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BSSG CUSC Report

Connection and Use of System Code
(CUSC)

The commercial arrangements for the Obligatory Reactive Power Service from offshore Generators

This report details the Balancing Service Standing Group (BSSG) work and considerations regarding the commercial arrangements for the Obligatory Reactive Power Service (ORPS) from Offshore Generators

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Any Questions?

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About this document

The purpose of this document is to report on the outcomes of the BSSG considerations of the commercial arrangements for offshore generators regarding the Obligatory Reactive Power Service.

Document Control

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0.1	07/09/2011	National Grid	Draft for Industry comment
0.2	14/09/2011	National Grid	CUSC Report

1 Executive Summary

1.1 Under the direction of the Secretary of State modifications to the industry frameworks (Grid Code, Balancing & Settlement Code, System Operator – Transmission Owner Code and the Connection & Use of System Code) were introduced on the 24th June 2009. The purpose of this was to allow for the development of competitive tendered offshore transmission networks.

1.2 As part of these developments a consequential change to the provision of reactive capability from offshore Power Stations within the industry codes was implemented. As a minimum, these generators must be capable of zero reactive capability at the Offshore Grid Entry Point (OGEP). This differs from onshore Power Stations who must have a reactive capability beyond this level, power parks for example must have a capability to a 0.95 lead and lag power factor. However it was determined that offshore connections should still contribute to the provision of reactive capacity, at the point with which the offshore network connects onshore, otherwise known as the interface point. Further to this as the Offshore Transmission Owner (OFTO) owns the cable connecting in at the interface point, it was determined that the OFTO should be obligated to provide reactive capability. Coupled with this additional provisions were inserted into the regulatory framework to allow offshore Power Stations to provide reactive power capability beyond the minimum, thereby contributing to the OFTO reactive obligation at the interface point.

1.3 Reactive capability is accessed and utilised by National Grid as the National Electricity Transmission System Operator (NETSO), through agreeing a Mandatory Service Agreement (MSA) with the provider and then instructing the Obligatory Reactive Power Service (ORPS).

1.4 At the introduction of the offshore regime the commercial arrangements surrounding the ORPS were not fundamentally altered, hence the prevailing arrangements are applicable to offshore generators. These arrangements centre on National Grid procuring the ORPS from generators providing the reactive capability. Where an OFTO has installed reactive capability, the asset(s) along with the other items of their asset base will be subject to the agreed rate of return as per the System Charging Methodology. Further to this the charges associated with the OFTO provision of reactive capability are levied from the offshore generator.

1.5 In comparing the costs offshore generators incur as opposed to those incurred by onshore generators in providing reactive power, it appears there could be a difference. This difference manifests when the offshore generator is not meeting the entirety of the OFTO reactive obligation, consequently requiring the OFTO to install capability which in turn is charged back to the generator. While there is no difference identified in any circumstance between the capital/fix operating costs of the reactive service there is a difference identified in the variable operating costs where the offshore Power Station is charged by the OFTO for the provision of reactive capability.

1.6 Providers of the ORPS receive payment to cover the variable operating costs; of the transformer heat losses and the incremental maintenance. Therefore a disparity appears wherever a generator is exposed to the variable operating costs, through Transmission Network Use of System charges, but is not entitled to receive payment under the ORPS.

1.7 However, on consideration of the variable operating costs and the associate exposure of offshore Power Stations, it becomes apparent that the OFTO will not be exposed to the majority of the variable operating costs. Analysis has indicated that the heat losses from transfer of reactive power over the connection point transformer account for a significant proportion of the variable operating costs. In the case of OFTO equipment, any energy losses over the network are defined as transmission losses and not charged to the OFTO. Therefore by inference it would not be expected that the OFTO charges the offshore Power Station for such losses.

1.8 Although the OFTO will be exposed to the incremental maintenance cost resulting from any utilisation of their reactive assets, which in turn will be charged to the generator. National Grid has calculated that the annual maintenance cost could be in the order of £10k, this estimate includes fixed and variable costs as the two can not be easily separated.

1.9 BSSG concluded that while the cost difference does exist it is a minimal difference. Also given the flexibility afforded offshore generators in the provision of reactive capability and the potential economic saving on cable rating where reactive power is provided at the interface point, the BSSG believe that the current commercial arrangements are appropriate.

1.10 However the BSSG did express concern regarding the impact of the NETSO use of OFTO assets that do not incur a direct utilisation cost in advance of generator assets that do. This issue is wider than just offshore as the same scenario can exist where onshore TO reactive assets are installed. Therefore it is the view of the group that this issue should be considered under the fundamental review of reactive power to be undertaken under the governance of the Grid Code.

2 Purpose & Introduction

2.1 This document describes the work and considerations of the Balancing Services Standing Group (BSSG)[1] in regards to the commercial arrangements for offshore Power Stations and the Obligatory Reactive Power Service (ORPS).

2.2 This document also contains details on an industry consultation and associate responses together with the BSSG findings and conclusions.

2.3 At offshore 'Go-Active' on 24 June 2009 the industry codes (Grid Code, Balancing & Settlement Code, System Operator – Transmission Owner Code and the Connection & Use of System Code) were modified under the direction of the Secretary of State for the purposes of introducing an offshore regime. The changes were primarily designed to facilitate the introduction of competitively tendered transmission networks offshore.

2.4 The principle function of the offshore regime was to classify any offshore subsea cable operating at a voltage of 132kV or above as transmission, thereby requiring the owner of the cable to have a transmission licence. These transmission licensees are otherwise known as Offshore Transmission Owners (OFTO). This principle is applicable to existing offshore generators who previously owned such cable as well as potential Power Stations connecting in the future. In the case of existing generators the subsea cable must be transferred to the OFTO by offshore 'Go-Live'[2].

