Planning and operating standards under BETTA

An Ofgem/DTI consultation document

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Summary

Currently, the transmission systems of the existing three transmission licensees in Great Britain ("GB")[1] are planned, developed and operated in accordance with standards specified in their respective transmission licences. These standards set out the criteria that the existing licensees are required to apply when planning, developing and operating their transmission systems to ensure a required level of security and quality of supply[2] under conditions that ought reasonably to be foreseen. The applicable standards and criteria differ from licensee to licensee[3] to correspond with different geographical, climatic and economic factors.

In the May 2002 report[4], Ofgem/DTI stated that one objective of the British Electricity Trading and Transmission Arrangements ("BETTA") reforms was to introduce a set of GB trading and transmission arrangements, and that it might be preferable for these arrangements to include a harmonised set of security and quality of supply standards. It was recognised that further work was required in order to determine the most appropriate way forward on this issue.

Given the above, it has been necessary to consider whether the existing different standards should be retained or whether, given the introduction of single GB trading and transmission arrangements under BETTA, it is appropriate to seek to harmonise some or all of the aspects of these standards. In order to do so, Ofgem/DTI have, through the SO-TO Expert Group ("STEG")[5], requested the expert advice of the existing transmission licensees.

In March 2003, Ofgem/DTI published a consultation on the planning and operating standards to apply under BETTA (the "March 2003 consultation")[6] based on the preliminary conclusions of the transmission licensees after consideration of some of the options available for addressing the existing differences between the standards and after consideration of an approach that could reconcile such differences under BETTA.

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[1] SP Transmission Ltd, Scottish Hydro Electric Transmission Limited (SHETL) and The National Grid Company plc (NGC).

[2] Both quality and security of supply are addressed in both planning and operating timescales.

[3] In the case of NGC, the standard of planning and operation is referred to as the "security and quality of supply standard". The Scottish licensees are required to plan and operate so as to meet a "transmission system security standard and quality of service". In this document the terms "planning and operating/operational standard(s)", and "security and quality of supply standard(s)" are used interchangeably.

[4] "The Development of British Electricity Trading and Transmission Arrangements (BETTA): Report on consultation and next steps." Ofgem/DTI, May 2002 Ofgem38/02.

[5] Terms of references of STEG meetings are available on the Ofgem website www.ofgem.gov.uk/scotland/steg.htm.

[6] "Planning and operating standards under BETTA, an Ofgem/DTI consultation." March 2003. 14/03.

In June 2003, after consideration of the responses to these initial conclusions and further thinking on the issues raised, Ofgem/DTI published its conclusions (the "June 2003 document")[7] on the matters outlined in the March 2003 consultation. The principal conclusions made in this document were that:

- Ofgem/DTI agreed with STEG's principal recommendations and requested that the transmission licensees undertake a more detailed review of operating standards to assess whether it is practical and beneficial for aspects of the existing operational standards to be aligned with a view to identifying which aspects may be practically harmonised under BETTA from day one
- that the work should be progressed by the transmission licensees and reported back to STEG
- any proposals relating to harmonisation of operational standards identified as part of this analysis will be the subject of an industry-wide Ofgem/DTI consultation
- it was not anticipated that there will be any significant change to the security and quality of supply delivered to different GB transmission customers under BETTA compared with the service which they received prior to the implementation of BETTA[8], and
- to the extent that different standards apply to different users of the GB transmission system, the appropriate commercial treatment of such differences needs to be considered in the development of the connection and use of system charging methodology to apply under BETTA.

Ofgem/DTI also considered that further work on the harmonisation of standards should recognise that in moving to a harmonised standard there should be an objective and transparent framework to allow for the consistent interpretation of the standards to be applied by the GB system operator when operating a GB transmission system. Furthermore, Ofgem/DTI considered that moving towards any conformed standard would take geographical, climatic and economic factors into account and stated that it was not intended that this work will result in any significant investment in the transmission system. Harmonisation of the existing standards has also been taken

[7] "Planning and operating standards under BETTA. An Ofgem/DTI conclusion document." June 2003. 61/03

[8] Ofgem/DTI recognised that a harmonised operational standard may well result in a small changes to the security of supply delivered to certain GB transmission customers under BETTA. In the event that such issues arose Ofgem/DTI intended to consult fully on the impact of these issues.

forward by the transmission licensees on the basis that changes with respect to the present standards have only been proposed where they are considered to be required for BETTA.

The June 2003 document explained that Ofgem/DTI had received technical advice from the transmission licensees through their participation at regular meetings of STEG. Since the publication of the June 2003 document a more flexible approach has been taken to soliciting expert technical advice and information from the existing transmission licensees. To this end, four STEG development groups ("DGs")[9] have since been established in order to examine specialised areas of operation, to develop the detail of the inter-transmission licensee arrangements, in particular the requirements for systems and procedures to support the interactions between transmission owners and the GB system operator under BETTA, and to provide information to STEG. The intention was that each DG would be responsible for delivery of an agreed and documented set of operating processes for each of four broad areas of interaction.

In light of the above structure, the Investment Planning Development Group ("DG4") was charged with the responsibility of undertaking the detailed review of existing standards requested by Ofgem/DTI in its conclusions to the June 2003 document. Following a multilateral workshop in July 2003, attended by representatives from Ofgem/DTI and of each transmission licensee, it was agreed that a sub group of DG4 would be established to undertake this work in accordance with the instructions of DG4.

Development and further clarification on the deliverables of the sub group has continued since the publication of the June 2003 document in light of:

- views and advice provided in discussions between the transmission licensees and Ofgem/DTI (including at DG meetings)
- Ofgem/DTI's development of the associated draft transmission licence conditions that were discussed in the June 2003[10], December 2003[11] and April 2004 Licences Consultation[12], and

[9] The work of each DG examines licensee interaction in each of the following areas: the control room (DG1), data exchange (DG2), commercial and charging (DG3) and investment planning (DG4).
[10] "The Regulatory framework for transmission licensees under BETTA. Second consultation on electricity transmission licences under BETTA, and Ofgem/DTI consultation, June 2003".
[11] "The Regulatory framework for transmission licensees under BETTA. Third consultation on electricity transmission licences under BETTA, and Ofgem/DTI consultation, December 2003".

- Ofgem/DTI's further consideration of interaction with other industry documents (e.g. GB Balancing and Settlement Code ("GB BSC"), GB Connection and Use of System Code ("GB CUSC"), GB Grid Code, SO-TO Code ("STC") etc) that it is proposed will apply under BETTA.

This development work has informed thinking about the scope of the work to harmonise existing security standards and has resulted in revisions to the deliverables for the DG4 sub-group. These revisions are reflected in the Terms of Reference (included as part of Appendix 1 to this consultation) and resulted in changes to the scope of works to include, at a minimum, a high level review of the existing planning standards of each licensee to ensure that the planning criteria were consistent with any of the harmonised changes that were identified as necessary for the operating standards.

A further, more detailed, review was also instigated to establish similarities and differences in the three planning standards and quantify extent of work needed to establish whether a harmonised planning standard could be achieved.

This review identified a large number of similarities between the existing standards but more importantly did not identify many unresolvable differences between the existing standards. Thus, a deliverable to harmonise planning standards and the production of a set of planning criteria for day one of BETTA was incorporated into the scope of the review to be undertaken by the transmission licensees.

This document comprises two volumes. Volume 1 also considers the changes that have been proposed to the existing standards. Chapter 5 provides a commentary on the general drafting changes proposed by the transmission licensees and invites views on the draft GB Security and Quality of Supply Standard ("GB SQSS") text which is provided in Volume 2. A single document is presented in Volume 2 as a proposed GB SQSS which contains planning and operational criteria developed from a comparison of the current standards split into separate sections detailing generation connection criteria, demand connection criteria and the criteria for the main interconnected system.

Ofgem/DTI have not identified any parts of the draft GB SQSS developed by the transmission licensees that do not meet with the objective to harmonise existing standards and propose that the draft GB SQSS should (subject to the responses to this consultation) form "the relevant standards" referred to in the proposed standard licence condition for each of the transmission licensees under BETTA.

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[12] "Publication of "near final" transmission licences under BETTA." Ofgem/DTI, April 2004, 82/04.

In parallel with taking forward work on the standards that should apply under BETTA, Ofgem/DTI have also been considering how and on whom the responsibilities to comply with such standards should rest under BETTA. The background and latest proposals on these matters are set down in the April 2004 licences consultation.

This paper:

- summarises the general motivation for and justification of proposals identified by the transmission licensees in the work they have undertaken through the DG4 sub group
- explains the approach used in developing the new standard and the need for guidance to support this document
- outlines proposals for a new harmonised GB SQSS, which includes:
    - criteria for a new harmonised planning standard
    - criteria for a new harmonised operating standard
    - new terms, definitions and revised GB terms
- invites views on all aspects of this consultation.

Ofgem/DTI anticipate that a conclusions report will be published in August 2004, in view of responses to this paper.

Table of contents

1. Rationale

1.1. The rationale for BETTA is set out in the December 2001 consultation[13] and the May 2002 report[14]. Further, on 30 January 2003 the DTI published a draft of the Electricity (Trading and Transmission) Bill (the "E(TT) Bill") together with a Regulatory Impact Assessment, which explains the purpose and impact as well as the expected costs and benefits of the proposed primary legislation to enable the BETTA reforms.

1.2. The principal objective of BETTA is to put in place a set of arrangements that will facilitate the development of competition in the wholesale trading of electricity for GB based on, where appropriate, the present arrangements in England and Wales. In the May 2002 report and in the December 2002 consultation[15], Ofgem/DTI stated that in meeting this objective it might be preferable for the BETTA arrangements to include a harmonised set of security and quality of supply standards.

1.3. The three transmission licensees in GB currently operate to different system security and quality of supply standards[16]. These standards set out the criteria that the existing licensees are required to apply when planning, developing and operating their transmission systems to ensure a required level of security and quality of supply under conditions that ought reasonably to be foreseen. The applicable standards and therefore criteria differ from licensee to licensee.

1.4. Given the above, it has been necessary to consider whether the existing different standards should be retained or whether, given the introduction of a single GB wholesale electricity market under BETTA, it is appropriate to seek to harmonise some or all of the aspects of these standards.

1.5. From a practical perspective, Ofgem/DTI recognise that work to harmonise operating and planning standards is a complex, technical matter. However, whilst some harmonisation of standards may occur for day-one operation under BETTA, Ofgem/DTI

[13] The Development of British Electricity Trading and Transmission Arrangements (BETTA): A consultation paper, December 2001 74/01.
[14] See footnote 4.
[15] "Regulatory framework for transmission licensees under BETTA. Volumes 1-4." An Ofgem/DTI consultation, December 2002 88/02.
[16] See earlier footnote 3.

do not anticipate that there will be any significant change to the security and quality of supply delivered to transmission customers for day-one of BETTA[17].

1.6. Ofgem/DTI also note that this proposal to conform the security and quality of supply standards is not intended to result in any significant investment in the transmission network (and significant new costs).

1.7. Whilst it may be considered that the simplest practical solution for initial operation under BETTA would be to roll forward the existing differing standards, Ofgem/DTI did not believe that is the case. Under BETTA, the GB system operator would be responsible for directing the operation of the transmission system in real time and it would appear sensible for GB system operator staff, as a minimum, to have a common set of definitions to work with in place for day one of BETTA. Furthermore, to the extent that further harmonisation can take place so as to avoid different sets of rules in undertaking security assessment studies then there may be benefits from further harmonisation from day one of BETTA.

1.8. In their initial conclusions presented in the March 2003 consultation the licensees noted these practical benefits and recommended that, as a minimum, definitions within operating standards should be harmonised by day one of BETTA and that furthermore a more detailed review should be undertaken to assess whether other practical changes can be made.

1.9. Ofgem/DTI agreed that further work was required to determine the most appropriate way forward on this issue and requested that the transmission licensees to undertake a review on the basis of their recommendations, as outlined in the June 2003 consultation.

1.10. Insofar as harmonisation of standards is concerned, the rationale for this document is to:

- consider the harmonisation proposals developed by the transmission licensees in accordance with the detailed review of the existing standards requested in the June 2003 consultation, and
- consult on the nature and impact of these changes in order to provide a basis for developing a harmonised GB standard for day one of BETTA.

[17] See earlier footnote 8.

1.11. Volume 1 also considers the changes that have been proposed to the existing standards. Chapter 5 provides a commentary on the general drafting changes proposed by the transmission licensees and invites views on the draft text which is provided in Volume 2.

2. Timetable

2.1. This is the third document published by Ofgem/DTI on the treatment of planning and operating standards under BETTA. This paper follows the March 2003 consultation, which consulted on the proposed approach for determining the planning and operating standards to apply under BETTA, and the June 2003 consultation which summarised the initial investigative work carried out by the transmission licensees and recommendations on the scope of harmonisation achievable for day one of BETTA.

2.2. This paper explains the basis on which transmission licensees have developed proposals to harmonise the existing standards and consults on those changes to the existing standards that are proposed as a result of the detailed review undertaken by the transmission licensees.

2.3. Ofgem/DTI propose to publish a final report in August 2004, which will set out Ofgem/DTI's conclusions on planning and operational standards under BETTA, taking into account the responses to this paper. This report will contain the final GB Security and Quality of Supply Standard ("GB SQSS") document that will apply for day-one of BETTA.

Views invited

2.4. Parties are free to raise comments on any of the matters covered in this paper and in particular on those matters where views have been requested. All responses, except those marked confidential, will be published on the Ofgem website and held electronically in the Ofgem Research and Information Centre. Respondents should try to put any confidential material in appendices to their responses. Ofgem prefers to receive responses in an electronic form so they can easily be placed on the Ofgem website.

