B the holding prices are limited by the proposed price caps. NGC suggests that this means that the holding price is still likely to be less than the prevailing Bid/Offer price and also that there will continue to be limited variation and volatility across the holding prices submitted by service

[19] The only limit would be that imposed by the number of digits allowed by the Information Systems before the decimal place.

providers. NGC suggests that for Alternative Amendment B whilst there are likely to be changes required to the despatch algorithm, these are of an incremental, rather than significant, nature.

5.12. Based on limited analysis, NGC estimate that the implementation and ongoing administration costs would be no greater than £500K for Alternative Amendment B. Again Ofgem notes that NGC's estimate of the implementation and administration costs associated with Alternative Amendment B is only an initial estimate based on limited analysis. Ofgem expects that the implementation and administration costs are likely to be significantly less than NGC estimate.

5.13. Respondents to NGC's consultation did not indicate any estimated implementation and administration costs to service providers associated with Alternative Amendment A or Alternative Amendment B. Ofgem would welcome views from respondents on estimated implementation and administration costs that market participants are likely to incur.

Impact on consumers – short-term

Alternative Amendment A

5.14. As discussed in Chapter 3, Ofgem estimates that the increase in procurement costs for frequency response under Alternative Amendment A are likely to be significantly less than the amount NGC estimates.

Alternative Amendment B

5.15. As discussed in Chapter 3, Ofgem estimates that the increase in procurement costs for frequency response under Alternative Amendment B are likely to be significantly less than the amount NGC estimates.

Benefits

Efficient investment signals

Alternative A

5.16. Ofgem considers that allowing service providers to be able to reflect the value of the service they provide at different times through changes in the prices they offer would provide more efficient signals to some derogated plant that potentially could provide the service, plant experiencing technical difficulties, the demand side and new entrants to invest in the service.

5.17. Under the current arrangements, there is limited information available regarding the true value of the frequency response service for potential new service providers to make efficient investment decisions in the frequency response service. In addition, the lack of information on the value of frequency response could affect efficient decisions on the construction of generation capacity. Ofgem considers that market based signals of the value of frequency response to service providers should facilitate greater efficiency in investment decisions in the capability to provide the frequency response service for current service providers and potential new entrants. Ofgem considers that Alternative Amendment A should provide a greater depth of price information and transparency. Price indicators are expected to develop that would reflect holding prices over the short, medium and long- term. Greater confidence in the pricing arrangements will in turn encourage more participants to enter the market thereby increasing liquidity and efficient pricing.

5.18. Ofgem considers that a market framework as proposed by Alternative Amendment A would enable service providers to compete to provide the service in the most economic manner which would provide incentives for investment in more efficient provision in the long-term. Future innovation in the service is likely to provide more efficient provision of frequency response in the long-term.

5.19. Ofgem does not consider that reforming the mandatory frequency response arrangements as proposed by Alternative Amendment A is likely to have an impact on the network investment signals to network owners.

Alternative Amendment B

5.20. Ofgem considers Alternative Amendment B would provide more efficient investment signals to service providers than the current arrangements but the accuracy of the investment signals may be distorted by the proposed price caps. Where caps are too low, relative to costs, profits can fall below levels necessary to encourage investment. Where appropriate, Ofgem considers that for a market to function properly, prices must be allowed to fluctuate according to market fundamentals. By introducing a fixed cap, and therefore introducing a limiting range within which prices can fluctuate, Ofgem considers that the investment signals for market providers would be distorted and impaired. Ofgem considers that the price caps proposed by Alternative Amendment B may limit the benefit of providing efficient investment signals.

5.21. Ofgem also does not consider that reforming the mandatory frequency response arrangements as proposed by Alternative Amendment B is likely to have an impact on the network investment signals to network owners.

Efficient system operation decisions

Alternative Amendment A

5.22. Ofgem considers that in the long-term the current mandatory frequency response arrangements would not facilitate NGC in securing frequency response to meet the needs of the system at minimum cost. Ofgem considers that NGC's SO incentives should provide NGC with a powerful incentive to develop alternative procurement strategies and contract with a variety of providers. As discussed above, Ofgem considers that Alternative Amendment A is likely to encourage more service providers to invest in the service which in the longer-term could give NGC more choice when selecting service providers. Ofgem considers that in the longer-term Alternative Amendment A is likely to result in more frequency response capacity being available which would enable NGC to make more efficient balancing decisions.

