WORKING GROUP REPORT

CUSC Amendment Proposal CAP010

Frequency Response Imbalance Exposure

Prepared by the Balancing Services Standing Group

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1.0	08/02/02	BSSG Chair	Formal version for submission to the CUSC Panel

DISTRIBUTION

Name	Organisation
Working Group Members	Various
CUSC Panel Members	Various

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1.0 Executive Summary and Recommendations of Working Group

1.1 All licensed generators are required to provide the service of mandatory frequency response as set out in CC.8.1 of the Grid Code. Prior to the introduction of NETA it was recognised that generators would incur imbalance charges under the BSC when mandatory frequency response was provided. A mechanism was introduced at NETA Go-live that was intended to compensate generators for this imbalance exposure due to providing response. The mechanism, known as imbalance compensation, included an element to compensate for the cost or avoided cost of energy production. This mechanism was implemented via the NETA Implementation Scheme in the Mandatory Services Agreements (MSA) and codified into the CUSC.

1.2 Following NETA Go-live, a number of providers raised concerns that the imbalance and energy compensation as calculated by the mechanism, did not, in certain circumstances, adequately cover the costs incurred as a result of the provision of frequency response. In order to address these concerns, the arrangements were reviewed by an informal, pre-CUSC Working Group and resulted in the submission of CUSC Amendment Proposal CAP001 by National Grid. However, because no agreement was reached within the Working Group on the price of the energy delivery due to the provision of frequency response, CAP001 only addressed the volume issue and hence the imbalance component of the compensation. CAP001 followed the Urgent Amendment Procedure and was approved by the Authority on 15 November 2001 with an effective implementation date of 21 September 2001.

1.3 Prior to the Authority's approval of CAP001, Innogy plc submitted CUSC Amendment Proposal CAP010. This seeks to modify the element in the payment for mandatory frequency response that compensates the service provider for exposure to system prices resulting from settlement imbalances consequent upon the provision of the service. CAP010 proposes calculating the reference price in the imbalance compensation payment by reference to Bid and Offer prices instead of the current method of using a single value reference price derived from the average of SSP and SBP for the previous month.

1.4 In accordance with the Terms of Reference provided by the Amendments Panel (see Annex 2), the BSSG considered whether Amendment Proposal CAP010 better facilitates achievement of the Applicable CUSC Objectives when compared to the extant mechanism for calculating the reference price. In undertaking this exercise, the BSSG also considered whether any Alternatives to CAP010 existed.

1.5 Further to three Standing Group meetings and associated debate and correspondence, the majority of BSSG members support the implementation of CAP010 as proposed. However, the BSSG also notes that some members remained neutral to the proposal and that National Grid objects to the implementation of CAP010.

1.6 The BSSG recommends that the CUSC Panel:

(i) On the basis of the views of the majority, approve the implementation of Amendment Proposal CAP010;

(ii) Note that the BSSG also considered potential Alternative Amendments. The majority view of the BSSG was that none of these alternatives would be formally proposed as an Alternative Amendment; and

(iii) Note National Grid's objections regarding Amendment Proposal CAP010.

2.0 Introduction

2.1 The Balancing Service of mandatory frequency response is set out and described in Connection Condition 8.1 of the Grid Code. All licensed generators are required to provide mandatory frequency response.

2.2 A mechanism was introduced at NETA Go-live which was intended to compensate Generators for imbalance charges incurred under the Balancing and Settlement Code (BSC) when mandatory frequency response was provided. The mechanism, although known as imbalance compensation, included an element to compensate for the cost or avoided cost of energy production. The compensation mechanism was discussed and agreed at a sub-group of the Transmission Users' Group (TUG), and was subsequently implemented via the NETA Implementation Scheme in the Mandatory Services Agreements (MSA) and codified in the CUSC.

2.3 A number of providers raised concerns that the imbalance and energy compensation as calculated by the mechanism, did not adequately reflect the actual costs incurred as a result of the provision of frequency response. As a consequence, some generators indicated their concern in continuing to provide this mandatory service when the costs of provision were not necessarily adequately compensated.

2.4 In order to address these concerns, the arrangements were reviewed by an informal pre-CUSC Working Group and resulted in the submission of CUSC Amendment Proposal CAP001 (Frequency Response Imbalance Payments) by National Grid. CAP001 proposed a number of improvements to the volume part of the mechanism. Due to the fact that no agreement was reached in the Working Group on the price of the response energy delivered, no amendment on this issue was proposed. CAP001 followed the Urgent Amendment Procedure and was approved by the Authority on the 15 November 2001 with an implementation date of 21 September 2001.

2.5 Amendment Proposal CAP010 (Frequency Response Imbalance Exposure) was submitted by Innogy plc for consideration by the CUSC Amendments Panel at their 9 November 2001 meeting. CAP010 proposes a change to the way the response energy is treated by valuing this energy at Bid/Offer prices rather than a single Reference Price. At the meeting, the CUSC Panel determined that the Balancing Services Standing Group (BSSG) should be actioned to act as a Working Group to consider CUSC Amendment Proposal CAP010.

3.0 Purpose and Scope of Report

3.1 At the CUSC Amendments Panel meeting of 9 November 2001, the CUSC Panel determined that the Balancing Services Standing Group (BSSG) should be actioned to act as a Working Group to consider the Amendment Proposal CAP010. The BSSG was issued with an additional set of Terms of Reference in respect of CAP010 (see Annex 2).