2.5. Responses marked 'Response to conformance of standards under BETTA consultation' should be sent by **Monday 23rd August 2004** to:

David Halldearn
Director – Scotland and Europe
Office of Gas and Electricity Markets (Ofgem)
9 Millbank

London
SW1P 3GE
Fax: 020 7901 7479

2.6. Please e-mail responses to BETTA.Consultationresponse@ofgem.gov.uk marked 'Response to conformance of standards under BETTA consultation'. All consultation responses will be forwarded to the DTI.

2.7. If you wish to discuss any matters in this document, please contact Anthony Mungall at Ofgem, by telephone on 0141 332 5647 or by email, anthony.mungall@ofgem.gov.uk or Dominic Scullard at the DTI (e-mail: dominic.scullard@dti.gsi.gov.uk telephone: 020 7215 2715).

3. Background

3.1. The background to and key aspects of the BETTA reforms were set down in the December 2001 consultation, the May 2002 report and the December 2002 consultation.

3.2. The December 2001 consultation noted that the three transmission systems in GB are currently planned and operated to comply with different system security and quality of supply standards. In addition to identifying the relevant standards, the December 2001 consultation noted that:

- each licensee has different criteria applying to generation connections and demand connections
- for each licensee, different criteria apply in relation to generation connections, demand connections and the main interconnected transmission system. The standards applying in relation to the interconnector between Scotland and England are also different
- different criteria apply to planning and development than to operation of each transmission network
- in the application of each individual element of a particular standard, different fault scenarios and possible system configurations are considered and one or more of these scenarios may dictate transmission investment or operating requirements
- in most cases, more than one design option would satisfy the criteria within the planning standards. In such circumstances, the licensee needs to make technical and economic assessments of each option to select the optimum design solution
- there is flexibility within each of the standards such that higher or lower levels of security may be permitted subject to customer request or economic justification, and
- the definition of transmission assets includes 132kV assets in Scotland, whereas in England and Wales only assets with voltages above 132kV are included.

3.3. The December 2001 consultation noted that were standards to be conformed, a number of significant issues were likely to arise, which may include the following:

- certain parts of a GB transmission system and/or connections may either exceed or not comply with any revised or conformed standard. This may require licensees to seek derogations[18] from the Authority, or new infrastructure to be installed. The potential costs involved could be significant
- the level of security and quality of supply will change in some areas, and associated increases or decreases in costs will arise. This may be through choice, or may arise as a consequence of conforming a mandatory standard
- whether the terms on which those participating in a single GB market under BETTA are equitable to the extent that standards applied to the connection of different participants differ, and
- from whom the costs of meeting planning and operating standards (i.e. the embedded transmission and balancing costs) in each area should be recovered.

3.4. Finally, the December 2001 consultation noted that the issue of conformance of standards was a matter that would require further consideration under BETTA, and that it was an issue that is closely linked with the development of transmission charging arrangements. Views were invited upon whether in principle it was desirable to seek to conform planning and operating standards as part of BETTA, and the factors that should influence any decision to do so.

3.5. The May 2002 report summarised the responses received to the December 2001 consultation and set out Ofgem/DTI's preliminary views in light of those responses. Whilst some respondents were in favour of conformance and some thought that the costs of conformance would be negligible, others argued that the present arrangements, which differed between Scotland and England and Wales, had served the different communities well and that the costs involved in conformance would not provide commensurate benefits.

3.6. Given the above, it was necessary to consider further how to progress issues relating to the conformance of standards under BETTA in advance of the implementation of revised governance arrangements for electrical standards, and in order to do so, Ofgem/DTI

requested the assistance of the existing transmission licensees in the STEG. In relation to the specific issue of planning and operating standards to apply under BETTA, Ofgem/DTI requested, through STEG, that the three transmission licensees draft a series of papers to offer expert advice and information on the current standards that are applied in each of the three transmission areas and also to establish:

- the extent of the differences between the operational and planning standards of the three transmission licensees
- some of the options open under BETTA for dealing with the differences between the planning and operational standards of the three transmission licensees and the relative merits of each option identified, and
- an approach that could reconcile differences in the current or proposed combined operating standards into common principles that could be used to class the level of risk of not meeting the standard as acceptable (i.e. can be managed) or unacceptable, given that a GB operational standard would provide a more robust basis for operating the network than continuing to utilise the existing three standards.

3.7. Volume 2 of the December 2002 consultation noted that given the allocation of transmission activities between the GB system operator and the transmission owners, it was likely that co-operation will be needed between all licensees in order to ensure that the security and quality of supply standards can be met in relation to the transmission system as a whole. Similarly, in meeting the relevant operational criteria of the standards, it was noted that it was likely to be necessary for the GB system operator to rely upon services provided by transmission owners. The transmission licensees are currently developing the processes by which these services will be delivered within each of the four DGs. These processes will discharge obligations placed on the GB system operator and transmission owners under the STC[19].

[18] Licensees can request a derogation which may be granted by the Authority.
[19] These obligations are set down in the draft STC text which is currently under review. Ofgem/DTI will publish the proposed near final version of the STC text by end July 2004.

3.8. In the March 2003 consultation[20], Ofgem/DTI further discussed issues relating to the treatment of planning and operating standards under BETTA. The March 2003 consultation:

- summarised the main issues identified by the transmission licensees in the work they have undertaken through STEG
- explained that, in any event, it is not anticipated that there will be any significant change to the security and quality of supply delivered to different GB transmission customers under BETTA compared with the service which they received prior to the implementation of BETTA[21], and
- recognised that different standards may apply to different users of the GB transmission system and proposed that these differences may need to be taken into account in the development of the connection and use of system charging methodology to apply under BETTA

in accordance with the above the consultation proposed:

- to accept the recommendation of the transmission licensees that a more detailed review of existing operating standards be undertaken to assess whether it is practical and beneficial for aspects of the existing operational standards to be aligned with a view to identifying which aspects may be practically harmonised under BETTA from day one
- that the transmission licensees commence this analysis work, and
- that any proposals relating to the harmonisation of standards that are identified as part of this analysis work should be the subject of a future Ofgem/DTI consultation.

3.9. The June 2003 document summarised the responses received to the March 2003 consultation on each of the above points and set out Ofgem/DTI's conclusions on these proposals and the way forward for progressing this work. This is discussed further in Chapter 4.

[20] See footnote 7.
[21] See earlier footnote 8.

3.10. In the June 2003 document, Ofgem/DTI requested that the transmission licensees to undertake a more detailed review of operating standards to assess whether it is practical and beneficial for aspects of the existing operational standards to be aligned with a view to identifying which aspects may be practically harmonised under BETTA from day one. Consequently, Ofgem/DTI also agreed a timetable with the transmission licensees via DG4 against which this analysis work was to be carried out. This timetable included dates at which any proposals identified as part of this analysis work relating to the harmonisation of operating and planning standards would be the subject of a future Ofgem/DTI consultation and the publication of a single harmonised standard.

3.11. Development and further clarification on the deliverables of the sub group has continued since the publication of the June 2003 document in light of:

- ♦ views and advice provided in discussions between the transmission licensees and Ofgem/DTI (including at DG meetings)
- ♦ Ofgem/DTI's development of the associated draft licence conditions that were discussed in the June 2003[22], December 2003[23] and April 2004 Licences Consultation[24], and
- ♦ Ofgem/DTI's further consideration of interaction with other industry documents (e.g. GB Balancing and Settlement Code ("GB BSC"), GB Connection and Use of System Code ("GB CUSC"), GB Grid Code, SO-TO Code ("STC") etc) that it is proposed will apply under BETTA.

3.12. This development work has informed thinking about the scope of the work to harmonise existing security standards and has resulted in revisions to the deliverables for the DG4 sub-group. These revisions are reflected in the Terms of Reference (included as part of Appendix 1 to this consultation) and resulted in changes to the scope of works to include, at a minimum, a high level review of the existing planning standards of each licensee to ensure that the planning criteria were consistent with any of the harmonised changes that were identified as necessary for the operating standards and to reflect the new market structure. The aim of this review was for the transmission licensees to develop one document containing operational and planning criteria, even if with

[22] "The Regulatory framework for transmission licensees under BETTA. Second consultation on electricity transmission licences under BETTA, and Ofgem/DTI consultation, July 2003". 59/03.
[23] "The Regulatory framework for transmission licensees under BETTA. Third consultation on electricity transmission licences under BETTA, and Ofgem/DTI consultation, December 2003". 178/03.
[24] "Publication of "near final" transmission licences under BETTA." Ofgem/DTI, April 2004, 82/04.

regional differences, but at the very least expressed using common terms appropriate for day one of BETTA.

3.13. Furthermore, the transmission licensees were conscious of the need for clarity regarding responsibilities under BETTA, in particular the transmission owner's obligation to provide transmission services and to plan and develop its own transmission systems in accordance with the relevant planning and operating standards. In this context, it would be ultimately necessary for the transmission licensees to satisfy themselves that they would be able to comply with the revised licence obligations in relation to security and quality of supply. In view of these considerations the scope of the review task was extended to:

- establish similarities and differences in the three planning standards currently applied by the licensees to their respective networks, and
- identify reasons for differences in the planning standards, quantify extent of work needed to establish materiality of the differences and also detail what can or cannot be achieved.

3.14. This detailed review identified a large number of similarities between the existing standards but more importantly did not identify many unresolvable differences between the existing standards. Thus, a deliverable to harmonise planning standards and produce a set of planning criteria for day one of BETTA was incorporated into the Terms of Reference.

3.15. The sub group has developed a draft GB SQSS in accordance with the scope of work outlined in the Terms of Reference that is intended to reflect the existing planning and operating standards and stated drafting assumptions provided by Ofgem/DTI that this work:

- does not introduce any significant changes in security and quality of supply delivered to transmission users
- does not require any significant additional new investment in transmission, and
- provides clarification of the requirements that will promote consistent understanding and application of the criteria between the three transmission licensees.

3.16. In parallel with taking forward work on the standards that should apply under BETTA, Ofgem/DTI have also been considering how and on whom the responsibilities to comply with such standards should fall. Some initial thoughts on these matters were set down in the June 2003 and December 2003 Licences Consultation. In the light of the responses to these consultations, Ofgem/DTI have further developed their thinking on this matter and, this is discussed further in the April 2004 licences consultation[25]. That document sets down further proposals for how the licence obligations on the GB system operator and transmission owners in relation to meeting relevant standards should apply under BETTA.

Drafting approach

3.17. A substantial amount of work has been undertaken by the transmission licensees to produce a draft harmonised GB standard, under Ofgem/DTI's policy direction and in accordance with the drafting assumptions provided by Ofgem/DTI. The proposed draft text for the GB SQSS is provided in Volume 2 to this consultation. Ofgem/DTI again offer thanks for the cooperation and useful contributions from the transmission licensees in this area.

3.18. Ofgem/DTI have considered how best to facilitate an understanding of the harmonised standard by parties across GB. Approaches have been considered such as an industry seminar or an "open session" where people could ask questions about the proposed changes to the existing standards that will apply for day-one of BETTA. However, in parallel with their work on harmonising the standards, Ofgem/DTI invited the transmission licensees to provide explanatory notes to support the draft GBSQSS and provide clarification to parties as to the basis on which the standard has been written and the choices made. Appendix 1 reproduces the guidance note produced by the transmission licensees. Ofgem/DTI also note that the proposed draft text for the GB SQSS has been based on the NGC's existing SQSS with the primary aims of not requiring any significant change in the security and quality of supply provided to transmission users or significant additional new investment by transmission licensees. As far as the draft GB SQSS meets this aim, Ofgem/DTI envisage that parties will not have many generic issues with the drafting and believe that the explanatory note appended to this consultation may remove the need for a seminar. Ofgem/DTI would welcome views on this matter.

[25] See earlier footnote 12.

Related consultation papers

3.19. A number of other consultation documents and papers associated with the Ofgem/DTI BETTA project have been recently published as follows:

- an Ofgem/DTI document on the SO-TO Code under BETTA[26]
- a consultation on transmission charging related licence conditions[27]
- initial thoughts on the price controls for SP Transmission Limited and Scottish Hydro Electric Transmission Limited from April 2005[28]
- a consultation on the form of transmission owner revenue restrictions and the consequential impact on NGC's revenue restrictions[29]
- a consultation on the establishment of the GB panels for the CUSC, BSC and Grid Code[30]
- a consultation on the provision of user outage data to transmission owners[31]
- a statement on access to the GB transmission system[32]
- near final changes to the generation, supply and distribution licences[33]
- a consultation on the regulatory framework for transmission licences to apply under BETTA[34]
- the publication of near final legal text for transmission licences under BETTA[35]

[26] "The SO-TO Code under BETTA. Summary of responses and conclusions on the June 2003 conclusions document on the SO-TO Code under BETTA, on SO-TO Code mini consultations and further consultation on the SO-TO Code." Ofgem/DTI April 2004, 40/03.
[27] "Transmission charging related licence conditions and the requirement to offer terms: arrangements under BETTA. An Ofgem/DTI mini consultation document", March 2004, 57/04.
[28] "Review of transmission price controls from 2005: SP Transmission Ltd, Scottish Hydro-Electric Transmission Ltd – Initial thoughts", March 2004, 52/04.
[29] "The form of transmission owner revenue restrictions and consequential effects on NGC's revenue restrictions". March 2004, 48/04.
[30] "Establishing GB Panels for the CUSC, the Grid Code and the BSC under BETTA – Ofgem/DTI consultation." February 2004, 38/04.
[31] "Provision of user outage proposals (Grid Code OC2 data) to transmission owners for transmission outage planning purposes under BETTA. An Ofgem/DTI mini consultation document." February 2004, 27/04. "The OC2 mini consultation".
[32] "Statement on access to the GB transmission system". January 2004,15/04.
[33] "Publication of near final changes to the electricity generation, distribution and supply licence conditions under BETTA." Ofgem/DTI April 2004. 93/04.
[34] "Regulatory framework for transmission Licences under BETTA: Third consultation on electricity transmission licences under BETTA." December 2003, 1781/03. "The December 2003 Licences Consultation".