2.5 During the development of the offshore regime the provision of reactive capability was considered by the Offshore Transmission Expert Group (OTEG). The group made two key recommendations;

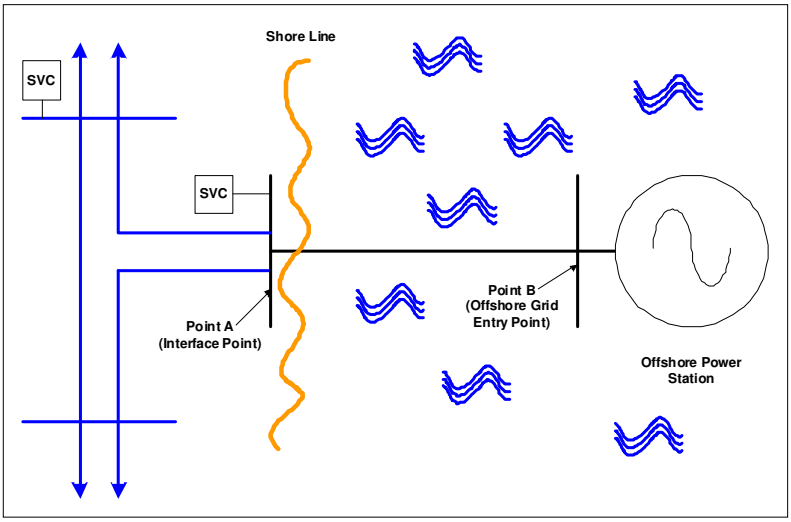
- As a minimum Offshore generators should be able to meet a zero transfer unity power factor (plus appropriate tolerances) at the Offshore Grid Entry Point[3] (OGEP)
- The OFTO should ensure a 0.95 lead and lag power factor capability is delivered at the onshore entry point, otherwise known as the Interface Point.

The figure below illustrates an offshore connection and includes both the Interface Point and the OGEP.

[1] The BSSG is a Standing Group established by the CUSC Amendments Panel to consider the development of Balancing Services under the CUSC. Further information is available at National Grid: Balancing Services Standing Group (BSSG) Meeting Documents

[2] The date of offshore 'Go-Live' is specific to individual generators rather than a single date applicable to all

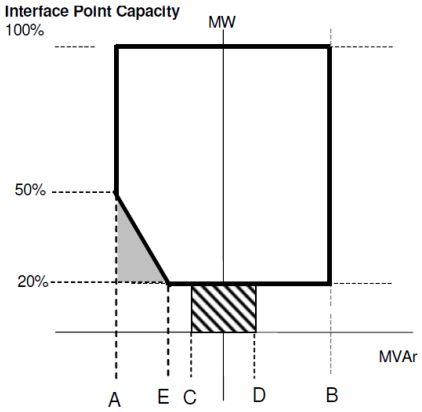
[3] Ownership boundary of the Power Station



2.6 The Grid Code, based on these recommendations, was modified for offshore Power Stations in regards to reactive power capability. This resulted in divorcing the respective requirements between onshore and offshore Power Stations. Specifically the Grid Code, CC.6.3.2 (e) specifies that the offshore generators must be capable of either; zero reactive transfer at the LV Side of the Offshore Platform (with a 5% tolerance) for all active power output levels under steady state voltage conditions, or have an alternate capability as agreed between the generator, the offshore transmission licensee and NGET.

2.7 The OTEG recommendations for OFTOs were implemented within the STC[4]. However while the overarching obligation is placed upon the OFTO, the STC and Grid Code allows for the contribution of generator owned assets to the OFTO obligation, where agreement between the NETSO, the OFTO and the generator is reached. The extract below illustrates the OFTO requirement.

Figure K1



Point A is equivalent (in MVAr) to 0.95 leading Power Factor at active power transfer equal to the Interface Point Capacity.

Point B is equivalent (in MVAr) to 0.95 lagging Power Factor at active power transfer equal to the Interface Point Capacity.

Point C is equivalent (in MVAr) to -5% of active power transfer equal to the Interface Point Capacity.

Point D is equivalent (in MVAr) to +5% of active power transfer equal to the Interface Point Capacity.

Point E is equivalent (in MVAr) to -12% of active power transfer equal to the Interface Point Capacity.

[4] STC Section K2 references the full requirements on Transmission Licensees; http://www.nationalgrid.com/NR/rdonlyres/DE34BA62-ACE8-4E88-A038-0CC138181843/35311/STC_SectK_GoActive.pdf

2.8 Therefore through the Grid Code and STC there are three possible technical scenarios to reactive power capability from offshore generators.

1. No Power Station contribution

No agreement is reached with the generator for the offshore Power Station to contribute to the OFTO obligation. As a consequence the OFTO will need to procure its own apparatus in order to meet the requirements. In such circumstance the offshore Power Station will be required to maintain unity power factor (0MVAr) at the LV side of the Offshore Platform, allowing for a 5% tolerance.

2. No OFTO involvement

Agreement is reached between the parties for the Power Station to contribute and furthermore the Power Station has the capability to overcome the reactive gains and losses along the OFTO network to meet the reactive capability envelope at the Interface Point.

3. The Power Station and the OFTO both contribute

Agreement is reached between the parties for the Power Station to contribute to the requirement. However the Power Station is unable to meet the full OFTO obligation and hence the OFTO will need to procure its own apparatus in order to meet the remaining requirement. Within this scenario there are numerous possibilities as to the ratio of contribution between the OFTO and the generator apparatus, as well as numerous control philosophies as to how the assets should work together to achieve a compliant voltage control system.