3.2 In accordance with the Terms of Reference provided by the Amendments Panel, the Standing Group has considered whether Amendment Proposal CAP010 better facilitates achievement of the Applicable CUSC Objectives when compared to the extant mechanism for calculating the compensation element (or reference price) used in the response delivery calculations. In undertaking this exercise, the BSSG has also considered whether any Alternatives to CAP010 exist.

3.3 This report summarises the findings and recommendations of the BSSG in respect of their consideration of Amendment Proposal CAP010. The report has been prepared in accordance with the terms of the CUSC. An electronic copy of this document can be found on the National Grid website, at:
http://www.nationalgrid.com/uk/indinfo/cusc/index.html

4.0 Description and Assessment Against CUSC Objectives

4.1 The Proposed Amendment Proposal

4.1.1 The current methodology for calculating imbalance compensation payments for the Mandatory Service of Frequency Response compensates service providers for costs incurred under the BSC. The principle behind this payment is set out in clause 4.4.3.3 of the CUSC (Annex 6 – Charging Principles). These payments are based on the expected volume of energy delivered in a Settlement Period and an estimate of the cost to the service provider of that variation.

4.1.2 The payment mechanism can be represented simply as follows. When the net response energy delivered in a Settlement Period is positive (low frequency response) the mechanism refunds a Reference Price and subtracts the SSP the generator would have received under the BSC (assuming this was positive).

$$LF_{MWh} \times (\text{Reference Price} - SSP)$$

4.1.3 When the net response energy delivered in a Settlement Period is negative (high frequency response) the mechanism refunds the SBP paid by the generator under the BSC and subtracts a Reference Price.

$$HF_{MWh} \times (SBP - \text{Reference Price})$$

4.1.4 Since NETA Go-live there have been moves to improve the accuracy with which expected variation in the volume is calculated (CAP001 and CAP009) in order to reflect better the imbalance costs faced by providers. However, it is recognised that the ‘Reference Price' remains a source of inaccuracy.

4.1.5 The reference price in any month is applied to all providers and is calculated as the average of the previous month's SBP and SSP data. To date, this mechanism for calculating the reference price has generated prices that have varied from one month to the next and have generally been considered to be higher than the actual cost of production. It should be noted that where a provider has a symmetrical response characteristic i.e. delivering on average equal volumes of low and high frequency response, the impact of the reference price is cancelled out. However, certain generators who provide on average more high frequency than low frequency response e.g. those operating at or near MEL, will be disadvantaged by a reference price higher than their actual production costs. Conversely, generators who provide on average more low frequency response will clearly gain under the current mechanism.

4.1.6 A table of reference prices since NETA 'Go-live' is shown in the table below:

Month	£/MWh	Month	£/MWh
Apr-01	25.34	Sep-01	23.10
May-01	36.95	Oct-01	18.54
Jun-01	28.37	Nov-01	16.36
Jul-01	30.86	Dec-01	22.56
Aug-01	21.85		

4.1.7 The change as proposed by this Amendment seeks to reflect better the generating Units' costs by replacing the 'reference price' currently used with a mechanism that uses Bid prices (for high frequency response energy) and Offer prices (for low frequency response energy). The effect would be to compensate the service provider in such a manner that it would treat the variation in the volume of energy supplied as if that variation had been achieved by way of a series of Bid/Offer Acceptances (each of one minute duration).

4.1.8 CUSC Amendment Proposal CAP010 proposes that the response energy volume continues to be calculated on a per minute basis (as per CAP001 and CAP009 methodologies). This per-minute volume profile will then be related to the Unit's Bid/Offer data to determine the expected energy variation falling in each Bid/Offer pair submitted for the Unit. Thus, the volume of energy delivered in each minute to be valued at the Offer or Bid price in each Bid/Offer pair would be calculated. The payment for the delivered Response energy would be the sum of the Offer payments over the Settlement Period less the sum of the Bid payments.

4.1.9 Finally, the imbalance compensation element of the payment in each Settlement Period would continue to be calculated by reference to SSP or SBP depending on whether the total expected Response energy is positive or negative.

4.2 Alternative Amendments

4.2.1 In accordance with the terms of the CUSC, the BSSG considered whether any 'Alternatives' to CAP010 existed. Although the Group discussed three possible options, on the basis of majority opinion, the BSSG considered that none of the three options presented a viable alternative to either the CAP010 methodology or the extant methodology. In view of this, no formal Alternative to CAP010 is put forward as part of this Working Group Report. The three possible options are briefly outlined below.

Fuel Based Reference Price

4.2.2 National Grid explained that service providers are continuing to raise concerns over the Reference Price and hence the level of imbalance compensation as calculated under the current mechanism. National Grid pointed out that without the development of an Alternative Proposal, should the Authority wish to reject CAP010 (for whatever reason), it would be left with no option but to determine that the current Reference Price mechanism continue to the used. In view of this and National Grid's objections to CAP010, National Grid was keen that an Alternative Proposal be developed and put forward by the BSSG.

4.2.3 National Grid's preferred solution was to derive reference prices by fuel type and a paper was circulated outlining a proposed fuel based Reference Price mechanism (see Annex 5). This proposal largely builds upon the work previously undertaken by the informal, pre-CUSC Working Group. National Grid argued that this method is the simplest way of deriving a Reference Price to closely reflect the actual cost or saved cost of energy production.