- publication of near final legal text for the STC under BETTA[36]
- a consultation paper on small generator issues under BETTA[37], and
- publication of near final text for the CUSC[38], BSC[39] and Grid Code[40] under BETTA.

3.20. In addition, a number of consultation documents are soon to be published as follows:

- a consultation paper on the framework for transmission charging under BETTA, and
- a consultation on the form of the incentive arrangements that should apply to transmission licensees under BETTA.

Outline of the remainder of this document

3.21. The remainder of this document covers a range of matters raised in the June 2003 consultation in relation to the conformance of standards under BETTA. Chapter 4 of this paper provides a summary of the main issues raised in response to the March 2003 consultation and Ofgem/DTI's conclusions as set out in the June 2003 consultation. Chapter 5 sets out a brief summary of the scope of the review task against which Ofgem/DTI instructed the transmission licensees to conduct this review, the preliminary similarities and differences of the existing standards identified by the transmission licensees and highlights general drafting changes proposed by the transmission licensees. Views are invited on all matters in this chapter. Appendices 1 and 2 reproduce the joint papers submitted to DG4 by the transmission licensees. Appendix 1 is intended to serve as an explanatory note to support the GB SQSS proposed by the DG4 sub-group explaining the basis on which it has been written and the choices made. Volume 2 reproduces the proposed harmonised GB SQSS document.

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[35] "Publication of near final transmission licence conditions under BETTA", Ofgem/DTI." April 2004, 82/04.
[36] "The SO-TO Code under BETTA: Draft text in progress and CUSC provisions relating to disputes and limitation of liability. An Ofgem/DTI mini consultation document." 148/04, July 2004.
[37] "Small generator issues under BETTA, Ofgem/DTI conclusions document." May 2004, 96/04.
[38] "The Balancing and Settlement Code under BETTA: Ofgem/DTI conclusions and publication of near final legal text of the GB BSC." Volumes 1 & 2. April 2004, 92/04a/b.
[39] "The Connection and Use of System Code under BETTA: Ofgem/DTI conclusions and publication of near final legal text of the GB CUSC." Volumes 1 & 2. April 2004, 91/04a/b.
[40] "The Grid Code under BETTA: Ofgem/DTI conclusions and second consultation of the text of a GB Grid Code and conclusions on change management between the STC and each of the GB CUSC, GB BSC and GB Grid Code, Volumes 1 & 2." April 2004, 92/04a/b.

3.22. The purpose of the third Ofgem/DTI consultation is to:

- explain the basis on which transmission licensees have developed proposals to harmonise the existing standards
- summarise the general motivation for and justification of proposals identified by the transmission licensees in the work they have undertaken through the DG4 sub group together with the associated rationale
- summarise the proposals for criteria for the new standard agreed by the transmission licensees
- consult on those changes to the existing standards that are proposed as a result of the detailed review undertaken by the transmission licensees, and
- provide a draft GB security and quality of supply standard prepared by the transmission licensees.

4. Summary of June 2003 consultation

Background to June 2003 consultation

4.1. In considering how to progress issues relating to the conformance of standards under BETTA Ofgem/DTI requested, through STEG, the expert advice of the existing transmission licensees recognising that the existing planning and operational standards apply to integrated transmission companies. Ofgem/DTI requested that the three transmission licensees draft a series of papers to offer expert advice and information on the current standards that are applied in each of the three transmission areas.

4.2. The transmission licensees submitted three papers to STEG[41] which made the following points:

- there are a number of differences in the planning and operating standards applied to the three transmission systems in GB
- the security standards applied under BETTA should be consistent with the stated aims of BETTA. Thus it is desirable that the GB system operator can operate a single operational standard across GB
- that the GB system operator, in conjunction with the transmission owners, should, for day one of BETTA, develop a new GB operational standard. It should be possible within this new standard to reconcile differences in present operating standards into common principles that could be used to class levels of risk of not meeting the standard as acceptable (i.e. could be managed) or unacceptable risks to the system
- that the planning standards presently applied are appropriate for the network characteristics and geography. Further analysis would be required to ascertain the extent of any benefits associated with seeking to unify planning standards across the three transmission owner areas. Any option chosen with respect to planning standards should give due regard to interactions with operational standard(s) and the need for co-ordination between planning and operational

[41] Paper 1, "Review of existing standards" submitted to STEG on 31 July 2002. Paper 2, "Options for standards under BETTA" submitted to STEG on 3 September 2002. Paper 3, "Combined operational standard" submitted to STEG on 30 October 2002. See appendix to the March 2003 document.

timescales. Moreover, it would be highly challenging to achieve a suitably robust, unified planning standard in time for day one of BETTA

- options with regard to operational standards should give due regard to interactions with planning standards and the need for consistency between operational and planning timescales

- that there are a number of degrees to which the standards under BETTA could be integrated, which include:

  - developing limited modifications to the existing operational standards by introducing a regional element, which effectively accommodates the different standards north and south. This would provide common terminology and a framework for the consistent interpretation of the standards

  - a reconciliation of the differences between the standards. Such a reconciliation will need to take account of the design of the existing networks and the applicable planning standards in each transmission licence area. It will also require a thorough examination of the present operating standards, investigation of risks and an assessment of the level of these risks

- the licensees recommended that an examination of the approach set down in the second of the above two options should take place but allow, where appropriate, the introduction of a regional element.

4.3. The above approach would provide a way forward for the development of the new GB operational standard and inform Ofgem/DTI's proposal for the operating and planning standard to be in place for day one of BETTA.

Ofgem/DTI conclusions in the June 2003 document

4.4. In summary, the principal conclusions made in the June 2003 document were that:

- Ofgem/DTI agreed with STEG's principal recommendations and requested that the transmission licensees undertake a more detailed review of standards to assess whether it is practical and beneficial for aspects of the existing operational

standards to be aligned with a view to identifying which aspects may be practically harmonised under BETTA from day one

- that the work should be progressed by the transmission licensees and reported back to STEG
- any proposals relating to harmonisation of operational standards identified as part of this analysis will be the subject of an industry-wide Ofgem/DTI consultation
- it was not anticipated that there will be any significant change to the security and quality of supply delivered to different GB transmission customers under BETTA compared with the service which they received prior to the implementation of BETTA[42], and
- to the extent that different standards apply to different users of the GB transmission system, the appropriate commercial treatment of such differences needs to be considered in the development of the connection and use of system charging methodology to apply under BETTA.

[42] Ofgem/DTI recognise that a harmonised operational standard may well result in a small changes to the security of supply delivered to certain GB transmission customers under BETTA. In the event that such issues arise it is currently the intention of Ofgem/DTI to consult fully on the impact of these issues.

5. The Development of a GB SQSS

5.1. As set out in previous chapters the detailed development work was carried out by the three existing transmission licensees at Ofgem/DTI's request. This work consisted of three phases:-

- a review of the existing standards applicable in each licence area
- an assessment of the impact of harmonising the minimum requirements across GB, and
- the development of a draft document that set out proposed security and quality of supply requirements to apply on a GB wide basis.

5.2. Development and further clarification on the deliverables of the sub group has continued since the publication of the June 2003 document, reflected in the Terms of Reference[43].

Review of existing standards

5.3. The relevant planning standards that are applicable in each transmission licence area define the range of system conditions to be assessed and the events for which the transmission system is required to be secure that need to be applied when designing the transmission system and connections to it.

5.4. Similarly, the operational standards then define the range of system conditions to be assessed and the events for which the transmission system is required to be secure that need to be applied when using the transmission capacity that has been designed in accordance with the criteria set out in the planning standard.

5.5. The criteria in each transmission licensee's existing standards are defined in relation to the Main Interconnected Transmission System ("MITS"), Demand Connections and Generation Connections for both planning and operational purposes.

5.6. In line with its Terms of Reference, the subgroup reviewed in detail, each of the licensees' existing operational standards comparing both the wording in the standard and their current application in practice.

[43] Included as Annex A in Appendix 1.

5.7. The current planning and operational standards of each of the transmission licensees are based on the same core Electricity Supply Industry ("ESI") standards that were current at Vesting.

5.8. Appendix 1 provides a more detailed description of the comparison between the existing standards. The detailed review has identified a large number of similarities between the existing standards and it is particularly noted that:

- chapter 2 of the NGC SQSS (Generation Connection Criteria) was derived directly from PLMSP-1 with which SP Transmission and SHETL are required by their respective licence conditions to comply
- the planning criteria in chapter 4 of the NGC SQSS on demand connection were derived directly from Engineering Recommendation P2/5 with which SP Transmission and SHETL are required by their respective licence conditions to comply, and
- many of the planning criteria in chapter 3 of the NGC SQSS on the main interconnected system are derived from PLM-ST-9 that, although does not form part of the relevant licence condition, is applied by both SP Transmission and SHETL.

5.9. Other similarities in operational practice were also noted between all three licensees:

- the system will not be put at risk of widespread disruption due to events that might, under any weather conditions, be regarded as "credible"
- if security against credible events can be achieved without significant economic penalty or increased risk of loss of supply to any individual demand group, then that security will be implemented regardless of whether it is explicitly required in the security standard
- where there has been a loss of supply, its restoration will be effected as fast and as safe is as practicable to do so
- there are circumstances under which it is appropriate for agreement to be reached with a relevant Distribution Network Operator ("DNO") on the preferred configuration of the transmission system, and that under these circumstances such agreement is sought, and

- guidance notes and associated training play a significant part in aiding consistency in interpretation and application of the security criteria set out in the standards.

5.10. As part of this review, a small number of significant differences between present operating criteria were identified. Some of these differences are within the wording in the standards and others relate to the interpretation of the standards in practice. Of the differences identified in the wording of the operational standards, the most significant is:

- the two Scottish transmission licensees' standards require the 400kV and 275kV transmission systems to be secure in the event of a single circuit fault outages for both intact system conditions (N-1) and prevailing system conditions (N'-1), whereas
- NGC's SQSS also requires the main interconnected transmission system to be secure in the event of a double circuit overhead line fault outage for both intact system conditions (N-D) and prevailing system conditions (N'-D).

5.11. However on more detailed consideration it was noted that the significance of this difference is qualified, as all transmission licensees' standards require the transmission systems to be secure in the event of a double circuit overhead line fault under prevailing system conditions when there is (or is forecast to be) adverse weather conditions.

5.12. The sub-group's comparison of NSP366 (a standard with which SP Transmission and SHETL are required to comply with by licence) and those parts of chapter 3 of NGC's SQSS which were derived from the former PLM-SP-2 identified a difference in the role of economic justification in the application of the planning criteria when designing the transmission system and connections to it. NSP 366 states "more or less than the defined standard of connection may be provided but any variation from the defined standard must be the subject of technical, reliability and economic appraisal" whereas NGC's SQSS allows for designs to be of a higher standard of security where there is economic justification and of a lower level of security at the request of a customer (provided that such a design would not have an adverse impact on any other customer).

Impact Assessment

5.13. Ofgem/DTI advised the transmission licensees that the purpose of this review work is to consider changes that are required for BETTA and noted that the draft legislation for BETTA currently permits the Secretary of State to designate only changes to licence

conditions and industry codes that are necessary and expedient for the introduction of BETTA. In its work the sub-group accepted that definitions of existing terms in the standards should not be changed (or new terms added) or changes made to the defined criteria that are considered unless that change was justified in relation to the introduction of BETTA. Harmonisation of the existing standards has been taken forward by the DG4 sub-group on the basis that changes with respect to the present standards have only been proposed where they are considered to be required for BETTA. Examples of justification put forward by the DG4 sub-group includes being necessary in light of the split of transmission sector responsibilities and also clarification to achieve consistent interpretation between transmission licensees.

5.14. In considering options for resolving differences between the existing standards, members of the sub-group have carried out high level analysis work to inform its view on the impact of producing a harmonised requirement across GB. Further detail on the assessment work is provided in Appendix 1.

5.15. The sub group used the output from the assessment work and took the following approach in developing a draft GB SQSS:

- establish if the present criteria (in any of the standards) could apply across GB
- develop revised criteria to apply across GB that is a compromise between the existing standards, and
- retain existing criteria as a regional difference in any instance where a compromise would result in additional investment or a significant change to the security and quality of supply delivered.

5.16. Where possible, criteria that were common across GB were preferred as these are considered to:

- deliver the harmonisation required for BETTA
- reduce the risk of misinterpretation of the criteria that apply in each of the licence areas
- reduce the risk of disputes about interpretation arising, and
- promote equal treatment across GB.

5.17. Thus, the sub-group has developed a draft GB SQSS that is intended to reflect the existing planning and operating standards and meet the following policy objectives that the harmonised standard:

- does not introduce any significant changes in the security and quality of supply delivered to transmission users
- does not require any significant additional new investment in transmission, and
- provides clarification of the requirements that will promote consistent understanding and application of the criteria between the three transmission licensees.

