

Stage 03: Report to the Authority

Grid Code

GC0063 – Power Available

What stage is this document at?

- | | |
|----|-------------------------|
| 01 | Workgroup Report |
| 02 | Industry Consultation |
| 03 | Report to the Authority |

This proposal seeks to modify the Grid Code to require intermittent generators to provide a power available signal. This will assist market participation of renewable generation and will improve system security.

The purpose of this document is to assist the Authority in its decision of whether to implement the proposed Grid Code Modification.

Published on: **20 November 2014**



National Grid recommends:

GC0063 should be implemented as it better facilitates Applicable Grid Code objectives (i), (ii) and (iii)



High Impact:

None identified



Medium Impact:

Owners, Operators and Developers of Power Park Modules or other generation with an uncontrollable energy source.



Low Impact:

Owners and Developers of Offshore Networks

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Any Questions?

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About this document

This document is the Report to the Authority for GC0063 which contains the responses to the Industry and Workgroup Consultations and the National Grid recommendations reflecting these. The purpose of this document is to assist the Authority in their decision on whether to implement the GC0063 proposed changes.

The revisions to the Grid Code proposed by National Grid and sent to the Authority require approval by that body and will, if approved, come into force on such date (or dates) of which Authorised Electricity Operators will be notified by National Grid, in accordance with the Authority's approval.

Document Control

Version	Date	Author	Change Reference
0.1	21 st May 2014	National Grid	Draft Report to the Authority
0.2	31 st October 2014	National Grid	Revised draft recirculated to workgroup
0.3	13 th November 2014	National Grid	Draft circulated to GCRP
1.0	20 th November 2014	National Grid	Submitted to Authority

1 Executive Summary

- 1.1 The Power Available Workgroup looked at how to provide the System Operator with a more accurate view of the available headroom for intermittent generators between their actual and potential output within Balancing Mechanism timescales; this concept or signal is referred to throughout this report as Power Available. This would allow the System Operator to better assess the possible frequency response or reserve actions from these generators, enhancing efficiency of operation and system security. It would also better facilitate market participation of intermittent generation in enhancing their provision of and recompense for response and reserve services.
- 1.2 The Grid Code defect that the Power Available Workgroup sought to address was associated with the provision of frequency response and reserve services by intermittent generators and the removal of barriers that may exist to their participation in these markets. The benefits of successful implementation will be that the System Operator is able to procure these services from intermittent generators, enhancing the security of the system, and that the generators will be able to participate in the market opening up another revenue stream to them.
- 1.3 By 2020 it is anticipated that in the UK there could be significant periods of time with very little conventional flexible generation running. Alternative sources of ancillary services must therefore be secured, of which wind would be the prime candidate. The need case for Power Available can be separated into two parts:
 - The identification of the issue and the need to do something – or the increasing need to understand the real time capability of wind farms when curtailed; and
 - The best option to take this forward.
- 1.4 Currently the real time potential maximum output of an intermittent generator is not accurately known by the System Operator, particularly if that generator has been constrained for any reason. This means that the System Operator is unable to call on intermittent generators to provide frequency response and reserve services. This presents the System Operator with an increasing operational challenge which will become more prevalent as the penetration of wind generation increases and will lead to the inefficient scheduling of services with potentially more expensive providers and the loss of associated revenues by wind farm owners.
- 1.5 Two items of data are presently submitted by Generators to provide the System Operator with a measure of potential generator output:

Physical Notification (PN) – which is submitted prior to Gate Closure

Generators are required to provide the best estimate (Physical Notification or PN) of their output for each half hour of the following day, which may then be revised up to an hour before real time (Gate Closure). This then becomes their Final Physical Notification which is used by the System Operator to determine the current generator output and forecast output going forward. The accuracy of PN-following for wind farms has been assessed to have an average deviation of 15% compared to a maximum of 5% for other generation types (see report item 6.8) owing to the difficulty in predicting possible output. A recent Grid Code change, C/11, removed the obligation for wind generators to follow their Physical Notification (PN), provided that they follow good industry practice i.e. submit PNs that are a true and accurate reflection of their estimated output at the time they were produced. This was introduced because wind generators can find it difficult to follow PNs due to the variable nature of their primary energy source. However, if a generator that participates in the BM is over-generating relative to its PN, in times of system

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stress BOAs issued to the generator to reduce output can result in zero payments to the generator for such volumes of over-generation.