4.2.4 Some BSSG members argued that this method of deriving reference prices could have as many difficulties as have emerged with an average of historic system buy and system sell prices. Specifically, these difficulties were:

- Some plant categories cannot be covered by published data, specifically hydro and pumped storage plant would have no obvious reference price, and dual fired generating units would also need some form of special consideration;
- Specific plants may show significantly different cost attributes depending on aspects such as a unique design, various environmental constraints -for example ash disposal costs, and thermal efficiencies widely different to those assumed in the heat rates;
- There could be a poor correlation between the reference fuel cost and that incurred by the plant in its operation. This difficulty is most obvious when looking at the relationship between the quarterly average fuel price and the movement in the daily spot price;
- The availability of the data will generally be two quarters in arrears leading to a sustained mismatch between the reference price and the underlying cost; and
- Would require a similar modification to the despatch procedures as that required for the bid/offer price proposal.

4.2.5 Whilst National Grid shared some of the concerns it's view was that a table of reference prices split by fuel type offered a close approximation of actual production costs. National Grid argued that

this method of deriving reference prices by plant category was clearly more appropriate than the current method, addressed its concerns on cost reflectivity, and did not pose any of the concerns raised by CAP010. Nevertheless, the BSSG did not support this option.

System Average Offer/Bid Reference Prices

4.2.6 A BSSG member proposed a potential Alternative to CAP010 based upon using the average of accepted Offer prices (for low frequency response) and the average of accepted Bid prices (for high frequency response). The Group discussed this proposal, but it was agreed that this method was not appropriate.

Fixed Price Reference Price

4.2.7 The possible Alternative of using a fixed-price reference price was also briefly discussed. The group widely agreed that this was not a viable solution as a single fixed-price could not possibly reflect the production costs of different generator types (i.e. production costs of oil sets are different to coal sets).

4.3 Working Group Views and Discussion

Discussion

4.3.1 The proposer outlined why generators' costs of production vary for a number of reasons (e.g. due to the size, type and age of plant, non-fuel costs, ash disposal etc). The proposer stated that a bids/offers approach was seen as the best available measure for cost of production in a competitive market. These arguments are described in detail in Annex 3 but in summary, the proposer believes bids and offers:

- Are reflective of frequently changing fuel prices;
- Are reflective of variation of costs with load; and
- Will remove the perverse incentive to deliver one type of response (high or low) ahead of the other.

4.3.2 The majority of BSSG members supported the use of Bids and Offers to pay for response energy and believed that it was an improvement over the existing methodology. Notwithstanding this however, National Grid did not agree and argued that the use of bids and offers to value frequency response energy was unacceptable. National Grid cited several arguments that are detailed further in Annex 4. In summary National Grid believes that using Bids and Offer to value response energy:

- Moves from cost reflective to value based principles without any benefits of a market mechanism;

- Would lead to an increase in the costs of providing frequency response and a subsequent increase in BSUoS charges;
- Provides the potential for service providers to preclude selection by submitting extreme prices;
- Would blur the distinction between short term energy balancing and frequency response and prohibit competition in such services;
- Will make optimal despatch in control time-scales difficult and require development of despatch systems; and
- Does not represent a step in the right direction towards enduring frequency response market arrangements.

4.3.3 The proposer disagreed with National Grid's views as outlined and stated they believed that the use of Bid/Offer prices did not:

- Depart from the cost reflective principles suggesting that Bid/Offer prices were a good indicator of the incremental costs incurred by a generator in producing more or less energy;
- Present any additional potential for providers of this service to preclude selection; and
- Complicate the control room optimisation algorithm any more than for other Balancing Services.

4.3.4 National Grid did not move from it's position and whilst it accepted that there were deficiencies with the current Reference Price approach it did not accept that CAP010 was an appropriate way of addressing the problem for the reasons stated in 4.3.2. Therefore National Grid proposed the Fuel Based Reference Price alternative as discussed in 4.2.3.

Conclusion

4.3.5 Following extensive discussion and debate between BSSG members, it was clear there were two opposing views within the BSSG relating to the CAP010 Amendment Proposal. In addition some members remained neutral to the proposal, stating that they had sympathy for both viewpoints. On balance, most BSSG members supported the Amendment as proposed, however, National Grid did not support the Amendment.

4.4 Assessment against Applicable CUSC Objectives

4.4.1 The Standing Group considered whether the Amendment Proposal as tabled would better meet the achievement of the Applicable CUSC Objectives.

4.4.2 The applicable CUSC Objectives are set out in paragraph 1 of Condition C7F of the Transmission Licence. CUSC Amendments should better facilitate achievement of the Applicable CUSC Objectives. These can be summarised as follows:

(a) the efficient discharge by NGC of the obligations imposed on it by the Act and the Transmission 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.

Original Proposer's Views

4.4.3 The proposer (Innogy plc) originally put forward the view that the Amendment Proposal better facilitated achievement of the Applicable CUSC Objectives set out in Condition C7F. Innogy argued that the Transmission Licence obligates National Grid to purchase ancillary services from the most economical sources available to it having regard to the quantity and nature of the ancillary services. The proposed amendment would better facilitate the efficient discharge of this Licence Obligation by aligning more accurately payments made with costs incurred, producing greater transparency in the relative costs of the service provision. This in turn will ensure that the most economic sources of mandatory response continue to make their full capability available for despatch by National Grid.

Respondent's Views

4.4.4 No representations were received outside of the Standing Group regarding the Proposed Amendment.

Working Group's Views

4.4.5 The majority of BSSG members supported the Amendment Proposal and felt that it better meets achievement of the Applicable CUSC Objectives set out in Condition C7F, paragraph 1a – the efficient discharge by National Grid of the obligations imposed on it by the Act and the Transmission Licence. This was on the same grounds at that of the proposer as detailed in paragraph 4.4.3 above.