5.23. Ofgem considers that economic and efficient system operation can be achieved by ensuring that NGC contracts for frequency response on terms that reflect the

underlying costs incurred by the service providers. Ofgem considers that Alternative Amendment A would enable service providers to better signal the value of the service and therefore NGC should be able to make more efficient decisions regarding which provider to use. Ofgem considers that the proposed market arrangements are likely to result in a more efficient outcome as NGC currently do not have visibility of all the costs to service providers and so cannot expect to optimise their interaction.

5.24. NGC suggest that in the short-term they could be deemed to be a distressed buyer and therefore open to possible price manipulation. As discussed in chapter 3, while Ofgem recognises there may be a degree a price exploration in the short term under Alternative Amendment A, Ofgem does not consider it likely that service providers would seek to manipulate prices as Ofgem conducts extensive ongoing market surveillance operations and analysis and has the ability to investigate and, if appropriate, use powers of investigation and enforcement under competition law, including the Competition Act 1998. Therefore Ofgem considers that Alternative Amendment is not likely to have negative impacts on NGC's efficient system balancing decisions due to price manipulation.

Alternative Amendment B

5.25. Ofgem considers that similar issues apply to Alternative Amendment B, as they do with Alternative Amendment A, except that the price caps proposed by Alternative Amendment B are likely to not provide as great incentives for more response to be made available. In addition Ofgem considers that Alternative Amendment B would limit the ability of service providers to signal the true value of the service in some circumstances. Therefore Ofgem considers the benefits to efficient balancing decisions would be limited.

Security of supply

Alternative Amendment A

5.26. The existing mandatory frequency response arrangements potentially create risks to long-term security of supply to the extent that they do not provide adequate

signals of the need, or provide the necessary incentives, for long-term investment in the frequency response service. Ofgem considers that Alternative Amendment A will provide market signals on the value of the frequency response service which should provide service providers with reliable additional information on which to determine their investment plans in the long-term thereby facilitating security of supply. Ofgem considers that Alternative Amendment A is likely to provide an incentive to both potential new entrants and current providers to invest in the service to the extent that such investment is economically justified. This should ensure that the amount of frequency response capacity being made available to NGC would assist the efficient and secure operation of the transmission system in the long-term.

5.27. Ofgem considers that if the current cost-based mandatory frequency response arrangements are not amended in the long-term NGC's ability to balance the transmission system may be affected. Frequency response is an important balancing tool that enables NGC to keep the system within safe and efficient operational limits. Insufficient frequency response capacity could reduce the ability of NGC to keep the system within safe and efficient operational limits and, potentially, increase the risk of system failures, to the clear detriment of consumers.

5.28. The BSSG agreed that the volume of frequency response available in the short-term would not be affected by Alternative Amendment A as it is a mandatory service. Ofgem agrees that the amount of mandatory frequency response from current providers should not be affected in the short-term. However, Ofgem considers that value based payments could attract interest from potential new providers that may not have a current mandatory requirement to provide the service (including the demand side) in the short-term. As discussed above, Ofgem also considers that in the short-term Alternative Amendment A should provide NGC with a powerful incentive to develop alternative procurement strategies and contract with a variety of providers which could increase the volume and diversity of supply. Ofgem considers that Alternative Amendment A is likely to have a positive impact on the short-term security of supply.

5.29. Ofgem considers that the introduction of market based arrangements for mandatory frequency response as proposed by Alternative A should assist security of supply on the electricity network in the short-term and the long-term.

Alternative Amendment B

5.30. Ofgem considers that Alternative Amendment B provides some benefits in respect of long-term security of supply to the extent that some current providers and potential new entrants invest in the service. As a consequence, security of supply would be enhanced by a more diverse and competitive market. However, the extent to which this occurs may be limited by the price caps as they may distort the market signals for investment. Although NGC has committed to review the price caps after two years the price caps would not be automatically removed and potentially they could be in place for a longer period. In the event the price caps were to be in place past the initial two year period market signals would be further distorted in the longer-term.