Maximum Export Limit (MEL) – which can be changed at any time

BM Participants (generators) are required to submit Maximum Export Limit (MEL) data to indicate the maximum power that a BM Unit could export onto the transmission system. The MEL is used by NGET to determine the amount of power available to the System Operator over and above that indicated by PNs and is used in the despatch of frequency response and to determine reserve levels provided by the market. For wind generation, MEL can be perceived as being based on actual or predicted wind speed in order to calculate the actual or forecast maximum capacity respectively. However, this would require frequent updates to MEL which may not be practical compared to submissions from generation with controllable energy sources. Across the industry, there are different practices for submitting MEL; some parties put in MEL as installed capacity, some set MEL to PN and others provide a more dynamic MEL (i.e. a MEL dependent upon the actual availability and output of the plant at a particular time). A very low proportion of wind farms (1.4% - see 6.19) revise their MELs between gate closure and real time, however, indicating that this 'dynamic' view of MEL is far from prevalent.

- 1.6 As the PN can only be revised up to Gate Closure, this cannot be accurate or dynamic enough to provide the System Operator with a view of generator capability suitable for use in determining operational actions. The interpretation and use of MEL by generators at present is neither consistent nor, in general, dynamic but as it can be adjusted up to real time could provide a signal of suitable accuracy.
- 1.7 The workgroup therefore, while exploring the use of both PNs and MEL, only considered changes to MEL as a solution to the defect identified. Three possible alternatives were developed by the workgroup and were presented as part of the consultations:
- Option 1 - Standardisation of the MEL definition where the update frequency is a variable to be determined by the Generator;
 - Option 2 - Dynamic MEL (Power Available signal used to calculate MEL), with an update frequency of 10 minutes; and
 - Option 3 - Power Available signal to the National Grid Control Centre via SCADA data connections for 'new' windfarms connecting to the system from a date to be determined, and also with MEL redefined (for Power Park Modules only) to indicate connected capacity

A further two variations on option 3 were proposed during the discussions that followed the Industry Consultation:

- Option 3(a) - Similar to option 3 but without the redefinition of MEL. So purely the provision of an additional Power Available signal; and
- 3(b) Retrospective application of option 3, so applying to all new and existing wind farms

Finally, the option of instead doing nothing was also discussed. However, this was discounted as the defect had been clearly defined and was accepted by the Workgroup.

- 1.8 In the draft Workgroup Report as presented to the GCRP in May 2014, and based on the majority of consultation responses received, Option 3 was recommended as the best compromise to address the deficiencies identified. National Grid were comfortable with all of the options however and, although Option 3 was the preferred solution to the identified deficiency, Option 2, redefinition of a 'dynamic' MEL, would be equally appropriate and has the advantage that it seeks merely to improve the accuracy and consistency of an existing data item. This option was however unpopular in the Workgroup and

ensuing consultations, with a majority view being in favour of option 3 on the grounds that this would be cheaper and would not be applied unilaterally to existing plant.

1.9 At the May GCRP Meeting, issues were still raised as to the most appropriate way forward and there was an overall lack of consensus in which GCRP members sought:

- More information on the defect that Power Available sought to address;
- Greater confidence in the costs that would be incurred; and
- Clarity on any retrospective application.

1.10 To progress these issues, a special session of the Generator Services Group facilitated by RenewableUK was arranged on 16 September followed by a further meeting of the workgroup on 8 October 2014 to summarise and round-up the discussions, and also to seek an agreed conclusion. At this workgroup meeting it was agreed by all parties that there was a need to resolve the defect, and that Option 3 was the most acceptable way of doing this. The further variations on option 3 proposed at these meetings, 3(a) and (b) as above, were not supported as:

- For 3(a), any retrospectivity was seen as being an unacceptable cost that should not be mandated upon users; and
- For 3(b), the exclusion of MEL redefinition in option 3, it was agreed that it was preferable to leave this in as the provision of connected capacity data to the market and System Operator would support more effective wind forecasting.

