

## **PRE-CONSULTATION DOCUMENT**

**GB ECM-06**

**For the charging and access arrangements associated with SQSS design variations based on customer requests**

**August 2006**

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## 1. Executive Summary

This pre-consultation document identifies the main options available for modifying the charging or access arrangements associated with Security and Quality of Supply Standard (SQSS) design variations that arise from customer requests.

The options identified in this document are by no means exhaustive and National Grid welcomes all industry views. The document has been published on the National Grid charging website at the following address:

<http://www.nationalgrid.com/uk/Electricity/Charges/modifications/uscmc/>

## 2. Introduction

As the transmission licensee, authorised to co-ordinate and direct the flow of electricity onto and over the transmission system within Great Britain, National Grid has duties under the Electricity Act to develop and maintain an efficient, co-ordinated and economical transmission system and to facilitate competition in generation and supply.

Along with these high level duties, National Grid is obliged under its transmission licence:

- (i) to keep the Use of System Charging and Connection Charging Methodologies at all times under review
- (ii) to make such modifications of the Use of System Charging Methodology as may be requisite for the purpose of better achieving the relevant objectives, which are:
  - a) to facilitate effective competition in generation and supply;
  - b) to result in charges which reflect, as far as reasonably practicable, the costs incurred by transmission licensees in their transmission businesses;
  - c) in so far as is consistent with a) and b) above, as far as reasonably practicable, they properly take account of the developments in transmission licensees' transmission businesses.
- (iii) to make such modifications of the Connection Charging Methodology as may be requisite for the purpose of better achieving the relevant objectives, which are:
  - a) to facilitate effective competition in generation and supply;
  - b) to result in charges which reflect, as far as reasonably practicable, the costs incurred by transmission licensees in their transmission businesses;
  - c) in so far as is consistent with a) and b) above, as far as reasonably practicable, they properly take account of the developments in transmission licensees' transmission businesses;

- d) in so far as is consistent with a), b) and c) above, of facilitating competition in the carrying out of works for connection to the GB transmission system.

In addition to the relevant objectives above, the transmission licence also prohibits National Grid from discriminating against any user or class of users unless such different treatment reasonably reflects differences in the costs of providing a service.

Before making a modification to the Use of System Charging or Connection Charging Methodology, National Grid is also required by the transmission licence to consult with CUSC Users on the proposed modification and allow them a period of not less than 28 days within which to make written representations.

The purpose of this document is to set out for pre-consultation the options available to modify the charging or access arrangements for SQSS design variations based on a customer request, considering the relevant objectives and in particular the objective to set charges which reflect the costs incurred by the transmission licensees in their transmission businesses.

### **3. Background**

The GB Security and Quality of Supply Standard includes criteria for variations to connection designs. The criteria allow generators or demand customers to choose a standard of connection which is higher or lower than the specified standard (e.g. a single circuit connection rather than a double circuit connection), provided this does not, either immediately or in the foreseeable future:

- (i) reduce the security of the main interconnected transmission system below the minimum planning criteria specified in the standard;
- (ii) result in additional investment or operational costs to any particular customer or overall, or a reduction in the security and quality of supply of the affected customers' connections to below the planning criteria in the standard, unless specific agreements are reached with affected customers; or
- (iii) compromise the Transmission Owners (TOs) ability to meet other statutory or licence obligations.

For the example of a single circuit connection to a generator, the generator would have to accept uncompensated access restrictions in the event that the single circuit is unavailable as a result of a fault outage or maintenance outage in order to meet these conditions. Without these arrangements, customers would be exposed to additional operational (compensation) costs as a result of the single circuit connection and condition (ii) above would not be met.

The criteria for variations to connection designs also state that should system conditions subsequently change, for example due to the proposed connection of a new customer, such that either immediately or in the foreseeable future, the conditions described above are no longer satisfied, then alternative arrangements and/or agreements must be put in place such that the standard continues to be satisfied.