5.18. These matters form the basis for the development instructions for a GB SQSS produced by the transmission licensees. These matters are discussed further in the paper attached as Appendix 1 which reproduces the paper that the sub-group submitted to DG4.

Draft GB SQSS

5.19. The proposed draft text for the GB SQSS is provided in Volume 2 of this consultation document.

5.20. Ofgem/DTI believe that the transmission licensees have conducted the investigation of the existing standards and development of a draft GB SQSS in accordance with the drafting objectives and policy direction provided. The sub-group has presented a draft GB SQSS that it considers meets in full the terms of Ofgem/DTI's request. Ofgem/DTI have not identified any parts of the draft GB SQSS developed by the transmission licensees that do not meet with the objective to harmonise existing standards and propose that the draft GB SQSS should (subject to the responses to this consultation) form "the relevant standards" referred to in the proposed standard licence condition for each of the transmission licensees under BETTA.

5.21. From a presentation perspective, there was seen to be significant benefit to the application, understanding and governance of security criteria by having a single document setting out the planning and operating criteria that will apply across GB under BETTA, following the example of the present standard in England and Wales. A single document is therefore presented in this consultation as a proposed GB SQSS which

contains planning and operational criteria developed from a comparison of the current standards split into separate sections detailing generation connection criteria, demand connection criteria and the criteria for the main interconnected system.

5.22. However, in light of the allocation of transmission licensee responsibilities under BETTA, it is proposed that the operating criteria should be grouped within one chapter. In the interest of clarification, a chapter has also been included in the draft GB SQSS that explains applicable voltage limits in the planning and operation of the transmission system.

5.23. The sub-group has also recommended that the transmission licensees should also develop a guidance note to support the interpretation of the GB SQSS. Ofgem/DTI consider that the existing transmission licensees currently have similar internal company guidance notes for their existing standards that do not form part of the licence obligation and that there is value in the transmission licensees developing a common approach to the application of the security and quality of supply standards that will apply under BETTA. Ofgem/DTI believe that it is important that such guidance is consistent with the standard itself and is limited to clarifying the minimum requirements that the standard sets out. On this basis, Ofgem/DTI agree that the guidance does not need to form part of the security and quality of supply standards that will defined as conditions of the transmission licensees under BETTA.

5.24. Appendix 1 reproduces a document submitted by the sub-group to DG4 aimed at providing a more detailed explanation of the results of the comparison of the existing standards and the reasoning for the proposed draft harmonised minimum requirements for the GB SQSS. Volume 2 contains a draft GB SQSS that has been developed by the sub-group.

5.25. Ofgem/DTI invite views on suitability of the draft GB SQSS that the transmission licensees have prepared to form the "relevant standards" in the proposed transmission licence obligations and would particularly like to draw attention to the following parts of the draft included as Volume 2 of this consultation.

General Drafting Changes

5.26. The draft GB SQSS has been based on the format of NGC's SQSS and includes planning and operational criteria within a single document. However as part of the review work,

the sub-group concluded that grouping the different criteria for pre-fault, post-fault without local system outage and post-fault with local system outage in separate sub-sections, would add clarity and promote a common approach between the three transmission licensees. Drafting has been proposed in Sections 2, 3, 4 and 5 of Volume 2 using this approach of grouping criteria in sub-sections.

Generation Connection Criteria

5.27. The existing planning criteria are different across GB in terms of the level of generation load factor that defines the maximum acceptable length of generation circuit. The sub-group has proposed that the most appropriate compromise is to define the equivalent criteria for the GB SQSS in terms of the annual expected energy from the generator on the basis that this parameter takes account of both the size of generator as well as its expected load factor. High level review work by NGC has not identified any additional investment requirements in Scotland (for transmission licensees or generators) or any reduction to the security of supplies throughout GB as a consequence of this proposed compromise. Drafting has been proposed in paragraph 2.7 of the draft GB SQSS included in Volume 2.

5.28. The background conditions used when applying generation connection criteria to design a power station connection are different across GB in terms of the assumption that should be made about the level of reactive power output. High level review work by the sub-group identified that a common GB requirement could not be achieved without additional investment in Scotland. As such a regional difference has been proposed in paragraph 2.8 of the draft GB SQSS included in Volume 2 to reflect the background conditions for generator reactive power output that are defined in the existing licence standards.

5.29. Under the existing standards, SP Transmission does not plan its 132kV transmission network to secure for the loss of a double circuit overhead line. The sub-group concluded that a common GB requirement could not be achieved without requiring additional transmission investment in the SP Transmission area or reducing the level of transmission system security in NGC's and SHETL' s area. As such a regional difference has been proposed in paragraph 2.10.3 of the draft GB SQSS included in Volume 2 to reflect the requirements of the licensees' existing standards.

5.30. Paragraph 3.1 of NSP366 requires the transmission licensees to make due allowance of the operational standards and the costs of available measures when applying the generation connection criteria. Paragraph 1.12 of NGC's SQSS sets out that consideration should be given to the associated operational criteria when NGC applies planning criteria. The sub group considered that given the proposed split of responsibilities under BETTA, a specific requirement to consider operation security criteria within the generation connection planning criteria would provide useful clarification. Drafting has been proposed in paragraph 2.12 of the draft GB SQSS included in Volume 2.

5.31. The high level review work by the sub group identified that the inclusion of paragraph 2.12 in the draft GB SQSS, without qualification allowing consideration of available operational measures, would require additional investment in Scotland. The sub group considered that a suitable compromise was to include such a qualification in the GB SQSS. Drafting has been proposed for paragraph 2.13 of the draft GBSQSS included in Volume 2.

Demand Connection Criteria

5.32. The applicable planning criteria for demand connections in each of the existing licence standards are all based on or are an exact replica of Engineering Recommendation P2/5. However the criteria for demand groups below 12 MW are not defined in NGC's SQSS. Given that Engineering Recommendation P2/5 is applied by distribution licensees across GB and that there are not any demand groups within these smaller categories currently connected to NGC's transmission system, the sub-group did not identify any issues with harmonising the definition of the demand groups across GB. Drafting has been proposed for Table 3.1 of the draft GB SQSS included in Volume 2.

5.33. The background conditions used when applying demand connection criteria to design the connection of a demand group are different across GB in terms of the assumption that should be made about the effective contribution from generation connected to a distribution network. Table 4.2 of NGC's SQSS sets out the contribution that should be assumed from all types of distribution connected generators with capacity of 100MW or above. The applicable standard in Scotland (Engineering Recommendation P2/5) sets out the contribution that should be assumed from specific classes of distribution connected generators but does not define a size threshold. A high level assessment of the existing standards suggested that a compromise between these requirements could

require additional transmission system investment across GB. As such a regional difference has been proposed in the draft GB SQSS with separate tables for England and Wales (Table 3.2) and for Scotland (Table 3.3). It is noted that Table 3.3 of the draft GB SQSS included in Volume 2 is not an exact replica of Table 2 of Engineering Recommendation P2/5 but Ofgem/DTI understands that it is intended to be an equivalent requirement.

5.34. Para 4.10 of NGC's SQSS explains the method by which the security criteria should be applied to nested demand groups to assess the maximum allowable loss of supply for a secured event. This type of explanation was considered as valuable by the sub-group and has been proposed for inclusion in the GB SQSS. The sub-group considered different types of nested demand groups across GB and concluded that the wording of paragraph 4.10 of NGC's SQSS did not correctly describe the approach for nested demand groups that exist in Scotland. Drafting has been proposed in paragraph 3.10 of the draft GB SQSS included in Volume 2 to describe a method of assessing nested demand groups that is considered as applicable throughout GB.

5.35. Table 4.1 of NGC's SQSS defines the minimum planning supply capacity following secured events for an 'Intact System' and 'with Single Arranged Outage' whereas the equivalent Scottish planning standard (Table 1 of Engineering Recommendation P2/5) uses 'First Circuit Outage' and 'Second Circuit Outage' in the definition of required minimum demand capacity. The sub-group considered that each of the definitions in the existing standards were equivalent and that it would be clearer to use a common description in the proposed GB SQSS. Drafting has been proposed in Table 3.1 of the draft GB SQSS included in Volume 2 which uses 'Intact System' and 'with Single Planned Outage'[44]. This approach has also been proposed in the drafting of Tables 3.2 and 3.3 of the draft GB SQSS included in Volume 2.

Main Interconnected Transmission System

5.36. Paragraph 3.2(i) of NSP366 specifies that the level of output capacity from thermal and hydro generating plant (to be used in the application of this part of the planning standard) should be derived from expected plant availability. The sub-group considered that this requirement was included in the scope of conditions set out in NGC's SQSS. However, the sub-group also considered that adding an explicit provision in the GB

[44] It is proposed to include a definition of "Planned Outage" in the GB SQSS.

SQSS would improve the clarity of this obligation and drafting has been proposed in paragraph 4.7.1 of the draft GB SQSS included in Volume 2.

5.37. NGC's SQSS sets out criteria for assessing background conditions where the power flows are set to those arising from "Planned Transfer Conditions" and those modified by applying an "Interconnector Allowance". Further explanation of "Planned Transfer Conditions" is provided in NGC's SQSS paragraphs 3.5 and 3.6 and of "Interconnector Allowance" in NGC's SQSS paragraph 3.7.

5.38. Paragraph 3.3 of NSP366 sets out the criteria that should be considered in designing the interconnection between SP Transmission and NGC in terms of "Planned Transfer" and "Interconnection Reserve". Further explanation of these terms is provided in NSP366 paragraphs 2.7 and 2.8 respectively.

5.39. The sub group considered that as a consequence of the interconnector circuits between SP Transmission and NGC and SHETL and SP Transmission becoming part of an integrated GB transmission system under BETTA (as opposed to being subject to separate contractual arrangements to manage power flows) that it was particularly important to develop criteria that could be applied across GB as far as possible. The sub group were not able to develop fully harmonised criteria as a high level review identified that neither of the existing standards could be applied across GB without triggering additional transmission system investment requirements or reducing the minimum level of security on the transmission system.

5.40. However, the sub group has proposed a compromise between the existing standards that incorporates some regional differences. The main regional difference proposed is that the interconnection allowance be applied only on the boundary between SP Transmission and SHETL and NGC and SP Transmission, whereas it would be applied across the whole transmission system in England and Wales as well as at the boundary with SP Transmission. Drafting has been proposed in the draft GB SQSS included in Volume 2 with Subsection C providing the detailed description of "Planned Transfer Condition" and subsection D providing the detailed description of "Interconnector Allowance".

5.41. Under the existing standards, SPT does not plan its 132kV transmission network to secure for the loss of a double circuit overhead line. The sub-group concluded that a common GB requirement could not be achieved without requiring additional

transmission investment in the SPT area or reducing the level of transmission system security in NGC's and SHETL' s area. As such a regional difference has been proposed in paragraph 4.6.3 of the draft GB SQSS included in Volume 2 to reflect the requirements of the licensees' existing standards.

5.42. Paragraph 3.9 (iv) of NGC's SQSS requires the transmission system to be secure for a fault outage when there is a prior outage (i.e. secure for N-2). NSP366 does not require the transmission licensee to consider this criteria when designing the transmission system. The sub group considered that a harmonised GB requirement could not be achieved without requiring additional investment in Scotland or reducing the minimum level of security required for England and Wales. Drafting has been proposed in paragraph 4.6.5 of the draft GB SQSS include in Volume 2.

5.43. Paragraph 3.14(iii) of NGC's SQSS sets out that in specific cases NGC may relax its operational criteria to consider only a single circuit risk. The converse is seen to apply in Scotland where security is tightened to avoid certain consequences of double circuit overhead line fault outages when there is a higher than normal likelihood of transmission faults. The sub group considered that the application of these rules resulted in the same logical conclusions regarding the circumstances under which "tight" and "relaxed" loss of supply criteria should be applied for double circuit overhead line fault outages. Drafting has been proposed in paragraph 5.5 of the draft GB SQSS include in Volume 2 to reflect the two conditions under which security can be tightened and which the licensees believe retain consistency with the present operational practice in all parts of GB.

Operational Criteria

5.44. There are strong similarities between the operational criteria defined in each of the existing standards in terms of the 'secured events' that need to be considered and the consequences that should be avoided. As part of the review work, the sub group identified a number of differences between the existing standards in terms of the circumstances for which the transmission system must be secure for identified events. The sub group were unable to develop fully harmonised operational criteria as a high level review identified that any compromise requirement would either required additional transmission system investment or reduce the minimum level of transmission system security provided to customers. Regional differences have been proposed in Table 5.1 and paragraph 5.4 of the draft GB SQSS included in Volume 2.

Voltage Limits

5.45. NGC's SQSS sets out "unacceptable voltage conditions" in the Glossary and Definitions (Chapter 5). A high level of review of the existing standards identified a number of differences in the applicable voltage limits. The sub group considered that some of these differences could be resolved but proposed that a harmonised GB requirement could not be achieved for others without requiring additional investment or adversely impacting on quality of supply.

5.46. The sub group also considered that clarity would be added if the voltage criteria were defined in a separate chapter of the GB SQSS rather than in the Glossary and Definitions. Drafting has been proposed in Chapter 6 of the draft GB SQSS included as Volume 2.

Terms and Definitions

5.47. The sub-group was asked to develop a common set of definitions as part of the terms of Reference for this work to harmonise security and quality of supply standards. The definitions in the existing standards were reviewed and in many cases were found to be consistent between standards. The drafting proposed in Volume 2 is substantially based on the definitions in NGC's SQSS with a small number of revisions, additional definitions and definitions that include regional differences. Further detail on the proposed changes from NGC's SQSS are provided in Appendix 1.