1.11 While the recommendation of the workgroup as set out in this report is therefore still Option 3, the provision of a new Power Available signal, the report has been rewritten to address the points discussed in the May 2014 GCRP meeting and subsequently, being:

- (i) A summary of the defect is now provided in points 1.1 to 1.7 above and an expanded executive summary has been provided to improve the narrative.
- (ii) The costs that would be incurred in providing a Power Available signal for new plant are agreed to be extremely low since it has been confirmed that a power available signal is in effect already available in new wind turbines and is used in wind farm Grid Code compliance testing. Retrofitting of a Power Available signal could in some cases be significantly more expensive but will not be mandated. By contrast, provision of a dynamic MEL (option 2) would apply across the board since MEL can only have one definition, and where applied to existing generators could result in substantial additional costs making Option 3 more appropriate. The question of costs was posed in both consultations; the answers received from respondents did not express this in absolute terms but relative to the other options as detailed.
- (iii) Retrospectivity is confirmed to not be a feature of the option 3 proposal. Both Options 1 and 2 would apply equally to new and existing generators as they affect the way in which data is submitted to National Grid as part of the Balancing Mechanism. Option 3 however would only by default be applied to new Generators. The date of application to new plant has been moved from April 2015 to April 2016 in response to feedback.
- (iv) It is likely that to facilitate provision of response & reserve services National Grid will approach existing generators that are BM participants

to provide the Power Available signal, or that some of these parties will likewise be interested in providing this to enhance their participation in the response & reserve markets. This would be non-mandatory and by bilateral agreement only.

- (v) An action remains under the GCRP to consider the lessons learned from the Power Available workgroup and to feed these back to the panel. This would be particularly in terms of the timescales, the identification of the defect, the stakeholder engagement achieved through the workgroup and the group's ability to come to a reasoned conclusion.

Trialling

- 1.12 Trialling was discussed in detail at the final workgroup meeting of 8 October 2014. It could be used to demonstrate functionality and to prove that the end-to-end process could work.
- 1.13 NGET's opinion was that it was unclear what questions would be answered by trialling; from the use of a power available signal in testing, and the ability of manufacturers to provide and use a similar power available function in Ireland, it is already known to be feasible. And in terms of the process or system changes that would be required by NGET as the System Operator to use the Power Available signal, a clear methodology was presented to the workgroup in the final workgroup meeting on 8 October 2014.
- 1.14 Some stakeholders were of the view that trialling could answer questions and that it would be helpful to know before a Grid Code change was implemented that the solution worked and was effectively defined.
- 1.15 Trialling would add additional time delays to the effective implementation and roll out of the proposed Power Available signal requirement. On the grounds that the additional benefits of trialling are not clear and that the trialling approach did not have support from the majority of the workgroup it is not proposed to take this forward as part of the solution.

BOA Settlement Accuracy

- 1.16 An associated issue for the outcome of this Workgroup and the proposed way forward is the accuracy of BOA settlement. The Workgroup, and the majority of the consultation respondents, agreed that any of the proposed solutions could be used to improve this through more accurate data submissions. While the governance of BOA settlement would need to involve the BSC panel, it is the view of National Grid that the Grid Code changes associated with any of the options described in this report could be effected prior to the finalisation of any attendant BSC modification. Option 3 is essentially a hardware solution and, while offering potential for use in a future BSC modification, does not in itself impact BOA settlement on implementation.
- 1.17 National Grid recognises that an accuracy standard could be used rather than reliance on a best estimate commensurate with good industry practice; however it was concluded that the approach adopted for PN accuracy should similarly apply to MELs. It remains the case that an accuracy standard could apply to options 1 and 2 while the solution proposed in option 3 effectively makes greater accuracy achievable by referencing the Power Available signal but does not by itself change any of the existing BOA settlement arrangements.

2 Introduction

Background

- 2.1 The Grid Code Review Panel established the Power Available Workgroup in July 2012 following the completion of the C/11 Workgroup (BM Unit Data from Intermittent Generation).
- 2.2 Prior to establishing the C/11 Workgroup, the Grid Code Review Panel recognised that the existing Grid Code data requirements were developed at a time when the predominant sources of energy were not intermittent and that predicting the output is easier when compared with intermittent sources. The C/11 Workgroup was established to consider whether the Grid Code data requirements needed to be amended to facilitate the participation of generation powered by intermittent sources in the Balancing Mechanism.
- 2.3 The C/11 Workgroup made a number of recommendations concerning the Physical Notification and Output Useable¹ data flows and in addition to investigate (i) a new 'Power Available' signal (or another solution) used as a proxy for Physical Notifications for the management of Bid/Offer in real time and (ii) changes to the provision of MEL.
- 2.4 A Power Available Workgroup was subsequently convened to consider the C/11 recommendations as defined within the Power Available Workgroup Terms of Reference that were approved by the Grid Code Review Panel.