4.4.6 National Grid who did not support the Amendment believed that the proposal did not better facilitate achievement of the Applicable CUSC Objectives set out in Condition C7F, paragraphs 1a and 1b. With regards to paragraph 1a, National Grid stated that the costs of frequency response provision would increase under this proposal (and hence BSUoS would increase) with no perceived benefit. With regards to paragraph 1b, National Grid felt that the use of the same prices for frequency response as those used for short-term energy balancing would prohibit competition in such Balancing Services by 'blurring' the distinction between such services. Furthermore, the mechanism would not create competitive pressure on the costs of providing frequency response.

5.0 Proposed Implementation and Timescales

5.1.1 As outlined in Section 8.0 below, if CAP010 were to be approved, it would require corresponding changes to both the Balancing Services Settlement System software and the Despatch System algorithm (used in the control room for optimal despatch purposes). In view of this requirement, the BSSG considered how CAP010 would best be implemented.

5.1.2 On balance, the majority of the BSSG agreed that it would be prudent to make CAP010 implementation dependent on the necessary changes being completed to the despatch system algorithm. Otherwise, if the Amendment were implemented before such changes were carried out, the System Operator would be unable to schedule frequency response in an optimum manner. The Group also agreed, that although changes to the Settlement Systems were required, this should not hold up implementation as payments could be reconciled (in a similar manner to CAP001) upon delivery of modified systems.

5.1.3 Notwithstanding the above, the proposer suggested the Amendment should be implemented as soon as possible as the despatch algorithm problem could be solved in the short term by using a simple Microsoft Excel based optimisation solution in the Control Room. National Grid pointed out that it would be inappropriate to implement this type of system in a real time operational environment such as the National Grid Control Room.

6.0 Impact on CUSC

6.1 The proposed amendment will require modification of certain clauses within Section 4.1.3 of the CUSC (calculation of payments and payment formulae).

7.0 Impact on Core Industry Documents

7.1 It is envisaged that the Amendment Proposal will have no impact on any core industry documents.

8.0 Impact on Industry Computer Systems

8.1 National Grid has undertaken an impact assessment of Amendment Proposal CAP010 on its Balancing Services Settlement Systems and the despatch algorithm used in the Control Room. The costs and implementation time-scales are summarised below:

	Cost	Time
Settlement System	£120k	8 months
Despatch System	£150k	9 months

8.2 National Grid also explained that the impact outlined above on the despatch algorithm is a potential crude enhancement which adds a penalty onto the response holding cost for each BMU to represent the probabilistic expectation of the response delivered energy and its cost. Significant further analysis would be required in order to develop the dispatch algorithm to fully optimise response holding. A full optimisation would require the development of probabilistic techniques to attempt to forecast the expected response behaviour of each generator relative to the system frequency in real time, and the interaction of this behaviour with its bid/offer ladder.

8.3 It is also expected that changes are required to the validation systems of service providers. This has not been considered in the report.

Annex 1 – Amendment Proposal

Amendment Proposal Form

Those wishing to propose an Amendment to the CUSC should do so by filling in this "Amendment Proposal Form" that is based on the provisions contained in Section 8.15 of the CUSC. The form seeks to ascertain details about the Amendment Proposal so that the CUSC Panel can determine more clearly whether the proposal should be considered by a Working Group or go straight to wider National Grid Consultation.

The Panel Secretary will check that the form has been completed, in accordance with the requirements of the CUSC, prior to submitting it to the Panel. If the Panel Secretary accepts the Amendment Proposal form as complete, then he will write back to the Proposer informing him of the reference number for the Amendment Proposal and the date on which the Proposal will be considered by the Panel. If, in the opinion of the Panel Secretary, the form fails to provide the information required in the CUSC, then he may reject the Proposal. The Panel Secretary will inform the Proposer of the rejection and report the matter to the Panel at their next meeting. The Panel can reverse the Panel Secretary's decision and if this happens the Proposer will be informed by the Panel Secretary.

The completed form should be returned to:

Mark Cox
Panel Secretary
Commercial Development
National Grid Company plc
National Grid House

Kirby Corner Road
Coventry, CV4 8JY

Or via e-mail to:

CUSC.Team@uk.ngrid.com

(Participants submitting this form by email will need to send a statement to the effect that the proposer acknowledges that on acceptance of the proposal for consideration by the Amendments Panel, a proposer which is not a CUSC Party shall grant a licence in accordance with Paragraph 8.15.7 of the CUSC. A Proposer which is a CUSC Party shall be deemed to have granted this Licence.)

Proposers Name:
(Name of party making the proposal. An Amendment Proposal may be made by a CUSC Party, a BSC Party or by "energywatch")

Innogy plc

Proposers Representative:
(The name of the person representing the Proposer (and his alternate) for the purposes of the Amendment Process)

David Tolley (Alternate - Raoul Thulin)

Organisations Name and Address:
(Organisation on whose behalf the Amendment is proposed)

Innogy plc
Windmill Hill Business Park
Whitehill Way
Swindon
Wiltshire
SN5 6PB

Capacity in which the Organisation Proposes to make an Amendment:
(i.e. CUSC Party, BSC Party or "energywatch")

CUSC Party

Description of the issue or defect which the proposed Amendment seeks to address:
(This should be in reasonable, but not excessive detail)

Current payments for the Mandatory Service of Frequency Response include an element intended to compensate the service provider for exposure to system prices resulting from the settlement imbalances incurred by the provision of the Service. The calculation of this payment is based on the variation in the expected volume of energy delivered in a Settlement Period and an estimate of the cost to the service provider of that variation. Where the variation in the energy produced is positive, a payment equal to the difference between the estimated cost of production and SSP is made for each MWh of expected energy. Where the variation in the energy produced is negative, the payment is based on the difference between SBP and the estimated cost of production.