Appendices

5.48. As part of the review of Appendices of NGC's SQSS, the sub group considered that:

- Appendix A was provided as guidance and that this could apply across GB
- Appendix B was applicable to 400kV and 275kV transmission circuits but did not adequately reflect the provisions in the existing standards in Scotland for 132kV transmission circuits
- Appendix C could apply across GB if amended to allow account to be taken of the seasonal availability of hydro generation plant

- Appendix D was applicable to the boundaries between the licence areas of SP Transmission and SHETL and SP Transmission and NGC but not within the SP Transmission and SHETL licence areas, and

- Appendix E could apply across GB but would benefit from clarification of the treatment of regional differences within the operational criteria.

5.49. The drafting of the appendices of the draft GB SQSS included in Volume 2 is substantially based on the existing appendices in NGC's SQSS but with a number of changes that include:

- Appendix B of the draft GB SQSS contains a replica of ERP18 as guidance for the levels of 132kV circuit complexity that is included as guidance in the existing Scottish standards

- Appendix C of the draft GB SQSS includes a revised formula for assessing generating plant output that provides a compromise between the requirements of the existing standards

- Appendix D of the draft GB SQSS includes a regional difference relating to the applicability of Interconnector Allowance, and

- Appendix E of the draft GB SQSS includes clarification of the treatment of the regional differences proposed in the GB SQSS Chapter 5.

5.50. Views are invited on all of the drafting in Volume 2.

5.51. The transmission licensees are further invited to consider and propose arrangements for coordinated review and governance of any changes to the proposed GB SQSS.

Views invited

5.52. Views are invited on any of the issues discussed within this chapter and are particularly invited on the justification and explanation for changes provided by the transmission licensees in Appendix 1 and the proposed harmonised GB SQSS text presented in Volume 2.

Appendix 1

This section reproduces the joint paper produced by the three transmission licensees on 18 June 2004[45].

Introduction

The Ofgem/DTI consultation document on 'Planning and Operating Standards Under BETTA' of March 2003 recommended work to be carried out by the GBSO (Designate) and the three GB transmission owners to consider which aspects of the existing planning and operational standards applied by the licensees may practically be harmonised for the introduction of BETTA. It was stated "it is not intended that this work

- will result in any significant investment in the transmission system, or
- any significant change to the existing security and quality of supply."

The Investment Planning Development Group (DG4) has been charged to carry out this work by the SO/TO Expert Group (STEG). Following a workshop on 3 July 2003 attended by all participants of DG4 it was decided to establish a sub group of DG4 to undertake this work. The output of the subgroup will also be reported to DG1 via DG4. The Terms of Reference of the sub-group were given as shown in Annex A.

This document is intended to support the GB Security and Quality of Supply Standard proposed by the sub-group, explaining the basis on which it has been written and the choices made.

The approach used in developing the new Standard

Resolving differences between the present standards

Differences between the present standards may be noticed in respect of

- different background conditions to be considered or assumptions to be made;
- different events to be secured against;
- different consequences to be avoided;
- similar background conditions, assumptions, secured events and avoided consequences, but differently worded;
- similar words, but different interpretation.

Generally when developing the new Standard, where there is a difference between any of the present standards, there is the choice of

1. retain each of the present criteria to apply regionally;
2. retain one of the present criteria to apply across GB;
3. develop a new criterion that applies across the whole of GB that
   - eliminates any differences in wording
   - resolves differences in interpretation
   - represents a suitable compromise on background conditions, assumption, secured event or avoided consequence, as appropriate.

[45] This introductory paragraph was not part of the paper.

For each option, it must be ensured that

- no significant additional investment in the transmission system will result as a consequence of the option, and
- no significant change to the existing security and quality of supply will result as a consequence of the option.

Wherever possible and so long as the above conditions are met, a single criterion applied across the whole of GB has been preferred since this

1. represents the harmonisation sought by Ofgem/DTI;
2. minimises risks to system operation due to misunderstanding of which variation of a criterion applies under which circumstances;
3. minimises the opportunity for disputes arising between transmission licensees and between licensees and customers regarding interpretation, disputes that would not have arisen under present industry and market arrangements;
4. promotes equality of treatment in respect of system and market access for transmission customers across GB;
5. represents the least possible compromise in respect of the operation of BETTA with one set of rules applying to all participants and agents.

The motivation of each licensee

While already motivated to meet the conditions set by Ofgem/DTI and by DG4, in harmonising the standards, it was necessary for the transmission licensees to recognise that each party had its own particular perspective:

- NGC, as GBSO-designate, for risks to security in operational timescales to be minimised and costs of achieving security to be managed; as TO, for maintenance and construction outages in England and Wales to be facilitated;
- SPT and SHETL, as TOs, for additional investment to be avoided, maintenance outages to be facilitated in Scotland in operational timescales and for security seen by customers not to be reduced.

Since these perspectives, while sharing much, are not exactly the same, it was sometimes necessary for a particular presentation of criteria to be proposed in order to maximise the confidence each licensee can have in the new GB processes when they are dependent on the actions of other licensees.

The need for accompanying Guidance

In developing the proposed GB SQSS, an attempt has been made to include in the Standard only that material that it is felt is necessary for the definition, enforcement and verification of licence conditions. In so doing, the greatest influence in deciding what should be included or not included in the Standard has been the precedents set by the present standards. In other words, if something is not addressed in any of the present standards, it is not addressed in the new Standard. The exception has been where it was judged to be critical that there is a shared understanding and procedure between different transmission licensees, so critical that the planning and operation of the GB system (as distinct from the three separate transmission

systems to which the present standards apply) would be at risk if the particular criterion were not be made a condition of the transmission licence, i.e. included in the Standard. Even in such a case, the text included has been kept to a minimum.

With the introduction of the NGC SQSS, various other guidelines that enabled efficiency of application and consistency of understanding by different engineers were included in complementary documents that were not licence conditions[46]. It is a similar situation in Scotland where the licence standards are relatively brief, but are supported by other notes. Such guidance documents could assume an even greater importance under BETTA since the guidance should be used by engineers in different companies.

It is believed that the further detail that the licensees felt was important to the planning and operation of the GB transmission system, but which could not be justified for inclusion in the Standard itself should be included in one common Guidance document supporting the GB SQSS that

- is not a licence condition;
- where explanation of the criteria is not appropriate for the Standard itself, gives some explanation;
- further promotes consistency of understanding and application across the three transmission licensees.

It has been suggested this Guidance should be produced and governed jointly by the three GB transmission licensees. Work is ongoing to develop this Guidance.

6. The present standards

This section lists the licence security standards currently applied and gives a few remarks on the relationships between them.

NGC

Criteria to be applied to system planning and development and to operation are all contained within one document:

- "NGC Transmission System Security and Quality of Supply Standard", Issue 2, November 2000.

SPT

Planning and development

- TDM13/10,001, "Security of Supply", Issue 2, October 1985.
  The document incorporates
  - Engineering Recommendation P2/5 (October 1978 revision) of the Electricity Council Chief Engineers' Conference);

[46] It is quite common for legislation produced by the government to be accompanied by guidance aiding understanding and interpretation. Indeed, such guidance is from time to time then revised even while the legislation remains unchanged.

  - NSP366, "Security of the 400kV and 275kV Systems in Scotland";
  - "Complexity of circuits";
  - Engineering Recommendation P18, "Complexity of 132kV circuits"
- The Grid Code.
- PLM-SP-1

Operation

- "Grid Control Instruction (system) BI-SSEB Operational Standards of Security of Supply" (dated 30 March 1981);
- The Grid Code.

SHETL

Planning and development

- "NSHEB Planning Document TM9001 (Transmission Planning Standard of Security)"
  The document incorporates
  - Engineering Recommendation P2/5 (October 1978 revision) of the Electricity Council Chief Engineers' Conference);
  - NSP366, "Security of the 400kV and 275kV Systems in Scotland";
  - Engineering Recommendation P18, "Complexity of 132kV circuits"
- The Grid Code
- PLM-SP-1

Operation

- "NSHEB System Operation Memorandum No 3";
- The Grid Code.

Remarks

- Structure of the present standards:
  - planning and operating criteria are in one common document for NGC, while there are separate documents for the Scottish licensees;
  - operating criteria and planning criteria in the NGC standard are grouped together around functional different parts of the system: generation connection, demand connection and the 'main interconnected system';
  - there are separate documents for the Scottish licensees for the connection of generation, the connection of demand and the planning of the main system.
  - the reference to the (Scottish) Grid Code in the Scottish licences is particularly significant in a security context in respect of voltage limits.
- Comparable standards:
  - the planning standards for the two Scottish licensees are almost identical. (A critical difference is in respect of the applicability of NSP366 to the 132kV transmission system).

- the Scottish licensees' operating standards have many similarities but are not completely the same.
- the NGC planning criteria for connection of generation and demand of demand were derived from PLM-SP-1 and ER P2/5 respectively, and thus can be compared directly with those documents.

- Standards with the most significant differences:
  - the NGC planning criteria for the main interconnected system are quite different from NSP 366;
  - the NGC operating standard has some significant differences from the Scottish licensees' operating standards.

7. Proposals for criteria for the new Standard

Structure of the proposed GB SQSS

At present, all of the security criteria to be applied when planning and operating the transmission system in England and Wales are contained in one document, and it is structured in the following way:

1. Introduction
2. Generation connection criteria, both planning and operation
3. Main interconnected transmission system criteria, both planning and operation
4. Demand connection criteria, both planning and operation
5. Glossary and definitions

Appendix A Guidance on substation configurations and switching arrangements
Appendix B Additional criteria to limit the complexity of transmission circuits
Appendix C Straight scaling and ranking order techniques for modelling planned transfer conditions
Appendix D Proportional scaling technique for applying the interconnection allowance
Appendix E Guidance on economic justification

The proposed GB SQSS is also one document that contains both planning and operating criteria. However, given that present Scottish standards are organised differently, with separate documents for

1. planning of generation connections
2. planning of demand connections
3. planning of the main system
4. operation of the system
5. voltage limits in operation of the system[47],

the following compromise structure of the new document has been proposed:

1. Introduction
2. Planning of generation connections
3. Planning of demand connections
4. Planning of the main interconnected transmission system
5. Operation of the transmission system
6. Voltage limits in planning and operation of the system

[47] The document of voltage limits in system operation is not a licence standard for either of the Scottish licensees.

7. Terms and definitions
Appendix A Guidance on substation configurations and switching arrangements
Appendix B Additional criteria to limit the complexity of transmission circuits
Appendix C Straight scaling and ranking order techniques for modelling planned transfer conditions
Appendix D Application of the interconnection allowance
Appendix E Guidance on economic justification

The following points may be noted:

- as presently in England and Wales, there is believed to be significant benefit to application of security criteria, their understanding by transmission customers and their governance by having all security criteria in one document, so the example of England and Wales is followed in having one document;
- as with the present England and Wales document, the terms and definitions used are common to both planning and operation;
- following the example of present Scottish standards, planning and operational criteria are separated;
- following the example of all the present standards, generation connection, demand connection and the main interconnected system have separate sections for planning;
- the voltage limits are presented in a separate section following the example of present Scottish standards in allowing these important parameters to be drawn out specifically.

Introduction to the Standard

This is based upon the Introduction to the NGC SQSS with minor changes introduced to reflect the different structure of the proposed GB SQSS compared with the NGC SQSS. The only other change concerns the dropping of the word 'maintenance' that appeared in paragraph 1.1 of the NGC SQSS from paragraph 1.1 of the GB SQSS in order to be consistent with the obligations on transmission licensees that are believed to be included in the proposed GB Licences.

Planning criteria

Overview

The standards presently employed by the three licensees have much in common:

- chapter 2 of the NGC SQSS on generation connection was derived directly from PLM-SP-1 that is still a licence condition for SPT and SHETL;
- the planning criteria in chapter 4 of the NGC SQSS on demand connection were derived directly from ER P2/5 that is still a licence conditions for SPT and SHETL;
- many of the planning criteria in chapter 3 of the NGC SQSS on the main interconnected system are derived from PLM-ST-9 that, while not a licence condition, is applied by both SPT and SHETL.

The greatest apparent differences concerned a comparison of NSP366 (a licence condition for SPT and SHETL for planning of the supergrid system) and those parts of chapter 3 of the NGC SQSS derived from the former PLM-SP-2.

Generation connection criteria

In view of the NGC generation connection criteria having been based upon the same document as is still used in Scotland, but also having been through a review, the NGC words were taken as a starting point, with variations as outlined below. (They are described by reference to particular paragraphs in the proposed GB Standard).

Paragraph 2.7 – there is a difference between the PLM-SP-1 maximum length of a generation circuit and that in the NGC SQSS. In the Review of Security Standards (RSS) in England and Wales in the 1990s, it was argued that the PLM-SP-1 rule applied to overhead lines, and this has been agreed by the GB licensees for the GB SQSS so that there is a common interpretation. However, there is a difference in the load factors used to govern when up to 20km of overhead line in a generation circuit may be tolerated, and when it should be no more than 5km. In the proposed GB SQSS, this has been resolved by reference to annual expected energy. This is because the transmission licensees have judged that

- in comparison with the England and Wales rule, it would not be appropriate to require small wind farms that have already applied for connection in Scotland to connect to the transmission system via overhead lines less than 5km in length, and such a rule would require additional investment on the part of the wind farm developers or the transmission licensee;
- to relax the overhead line length restriction for large power stations that have applied for connection in England and Wales and which have an expected load factor between 30% and 65% might risk a lowering of security in England and Wales, or an increase in the costs of operating the system.