Clearly, this represents a significant risk to customers that choose single circuit design variation connections, since the connection may be modified to a double circuit connection in the future for reasons completely beyond their control.

Prior to the implementation of the plugs 'shallow' connection charging methodology in 2004, all assets associated with generation connection were classified as 'connection'. Consequently, a customer choosing a lower standard of connection design had the capital savings directly reflected in its connection charges. The customer was able to compare the savings with the loss of revenue caused by the associated access restrictions and choose the most efficient connection design.

Following the implementation of the 'shallow' plugs methodology, some assets for connecting generation have been reclassified as 'infrastructure' and since infrastructure assets are funded from use of system rather than connection charges, the savings are no longer passed through to the generator.

The current arrangements accept that the benefits associated with the move to a shallow connection charging methodology outweigh the disadvantage of a reduced incentive for generators to consider single circuit connections. These advantages include:

- (i) Minimising the risk that facilitating competition is made difficult by the construction of single circuit connections. If further generation seeks a connection in the same location in the future, it may be difficult and expensive to achieve the necessary consents and construct a second circuit.
- (ii) Shielding generation from design decisions made by the Transmission Owner for wider system reasons.

National Grid recognises that in extreme cases, the current arrangements could potentially lead to inefficient capital investment.

### **3.1 Application**

There are three scenarios in particular in which design variation connections are either currently an issue or are anticipated to be an issue in the future:

- (iii) Scottish island generation connections;
- (iv) Scottish highland generation connections;
- (v) Offshore generation connections;

For the Scottish Island connections and offshore transmission connections, the costs associated with the provision of additional circuits, is so high that a single circuit connection may be the most efficient solution. For the Highland onshore connections, the circuit (distance related) cost is not as significant, but the difference in substation cost between the provision of a double and single circuit solution is significant.

Clearly, any proposals must be applicable to the whole of the GB system as well as the specific areas listed above. The connection of generation offshore is currently being considered and there is value in ensuring that the arrangements developed here can be extended to deal with the future regime offshore.

It should be noted that any solution that reflects the capital efficiencies associated with a lower standard of connection in reduced charges will inherently expose that

customer to the effect of future TO decisions. This is a significant risk to the customer as he has no influence over TO decisions, for example, to accommodate other user's connections or system reinforcement. This introduces significant uncertainty with respect to future charges.

National Grid has consulted the industry at the Charging Issues Standing Group (CISG) and Transmission Charging Methodologies Forum (TCMF) during May and June respectively. Several potential options have been considered and in order to establish the appropriate way forward, National Grid invites views from the industry on the options listed below:

- Status Quo
- SQSS change to replace design variations with option for the TO to design to a standard lower than the deterministic criteria where there is an economic justification
- Change to the connection charging methodology to move to a deeper connection boundary for generation connections
- Change to the use of system charging methodology to reflect the savings associated with single circuit connections through to generators

Given the advantages described above, National Grid believes that the status quo option is worthy of further consideration. The options that represent a change from this status quo are described below.

## **4. Option Assessment**

### **4.1 Option 1 - SQSS Modification**

This option involves the 'variation to connection design' criteria in the SQSS being replaced with a clause allowing TOs to design to a standard lower than the deterministic criteria provided there is an economic justification. Generators would be given full access rights whether they were connected with a single or double circuit (the additional compensation costs associated with a single circuit connection would be included in the economic analysis completed by the TO).

This option gives the responsibility for decisions on assets that may be utilised by more than one user to the relevant TO and customers are protected from costs and risks associated with TO decisions taken to accommodate other transmission users. With the TO assessing the economic case, the option for the customer to influence the connection design by requesting a design variation is removed.

For the example of a single circuit generation connection in the event of a maintenance outage of that single circuit, the level of compensation payable is effectively set by the generator. As a result, the economic analysis required to determine the most economic solution would be difficult for the TO to perform. To simplify this problem, compensation payments due to the single circuit connection could be limited to a pre-defined 'market rate' however, under these circumstances it could be argued that generators on a single circuit are being discriminated against, as they did not choose the access restriction and the associated cap on compensation.