2.9 Whilst the technical requirements under the Grid Code for offshore Power Stations were altered at offshore 'Go Active' the commercial arrangements for the service were not fundamentally altered. The BSSG have therefore undertaken to consider the commercial arrangements around the ORPS. The BSSG conclusions are detailed within this document.

3 The Commercial Arrangements

3.1 Further to the technical reactive power capability obligations upon Power Stations (contained within the Grid Code and Bilateral Agreements where applicable), Large[5] and Medium[6] transmission connected generators are also required to provide a reactive power System Ancillary Service[7]. The System Ancillary Service excludes synchronous or static compensation except as part of a Power Park Module. Consequently, OFTO reactive assets do not qualify for the service.

3.2 The CUSC Section 4, Balancing Services and Schedule 3 outline how the reactive power System Ancillary Service is commercially managed and paid for by National Grid in the role National Electricity Transmission System Operator (NETSO). In summary National Grid enters into a Mandatory Service Agreement (MSA) with each Large and Medium Power Station required to have reactive capability under the Grid Code[8]. Thereafter the Power Station is paid an industry wide formula derived price for each MVArh produced entering the transmission system. This is known as the Default Payment Mechanism (DPM) and the service is known as the Obligatory Reactive Power Service (ORPS).

3.3 At offshore 'Go-Active' the commercial arrangements around the reactive System Ancillary Services remained fundamentally unchanged. Consequentially the existing principles around which the regulatory regime is based will be applied to offshore Power Stations. The results of applying these principles to the three scenarios previously discussed in this document are outlined below;

1. <u>No generator involvement</u>
As no generator apparatus is providing reactive capability or is consequentially contributing to the ORPS, no MSA will be entered between the parties.

2. <u>No OFTO involvement</u>
As the generator apparatus will be providing reactive capability and is fully contributing to the ORPS, National Grid and the user will enter a MSA reflecting the reactive capability of the generators assets entering the transmission system, in exactly the same way onshore generators would be. In this instance all MVArh metered at that point will be paid the DPM.

3. <u>The generator and the OFTO both contribute</u>
As the generator apparatus will be providing reactive capability and is contributing to the ORPS, National Grid and the user will enter a MSA reflecting the reactive capability of the generators assets entering the transmission system. In this instance all MVArh metered at that point will be paid the DPM.

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[5] Power Stations with a Registered Capacity of; 100MW connecting to National Grid Electricity Transmission; 30MW connecting to Scottish Power Transmission and 10MW connecting to Scottish Hydro-Electric Transmission Limited any Offshore Transmission System.

[6] Power Stations with a Registered Capacity between 50MW and 100MW, within NGETs Transmission Area.

[7] Grid Code CC.8.1; link http://www.nationalgrid.com/NR/rdonlyres/83FD31D3-0F0E-4B20-8345-9636E0093453/44731/GC_CC_I4R5.pdf

[8] Additional rules apply where the Power Station has a reactive capability below 15MVAr

3.4 Any plant OFTO owned contributing to the reactive power capability obligations defined under the STC will be subject to the agreed rate of return as part of the terms of the transmission licensee appointment. The agreed rate of return is levied from the Users of the network through the Transmission Network Use of System charge (TNUoS). Specifically the costs associated with reactive assets are recovered through the local circuit elements of TNUoS as outlined in paragraph 2.50 of the Use of System Charging Methodology[9]. As a result the offshore generator's tariff will recover the majority of these costs over the transmission licensee twenty year regulatory revenue streams. The remaining costs will be spread across the industry through the residual element.

3.5 In addition to the charging methodology revenue stream applicable to OFTOs, National Grid is unable to procure Balancing Service from other transmission licensee as defined within National Grid's Transmission Licence.