The Power Available Workgroup

- 2.5 The membership of the Power Available Workgroup is given at the end of this report in annex 7. The full proceedings of the workgroup are also detailed on the National Grid website at this link:

<http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-code/Modifications/GC0063/>

Benefits

- 2.6 At a high level, the proposals discussed as part of the Power Available Workgroup would help to facilitate:
 - The efficient integration, participation and operation of renewable generation into the energy market;
 - The opportunity for renewable generation to earn additional revenues from the provision of Balancing Services, for example reserve, Bid Offer Acceptances (BOAs) and frequency response;
 - Reduction in the need to take actions on out of merit alternatives; and
 - Enhanced system security by providing more options for the provision of balancing services particularly in regions where less generation with controllable fuel sources is available.
- 2.7 The above effects of the proposals would improve the efficient operation of the system and allow all BSUoS payers to benefit from reduced costs of the balancing mechanism.

¹ Output useable is defined in Grid Code as a forecast (daily or weekly) value based on the intermittent power source being at a level which would enable the genset to generate at Registered Capacity.

Workgroup Considerations

- 2.8 The Power Available (PA) Workgroup sought to better articulate the current and anticipated deficiencies in data flows that will become increasingly dominant in the future with the growth of intermittent generation. The identified deficiencies fell into two broad categories:
- Accurate settlement of Bid Offer Acceptances (BOAs); and
 - Operational data necessary for the System Operator to operate the Transmission System in an economic and efficient manner.
- 2.9 The Workgroup recognised that one solution to address both potential categories of deficiency may be possible however these would need to be progressed under separate governance arrangements.

Accurate BOA volume settlement

2.10 The PA Workgroup considered data flows that were relevant to accurate BOA volume settlement and further noted that the volume of BOAs (Accepted Bids) from intermittent sources in 2013 (Oct 12 – Sept 13) represent ~2.1% of the total volume. It also noted that the solutions being considered for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if this was considered necessary by BSC parties. Therefore, the PA Workgroup focused on the first broad category; operational data for the system operator.

Operational Data for the System Operator

- 2.11 The Workgroup recognised that when an intermittent generator has reduced its output, the System Operator has no visibility of what the potential headroom could be for the provision of reserve or frequency response if required for operational balancing of the system.
- 2.12 A number of options to overcome this deficiency were considered by the Workgroup:
- 2.13 Option 1 - Standardisation of MEL which would require MEL submissions that would be expected to vary with forecast intermittent energy source, where the update frequency was a variable to be determined by the User;
- 2.14 Option 2 - Dynamic MEL (Power Available signal used to calculate MEL), with an update frequency of [10 minutes]; and
- 2.15 Option 3 - Power Available Data via SCADA i.e. the submission of Power Available as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.
- 2.16 At the heart of these options is the Power Available signal, which is an indication of the maximum achievable output which could be delivered by an intermittent generator under the current prevailing conditions (e.g. weather), for example, the present output may have been reduced for the provision of balancing services to the system operator. It is defined as:

*A value / signal prepared in accordance with good industry practice, representing the instantaneous sum of the potential **Active Power** available from each individual **Power Park Unit** within the **Power Park Module** / **BM Unit** calculated using any applicable combination of meteorological (including wind speed), electrical or*

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*mechanical data measured at each **Power Park Unit**. The **Power Available** shall be a value of between 0MW and **Registered Capacity** which is the sum of the potential **Active Power** available of each **Power Park Unit** within the **Power Park Module / BM Unit**. A turbine that is not generating will be considered as not available.*