Under these arrangements, TOs would be responsible for designing the most economically efficient connection, but would not be exposed to the resultant

compensation costs. National Grid believes that this is inappropriate and that this option should be accompanied by arrangements to provide a financial incentive on the TO to make the right decision.

National Grid believes that this option would be difficult due to the problems described above with respect to the TO economic assessment. Given that the generator sets the compensation payable when access is withdrawn, it seems appropriate that the decision to accept a single rather than a double circuit connection should continue to sit with the generator.

#### **4.2 Option 2 - Deeper Connection Boundary**

This option involves a return to a deeper connection boundary for all GB generation connections. The generator connection substation and spur circuits would be charged as connection assets and therefore, any savings associated with a single circuit connection would be passed through to the customer. This requires the full cost of both circuits to be charged as connection assets to reflect the full asset cost.

It is worth noting that this is different from the previous 'generator only spurs' arrangements where half the value of the second spur circuit was classed as infrastructure to reflect the general benefit of this additional security.

The savings associated with any design variation would be passed through to the customer, allowing the customer to compare these savings with the loss of revenue associated with the uncompensated access restrictions. This should lead to efficient transmission investment.

This option directly exposes the customer to TO decisions made for wider system reasons, for example, if the TO believes that more generation will connect at a site in the future, a substation with additional capacity would be constructed, but until the additional generation connects the original User will have to pick up the cost for these additional assets. In addition, a generator connecting to an existing spur, further utilising existing assets, will also experience a step increase in charges when it is deemed the assets need to be replaced.

It should also be noted that a generator choosing a single circuit connection would be exposed to an unpredictable step increase in charges if future customer connections necessitated the second circuit.

The definition of a consistent boundary between connection and infrastructure assets is problematic given the variety of existing and proposed connection designs. This is likely to lead to complex arrangements that lack transparency.

National Grid believes that whilst this option has advantages over an SQSS change, there are still significant issues including the risks posed to the generators by TO decisions taken for wider system reasons and the practical difficulties associated with the definition of a consistent connection boundary.

#### **4.3 Option 3 - TNUoS Methodology Amendment**

This option involves changing the use of system charging methodology to reflect the savings associated with lower standard connections through to generators. National Grid believes that the full cost saving would have to be passed through to ensure that

the cost benefit analysis performed by the generator leads to the most economic solution. The methodology amendments proposed include both the implementation of a nodal security factor and a substation discount:

### **Nodal security factor**

Presently the network required to provide adequate security is accounted for using a locational security factor. This security factor is derived using a Secured DC Load Flow (SECULF) programme.

The SECULF programme is a separate self-contained application that uses the same network and nodal data as the DCLF transport model. In the same way as the DCLF transport model produces a marginal cost for each node for the unsecured intact system, the Secured DCLF programme additionally calculates the marginal cost for each node taking into account the requirement to be secure against a set of contingencies. The programme does this by identifying the worst contingencies in terms of maximum flows for each circuit. The secure and intact marginal costs are compared on a nodal basis and a “least squares fit” employed to derive the GB security factor. The GB security factor is calculated at each Price Review and is currently 1.8.