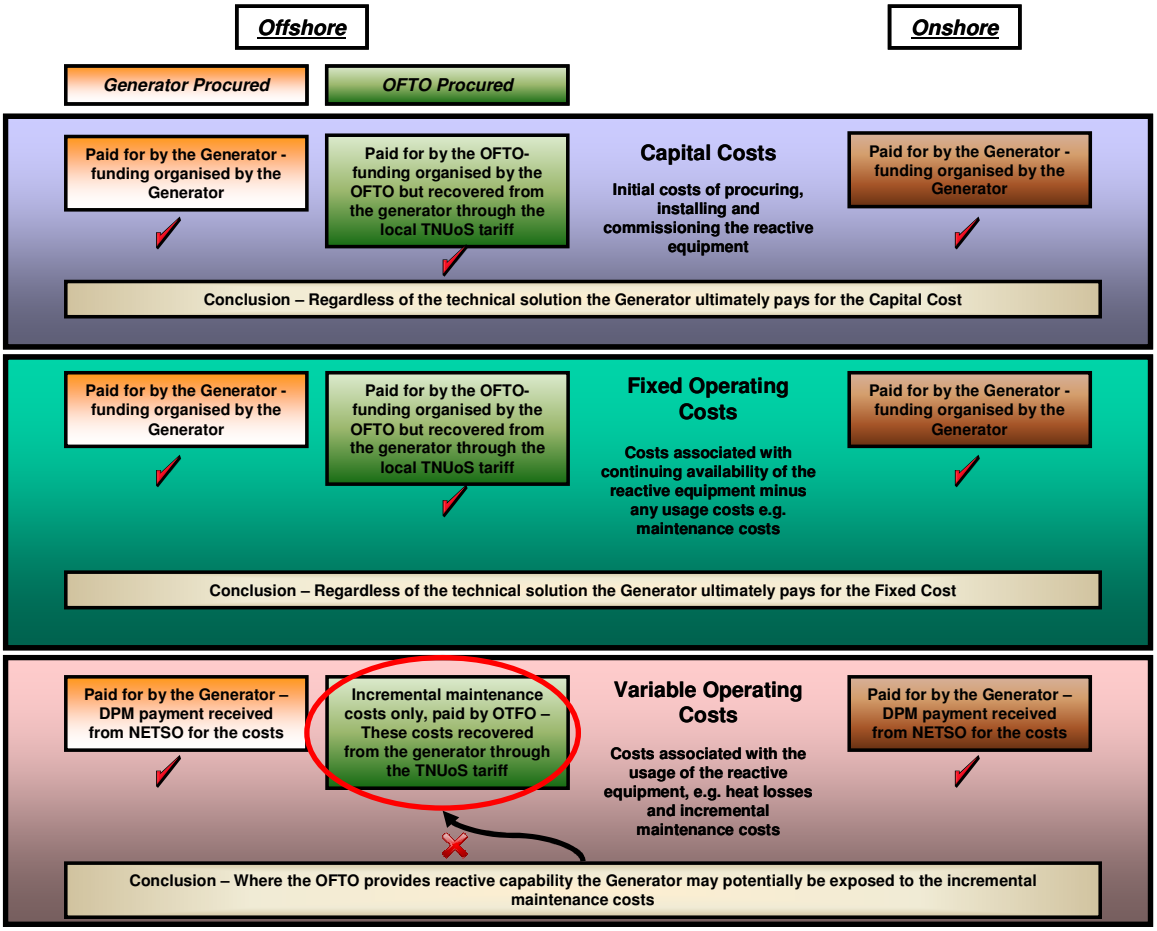
[9] Use of System Charging Methodology
http://www.nationalgrid.com/NR/rdonlyres/C20ACF42-4D18-45C1-ACBF-CB52D3D7C481/43444/UoSCMI6R3v10Final.pdf

4 Onshore vs. Offshore Comparison

4.1 Upon considering the existing commercial framework prevalent to offshore generators the BSSG undertook to examine the comparison between the reactive costs and revenues of offshore generators as opposed to onshore generators. This comparison took account of the whether the generator or the OFTO owns the assets.

4.2 A principle approach to this examination was taken for the purposes of the comparison. The costs and revenues have been broken down into specific categories capital costs, fixed operating costs and the variable operating costs, the figure below summarises these against onshore and offshore generators. Within offshore this is further broken down into generator procured and OFTO procured reactive assets. The ticks indicate where the analysis suggests the principle is consistent and the cross indicates where a difference exists.

Summary of offshore vs. onshore Power Station and the cost and revenues of reactive power



4.3 It can be seen that the summary above does not explicitly consider scenarios where a combination of OFTO and generator assets are utilised. This is because there are only two different costs and revenue steams, i.e. the principles still apply to the constitute parts within any combination solution.

Capital and Fixed Operating Cost

4.4 The summary illustrates that within the current regulatory regime, the capital costs and fixed operating costs are for all intent and purposes

costs borne by the generator regardless of whether Power Station is onshore or offshore. This is notwithstanding where the generator provides the reactive capability there maybe choices as to how the funding is secured and repaid as opposed to where the OFTO provides the capability and charges the generator through the prescribed charging methodology. It is also accepted that the exact costs of reactive power capability will be specific to the individual projects and could differ significantly from project to project. Within a combination scenario the generator will directly bear the costs on any asset they own and indirectly bear the cost for any OFTO asset. Principally, this is not considered inconsistent with scenarios where the generator providers all the reactive capability or where the OFTO provides all the capability.

Variable Operating Costs

4.5 However, when considering the variable operating costs, it can be demonstrated that a potential difference exists between onshore and offshore Power Stations. Although it should be noted the difference is not directly attributed to being offshore but rather whether the OFTO is providing the capability or the generator. To put another way, where the offshore generator provides the reactive capability the arrangements are considered consistent with those of the onshore generator.

4.6 As highlighted within the figure above the variable operating costs are those incremental costs incurred as a result of providing a reactive power service to National Grid, specifically these are the maintenance costs and the current losses from the reactive equipment. The CUSC[10] states primarily that the DPM should be based on the variable costs of Power Station providing the ORPS. Consequently, only Power Stations owning reactive assets providing reactive power will be entitled to DPM, to cover the variable operational costs incurred; OFTOs with reactive capability are not entitled to DPM.

4.7 However as previously mentioned the costs of any OFTO reactive assets will be charged back to the offshore generator through the local TNUoS charge, this is assumed to include the operating costs[11]. Therefore while there is no DPM payment for OFTOs, they will still incur the variable operational costs which will be forecast by the transmission licensee and charged back to the offshore generator. On further consideration of the variable operational costs that the OTFO will be exposed to it is apparent that a significant element of the variable operating costs will not fall on the transmission licensee, namely the current losses. This is by virtue of the OFTO owned equipment being classified as transmission. Any associated energy losses will be treated as transmission losses as defined under the Balancing Settlement Code (BSC) and socialised amongst the generators and suppliers participating within the wholesale electricity market through the Balancing Service Use of System (BSUoS) charge[12].