- 2.17 Whilst the means by which it may be provided and the frequency of update may differ for the options considered by the Workgroup, the underlying nature of the Power Available signal is the same and is based on the prevailing intermittent energy source and characteristics of the Power Park Units (e.g. wind turbines). However, options 1 and 2 would require the generator to create a MEL profile going forward and therefore would also need to include a forecast element. Conversely, option 3 would require a frequently updated signal corresponding to the spot value of Power Available which the System Operator would use going forward.
- 2.18 After consideration of the advantages and disadvantages of these options, the Workgroup concluded that option 3 (the Power Available Data Feed to National Grid Control Centre via SCADA data connections) would best address the deficiencies identified. It is envisaged that this option would only apply to New Generators with a Completion Date on or after 1st April 2016.
- 2.19 In exceptional circumstances where National Grid can reasonably demonstrate that a Power Park Module has a significant effect on the National Electricity Transmission System it may require some existing Generators to provide a Power Available signal. This would be subject to mutual agreement.



Workgroup Meeting Dates

M1 - 11 September 2012
M2 - 09 October 2012
M3 - 08 November 2012
M4 - 10 December 2012
M5 - 12 February 2013
M6 - 14 March 2013
M7 - 01 May 2013
M8 - 11 June 2013
M9 - 11 September 2013
M10 - 29 October 2013
M11 – 8 October 2014

- 3.1 At the July 2012 Grid Code Review Panel (GCRP), National Grid presented the concepts of Power Available and High Wind Speed Shutdown (minutes 2589 and 2607-2618) where it was proposed that a Workgroup should be established to examine whether the development of a Power Available signal would be appropriate for implementation by intermittent generators.
- 3.2 The GCRP agreed that this issue required further investigation and approved the draft Terms of Reference presented by National Grid (minutes 2590 and 2615 and pp12/34). The GCRP also recommended that, for efficiency, it may be appropriate to hold a joint Workgroup to discuss the two concepts, whilst ensuring that the two sets of terms of references were fully addressed. This report addresses the issue of Power Available.

Terms of Reference

- 3.3 A full copy of the Terms of Reference can be found in Annex 1. A summary of these as relates to the scope is though presented below:

The Workgroup shall consider and report on the following:

- Clearly define the defect that Power Available attempts to resolve by:
 - Quantifying the current accuracy of FPNs (PN at gate closure) from intermittent generators
 - Quantifying the volume of energy curtailed from intermittent generators
- Identify how the concept of Power Available can be implemented by:
 - Creating a technical standard to calculate Power Available across different intermittent generator manufacturers
 - Identify the method by which data will be collected
 - Identify the obligations on wind farms to collate data
 - Identify how data will be aggregated and converted into a Power Available signal
 - Assess the accuracy (based on time intervals) required for the provision of such data
 - Identify the technical equipment required
- Examine any required information systems changes
- Quantify the benefits to wind farms that can be gained from Power Available by:
 - Examining the potential volumes of generation that can utilise such a signal for settlement purposes, within both current and future connections
- Review the information that is currently available to wind farm operators and assess the value of this to National Grid as National Electricity Transmission System Operator (NETSO).
 - Take into account any analysis carried out by the High Wind Speed Shutdown (HWSS) Workgroup
- Identify additional items of information which could be of benefit and assess the value of providing these to National Grid as NETSO
- Assess the investment required to implement a minimal Power Available signal versus a highly accurate signal aggregated on a per turbine basis
- Examine how Power Available will operate under different scenarios such as:
 - high wind speed shutdown
 - turbine faults

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- Assess whether retrospective application of Power Available will be appropriate
- Assess whether other renewables should be taken into account
- Take account of and feed into the "High Wind Speed Shutdown" work being carried out under a Grid Code Workgroup
- Take account of the work in C/11 – BM Unit data from Intermittent Generation. This proposed a concept of calculating a generator's Maximum Export Limit (MEL) based on predicted/actual wind speed
- Take account of relevant international practice and the approach taken in European Code development.

Development of Scope

- 3.4 While the Power Available workgroup originally set out to consider Power Available in the context of both MEL and PN data, following discussion the deficiencies identified were refined to the ability of the System Operator to understand headroom when wind was curtailed in order to establish reserve and response levels.
- 3.5 It was acknowledged by the workgroup that the current Grid Code provisions for MEL and PNs work for conventional generation, and further that wind generation is capable of complying with the requirements of the Grid Code and indeed has to undergo compliance testing to establish this.
- 3.6 In NGET's view, however, wind farm operators' interpretations of the MEL definition and their subsequent data submissions remain inconsistent and therefore their MEL data is unreliable. This leads to the SO being unable to call on wind farms in the response and reserve markets.