Since NETA Go-live there have been moves to improve the accuracy with which expected variation in the volume is calculated (CAP001) in order to reflect better the imbalance costs faced by providers. However, the value that is applied to the imbalance volume (known as the 'reference price') remains a source of significant inaccuracy in estimating the cost of the imbalance. The reference price in any month is applied to all providers and is calculated as the mid-point of the previous month's average SBP and SSP.

The application of a single reference price to all units providing the service - irrespective of fuel type, plant loading or local conditions - results in a cost estimate that does not reflect any generating unit's actual costs. This means that imbalance compensation payments will not reflect the costs of imbalance exposure, with the attendant risk of market failure.

Description of the proposed Amendment and of its nature and purpose:
(This should be in reasonable but not excessive detail)

The change proposed by this Amendment seeks to reflect better the generating Units' costs by replacing the 'reference price' currently used with Bid prices for energy delivered in response to positive frequency deviations and Offer prices for energy delivered in response to negative frequency deviations. The effect will be to compensate the service provider in such a manner that it would treat the variation in the volume of energy supplied as if that variation had been achieved by way of a series of Bid/Offer Acceptances each of a minute's duration. In a competitive environment Bids and Offers should be the best indicators of marginal costs available.

This proposal assumes that the method for calculating expected energy is that promoted in CAP001, although it would also cater for any changes that might be adopted in the future.

The required calculation might be achieved by calculating the expected variation in energy delivered as a result of Response provision in each minute. Under the CAP001 methodology, this would be by reference to the average System Frequency deviation during the minute and the relevant Response matrix in the applicable Ancillary Services Agreement. Relating this to the Unit's Bid/Offer data determines the expected energy variation falling in each Bid/Offer pair submitted for the Unit. Thus, the volume of energy delivered in each minute to be valued at the Offer or Bid price in each Bid/Offer pair is calculated. The payment for the delivered Response energy is the sum of the Offer payments over the Settlement Period less the sum of the Bid payments.

Finally the compensation payment is calculated as the difference between the payment for the delivered Response energy and the imbalance payment calculated by reference to SSP of SBP depending on whether the total expected Response energy is positive or negative. The direction of the payment would be so as to replace the imbalance payment (which may be a cost or a credit) with a payment for the delivered Response energy as if it were a Bid/Offer acceptance in the BM.

An indication of those parts of the CUSC which would require amendment in order to give effect to (or would otherwise be affected by) the proposed amendment and an indication of the nature of those amendments or effects.
(This should be given where possible)

Section 4.1.3 – calculation of payments and payment formulae. Amendment required to reflect revised payment for energy delivered when providing Frequency Response as outlined above.

Reasons why the Proposer believes that the proposed Amendment would better facilitate achievement of the Applicable CUSC Objectives as compared with the current version of the CUSC with background information in support thereof.

The Transmission Licence obligates National Grid to purchase ancillary services from the most economical sources available to it having regard to the quantity and nature of the ancillary services.

This proposed amendment would better facilitate the efficient discharge of this licence obligation by aligning more accurately payments made with costs incurred, producing greater transparency in the relative costs of service provision. This in turn will ensure that the most economic sources of mandatory frequency response continue to make their full capability available for despatch by National Grid.

An indication of the impact of the proposed Amendment on Core Industry Documents.
(This should be given where possible)

No impact on core industry documents is foreseen.

An indication of the impact of the proposed Amendment on relevant computer systems and processes used by CUSC Parties.
(This should be given where possible)

The proposed amendment will require modification to the billing system used by National Grid to calculate the Frequency Response payments.

A statement to the effect that the Proposer acknowledges that on acceptance of the proposal for consideration by the Amendments Panel a Proposer shall grant a Licence in accordance with Clause 8.15.7 of the CUSC.
(A signature to this effect must be given by a proposer which is not a CUSC Party)

Annex 2 – Working Group Terms of Reference

CAP010: Frequency Response Imbalance Exposure
Balancing Services Standing Group - Terms of Reference Paper

Introduction

1. Current payments for the Mandatory Service of Frequency Response include an element that is intended to compensate service providers for any exposure they may have to system prices that result from any imbalance that is incurred following the provision of the service. CUSC Amendment Proposal CAP010 puts forward an alternative mechanism to calculate such costs. The proposal is to replace the reference price mechanism currently used with a mechanism that uses Bid Prices (for energy delivered in response to positive frequency deviations) and Offer prices (for energy delivered in response to negative frequency deviations). At the 9th November 2001 Amendments Panel meeting, the Amendments Panel determined that the Balancing Services Standing Group (BSSG) should be actioned to consider whether Amendment Proposal CAP010 better facilitates achievement of the Applicable CUSC Objectives when compared to the current mechanism (following implementation of CAP001).