The proposed compromise rule takes account of both load factor and size of a connecting power station and has been based on analysis conducted at NGC by Keith Bell. It is judged to

- not require additional investment in Scotland;
- not compromise security in England and Wales.

However, a simple alternative to the proposed rule would be for regional difference in respect of the load factors above which a maximum 5km overhead line in a generation circuit would be required, i.e. for generators connecting to the transmission system in England and Wales, the threshold would be a load factor of 30%, while for generators connecting Scotland it would be 65%. This would have the disadvantage of being quite a clear difference in treatment of generators depending on where in GB they are connecting.

A further alternative would be for the GB SQSS to converge upon the more onerous of the two present rules, and for relaxation to be permitted at a customer's request in accordance with the criteria in paragraphs 2.15 to 2.18 of the proposed Standard.

Re-organisation of the criteria into separate subsections for pre-fault criteria, post-fault criteria with no local system outage and post-fault conditions with no local system outage. While not changing the implication of the Standard, it was felt that a re-organisation of the section added clarity and would promote consistency of understanding and application by the three licensees.

Paragraph 2.8 – the proposed wording states that, for the assessment of stability of generators connecting in Scotland, such reactive power output as may be reasonably expected should be modelled; otherwise, a number of sites in Scotland would be non-compliant without significant additional investment.

Paragraph 2.8.4 – in line with the proposed GB SQSS terms and definitions (discussed in section 0 below), the term 'planned outage' is used.

Paragraph 2.10 – it is noted that it not the practice in SPT to plan against a secured event of a double circuit fault outage on the 132kV system. In order not to reduce security in the NGC and SHETL areas, and not to cause additional investment in the SPT area, there is a regional difference as regards secured events.

Paragraph 2.13 – without this paragraph, it would be necessary for the Scottish licensees to make additional investments; however, adding it does not lower the level of security NGC has provided in England and Wales with respect to what has been put in place since vesting. (The words are based on those used in paragraph 3.4(iii) of the present NGC SQSS revised for consistency of understanding among the three licensees; they are also used in paragraph 4.10 of the proposed Standard).

Demand connection criteria

In view of the NGC demand connection criteria having been based upon the same document as is still used in Scotland, but also having been through a review, the NGC words were taken as a starting point, with variations as outlined below. (They are described by reference to particular paragraphs in the proposed GB Standard).

Regional difference for the table specifying the contribution of generation to demand group security. It may be noted that the NGC SQSS Table 4.2 has a reference to 'Large' embedded power stations (this is a historic reference believed to be consistent with Grid Code obligations on submission of data to NGC by distribution network operators), while ER P2/5 has no such qualification. Moreover, while Table 4.2 of the NGC SQSS is generalised to apply to all generation types (with contributions delineated by reference to load factors), ER P2/5 has references to specific technology. Given both of these differences, it was felt easiest to require a user of the GB SQSS to refer to different tables of generation contributions depending on whether the demand group to which the generation is contributing is in England and Wales or in Scotland[48].

Addition of smaller demands group to table. There are transmission connected demand groups as small as 1 MW connected in Scotland; to permit these to be treated correctly in a GB SQSS, the minimum supply capacity table has been extended to incorporate the criteria for smaller demand groups from ER P2/5. This makes no change to security experienced by transmission customers in England and Wales and does not require any of the licensees to make any additional investment.

[48] It may be noted that, through the Electricity Networks Association and following a request from the DTI for the potential contribution of embedded renewable generation to distribution network security to be captured, the generation contribution table of ER P2/5 – "table 2" – is in the process of being revised; a new standard – ER P2/6 – may be expected to be in place in early 2005. It would seem prudent for the transmission licensees to take some account of what this says in the demand connection criteria of the GB SQSS, but if it is to be done, it should be in a second issue of a GB SQSS, and is beyond the scope of the present harmonisation exercise.

Wording on small demand groups and permitted loss of supply. The wording in paragraph 4.10 of the NGC SQSS is intended to clarify what is the appropriate permitted loss of supply capacity to demand groups that are nested. While these words give an accurate clarification for the sorts of nested demand groups found in England and Wales, there are some demand groups in Scotland for which the result is incorrect. Some revised words have therefore been proposed intended to give the correct clarification in both cases. (This is discussed further in this document in 0).

References to outage conditions. In respect of the minimum supply capacity, it may be observed that ER P2/5 refers to 'first' and 'second' circuit outages, while the NGC SQSS refers to secured events with different 'initial conditions' – an 'intact system' and with a single 'arranged outage' (where 'arranged outage' is not a defined term). It is judged that the proposed defined GB term 'planned outage', being defined, provides clarity essential to application of the Standard by different parties, and that its use is synonymous with what 'arranged outage' is believed to mean. Moreover, it is a term used elsewhere in the Standard. Thus, the term 'planned outage' in specifying initial conditions has been proposed as a means of harmonising the present standards, with the result that the implication of the GB Standard is unchanged from both the NGC SQSS and ER P2/5.

Main interconnected system planning criteria

In comparison with the present NGC SQSS, the following points may be noted

Re-organisation of the criteria into separate subsections for peak demand with an intact and conditions arising in the course of a year of operation. While not changing the implication of the Standard, it was felt that a re-organisation of the section added clarity and would promote consistency of understanding and application by the three licensees.

Addition of simple intact system condition. This is equivalent to paragraph 3.2 (i) of NSP 366; while implied by paragraph 4.7.1 of the proposed GB SQSS (conditions in the course of a year of operation *include* conditions at time of peak demand, in turn equivalent to paragraph 3.4 (iii) of the NGC SQSS), its explicit capture in the subsection on peak demand was felt to enhance clarity and aid application.

Definition of 'planned transfer' and use of the 'interconnection allowance'. With the removal of the present management arrangements on the 'interconnector' circuits between SPT and NGC, not to have rules consistent across GB for determining the minimum transmission capacity risks anomalous situations and inefficiency in respect of transmission investment costs or system operating costs, or both. For example, an SPT rule may determine that investment is not required in the SPT area, but the England and Wales rule may determine a need for investment in England and Wales even when, due to relative lack of system capacity in the SPT area, power transfers could not reach the level against which the SQSS would require investment in England and Wales. The extra capacity invested in England and Wales, while required by the SQSS, would not be used (while it is possible that there would be increased system operation costs due to the lower level of capacity in the SPT area). Conversely, the SQSS may require additional capacity in the SPT area that could not be utilised due to a lower requirement in England and Wales.

Thus, it can be seen that consistency is extremely important. The challenge in the harmonisation of GB planning standards is to find a consistent rule that does not require fundamental change, does not require additional investment and does not lower security.

It is believed that an appropriate harmonisation has been achieved by

1. extending the England and Wales idea of 'planned transfer' into Scotland but modifying its modelling (described in Annex C of the proposed GB SQSS) to take account of the different seasonal availability of hydro plant (a significant factor in Scotland and explicitly addressed in NSP 366);
2. recognising the conceptual equivalence of 'interconnection reserve' in NSP 366 and 'interconnection allowance' in the NGC SQSS, and so applying 'interconnection allowance' to the boundary between the SPT area and the England and Wales area;
3. noting the restriction on application of interconnection allowance that limits its application only to system peak demand conditions and boundaries which have at least 1500 MW of demand on both sides at peak – in light of growth of demand in the SHETL area since NSP 366 was written, it has been judged appropriate that the interconnection allowance can and should be applied to the boundary between the SHETL and SPT areas;
4. avoiding unforeseen consequences by restricting application in Scotland to the boundary between SHETL and SPT and that between SPT and the England and Wales area.

The consequence is that, at the expected time of BETTA 'go active', the power transfer that the proposed GB SQSS requires to be accommodated securely by the Scottish transmission licensees is one that can be complied with without additional investment. With the other provisions of section 4 of the proposed GB SQSS, the net result is that section 4 neither requires additional investment nor lowers security.

Regional differences in respect of secured events.

- To avoid additional investment in Scotland and lowering of security in England and Wales, 'N-2' at system peak demand is applied only in England and Wales.
- To avoid additional investment in the SPT area, double circuit security is not required on the 132kV system in the SPT area.

Operational criteria

Similarities between standards

The harmonisation of operational criteria has been greatly helped by the fact that all three licensees' present standards have a common root and therefore show strong similarities, for example in the set of credible 'secured events' and in consequences to be avoided.

Once the single set of 'credible events' that must, under at least some circumstances, be secured against has been defined, the apparent differences between the present standards largely constitute differences in the circumstances under which these events are secured against. These apparent differences have generally been resolved by recognising the levels of risk that all three licensees regard as unacceptable. In particular, although it might appear that in Scotland the system is not secured to a double circuit fault, in fact it is if the consequences of not securing to a double circuit fault are expected to be particularly severe. In this regard, practice in Scotland

in managing risks converges with that in England and Wales, and these particularly severe consequences have been characterised in a common way for all three licensees in paragraph 5.3 of the proposed Standard. In essence, the delineation of acceptable and unacceptable consequences has been drawn from the demand group sizes already defined in ER P2/5 and in the NGC SQSS.

Normal operational criteria

The avoidance of severe consequences even for the least likely of the full set of secured events is one of three sets of operational security criteria that should all be applied at all times, and are referred to in the proposed Standard as 'normal operational criteria'. The other two are

- consequences to be avoided for fault outages of single items of plant;
- consequences to avoided for more onerous secured events in England and Wales.

In the former (paragraph 5.1 in the proposed Standard), in order that a common set of secured events may be used for the whole of GB, security against a fault outage of a section of busbar or mesh corner is required only where it has been designed to be possible. This is because some parts (though not all) of the transmission system in the SHETL area have previously not been operated or designed to be secure against such events. Nevertheless, in order that security is not reduced in the other regions, the event is still listed. (It may be noted in passing that if security against a fault outage of a section of busbar or mesh corner is at all possible, it should be secured against regardless of cost (for example in constraining generation)).

In simple terms, the consequences to be avoided in the former criterion are common to the whole of GB. However, some small differences might be noted:

- in the permitted loss of supply capacity (Table 5.1), variations from the 'default' standard are permitted so long as particular sites were designed on that basis, and that that design was compliant with the relevant planning criteria. (If a site was not designed that way, it cannot be operated that way; this idea is consistent with the present NGC SQSS).
- the voltages outside of which voltage conditions are unacceptable are different region by region in some instances. (See section 0 for further discussion).
- the precise fault clearances to be used in assessment of instability are dependent on location. (See section 0 for further discussion).

The latter criterion (paragraph 5.4 in the proposed Standard) is necessary in order that there is no lowering of security to customers in England and Wales.

It should be noted that paragraph 5.2 in the proposed Standard is essentially a carry through of paragraph 4.18 in the present NGC SQSS and used to clarify what is the appropriate permitted loss of supply capacity for demand groups that are made up of smaller demand groups. However, the words used in the proposed GB Standard are different from those in the present NGC Standard because when the NGC words are applied to some situations in Scotland, they would appear to show non-compliance where, if one were to consider each constituent demand group, there is none. (This is explained further below in Annex B).

Conditional further operational criteria

All the present standards have further operational criteria conditional upon conditions on or affecting the system. In general,

- in Scotland, security is 'tightened' to avoid certain consequences of double circuit overhead line fault outages when there is a higher than normal likelihood of transmission faults;
- in England and Wales, there is the scope to 'relax' security under certain circumstances, i.e. to permit the possibility of certain consequences of double circuit overhead line fault outages when there is less likelihood of transmission faults than normal, there is an economic benefit in doing so and these consequences cannot be avoided for such faults.

In the NGC SQSS operational criteria, the 'normal' criterion for a double circuit overhead line fault outage sets a limit on the loss of capacity at risk to such a fault. Where there is a significant economic justification and a double circuit overhead line fault is 'unlikely' (i.e. there is 'favourable' weather), the loss of supply capacity at risk to a double circuit fault may be higher than normal. (That is, paragraph 3.14 (iii) of the NGC SQSS relaxes the restriction on loss of supply capacity).

Paragraph 5.5 in the proposed GB Standard resolves this issue in two conditions under which security can be tightened and which the licensees believe retain consistency with present operational practice in all parts of GB. In the proposed GB SQSS, if the likelihood of a double circuit overhead line fault is significantly higher than normal, and there would not be a significant economic penalty for reducing the loss of supply capacity at risk to a double circuit fault, then the loss of supply capacity at risk to a double circuit fault must be reduced.

Thus, in the NGC SQSS, if the overhead line fault rate is relatively low, the loss of supply capacity at risk to a double circuit overhead line fault may be increased. Conversely, in the proposed GB SQSS, if the overhead line fault rate is relatively high, the loss of supply capacity at risk to a double circuit overhead line fault is decreased. So it is that the NGC SQSS (paragraph 3.14(iii)) and the proposed GB SQSS (paragraph 5.5) are, in this respect, effectively equivalent.

In all other respects, the consequences in the GB SQSS to be avoided for double circuit overhead line faults in the England and Wales area are the same as those defined in the NGC SQSS (see paragraphs 5.3 and 5.4 of the proposed GB SQSS). Similarly, for double circuit overhead line faults in Scotland, the consequences to be avoided specified in the GB SQSS, and the circumstances under which they are to be avoided, are effectively the same as in the present SPT and SHETL operating standards.