5.31. Ofgem considers that Alternative Amendment B could attract some interest from potential new providers that do not have a current mandatory requirement to provide the service in the short-term. Ofgem also considers that in the short-term Alternative Amendment B should provide NGC with some incentive to develop alternative procurement strategies and contract with a variety of providers which would increase the volume and diversity of supply to the benefit of short-term security of supply. However, Ofgem considers that the price caps proposed by Alternative Amendment B could weaken the incentives to NGC to develop new sources of frequency response and to potential new service providers to participate and therefore the benefits to short-term security of supply would be limited. Further, if the efficient price of frequency response is above the capped price, such an approach would not provide efficient investment signals for frequency response, to the detriment of security of supply and consumers.

Impact on consumers – long-term

Alternative Amendment A

5.32. As discussed above, Ofgem considers that Alternative A would make an important contribution to security of supply in long-term. This should benefit consumers in the long-term by reducing the risk of disconnections in supply and the avoiding the costs involved.

Alternative Amendment B

5.33. As discussed above, Ofgem considers that Alternative Amendment B provides more limited benefits to security of supply and therefore the benefits to consumers would be less than Alternative Amendment A in the long-term.

Environmental impact

Alternative Amendment A

5.34. Ofgem considers Alternative Amendment A would enable large CHP and renewables to more accurately reflect the value of the frequency response service in the event that they are called upon to provide the mandatory frequency response service. As discussed above, Ofgem considers that Alternative Amendment A would improve the efficiency of the investment signals in frequency response to current and potential service providers which would also apply to large CHP plant and renewables. Therefore, Ofgem considers that Alternative Amendment A could have a positive environmental impact.

Alternative Amendment B

5.35. Ofgem considers Alternative Amendment B is likely to limit the ability of CHP and renewables to more accurately reflect the value of the frequency response service in some circumstances in the event that they are called upon to provide the mandatory frequency response service. Ofgem considers that Alternative Amendment B could have a limited impact on improving the efficient investment signals to large CHP plant and renewables. Therefore, Ofgem also

considers that Alternative Amendment B could also have a positive environmental impact.

Evaluation of costs and benefits

5.36. Table 5.1 below evaluates the mandatory frequency response arrangements under Alternative Amendment A and Alternative Amendment B in respect of each of the key issues. In a qualitative sense, Ofgem has attempted to determine the costs or benefits associated with economy and efficiency, security of supply and the impact on consumers and the environment. In a quantitative sense, Ofgem has attempted to determine the costs associated with the implementation and administration for Alternative Amendment A and Alternative Amendment B.

Table 5.1- Ofgem's estimated costs and benefits associated with Alternative Amendment A and Alternative Amendment B relative to the base case

	Alternative A	Alternative B
Promoting economy and efficiency		
♦ efficient investment signals	✓✓✓	✓✓
♦ efficient system operation decisions	✓✓✓	✓✓
♦ implementation & admin costs	✗✗ (£2m)	✗ (£500k)
Security of supply		
♦ long-term security of supply	✓✓✓	✓✓
♦ short-term security of supply	✓✓	✓
Impact on consumers		
♦ long-term	✓✓	✓
♦ short-term	✗✗	✗
Effect on environment	✓	✓
Total relative to current arrangements	£2m	£500k

6. Initial conclusions

6.1. Ofgem estimates that the implementation and administration and increased procurement costs associated with Alternative Amendment A and Alternative Amendment B are likely to be significantly less than NGC's estimate. Ofgem considers that Alternative Amendment A, and to a lesser extent Alternative Amendment B, should provide benefits to efficient investment signals, to efficient SO balancing decisions, to security of supply and, to a limited degree, to the environment, particularly in respect of the government's targets for CHP and renewable generation.

6.2. Ofgem considers that, on balance, the benefits of the Alternative Amendment A outweigh the costs (or negative impacts). Ofgem considers that the benefits of Alternative Amendment B are less than Alternative Amendment A and do not outweigh the costs to the same extent. Therefore the analysis set out in this document has led Ofgem to form the initial view that Alternative Amendment A should be implemented. This initial view is without prejudice to Ofgem's final consideration of whether to direct the implementation of Alternative Amendment A, which includes a consideration of whether Alternative Amendment A better facilitates achievement of the CUSC Applicable Objectives and is consistent with Ofgem's principle objective and general duties, taking into account, among other things, the responses received to this IA.