2. This paper outlines the terms of reference that the BSSG should work to.

Relationship with Amendments Panel

3. The Standing Group shall seek the views of the Amendments Panel before taking on any significant amount of work. Where the Standing Group requires instruction, clarification or guidance from the Amendments Panel, particularly in relation to their Scope of Work, the Standing Group Chairman should contact the CUSC Panel Secretary.

Meetings

4. The Standing Group shall develop and adopt its own internal working procedures and provide a copy to the Panel Secretary for each of its Amendment Proposals.

Terms of Reference

5. The BSSG has been actioned to act as a Working Group to consider CAP010 in line with the Amendment Procedures described in Section 8 of the CUSC.

6. In progressing the Amendment Procedures in respect of CAP010, the BSSG should be cognisant of the Standing Terms of Reference of the BSSG.

7. The BSSG Chairman should, in line with the CUSC be responsible for producing a Working Group Report with recommendations. The report should be submitted to the Panel Secretary by 9th February 2002 for circulation to Panel Members and the Conclusions of such report should be presented to the Amendments Panel meeting scheduled for 22nd February 2002. The report should be written with reference to Section 8.17 of The CUSC.

Annex 3 – Proposer's Views

Introduction

1. CAP010 seeks to replace the reference price used to calculate the compensation payment to providers of Frequency Response for exposure to imbalance costs when delivering energy in response to system frequency changes. The proposal is to use Bid and Offer prices as the reference when calculating the compensation payments that should be made.

2. The reference price is currently calculated as an average of the average SBP and SSP in the preceding calendar month in which the service is provided. During low frequency periods, power is delivered to the system and providers are exposed to SSP. The mechanism effectively exchanges SSP for the reference price. During high frequency periods, power output is reduced and providers are exposed to SBP. Under theses circumstances the mechanism exchanges SBP for the reference price. This can be seen from the simple representation of the payment mechanism shown below:

   $£_P = P_{MWh}$ * (Reference Price – SSP)
   $£_H = H_{MWh}$ * (SBP – Reference Price)

3. The mechanism for calculating the reference price has generated prices that have varied considerably from one month to the next thus producing compensation payments that have not reflected the costs incurred. This has been partly due to the inadequacy of the reference price but also because of the incorrect measurement of the response energy. The introduction of CAP001 leads to a more accurate identification of the volume.

4. By using the per minute volume of response energy from the proposed calculation, it is now possible to treat this energy in the same manner as any other Bid/Offer Acceptance in the Balancing Mechanism. The appropriate price for this energy is the relevant Bid or Offer price depending on whether energy delivery is positive or negative.

The case for CAP010

5. Innogy's view (supported by virtually all service providers) is that the current imbalance compensation payment fails to reflect the costs likely to be incurred under the Balancing and Settlement Code when providing Frequency Response (CUSC para. 4.4.3.3). These costs arise because of the inability of the BSC to accurately capture the instruction that is effectively given to a BM Unit when operating in a frequency sensitive mode. For example a 500 MW Unit that is part loaded and frequency responsive will deliver a varying output yet the BSC Settlement assumes

the output to be constant thus leading to an imbalance cost. The purpose of the compensation payment is to cancel this cost.

6. If the System Operator were equipped with sufficiently sophisticated systems then he would be able to instruct the plant on a minute by minute basis in the same manner as plant is currently instructed in the BM for more substantial balancing actions. In such circumstances the BM Unit would receive Bid and Offer acceptances around the PN to reflect short term balancing actions in response to frequency perturbations. The imbalance cost is thus the difference between the Bid or Offer price and the relevant imbalance price.

7. As long as the payment mechanism is not cost reflective, there will be perverse incentives on providers not to provide either High Frequency Response or Low Frequency Response depending on where their true costs lie in relation to the reference price. The use of Bids and Offers ensures that providers have an incentive to provide a full and reliable service.

8. Current developments in the BSC initiated by NGC (P34) could result in the failure to deliver the expected volume of Response energy exposing a provider to system prices. This immediately imposes different risks and hence costs on the provision of High Frequency Response compared with Low Frequency Response.

9. Such a move would necessitate different prices for the energy delivered due to the different types of Response under any cost reflective regime. Failure to adopt CAP010 could leave providers of Mandatory Frequency Response without any adequate route to reflect this asymmetry in the cost of providing the service.

<u>Views from the Working Group members.</u>

10. In general, Working Group members have supported the use of Bids and Offers to pay for response energy. Working Group members argue that such an approach would have a number of merits. Specifically:

- It ensures that the relevant costs are automatically tracked on a generating unit basis;
- It would be relatively easy to administer since Bid/Offer data is already collected;
- It does not rely on an administered approach with its attendant risk of perverse incentives;
- It would be consistent with NETA principles and objectives;
- It allows demand-side participation on an equivalent basis;
- It creates competitive pressure on the costs of providing frequency response; and
- It would provide appropriate economic signals as envisaged by the Charging Principles.

Annex 4 – National Grid's Views

National Grid does not support the CAP010 proposal of valuing frequency response energy at a generating BM unit's relevant Bid or Offer price. We believe that this energy should be treated with a Reference Price (or Prices) to reflect the costs of energy production.

Move From Cost Reflective to Value

Mandatory Frequency Response is provided in accordance with the CUSC on a cost reflective basis. Under CAP010, cost reflectivity would be lost as the energy volume delivered would be paid at Bid and Offer prices rather than a price that represents the cost of production. This is a clear move from cost reflective to value based principles which would increase the cost of frequency response provision without the full benefits of a market mechanism.