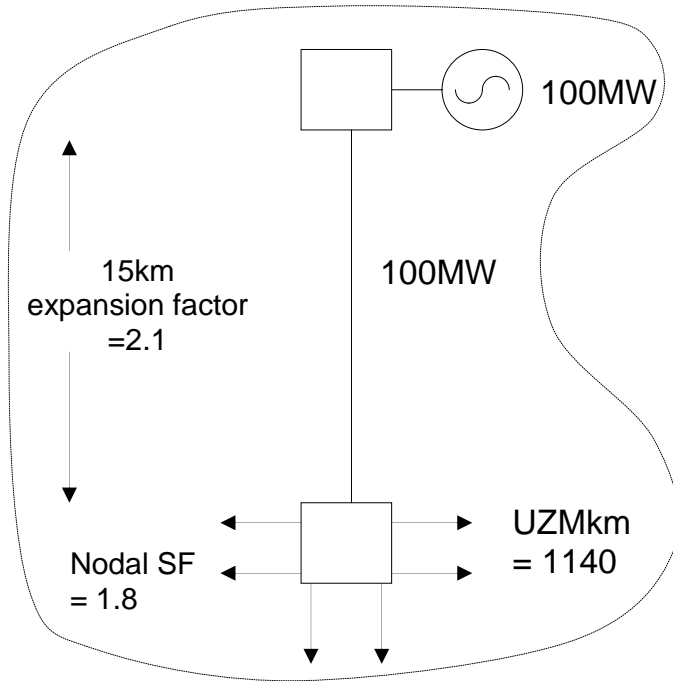
It is proposed that for each single circuit connected generator, the nodal security factor is calculated explicitly. If the TNUoS tariff calculated using this nodal security factor rather than the GB average results in an adjustment which is greater than a preset threshold, a new zone for the node will be established using the adjusted tariff. National Grid believes that a threshold of +/-£1/kW is appropriate since this is equal to the zoning tolerance. This threshold will additionally avoid the complexity and reduced predictability associated with too many tariff zones.

To ensure consistent treatment, National Grid proposes that the calculation of the nodal security factor is based on the following:

- (i) the single circuit design should connect directly into the ‘weighted average’ centre of the zone;
- (ii) a security factor equal to the GB average, currently 1.8, should be assumed at the ‘weighted average’ centre of the zone.

The calculation of nodal security factors in accordance with these proposals is illustrated in the examples below for a Highland connection and an Island connection.

**Example 1: Highland generator single circuit spur**



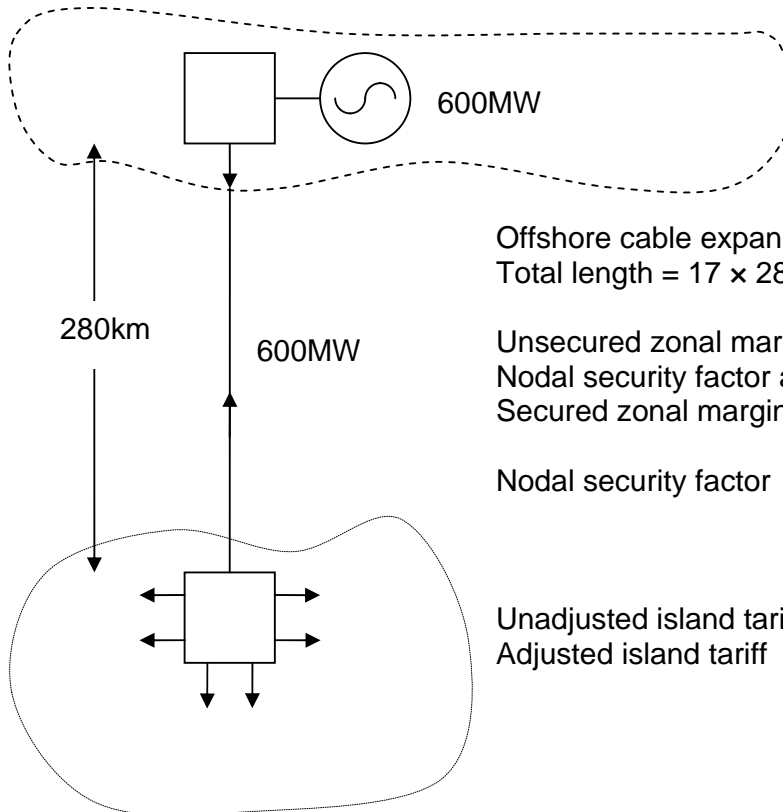
Circuit length = 15km  
 Expansion factor for 132 OHL = 2.1  
 Marginal km of line = 31.5  
 Secured zonal marginal km =  $1140 \times 1.8 = 2052$

$$\text{Nodal SF} = \frac{(2052 + 31.5)}{(1140 + 31.5)} = 1.78$$

Zonal Tariff = £21.00/ kW  
 Spur Tariff = £20.77/ kW

Therefore spur tariff would remain at £21 as zoning tolerance (+/- £1) is greater than discount.