4.8 While this paper discounts the heat (current) losses as a differential between generators providing reactive capability and those that do not. An inconsistency does exist when considering the incremental maintenance requirements of the reactive assets cause by the usage of the equipment. The generator providing the reactive power will be directly remunerated via the DPM for the maintenance costs where as

[10] Section 1 of Appendix 7 Charging Principles within Schedule 3 of the CUSC

[11] This report assumes that the successful OFTO charges will reflect their forecast costs base

[12] BSC Section T Settlement and Trading Charges, paragraph 2 contains the treatment of Transmission Losses.

the generator not providing will be charged the forecast[13] costs of maintenance by the OFTO while receiving no income themselves.

4.9 As a proxy the following analysis has been used to gauge the materiality of the variable operating costs. Using the example of a 200MW offshore Power Station, a reactive power range of ±66MVAr will be required to meet the STC section K obligations. Assuming that static compensation is used to perform a large part of the compensation duty required to cater for the capacitive gain of the offshore cable, (i.e. the generator is maintaining zero reactive output at the OGEP), and Static Var Compensator (SVC) with a capability of approximately ±80MVAr is likely to be needed. Assuming that the equipment will be designed such that losses are minimised in the most heavily used operating range, these are likely to average 0.3MW[14]. The costs are estimated as;

- Heat losses in such a scenario could be approximately £197k per annum[15]
- Maintenance costs could £10k [16]per annum

4.10 As the analysis shows the majority of the variable operating costs are contained within the heat losses which in principle are consistent between onshore and offshore generators in so far as the generator should be held neutral to the cost. While National Grid estimates the maintenance cost to be approximately £10k it cannot be easily ascertained how much of that figure is to be allocated to the fixed maintenance cost (generator bears the cost of) and how much is the incremental maintenance cost incurred by the utilisation.

4.11 In conclusion it is the view of the BSSG that offshore generators that don't fully meet the OFTO reactive capability obligation could be exposed to additional costs as compared to those that meet the OFTO obligation or onshore generators. Although through the example highlighted above it can be seen that the cost is not easily accurately identified. Further to this it should be noted that through the flexibility afforded within the offshore regime there is the potential for an offshore generator to make significant TNUoS saving by means of reduced cable rating as a direct result of having the necessary reactive assets located on the transmission system (interface point owned by the OFTO) rather than at the OGEP owned by the Generator. This comes back to the OTEG group recommendation which determined the reactive capability obligation should be at the onshore interface point based it being less economic to have additional cable rating to transfer the reactive power from an offshore point.

[13] OFTO as part of the tender process must submit their bid which includes the entirety of their charges over the 20 year term. Therefore the OFTO must estimate the costs over this term.

[14] Derived from loss characteristics of SVCs installed on the England & Wales transmission system and based on 80% utilisation within a +/- 20MVAr range

[15] Using a price of £75MWh

[16] Based on costs incurred in maintaining the England and Wales transmission system

5 Utilisation of Reactive Assets

5.1 The BSSG also considered National Grid's utilisation of reactive assets resulting from the offshore regime. It was identified that through this regime the NETSO could potentially instruct reactive power for the purpose of managing the voltage on the transmission system, from apparatus resulting in two different cost implications to the NETSO. Instructed generator assets will be priced at the DPM whereas OFTO assets will have no direct price [17]associated.

5.2 The BSSG considered this issue by examining two separate offshore scenarios.

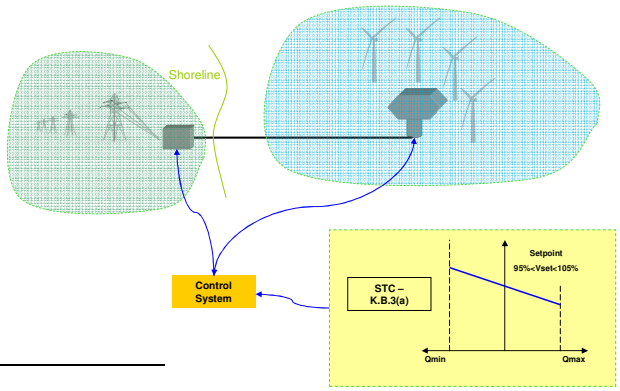
Scenario 1: Instruction of Power Station and OFTO from a single Reactive Capability

5.3 In the first scenario the offshore Power Station and OFTO both contribute towards the reactive capability requirements. However it has been identified that the regulatory regime is not prescriptive about the methodology employed to bring about the practical despatch of the reactive assets.

5.4 Further to this, given the flexibility provided by the framework a spectrum of different control philosophies will likely be employed that potentially could utilise the assets in different ways. For instance it is possible that the generator assets could be used to manage capacitive cable gain while the OFTO assets manage the dynamic voltage fluctuation or vice-versa. It is also conceivable that the generator and OFTO assets could employ an integrated control system, whereby the generator and OFTO assets work together dynamically. It should be noted that the design and implementation of the control philosophy is the developer's responsibility.

5.5 Whatever the control system provided, assuming the OFTO and generator can prove compliance with the STC and Bilateral/Grid Code respectively, National Grid should simply manage the control system provided.

5.6 There was a concern that given combined contribution scenarios, National Grid may despatch the OFTO asset to avoid the direct costs that would be incurred via the despatch of the generator. Should the choice of asset utilisation be available, then National Grid is mandated through it transmission licence to make the most economic decision, be it to despatch the generator and incur the direct cost or the OFTO and potentially increase transmission losses. However, it is believed that in the majority of cases a single despatch-able integrated control system will be provided to the NETSO which will not enable choice of despatch.