Use of Bid/Offer Prices

The use of Bid/Offer prices to pay for frequency response raises a number of issues. Using the same prices for frequency response as for short term energy balancing would prohibit competition in these Balancing Services by blurring the distinction between such services. This mechanism would not create competitive pressure on the costs of providing frequency response. In addition, using Bid-Offer prices as submitted into the Balancing Mechanism provides potential for providers of this mandatory service to preclude selection by submitting high prices and making the system prohibitively expensive to operate.

Control Room Optimisation

Any mechanism by which mandatory frequency response energy is valued at continuously varying prices will be difficult (if not impossible) to fully optimise. As frequency response is an automatically delivered service relative to a continuously changing system frequency, it is not possible to accurately assess costs prior to real time. This is because, the level of response power delivered, and hence the relevant price in the Bid-Offer ladder, is dependent upon the actual frequency deviation in real time. To achieve a satisfactory level of optimisation, probabilistic techniques will need to be developed in order to forecast expected response behaviour relative to system frequency.

Enduring Frequency Response Arrangements

National Grid is committed to the development of an implementation plan for a Frequency Response Market and the Balancing Services Standing Group is considering this issue. We believe it is important that the issues raised by this CUSC Amendment Proposal be considered in the context of the whole market debate. Whilst CAP010 moves from cost to value based principles, we believe this does not represent a step in the right direction towards frequency response market arrangements that will deliver benefits to the industry as a whole. CAP010 will requirement significant investment in National Grid's IT systems (for both Control Room optimisation and settlement systems) in

addition to the systems of service providers. If, as we suspect, Bid/Offer payment for Frequency Response energy does not form part of enduring frequency response market arrangements, then this significant investment will be wasted.

Annex 5 – Fuel Based Reference Price

Balancing Services Standing Group (BSSG)

Fuel Based Reference Prices – An Alternative to CAP010

Paper by National Grid

17 January 2002

Introduction

1. Further to discussion at the BSSG, this paper proposes that a fuel based Reference Price mechanism is debated and put forward as an alternative to using Bids and Offers (CAP010) to pay for frequency response energy. This paper builds on work previously undertaken and proposes how quarterly Reference Prices can be derived, based on published fuel prices and typical incremental heat rates.

Background

2. The imbalance compensation mechanism for mandatory frequency response includes a Reference Price for the payment of response energy.

3. The Reference Price in any month is applied to all providers and is currently calculated as the average of the previous month's SBP and SSP data. To date, this mechanism for calculating the Reference Price has generated prices that have varied from one month to the next and have generally been considered to be higher than the actual cost of production.

4. The current Reference Price leads to providers being advantaged or disadvantaged depending on whether they provide predominantly low or high frequency response. This leads to perverse incentives on providers to deliver one type of response (i.e. high or low frequency) ahead of the other.

5. A number of generators have raised concerns directly to National Grid over the Reference Price issue. Indeed some have indicated their concern in continuing to provide this mandatory service when the compensation mechanism leaves them disadvantaged. As a consequence, National Grid is keen to resolve the issue and implement a mechanism that more accurately reflects the actual cost of production.

Bid/Offer Payment for Response Energy

6. CUSC Amendment Proposal CAP010 was submitted by Innogy plc to the Amendment Panel for consideration at their 9 November 2001 meeting. CAP010 as submitted, proposes that the response energy delivered is valued at Bid and Offer prices rather than the current

Reference Price method. The Panel determined that the Balancing Services Standing Group (BSSG) should be actioned to act as a Working Group to consider this proposal.

7. Although the majority of BSSG members support the implementation of CAP010, National Grid has a number of concerns and believes the use of Bids and Offers to value response energy is inappropriate. In summary, National Grid argues that CAP010:

- Moves from cost reflective to value based principles without any benefits of a market mechanism;
- Provides the potential for service providers to preclude selection by submitting extreme prices;
- Will make optimal despatch in control time-scales difficult and require development of despatch systems; and
- Does not necessarily represent a step in the right direction towards enduring frequency response market arrangements

8. In light of the general discontent with the existing Reference Price mechanism and National Grid's concerns regarding the use of Bids and Offers, National Grid believes it is imperative that a simple alternative is developed.

Fuel Based Reference Prices

9. During August 2001, a pre-CUSC Working Group reviewed the Reference Price but failed to reach agreement on a way forward. A paper[1] submitted to the group, based on a suggestion made by AES Drax, considered deriving fuel based reference prices but concluded at the time, that the use of Bids and Offers was more appropriate. However, National Grid proposes that a fuel based reference price mechanism should be considered as an alternative to using Bids and Offers.

10. The pre-CUSC Working Group considered the derivation of Reference Prices from:

- Typical heat rates/efficiencies for plant categories;
- Published fuel costs; and
- An estimate of the works power requirement.

Typical Heat Rates/Efficiencies

11. The appropriate heat rate (or efficiency) to use is the incremental heat rate and should ignore the fixed heat component of generation. There will be a variation of heat rates between fuel types and different plant

[1] Derivation of a Reference Price – 24 August 2001

sizes. This variation needs to be reflected within the table of Reference Prices.

12. There appears to be no published source for this information and it is proposed that the BSSG debate and agree appropriate categories. As a starting point for this discussion, this paper proposes the use of the categories and heat rates contained in the Innogy paper referred to above.

Published Fuel Costs

13. Historic fuel price data (generally quoted in pence per kWh) can be obtained from a number of published sources. These include:

- DTi – quarterly prices published one quarter in arrears on website. This is the average price paid by major UK power producers over the quarter;
- Various other sources providing daily market price information including Platts, Petroleum Argus, Fame and Heren (available through subscription).