The thrust of NGC SQSS criterion given in 3.14 (ii) of the NGC SQSS has been retained in the proposed GB Standard in paragraph 5.6, but with revised wording. The revision arises from the licensees having different interpretations of what the original NGC words meant, and believing the revision to be necessary to ensure that customers receive the same level of security as they do now, and to prevent the GBSO recalling outages unnecessarily. To this end, a new term of 'major system risk' has been defined.

Post-fault restoration of security and authorised variations

The words in these sections have been taken from the NGC SQSS. One consequence of this is, for example, that where a demand group was designed in accordance with the relevant

planning criteria but not designed to avoid loss of supply capacity, say, for a double circuit fault, loss of supply capacity is permitted.

Voltage limits in planning and operation

Section 6 of the proposed GB SQSS draws together the voltage limits to be applied in planning and operation. (This is instead of the limits appearing, as in the NGC SQSS, in the Glossary section, and is felt to aid clarity and consistency).

The following points may be noted:

- some harmonisation of limits has been achieved – this has been done in order to minimise risks of misapplication of the Standard and promote consistency across GB, and has been done where the security given to customers is not lowered as a consequence and no additional investment would be required (for example in protection systems or insulation).
- there remain some regional differences in respect of the precise limits and circumstances under which they can be relaxed. This is in order to maintain consistency with present standards and practice where a sufficient degree of confidence could not be gained regarding customer security, plant integrity and the possible need for additional investment under some harmonised limits. (It may be further noted that the only remaining difference between the limits for SPT and for SHETL in Table 6.5 of the proposed Standard concerns a 1% difference in each of the maximum and minimum steady state voltages at nominal voltages of less than 132kV).
- what appears in Table 6.1 as 'Note 3' is a re-phrasing of Note 2 of the equivalent table in the NGC SQSS. This was in order to enable a clear understanding to be gained by all three transmission licensees.
- in order to provide confidence that customer security in Scotland will not be compromised when the system is operated by NGC, and to add clarity to the application of voltage limits, an assertion has been added that unacceptable voltage rules apply to sites having direct connection to the GB transmission system – this makes clear that if any power is supplied to the site, the power should be supplied at an acceptable voltage.

Terms and definitions

It has been judged that a common set of definitions, because it will be an instrument used or referred to by many different parties and will help to define the new relationship between transmission licensees brought about by BETTA, should avoid ambiguity wherever possible. On occasions, the same term can be found in everyday use in different licensees but with different meanings. If the same term is to be used in a GB SQSS context, there is a risk of disputes arising between licensees because of different interpretations, and of BETTA processes therefore not being followed in a timely or 'correct' manner. Since the implementation of BETTA involves the application of new processes enabling the achievement of the objectives of BETTA, the need to avoid such a circumstance of incorrect or untimely application of BETTA processes due to misapplication or misinterpretation of terms can be said to arise as a consequence of BETTA.

As noted in section 0 above, where there is some possible difference between the present standards, in this case in respect of definition, meaning or interpretation of a term, it has been preferred that one definition should be used across the whole of GB. In some cases, in order not to require additional investment or reduction in security, it has been necessary to revise the term. In other cases, the best means of meeting the objectives of the harmonisation of standards

seemed to be the use of a new term specific to the GB SQSS where it can be judged as consequential to BETTA. In a few cases, it has nevertheless seemed necessary to define terms, e.g. 'large', 'medium' and 'small', that have different meanings when used in different regions. (This has been seen by the licensees as a 'last resort' option due to the practical difficulties it gives rise to in applying the Standard and the risks of misapplication).

It has been preferred that definitions should be as brief as possible and based, as far as possible, on definitions that appear in at least one of the present standards. Where extra explanation was felt to be necessary, it was generally suggested that this should be added to the Guidance document supporting the Standard.

Some particular points of discussion are present below

Revised GB terms

Fault outage – this term has different meanings in different standards among those used at present. In order that the same single term can used by all transmission licensees in all areas, in all timescales and with the same understanding, a common definition was agreed.

Insufficient voltage performance margin – a requirement to plan the transmission system to be robust against the risk of voltage instability is observed by each licensee; however, one of the 'sensitivities' against which robustness is defined is different for SPT and SHETL as from NGC. This concerns variations of demand. It was not believed that the NGC form was appropriate for Scotland due to demand variations being different as a consequence of the different climactic conditions. On the other hand, the Scottish form could be applied with equal validity across GB, and is in any case the same as that from which the England and Wales form was derived. Thus, the Scottish form was chosen for application across GB in order that no additional investment will be required anywhere, and security will not be lowered. In order not to make the definition of 'insufficient voltage performance margin' too long, this demand sensitivity was defined by means of a new term – 'credible demand sensitivity' – referenced in the definition of 'insufficient voltage performance margin', the application of which results in the same practices in the different regions of GB as are carried out now.

Planned outage, **unplanned outage** and **fault outage** – various terms are used throughout the present standards concerning outages; many of them are undefined and, on occasions, seemingly contradictory. It was felt necessary for BETTA to converge upon some common terms for GB that can be understood in the same way by all the licensees that share responsibility for investment planning and operational/outage planning. Moreover, in light of the significance under BETTA of the planning of outages within a new GB process that nevertheless has as a set of underpinning rules the GB SQSS, it was felt appropriate that these common definitions should make reference to the GB outage planning process.

Transmission Capacity – simply to use the NGC definition would lead to certain situations in Scotland where significant additional investment would be needed (since, otherwise, by not being permitted to utilise operational intertripping in certain circumstances, further circuits would be needed). In order to avoid this, but retain the present level of security experienced by customers in England and Wales, the definition has been revised.

A number of other terms have been taken directly from the NGC SQSS but have had references to NGC Transmission System changed where appropriate to GB Transmission System.

Newly defined GB terms

Transfer capacity – this is a term presently used in standards used by all three transmission licensees; however, it is not defined in the NGC SQSS. Since a definition was judged to be necessary for BETTA (to aid consistency of application of the Standard by all three licensees), the definition has therefore been taken from the relevant Scottish standard.

Voltage collapse – the meaning of 'voltage collapse' is left for a reader of the NGC SQSS to imply from the definition of 'system instability'. However, with the revision of the definition for the GB SQSS of system instability (discussed below), and the retention of the term 'voltage collapse' elsewhere, it was judged to be necessary to define voltage collapse.

New GB terms

Credible demand sensitivity – this is new term introduced to deal with a difference between SPT/SHETL practice on planning of voltage performance margins, and NGT practice, and to provide a common GB footing enabling retention of present levels of security without requiring additional investment. (See also the discussion above on 'insufficient voltage performance margin').

Generating plant type – this term has been introduced to facilitate the revised modelling of transfer described in section 0.

Major system fault – no term exists in any of the present standards to cover the idea expressed by this term, and yet it was believed to be important to allow the GBSO to operate the system in Scotland in a manner consistent with current practice. (The term is used in the context of relaxation of maximum steady state voltages in operational timescales.)

Major system risk – a comparable term exists in the NGC SQSS ('high system risk') but that term is not defined. It was felt necessary to define a term for use in the same context as 'high system risk' is used in the NGC SQSS, but to use a different term in order to make clear that it does not have exactly the same meaning as custom and practice in NGC has established. This is in order that the Scottish licensees can have confidence in the way the GBSO is operating the system in Scotland, in particular that outages will not be recalled unless strictly necessary. Nevertheless, the definition agreed upon has been judged by all licensees not to lower the level of security experienced in their areas.

Transient time phase – this term has been introduced in order to add clarity to the meaning of 'voltage step change' (its only use in the proposed GB SQSS is in the context of voltage step change) – before it was introduced, the three licensees had different interpretations of the definition and application of voltage step change implied by the NGC SQSS. Use of the proposed term enables continuation of the levels of security experienced by customers and avoidance of additional investment.

Regionally differentiated terms

Double circuit overhead line – SPT presently has a different definition of 'double circuit overhead line' from NGC and SHETL. Since, without undertaking a detailed review of all circuits in each licensee's area, converging on one GB definition might entail a lowering of security or a need for additional investment, a regionally differentiated definition has been proposed, though it should be noted that such a definition will require a clear communication between the licensees of what double circuit fault outages are to be considered when evaluating security.

Large, **medium** and **small power stations** – the definitions used differ in respect of the size of power station meant in each region. The sizes referred to in the proposed GB SQSS mirror those in the proposed GB Grid Code.

System instability – there is a regional differentiation in respect of the fault clearance time to be assumed when determining system stability. (The specification of fault clearance time appears in the NGC SQSS as part of the definition of 'fault outage', but was felt by the licensees to give greater clarity when included instead in the system instability definition since it specifically concerns system instability). This was judged to be necessary since otherwise there might be a lowering of security of a need for additional investment.

It may also be noted that the reference to voltage collapse that appeared in the NGC SQSS definition of system instability does not appear in the GB SQSS definition. This is because it would otherwise have severely compromised the clarity of the main operational security criteria; in any case, the stipulation of avoidance of voltage collapse is believed to be covered by the requirement in section 6 of the proposed GB Standard to avoid 'any inability to achieve a steady state voltage'; since a collapse of voltage is indeed that, its avoidance is covered. It has nonetheless been argued by some that in the context of paragraph 5.3 of the proposed Standard, there should be some direct reference to voltage collapse affecting wind generation. While it could be argued that a reference would be outside the scope of the BETTA harmonisation exercise, it also been judged by the GB SQSS sub-group that, to be consistent with the intention of paragraph 5.3, such an affect should be qualified by reference to how much generation is affected. Such a reference would actually be generally applicable to all existing generation (and be within the scope of the BETTA exercise), and could indeed be included as an additional sub-paragraph of 5.3, but it was judged to be covered and generally well-understood by operators and operational planners by reference to the rule that unacceptable frequency conditions must be avoided. Voltage collapse affecting what everyone on the sub-group agreed would be an excessive amount of generation would lead to such acceptable frequency conditions, and thus should be avoided anyway. Indeed, other mechanisms than voltage collapse affecting generation could lead to such unacceptable frequency conditions, are not addressed explicitly by any of the present standards, and yet are understood and avoided by the all the licensees. An example of such a mechanism is loss of supply capacity affecting station transformers. The conclusion was that the avoidance of unacceptable frequency conditions adequately and succinctly covers all the relevant possibilities.

It may be finally be noted in relation to voltage collapse that explicit reference to it occurs in the planning criteria due to its inclusion in the definition of insufficient voltage performance margin, a definition largely carried over from the NGC SQSS (see discussion above on this term). Also, for the avoidance of any doubt, it will be possible

for the above issues to be addressed in the Guidance to be developed by the licensees to complement the Standard.

The appendices to the proposed Standard

There are five appendices in the proposed GB SQSS:

A Recommended substation configurations and switching arrangements
B Circuit complexity
C Modelling of planned transfer
D Application of the interconnection allowance
E Guidance on economic justification

The bulk of these appendices has been taken directly from the NGC SQSS – Annex A is a verbatim copy as is the first half of Annex B; the second half of Annex B is a set of recommendations taken directly from the Engineering Recommendation P18 document included in the Scottish licensees' standards (where the criteria are also recommendations). (It might also be noted, both in the context of Annex B and elsewhere in the proposed GB SQSS, that the supergrid part of the MITS where MITS is as defined in the GB Standard is the same thing as the MITS as defined in the NGC SQSS).

Appendices C to E are substantially based on the NGC SQSS, in the case of appendices C and D with some paragraphs transferred from chapter 3 of the NGC SQSS with the aim of gathering all related criteria together and aiding clarity. However, in these three appendices, there are a few changes introduced as a consequence of harmonisation for BETTA, and these are discussed below.

Modelling of planned transfer

It was noted in section 0 above that the present standard used by the Scottish transmission licensees for planning of the main interconnected system – NSP 366 – requires that account be taken of the different seasonal availability of hydro generation. This has been accommodated in the 'straight scaling technique' by specification of application to each generator of a 'scaling factor to their registered capacity *proportional to the expected availability of the generating plant type* at the time of ACS peak demand'. Such a specification has also been included in the equations that replace equation C.1 from the NGC SQSS. It may be noted that use of the revised technique and equations in the proposed GB SQSS for the system in England and Wales result in the same output as use of Annex C of the NGC SQSS.

Application of the interconnection allowance

The methods described in Annex D in the NGC SQSS are not presently used in Scotland. It has been argued in section 0 above that it would be appropriate for them to be applied on a GB basis with the following proviso, included in paragraph D.2 of the proposed GB SQSS: the boundary between the two [contiguous parts into which the system is divided for application of the interconnection allowance] lies on the boundary between the SHETL and SPT areas, or between the SPT area and the England and Wales area, or entirely within the England and Wales area. This proviso has been judged to be necessary to avoid any unforeseen consequences but to nevertheless represent the most important boundaries.

In comparison with Annex D of the NGC SQSS, some additional clarity has been introduced into Annex D of the proposed GB SQSS to enable its application by the Scottish transmission licensees.

Guidance on economic justification

The guidance on economic justification is essentially that contained within the NGC SQSS. In this, it is stated that evaluation of expected costs of operating the system and of unreliability should done on a basis of simulated system operation against operational security criteria. This idea is retained, but since there are some implied regional differences in operational criteria – in particular, in Scotland N'-D security is dependent upon conditions – an extra sub-paragraph is added to make clear that prevailing conditions, their duration and the relevant secured events under those conditions should be taken into account. (That they are taken into account is important to meeting Ofgem/DTI's requirement that a new GB SQSS does not require significant additional investment).

Annex A Terms of Reference of the GB SQSS sub-group of DG4

Composition of the sub group

The subgroup will compose of representatives from the three transmission licensees. The number of representative from each party should be at least one and not more than three. The chair of this subgroup will be appointed by the DG4 group. The subgroup at their first meeting will also appoint a secretary. OFGEM will also be invited to the sub group meetings.