[17] National Grid is incentivised to minimise transmission losses which includes OFTO reactive assets

Scenario 2: OFTO Utilisation vs. onshore Power Station Utilisation

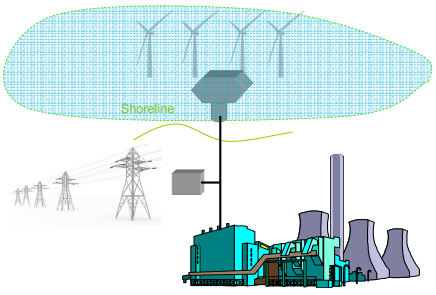
5.7 The second scenario considered two potentially competing providers; in other words the reactive output from the two providers could affect the voltage on the local network. The diagram below illustrates this scenario where there is an onshore Power Station located geographically and electrically close to an offshore Power Station where the OFTO is providing the reactive capability.

5.8 In the same manner as in scenario 1, where National Grid has choice of which asset to utilise the NETSO must take the most economic option. It is considered likely that this would be to despatch the OFTO asset rather than the Power Station. The rationale for this is driven from National Grid's obligation to operate the system in an efficient and economic manner[18] ensuring that end consumer costs are minimised where possible. This is also consistent with onshore TO reactive assets that potentially could despatched in advance of a local generator.

5.9 Whilst the BSSG acknowledges the NETSO actions in the highlighted scenarios, and the consistency with the use of onshore TO reactive assets, concern was expressed over the use of such assets and the consequential impact on competition from generators for reactive services in areas where the assets were installed.

5.10 Parallels between the potential use of OFTO reactive assets and use of onshore TO reactive assets can be drawn here. In effect where there are insufficient generation assets within a geographical region to practically allow the NETSO to manage the network voltage to the required standards, then TO assets may be installed to assist. The upshot of this is that the asset becomes available for NETSO use (without the direct utilisation costs) over all operational periods including those where sufficient generation assets are available. Therefore whilst the underlining reasons for the installation of onshore TO reactive assets and OFTO reactive assets is different, in both cases there is a potential impact upon competition for reactive services. However that said it is also the case that reactive power provision is only effective over a discrete geographical region in which the providers are located within. As a consequence the NETSO is only afforded limited options to ensure the voltage is maintained correctly.

5.11 The group considered that the issue of reactive power assets being installed as transmission assets and earning an administered rate of return and being available to the SO to despatch without direct cost should be considered as part of the planned review of reactive power arrangements.



[18] The Electricity Transmission Licence obligates National Grid to operate the system efficiently and economically

6 Industry Consultation

6.1 On the 3rd February 2011 the BSSG consulted the industry on the commercial arrangements and the comparison between offshore and onshore Power Stations as outlined above. The consultation is contained within Annex 1.

6.2 Six responses were received, from Cardiff Power, Centrica, Transmission Capital, EDF Energy, Thanet OFTO Ltd and RWE Npower plc, none were confidential responses. The responses received are contained within Annex 2. Below is a high level summary of the views received to each of the questions asked within the consultation. For completeness, there was a fourth question within the consultation which asked for any additional comments. This question is not summarised below.

6.3 Question 1 – Do you agree with the findings of the comparison between the offshore and onshore generator?

- Generally agreed – (4) Cardiff Power, Centrica, Transmission Capital, EDF
- Generally Not Agreed – (1) RWE NPower
- Neutral – (1) Thanet

6.4 Question 2 – Do you believe the commercial arrangements as described in the consultation are appropriate for the offshore regime?

- Generally Agreed – (4) Centrica, Transmission Capital (Generators), Thanet, EDF
- Generally Not Agreed – (2) Transmission Capital (OFTOs), RWE NPower
- Neutral – (1) Cardiff Power

6.5 Question 3 – Do you believe alternative commercial arrangements should be considered? If yes please describe those alternative arrangements.

- Yes – (3) Cardiff Power, Transmission Capital, RWE NPower
- Generally No – (2) Centrica, EDF
- Neutral Thanet

7 Industry Response and BSSG Response

7.1 The following section highlights specific points raised from the industry consultation and provides the BSSG response.

7.2 ***The consultation does not address the level of control the generator has in decision making (Cardiff Power)***

7.3 The consultation did not directly discuss the level of choice afforded to OFTOs and offshore generators as the consultation was not primarily concerned with the tender process. Also the consultation assumed that the tender process will output an acceptable reactive solution to both parties. While the offshore generator cannot directly chose their level of reactive participation[19], the tender process is likely to ensure that in most cases the generators preferred solution will be adopted. For example where a generator highlights their own reactive assets (be it from the turbines or from some form of static compensation) within the data room, it is likely that the successful tender, in producing the most economic bid will have utilised the available reactive assets rather than offering purely their own assets. It is accepted that the process can not guarantee an output which meets the generator preferred solution although it should be the most economic connection. This is notwithstanding the generator build option which gives the generator full control over the technical reactive solution.

7.4 ***The consultation does not address the likely optimum solution of the mixed asset ownership provision approach (Cardiff Power).***

7.5 Commercially there are only two scenarios for consideration, either the assets are generator owned or they are OFTO owned, which in turn have their own commercial arrangements. However, it is accepted and assumed that a number of projects will utilise both generator and OFTO assets to meet the overall OFTO reactive obligation. Furthermore, given that the analysis of this paper suggests the only difference between the two ownership options is within the variable operating costs, it is the view of the BSSG that the principle of the difference is the important factor to consider.

7.6 ***Has National Grid addressed the Ofgem/DECC statement that generators should be paid for the OFTO reactive provision (Cardiff Power)?***

7.7 Ofgem/DECC stated that they considered that offshore generators should be compensated for the costs associated with the OFTO-provided reactive power compensation equipment that they incur on a specific basis. As these costs will be of a fixed nature under current arrangements, we consider that there would be merit in NGET developing proposals for a capability based balancing services payment for offshore generators.