14. National Grid proposes that the DTi quarterly prices be used to derive fuel based reference prices for each quarter but suggests that data from other sources could be used to produce reference prices that are updated more frequently. A table of reference prices derived from the DTi quarterly prices is shown in Appendix 1.

Works Power and other Incremental Costs

15. In addition to the gross fuel costs, works power requirement and other incremental costs such as fuel handling costs, ash disposal etc need to be considered. These costs are relatively small but can vary between plant types.

16. As with plant efficiency, there appears to be no published source of this information. As a starting point for this discussion, this paper proposes to use the costs contained in the Innogy paper referred to previously.

Recommendations

17. National Grid invites the BSSG to:

(i) Debate the concept of Fuel Based Reference Prices as a viable alternative to CAP010;
(ii) Agree a suitable table of typical heat rates and plant categories;
(iii) Agree the DTi fuel price data be used as a published source of fuel prices; and
(iv) Agree suitable values for works power and other costs.

Appendix 1 – Fuel Based Reference Prices

Fuel prices taken from 2001 Q3 in table 3.2.1 of DTI Quarterly Energy Trends.

Fuel	Plant Category	Heat Rate (kJ/kWh)	Efficiency (%)	Fuel Price (p/kWh)	Heat Cost (£/MWh)	Other Costs (£/MWh)
Coal	660MW	8300	43.4	0.465	10.72	0.55
	500MW	8800	40.9		11.36	
	250-400MW	9200	39.1		11.88	
	<250MW	9700	37.1		12.53	
Oil	>600	8500	42.4	1.015	24.25	0.40
Gas	Conventional	8600	41.9	0.620	14.81	0.35
	CCGT	5800	62.1		9.99	0.00

Annex 6 – Charging Principles

4.4 CHARGING PRINCIPLES

4.4.1 Application

The provisions of this Paragraph 4.4 shall apply to payments made by **NGC** to a **User** pursuant to **Mandatory Services Agreements** in respect of the provision of the **Mandatory Ancillary Service** of **Frequency Response**, and (if agreed between **NGC** and a **User**) may also be incorporated by reference into any other **Ancillary Services Agreement** as a term thereof so as to apply in respect of payments made by **NGC** to that **User** in respect of the provision of other **Ancillary Services** (but for the avoidance of doubt not so as to thereby create any obligations on **NGC** and that **User** under the **CUSC** in respect thereof).

4.4.2 Charging Principles - General

4.4.2.1 These principles are to be used to establish the basic arrangements but are not intended to stifle innovation in the development of new services or the giving of appropriate economic signals.

4.4.2.2 The charges shall be "cost reflective" ie. based and founded upon the actual or estimated costs directly incurred or to be incurred by the **User** for the purpose of providing the service or capability concerned.

4.4.2.3 Where a capability to provide an **Ancillary Service** is required by the **Grid Code** from all **BM Units** or **CCGT Units** (as opposed to a capability made available by agreement between **NGC** and a **User** from some only of the **User**'s **BM Units** or **CCGT Units**), no **Ancillary Service** capability payment shall be made.

4.4.2.4 The cost of "Grandfathering" **User**'s Equipment (i.e. bringing equipment owned by the **User** on 30th March 1990 to a condition of compliance with the **Grid Code**) shall not be included in **Ancillary Services** payments. Where a **Derogation** is withdrawn or reduced in scope then, except in relation to **Frequency Response**, the **User** shall be entitled to take the cost of meeting the

withdrawal or reduction in the scope of the **Derogation** into account in its charges.

4.4.2.5 Subject to the other provisions of this Paragraph 4.4.2, the charges shall take due account of any change in or amendments to the **Grid Code** or any other statutory or regulatory obligation coming into force after 30th March 1990 affecting the provision of **Ancillary Services**.

4.4.2.6 If as a result of any changes to the **Balancing and Settlement Code** the **User** ceases to be entitled to receive payment under the **Balancing and Settlement Code** in respect of any elements of **Ancillary Services** provided by it which are expressed in this Paragraph 4.4 to be paid for under the **Balancing and Settlement Code**, the **User** shall be entitled to charge for such elements under an **Ancillary Services Agreement**. Where, however, such change entitles the **User** to be paid for any elements of **Ancillary Services** which are expressed in this Paragraph 4.4 to be paid for under an **Ancillary Services Agreement** the **User** shall cease to be entitled to charge for such elements under an **Ancillary Services Agreement**.

4.4.3 Charging Principles – Frequency Response

4.4.3.1 The variable cost of producing **Primary Response**, **Secondary Response**, **High Frequency Response** shall include sums in respect of the additional inefficiency costs incurred in providing these services but shall not include any sums payable in respect of any costs which are the subject of Paragraph 4.4.3.3.

4.4.3.2 Part-loading of a **BM Unit** at a level other than that specified in a **Physical Notification** in order to provide **Frequency Response** will normally be achieved by the issue of a **Bid-Offer Acceptance**.

4.4.3.3 In recognition of the costs likely to be incurred under the **Balancing and Settlement Code** when providing **Frequency Response**, an additional amount based upon an expected exposure to energy imbalance and non-delivery charges when providing these services shall be payable under Paragraph 4.1.3.9A.

Annex 7 – Copy of Representations Received

No representations regarding Amendment Proposal CAP010 have been received from outside the Standing Group.