6.3. In this regard, Ofgem considers that Alternative Amendment A would enable NGC and service providers to contract for frequency response on market based terms, should provide signals for efficient investment to service providers (including CHP plant and renewables), has the potential to promote more efficient decisions by the SO and would help facilitate the efficient and secure operation of the transmission system in the short-term and long-term. Ofgem considers that these efficiency benefits outweigh the implementation and administration costs and likely increased procurement costs in the short-term associated with Alternative Amendment A. Ofgem's initial view is therefore that Alternative Amendment A would better facilitate the Applicable CUSC Objective (a) the efficient discharge by the licensee of the obligations imposed upon it under the Act and by this licence.

6.4. Further, Ofgem considers that Alternative Amendment A would facilitate more competitive and transparent mandatory frequency response arrangements. Ofgem considers that in the longer-term the amount of frequency response capability is likely to increase particularly from more diverse sources of supply which would increase the amount of competition and liquidity in the mandatory frequency response market as proposed by Alternative Amendment A. Ofgem's initial view is therefore that Alternative Amendment A would also better facilitate Applicable CUSC Objective (b) facilitating effective competition in the generation and supply of electricity, and (so far as consistent therewith) facilitating such competition in the sale, distribution and purchase of electricity.

6.5. Subject to full consideration, therefore, Ofgem's initial view is that Alternative Amendment A better facilitates Applicable CUSC Objectives (a) and (b). Ofgem also considers that Alternative Amendment A and Alternative Amendment B could have a positive environmental impact. Ofgem would welcome views on the initial conclusions provided in this IA.

Appendix 1 Frequency response

Introduction

1.1 This Appendix provides an overview of NGC's role as SO and the current payment mechanisms for frequency response.

NGC's role as System Operator

1.2 In its role as SO, NGC is responsible for:

- ensuring that the system remains within safe operating limits and that the pattern of generation and demand is consistent with any transmission system related constraints (system balancing); and
- the residual purchasing and selling of electricity to keep the transmission system in balance in real time (electricity balancing).

1.3 The Balancing Mechanism was designed as a tool to assist NGC, as the SO, to keep the Transmission System in balance in real time by providing a mechanism to adjust levels of generation and demand through the acceptance of Bids and Offers submitted to the Balancing Mechanism. The SO also uses the Balancing Mechanism to ensure that the system remains within safe operating limits, and that the pattern of generation and demand is consistent with any transmission system constraints. System balancing actions include frequency control and resolving transmission constraints.

1.4 As well as the Balancing Mechanism, NGC, as SO, has commercial freedom to trade in other markets and can use a range of other tools to contract with generators, suppliers and customers to balance the system. It can, for example, enter into balancing services contracts, typically option contracts that allow it to call on a service when it needs it; forward trades (typically non-locational) and pre gate closure balancing trades (PGBT). At Gate Closure, which occurs one hour before the start of the settlement period, bilateral trading stops and NGC takes control of balancing the system.

1.5 The costs incurred by NGC in procuring balancing services, both pre-Gate Closure and in the Balancing Mechanism are subject to an incentive scheme.[20] NGC also has an obligation under its transmission licence to operate the system in an economic, efficient and co-ordinated manner.[21]

Frequency response

1.6 Frequency response is a balancing service which is used by NGC to balance the continuously changing system frequency that is determined and controlled by the balance between system demand and total generation. NGC has a duty under the Electricity Safety, Quality and Continuity Regulations 2002 to control the frequency of the system to within $\pm 1\%$ of the nominal system frequency of 50 Hz. NGC must therefore ensure that sufficient generation and/or demand is held in a position where it is ready to provide frequency response to manage all credible frequency change contingencies.

1.7 Frequency response services may be categorised into Primary, Secondary and High frequency services. The distinction between these categories depends on the time in which the frequency response will be available after an event and for how long it can be sustained. This is explained in more detail below::

- **Primary response** is defined as additional active power that will be available 10 seconds after an event and can be sustained for a further 20 seconds;
- **Secondary response** is defined as additional active power that will be available 30 seconds after an event and can be sustained for a further 30 minutes; and
- **High Frequency response** is defined as the reduction in active power that will be available 10 seconds after an event and can be sustained thereafter.