7.8 It is the view of the BSSG that this has been addressed through the investigation undertaken by the group together with the finding of the report. This is to the extent that the findings of the report do not consider that there is significant difference in the treatment of onshore and offshore parties under the current arrangements. However there is concern around the NETSO use of OFTO assets and the potential

[19] Generators submit information regarding the project, such as reactive capability, into the data room whereby the potential OFTOs can view the information to create their bids

impact this could cause upon competition within the reactive powers services.

7.9 ***What would happen in the case of multiple generators connected to a single OFTO (Cardiff Power)?***

7.10 The offshore regime has been designed to accommodate multiple generator connections through a single OFTO. The OFTO is obligated to provide sufficient reactive capability to meet the maximum transfer of active power through the transmission cable[20]. This therefore future proofs each transmission line to additional generators. It should be noted that where there is additional transmission capacity beyond the requirements of the current generators, then there is a discount in the local tariff so as to ensure that the existing generator is not over paying.

7.11 ***What about the impact of 'free' OFTO reactive provision on the reactive market (Centrica, RWE)?***

7.12 Given the current early stage of the offshore regime it is not possible to fully appreciate the extent to which OFTO assets that are sources/sinks of reactive power are likely to be installed. Consequentially it is possible neither to determine the contribution such assets will make to power system operation, nor the associated cost impact.

7.13 It should be acknowledged that the influence of specific assets to manage reactive power flows and voltage issues tends to be restricted to localised electrical areas and hence that OFTO assets are likely to be effective to manage such issues in close proximity to their point of connection to the onshore transmission system.

7.14 As discussed within section 5 there is concern about the impact of OFTO assets on the competition in the reactive power services. However, it has also been identified that this is the same impact that onshore TO assets could have upon the competition. Hence the group believes that this issue should be considered under the fundamental review of reactive power to undertaken through the Grid Code.

7.15 ***Will Tri-party MSAs be required (Centrica)?***

7.16 Within the current regulatory framework National Grid is able to contract directly with the generators for their contribution toward the OFTO obligation. As the contract is only for the generator contribution it does not require the OFTO to be party to the agreement.

7.17 ***How will National Grid instruct both OFTO and generator under 'the mixed' solution (avoid competing) (Centrica)?***

7.18 As highlighted within Section 5 Utilisation of Reactive Assets beyond the performance requirements defined within Section K of the STC for the overall reactive power capability, there are no prescriptive methods defined for how the generator and OFTO assets should work together. Whilst allowing maximum flexibility to the developers this could result in a number of individual solutions impacting on NETSO despatch which will need to be accounted for. It is credible that in some circumstance a single control system for both ownership assets is despatch-able where as for some situations the NETSO might need to despatch the OFTO and generator separately. However, National Grid will for each project understand the control philosophy employed, and as with any other part

[20] The STC section K defines the reactive capability against the Interface Point Capacity which the maximum amount of active power transferable at the Interface Point.

of the transmission network control power flows as necessary to meet the system requirements.

7.19 ***How will metering of reactive power be achieved (Centrica)?***

7.20 As with onshore generator, National Grid will utilise the offshore generators settlement meters located at the OGEP or else as defined under the terms of the BSC[21]. Where the meter is not located at the high voltage side[22] of the offshore platform, an adjustment factor must be agreed between National Grid and the provider.

7.21 ***What happens if an OFTO connects to OFTO (Centrica)?***

7.22 OFTO to OFTO connections have not been accounted for within the current frameworks, specifically concerning the technical requirements under the Grid Code and STC as they stand. In effect the codes assume all offshore connections to be radial in nature. It is envisioned that were OFTO to OFTO connections to become a viable option then significant modifications to the regulatory regime would be required at which point the BSSG believes that the commercial arrangements should be reviewed.

7.23 ***What about the impact on the OFTO assets from heavy use by National Grid due to the 'free' service? Also should there be an additional mechanism to cover the risk of heavy OFTO equipment use (Transmission Capital)?***

7.24 The BSSG believe that all transmission owners are exposed to the risks of asset failure and the group saw no compelling reason to consider additional options for OFTOs. It should also be noted, that this area is directly related to the offshore tender process and considerations in this area would be best taken place in a different forum.

7.25 ***To cover the difference between the maintenance costs of the OFTO asset should a separate bilateral contract between the two parties be consider (EDF Energy)?***

7.26 The offshore regime has been designed without the need for the OFTO and generator to contract. However that does not necessarily mean that they could not. Although without this being a mandatory requirement there would be no incentive on the OFTO to agree.

7.27 ***Within the generator build option, where the generator chooses to meet some of the reactive ability from the turbines, what is there to prevent the appointed OFTO from increasing their reactive asset base to meet the full compliance requirements (EDF Energy)?***

7.28 Developing under the generator build model will require the generator to comply with the relevant condition of the Grid Code. In reactive terms this means delivering 0.95 lead and lag power factor at the Interface Point. Therefore it is assumed that a compliance solution will be delivered (at least in the majority of cases). Once the project is complete, the transmission components will be transferred to the most economic offer made which should preclude any OFTOs wishing to increase the asset base.

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[21] BSC section K defines the meter requirements

[22] National Grid pays all providers of reactive power at the HV side of the transformer connecting the transmission network and the Generator network.

7.29 ***Are generators obligated to maintain unity power factor at the Offshore Grid Entry Point or is it just the capability to (EDF Energy)?***

7.30 Any offshore Power Station choosing to meet the minimum Grid Code requirements are obligated to maintain the capability of unity power factor at the OGEP. However, the Bilateral Agreement between National Grid and the provider will require the generator to maintain unity.