Scope of Work

(a) Harmonise definitions and terminology across the GB transmission network in operational standards to promote consistency, transparency and clarity in interpretation and application.

(b) Develop a new framework for GB operational standards that the GBSO can implement on day one of BETTA going live.

(c) To achieve (b) above it will be necessary to deconstruct the existing operational standards to establish similarities and differences in the three operational standards currently applied by the licensees to their respective networks.

(d) Establish areas where there is commonality between operational standards, develop suitable rules and/or guidance notes so that operational standards, with limited modification where necessary, can be applied across GB transmission network. These modifications should ensure that the existing security and quality of supply to users is maintained.

(e) Establish those differing operational standards which can not be harmonised unless major modification is carried out, there would be significant network investment required or a deterioration of the security and quality of supply. This may introduce a regional operational element. It will be necessary to highlight the reasons why regional variations should be kept.

(f) For these regional variations develop suitable rules and/or guidance notes through which the differences may be practically accommodated by operational planners and control room staff with minimal risk to the achievement of the required level of system security and quality of supply.

(g) Remove or clarify, where appropriate outdated and obsolete references contained in the three current operational standards.

(h) Undertake a high level review of the current planning standards of each licensee and update the wording to harmonise where possible, remove obsolete references, improve clarity, reflect changes to the operating standards and to reflect the new industry and market structure. This review should be carried out with a focus on achieving and delivering workable operating standards for day one of BETTA. The aim will be to produce planning standards for each licensee.

(i) Establish similarities and differences in the three planning standards currently applied by the licensees to their respective networks.

(j) Identify reasons for differences in the planning standards, quantify extent of work needed to establish materiality of the differences and also detail what can or cannot be achieved.

(k) The deliverables will be confirmed to DG4 after initial meeting of the sub group.

(l) The subgroup must prepare a realistic work plan to deliver the above.

(m) Consider at what point(s) in the process would consultation via Ofgem be appropriate.

Accountability

The group shall be accountable to Investment Planning development group DG4. The chair of the group will provide regular reports to DG4 and work progressed in accordance with DG4's instructions.

It is anticipated that DTI/Ofgem, on conclusion of this work, will carry out a full consultation. Ofgem may also wish to take a lead role in presenting the proposals in an industry seminar on a date to be agreed.

Annex B Discussion of nested demand groups

The following words appear in the present NGC SQSS in paragraphs 4.10 and 4.18 and are important in distinguishing what is the appropriate permitted loss of supply capacity for 'nested' demand groups, i.e. demand groups that comprise smaller groups, such as shown in figure B.1 below ('example 1').

> For a Secured Event on connections to a Demand Group comprising more than one site, the permitted Loss of Supply Capacity is that set out in [Table 4.1 for planning timescales and 4.3 for operation] for the site with the smallest demand.

However, the above words (call them 'variation A') would not work for some situations in Scotland. An example of such a situation is shown in figure B.2 below ('example 2'). The following alternative words have therefore been suggested above for inclusion in the GB Standard in paragraphs 3.10 for planning and 5.2 for operation:

> For a secured event on connections to more than one demand group the permitted loss of supply capacity for that secured event is the maximum of the permitted loss of supply capacities set out in [Table 3.1 for planning and Table 5.1 for operation] for each of these demand groups.

Call the above words 'variation B'.

This Annex seeks to explain what is intended by reference to the examples shown in figures B.1 and B.2. In the figures, a local system outage is shown by a squiggly line and a secured event by a jagged arrow.

The intention of both sets of words is to define the correct permitted loss of supply capacities for nested demand groups such that

- the permitted loss of supply capacity for each constituent demand sub-group is correct;
- the permitted loss of supply capacity for the conjoined demand group is consistent with what the permitted loss of supply capacity would be for a group of that size with those initial conditions and that secured event were it not made up of smaller demand sub-groups;
- the permitted loss of supply capacity for the conjoined demand group is consistent with the loss of supply capacity for each of its constituent sub-groups.

The associated demands and permitted losses of supply (taken from Table 3.1 of the proposed GB SQSS for planning timescales or Table 5.1 for operation) are summarised in Tables B.1 and B.2. Application of variations A and B of the qualifying words regarding nested demand groups and the condition of demand equal to the maintenance period demand with the local system outage shown in the figures give the results shown in Table B.3. (Note that Tables 3.1 and 5.1 of the Standard also specify times for which loss of supply is permitted, but this is not discussed here).

It can be seen from Table B.3 below that 'variation B' – the words proposed for the GB SQSS – gives the 'right answer' for both examples while the original NGC SQSS words ('variation A') do not.

Table B.1 – demands and permitted losses of supply for the example in figure B.1

Group	Sub-groups	Maintenance period demand	Group demand	Permitted loss of supply capacity
A	-	40	50	40
B	-	220	290	20
C	-	400	500	none
D	D = A + B	260	340	none
E	E = A + B + C	670	840	none

Table B.2 – demands and permitted losses of supply for the example in figure B.2

Group	Sub-groups	Maintenance period demand	Group demand	Permitted loss of supply capacity
F	-	20	30	20
G	-	15	20	15
H	-	5	8	5
I	I = F + G	35	50	35
J	J = G + H	20	28	20
K	K = F + G + H	40	58	40

Table B.3 – permitted losses of supply for the Secured Events shown in the examples

Example	Variation A	Variation B	'Right answer'
1	40 MW	40 MW	40 MW
2	5 MW	40 MW	40 MW

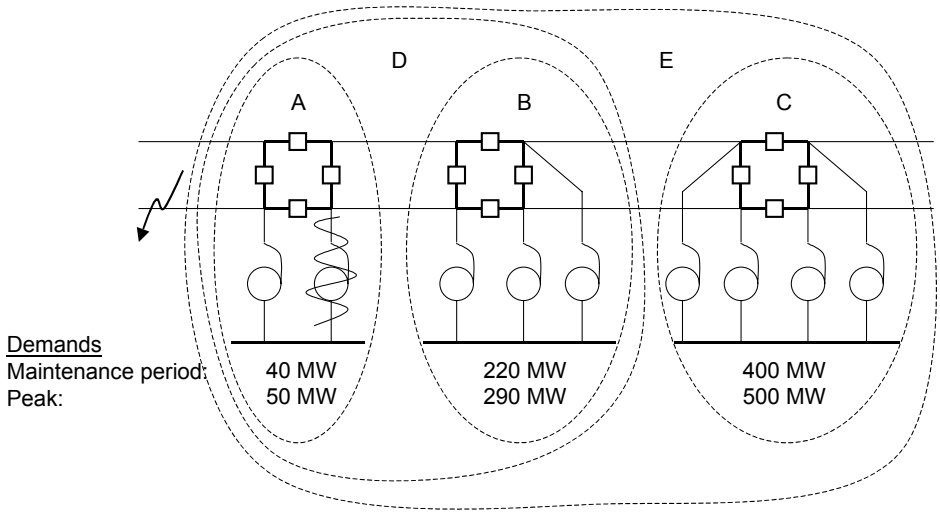

Figure B.1: example 1 of nested demand groups

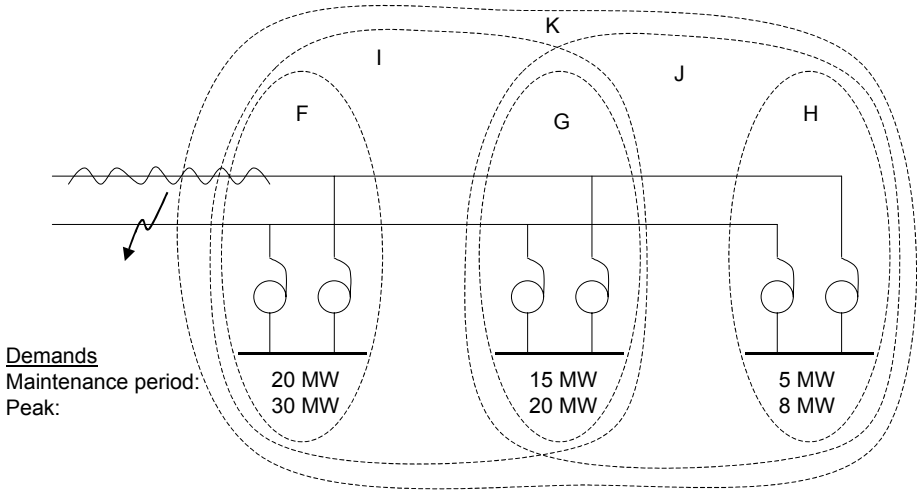

Figure B.2: example 2 of nested demand groups

Annex C Comparison of the present standards

The following tables are based on some initial analysis previously presented by the licensees in July 2002. They are intended as a brief summary, but, in view of their brevity and the time that has lapsed since they were first drawn up, should not be taken as a definitive comparison.

Main criteria	NGC		SPT		SHETL	
	Planning	**Operational**	**Planning**	**Operational**	**Planning**	**Operational**
Main Interconnected Transmission System	At system peak demand, intact system, boundary transfers at 'planned transfer' plus 'interconnection allowance', secured against single circuit, double circuit, Busbar & mesh corner faults, and two single circuits, i.e. N-2 For 'year round', assuming a 'typical' background, secured against single circuit, double circuit, Busbar & mesh corner faults, i.e. N'-D. May consider re-arranging outages and/or balancing services to achieve security where economically justified and circuits can be maintained	Secured against single circuit, double circuit, Busbar & mesh corner faults, i.e. N'-D Can be relaxed to N'-1 in fair weather if consequences not severe	At 100% system peak demand, intact system, secured against single circuit, double circuit or Busbar fault, i.e. N-D At 75% system secured against single circuit or Second circuit fault, i.e. N-2 Interconnection with NGC planned to more onerous of the two standards – by convention, taken to be NGC standard	Fair Weather: System secured against single circuit fault or busbar fault, i.e. N'-1, except where consequence of supergrid double circuit fault would be great, in which case 'best endeavours' N'-D Severe Weather: System also secured against double circuit fault, i.e. N'-D	At 100% system peak demand system secured against single circuit, double circuit or Busbar fault, i.e. (N-D) At 75% system secured against single circuit or Second circuit fault, i.e. N-2	Fair Weather: System secured against single circuit fault, i.e. N'-1, except where consequence of double circuit fault would be great, in which case N'-D Severe Weather: System also secured against double circuit fault, i.e. N'-D
Demand Connection (planning)	With local planned outage, minimum supply capacity is 'maintenance period demand' secured against a single circuit outage or loss of		With local planned outage, minimum supply capacity is 67% group peak demand, secured against a single circuit		With local planned outage, minimum supply capacity is 67% group peak demand, secured	

300 - 1500MW (P2/5 class E)	largest reactive source	outage	against a single circuit outage
60 - 300MW (P2/5 class D)	Identical		
Up to 60MW (P2/5 class C)	Identical		

Voltage limits			**NGC**	**SPT**	**SHETL**
Pre-fault planning limits		400	+2.5% to -2.5%		
		275	+5% to -5%		
		132	+5% (be able to achieve at least 105%)		
Steady state limits	Planning	400	+2.5% to -5% (+5% 15 for mins) (-10% radial network with no Stn auxiliaries)	TDM 13/9:- +5%	TDM 13/9:- +5%
		275	+5% to -10%	+10%	+10%
		132	+5% (be able to restore to at least 100%)	+10%	+10%
	Operation	400	+5% to -10% (+10% for 15 mins)	+ 3% to -3% (Grid Code capability +5% to -5%) (+10% for 15mins)	n/a
		275	+10% to -10%	+5% to -5% (Grid Code capability +10% to -10%) (+15% for 15mins)	+5% to -5% (Grid Code capability +10% to -10%)
		132	+10 to -10%	+5% to -10% (Grid Code capability +10%to-10%) (+20% for 15mins)	+5% to -10% (Grid Code capability +10%to-10%)
Step change limits	Planning		+6 to -6% (-12% for loss of Busbar, Mesh corner or Supergrid transformer)	TDM 13/9:- single circuit outage + 6% - 6% double circuit outage +6% -12%	TDM 13/9:- single circuit outage + 6% - 6% double circuit outage +6% -12%
	Operational		+6% to -6% (-12% for Double circuit, Busbar or Mesh corner faults)	As above	Op Memo 3:- Secure against step changes outside the range 85% to 110% of nominal voltage

Stability	NGC	SPT	SHETL
Considerations	pole-slipping, poor damping or voltage collapse	pole-slipping or poor damping	pole-slipping or poor damping
Main Interconnected Transmission System	3 phase to earth single circuit, double circuit, Busbar & mesh corner faults Assumes the failure of the fastest protection system on each faulted circuit.	Planning: The system shall remain stable for any 3-phase fault but if this cannot be guaranteed, stability shall be achieved for 2-phase to earth faults. Applies at all demand levels and for a single circuit fault following a first circuit outage, i.e.. N'-1 Operation: standard says, in severe weather the network is secured against double circuit 2-phase to earth fault. In practice, tested against 3-phase to earth fault first. 'Typical' protection clearance times assumed in both planning and operation	Planning: The system shall remain stable for any 3-phase fault but if this cannot be guaranteed, stability shall be achieved for 2-phase to earth faults. Applies at all demand levels and for a single circuit fault following a first circuit outage, i.e.. N'-1 Operation: standard says, in severe weather the network is secured against double circuit 2-phase to earth fault. In practice, tested against 3-phase to earth fault first. 'Typical' protection clearance times assumed in both planning and operation