Timescales

- 3.7 In total the Workgroup met 11 times between September 2012 and October 2014. The Workgroup reported firstly to the November 2013 GCRP with a draft of the final report to the Authority. Subsequently a Workgroup Consultation (which ran from 20 December 2013 to 27 January 2014) and then an Industry Consultation (7 March to 7 April 2014) took place to give interested parties the opportunity to input to this report and to inform the conclusions reached.
- 3.8 A revised version of the final report, based on the comments received during the consultations and the majority view of stakeholders, was presented to the May 2014 GCRP seeking approval for submission of the report to the Authority. At this meeting it became apparent that significant obstacles remained to reaching an agreed solution.
- 3.9 The report was further discussed at a special session of the Generator Services Group on 16 September 2014 and at a workgroup meeting on 8 October 2014. Following this it was revised again, recirculated to the workgroup for comment and presented once more to the GCRP in November 2014.

4 An Introduction to the System Operator Challenge



What is MEL?

The MEL is used by NGET to determine the amount of power available to the System Operator over and above that indicated by the PNs.

MEL is defined by BC1.A.1.3.1 of the Grid Code, as “A series of MW figures and associated times, making up a profile of the maximum level at which the BM Unit may be exporting (in MW) to the National Electricity Transmission System at the Grid Entry Point or Grid Supply Point, as appropriate.”

- 4.1 The Grid Code was written at a time when there were very low volumes of generation from intermittent power sources connected to the system. The Grid Code requires generators with intermittent power sources, such as wind, wave, or photovoltaic, to interact with the System Operator in the same way as a traditional generator with a controllable power source.
- 4.2 The System Operator receives a number of data items from generators (these are described in more detail in section 5) however two key data submissions are Physical Notifications (PN) and Maximum Export Limits (MEL). Essentially, PN indicates what a generator intends to output (typically between MEL and the Stable Export Limit (SEL)) and the MEL indicate what a generator is capable of outputting at any specific time if requested by the System Operator. Amongst other things, PN and MEL allow the System Operator to:
- Calculate the total generation volume connected to the system and forecast to be connected going forward;
 - Calculate the available reserve on the system provided by the market;
 - Determine transmission constraints;
 - Amend generation output via Bid Offer Acceptances (BOAs) to match demand and manage constraints through the Balancing Mechanism;
 - Hold additional reserve on generation to meet operational requirements; and
 - Despatch frequency response from generation in order to manage the system frequency within operational and statutory limits.

System Balancing

- 4.3 The Grid Code envisages that the System Operator aggregates the sum of all notified PNs and compares this with the forecast demand profiles. The SO then plans to take balancing actions to modify the notified total generation to meet the forecast demand. Some of these planned actions can be short term actions that can be taken in real time. Others, such as the starting up or shutting down of entire BM Units, require action to be taken many hours in advance.
- 4.4 The main way in which the System Operator balances generation and demand in real time is by issuing Bid Offer Acceptances (BOAs) that vary generator outputs. BM Participants can submit a series of prices to offer to increase their output from a BM Unit from their PN up to their MEL, and to bid to reduce their output from a BM Unit from their PN down to their SEL.
- 4.5 This process works well where the generating plant operators can control the power source. However, the System Operator is uncertain how effective this process is for generation with an intermittent power source given that such BM Participants may be unable to accurately forecast their output 1 hour ahead of real time for the whole of the relevant balancing period. Such generators will also generally seek to maximise output at any point in time and will therefore only seek to participate in the BM to be deregulated; increasing output will not be possible.
- 4.6 The System Operator may also take BOAs, or other balancing actions, to resolve constraints on the Transmission System. These may be thermal constraints, determined by the maximum total post fault capacity of all the

circuits connecting one area of the system or may be due to voltage or stability constraints.

Frequency Response

4.7 Frequency response is despatched by instructing a generator to operate in a frequency responsive mode of operation. The volume of response is specified through the Grid Code based on the Registered Capacity of each Generating Unit or Power Park Module and confirmed through compliance tests following commissioning. These tests are used to derive the Frequency Response Matrix, but the actual frequency response available in the operational timeframe is determined by establishing the output of the generator relative to its Maximum Export Limit and deriving the frequency response capability at that operating point from the tested frequency response matrices. Typically, the System Operator will change the operating point of the generator via a BOA to obtain the required frequency response capability.