[20] For more details on NGC's SO incentive scheme see "NGC System Operator incentive scheme from April 2004, Proposals and statutory licence consultation, February 2004" which is available on Ofgem's website.
[21] Special Condition AA4.1.

1.8 Further information in relation to the frequency response services is provided on NGC's website.[22]

Mandatory frequency response

1.9 All generators subject to the Grid Code in England and Wales[23] are required to be capable of providing mandatory frequency response services.[24] Therefore, all licensed generators[25] are obliged to provide the service of mandatory frequency response, unless they hold a derogation from this requirement. Derogations are directions from the Authority relieving a licensee from its obligation to comply with a technical standard or code in its licence in specified circumstances and to a specified extent.[26] Most of the generators holding derogations are nuclear as the physical characteristics of the plant prevent them from providing the service.

1.10 Under the current arrangements, NGC procures mandatory frequency response via non-tendered bilateral contracts. The payments made for mandatory frequency response under the CUSC are calculated in accordance with 'cost reflective' charging principles[27] and are designed to reflect inefficiency, and 'wear & tear' costs associated with service provision. For this reason there is a range of contract prices designed to reflect the different costs incurred by different generation equipment. The cost reflective charging principles require that payments are based and founded upon the actual or estimated costs directly incurred or to be incurred by the service provider for the purpose of providing the service or capability concerned. The payment mechanisms under the CUSC associated with mandatory frequency response comprise two elements, the Holding Payment and the Response Energy Payment.

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[22] See: http://www.nationalgrid.com/uk/indinfo/balancing/mn_services.html.
[23] The British Electricity Trading and Transmission Arrangements (BETTA) are planned to be introduced in April 2005. It is proposed that under BETTA there will be a single grid code for Great Britain to apply to all users of the GB transmission system in place of the two separate grid codes that currently apply in England and Wales and in Scotland. Ofgem/DTI propose to use the requirements for mandatory frequency response currently embodied in the England and Wales Grid Code to apply to generators across GB.
[24] Section CC.8.1 of the Grid Code.
[25] Statutory Instrument 2001 No. 3270 requires generators which are normally capable of exporting 100MW to have a generation licence.
[26] For more information on derogations see the Guidance Note "Derogation from Codes and Standards in Electricity Generation, Supply, Distribution and Transmission Licences" published on Ofgem's website.
[27] Section 4.4 of the CUSC.

Holding Payments

1.11 This payment is paid during the period that a generator is held on standby in a frequency sensitive mode ready to provide frequency response. Holding Payment rates (£/MWh) are agreed between the service provider and NGC for each of Primary, Secondary and High frequency response and payments are made in accordance with the price and power delivery tables detailed within the MSA. These rates are based on the cost reflective charging principles. Under the current arrangements, service providers have the right to request that prices relating to the Holding Payment are amended on a bi-monthly basis. This request takes the form of a bilateral agreement with NGC with reference to the cost reflective charging principles.

Response Energy Payment

1.12 This payment is made for the expected volume of frequency response delivered. It is intended to compensate generators for Energy Imbalance exposure under the Balancing and Settlement Code (BSC) due to providing Frequency response. The mechanism also includes an element to compensate for the cost or avoided cost of energy production.

Associated Balancing Mechanism Bids and Offers

1.13 The availability of frequency response depends upon a generator's operating level within the Balancing Mechanism and, sometimes, response is only available once a Bid or an Offer has been accepted. NGC incurs costs in moving a generator away from its preferred output (the Final Physical Notification) to place the generator in a position where it would have frequency response capability available. The payment mechanism is via Bid/Offer Acceptances in the Balancing Mechanism under the settlement rules contained in the BSC.

Commercial services

1.14 Frequency response may also be procured by NGC through the commercial services route. Commercial services apply to any party not bound by the Grid Code, or to any Grid Code obligated party who wishes to offer commercial terms for service levels exceeding Grid Code requirements. Commercial services typically apply to generators capable of special/enhanced governor control modes of operation and demand side measures delivered through low frequency relay tripping. Commercial services are freely negotiated between NGC and the service providers both in terms of contract form and price.