7.31 ***The original cost benefit analysis that underpins the technical requirements should be re-examined to see if the benefits still hold true (RWE)***

7.32 National Grid considers that the technical solution and the associated benefits from should continually be borne in mind so as to ensure inefficient developments do not occur. However, the BSSG is of the view that nothing fundamental has occurred that could impact upon the original cost benefit analysis. It has been further noted that the high degree of flexibility build into the technical solution provides extra confidence that the most efficient connections on a case by case basis will develop.

7.33 ***Is there a conflict of interest given that National Grid is party to the agreement on the reactive solution provided and despatch of the OFTO asset is currently free for NETSO use (RWE)?***

7.34 National Grid is party under the Grid Code and through the Bilateral Agreements to the reactive solutions. However, National Grid would only actively participate within the technical solution in instances where there was a belief that the solution could impact upon the integrity of the transmission system. In all other circumstances National Grid would not directly comment.

7.35 ***Should further consideration of potential other mechanisms be considered (Cardiff Power, Transmission Capital, RWE)***

7.36 The BSSG believe the current commercial arrangements for offshore generators are comparable to those onshore including when considering OFTO reactive assets. It is acknowledged that there is a small difference in the principle costs when the OFTO provides reactive assets. However this is confined to the incremental maintenance cost of the asset.

8 Conclusions

8.1 The offshore regime in bringing competition to offshore transmission ownership is complex. This is further complicated by the flexible options afforded to OFTOs and generators as regards to the provision of reactive capability.

8.2 The BSSG have examined and considered the commercial arrangements around the provision of reactive power from offshore Power Stations. Under the existing commercial framework offshore generators that contribute to the reactive power capability obligations placed upon the OFTO will be subject to the same arrangements as onshore Power Stations. Those that do not contribute are considered to not be providing a service and hence are not subject to the same arrangements.

8.3 Through a comparison of onshore and offshore generators it can be seen that in principle, there is minimal difference in the financial exposure for those generators providing and those not providing reactive power.

8.4 The analysis identified the difference as the reimbursement for the incremental maintenance costs incurred on the reactive equipment, received by generators providing reactive power, through the DPM payments. The example provided illustrated that for a 200MW offshore Power Station the cost of annual maintenance of static compensation owned by the OFTO in this scenario could be of the order of £10k. However, that this figure is the total maintenance cost and the generator should only receive income for the incremental maintenance costs and not the fixed costs.

8.5 Therefore the BSSG is of the view that the commercial arrangements for offshore generators are comparable to those of onshore generators. Consequently, the BSSG is not recommending any specific amendments for offshore generators at this time.

8.6 However the BSSG has expressed a concern regarding the potential NETSO use of OFTO reactive assets. OFTO reactive assets in the same manner as onshore TO reactive assets, once installed, do not have a direct utilisation cost to the System Operator, consequentially by acting economically the NETSO may be obligated to use such apparatus in advance of generators asset that incur the cost of the Default Payment Mechanism for any reactive power generated or absorb on behalf of the network. The BSSG believe that the impact of TO reactive assets should be considered within the fundamental review of reactive power to be undertaken within the Grid Code.

Annex 1 – The Consultation

[See attachment]

Annex 2 – Industry Response Received

[See attachment]

Annex 3 – Attendance

BSSG Member	BSSG Meeting							
	30/06/10	25/08/10	29/09/10	10/11/10	14/12/10	02/02/11	04/05/11	07/09/11
David Smith (NG)	Y	Y	Y	Y	Y	Y	Y	N
Emma Clark (NG)	Y	Y	Y	Y	Y	Y	Y	Y
Neil Rowley (NG)	Y	Y	Y	Y	Y	Y	Y	Y
Shafqat Ali (NG)	Y	Y	N	N	Y	Y	Y	Y
Tariq Hakeem (NG)	N	Y	Y	Y	Y	Y	Y	Y
Ivo Spreeuwenberg (NG)	Y	N	N	N	N	N	N	N
Steve Curtis (NG)	N	Y	Y	Y	N	Y	Y	Y
Malcolm Arthur (NG)	N	Y	Y	Y	N	N	N	N
Steve Lam (NG	N	N	N	Y	Y	Y	Y	N
Tim Tuscott (NG)	N	N	N	Y	Y	N	N	N
Nolan Robertson	N	N	N	Y	Y	Y	N	N
Nigel Fox	N	N	N	N	N	Y	Y	Y
Ewan Stott (Scottish Power)	N	Y	Y	N	N	N	N	N
Raoul Thulin (RWE)	Y	Y	Y	Y	Y	Y	Y	Y
Garth Graham	N	N	Y	N	Y	Y	N	N
Lisa Waters (Waters Wye)	Y	N	N	Y	N	Y	N	N
John Costa (EDF)	Y	N	Y	Y	N	Y	Y	Y
Chris Proudfoot (Centrica)	Y	Y	N	N	Y	N	N	N
Guy Philips (E.ON)	Y	Y	N	N	Y	Y	Y	Y
John Morrison (EDF)	N	Y	N	N	N	N	N	N
Simon Lord (First Hydro)	N	N	N	N	Y	Y	N	N
Hannah McKinney (EDF)	N	N	N	N	Y	Y	N	N
Ross Haywood (RWE)	N	N	N	N	Y	N	N	N
Nicholas Bradford (EDF)	N	N	N	N	Y	N	N	N
Sarah Owen (Centrica)	N	N	N	N	N	N	N	Y