**Example 2: Single Circuit Scottish Island Transmission Connection**



Offshore cable expansion factor = 17  
 Total length =  $17 \times 280 = 4760$  km

Unsecured zonal marginal km = 1140  
 Nodal security factor assumed to be 1.8  
 Secured zonal marginal km =  $1140 \times 1.8 = 2052$

$$\text{Nodal security factor} = \frac{(2052 + 4760)}{(1140 + 4760)} = 1.15$$

Unadjusted island tariff = £110 /kW  
 Adjusted island tariff = £69 /kW

Another proposed connection design for the Scottish Islands involves multiple cables with ratings that sum to the rating of the generator (e.g. 2x300MVA cables to connect a 600MW generator). A discount is still justified as the connection would have a non-firm access right and the requirements of the GB SQSS would not be met.

The locational security factor would be calculated by modelling the cable as having the combined capacity of all conductors. Under these circumstances, it may be necessary to introduce a 'multi cable' expansion factor in the transport and tariff model where the cable unit cost would be that for a km of two cables and not just one.

It is anticipated that future networks to connect offshore generation may be similar to this 'multiple cables' design and therefore the same approach would be applied.

### **Substation discount**

A substation discount is also proposed to reflect the savings associated with the reduced substation asset requirements associated with a single circuit connection design. National Grid proposes to reflect these savings with a £/kW discount to the residual tariff, this approach prevents the introduction of inappropriate negative generation charges for small generators in Scotland. Generic cost analysis has been performed to compare the substation costs associated with single circuit and double circuit connection designs. For transmission voltages of 132kV and above, this analysis shows that the residual tariff saving should be £0.50/kW. For 33kV shared substations, the analysis shows that the saving should be £2.50/kW, due to the significant cost of 132/33kV transformers.

In addition to the introduction of a substation discount for 33kV substations, National Grid believes that an amendment to the Connection Charging Methodology should be considered so that sole-user connections at voltages below the transmission voltage are always charged as connection assets.

Overall, the option to include a nodal security factor together with a substation discount in the use of system charging methodology provides a transparent signal which reflects the capital efficiencies associated with single circuit design variations through to customers.

It should be noted that, as with option 2, a generator choosing a single circuit connection would be exposed to an unpredictable step increase in charges if future customer connections necessitated the second circuit.

The signal produced may not cover all feasible design variation examples and clearly there is a trade off between the accuracy of the design variation signal and the transparency of the methodology. However, National Grid believes that the combination of the nodal security factor and substation discount will cover a sufficient number of design variations.

National Grid believes that this option may have advantages over options 1 and 2. Like option 2, this option reflects the savings associated with design variations through to customers so that cost benefit analysis comparing these savings with the loss of revenue associated with the uncompensated access restrictions can be performed, which should result in efficient transmission investment. National Grid also believes that this option has advantages over option 2 in terms of simplicity and transparency.

## **5. Responses to this pre-consultation**

Comments and views are invited on all of the issues raised in this pre-consultation document. To ensure that your comments and views are considered as part of National Grid's forthcoming consultation document, responses must be received by close of business on Friday 8 September 2006.

If you wish to provide comments on this pre-consultation document, responses are welcome via email to: [Tom.Ireland@uk.ngrid.com](mailto:Tom.Ireland@uk.ngrid.com)

Alternatively, Users can send their comments in writing, addressed to:

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