Intermittent Generation trends

4.8 The projected profile of generation that will be connected to the system in the coming years to 2035 is shown in Figure 1 below. It can be observed that the majority of new connections over the next 5-10 years are by wind farms. This chart is based for the next few years on data in National Grid's Transmission Entry Capacity (TEC) Register but beyond this also includes National Grid's views on future generation scenarios.

Demand and generation background: Gone Green

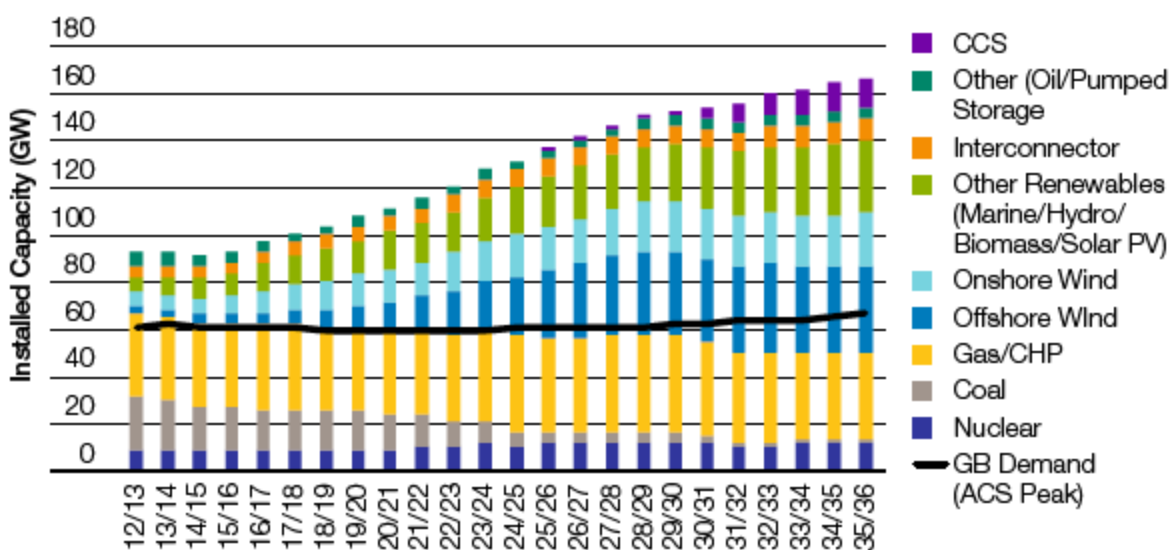


Figure 1 : Demand and Generation Background: Gone Green 2013.

4.9 In order to manage the system efficiently, the System Operator requires a clear understanding of the output that a generator is capable of given the available power source and any associated uncertainties. This understanding will become more important as the volume of intermittent generation grows. In addition the System Operator is continuing to improve its wind forecasting capability to support operational decisions it must make in advance of real time. The wind forecasting process employed by the System Operator is described in section 6.33.

4.10 At present, BOAs would normally only be taken on wind generation to manage specific system constraints, rather than just to balance energy. However, the System Operator considers this likely to change in the next few years as wind generation forms a greater proportion of the overall generation mix. National

Grid has already had occasions of wind generation contributing over 25% of minimum demand on a windy summer night.

- 4.11 As intermittent generation grows in volume, the System Operator expects its use of balancing actions and frequency response from intermittent generation to grow. This will particularly be the case during periods of low demand and high wind where use of services from intermittent generation may be the most economic solution. If this were not possible, services would need to be procured from other sources (e.g. interconnectors, generation, demand, energy storage) that would not ordinarily operate during such market conditions and are therefore likely to be more expensive options. In addition to this, wind power is technically well placed to provide rapid frequency response which will be required during periods of low system inertia that result from lower demand minimums and reduced levels of rotating plant synchronised to the system.
- 4.12 There are parts of the National Electricity Transmission System (NETS) where wind generation is providing an increasingly dominant contribution to flows across constrained boundaries and therefore the use of BOAs from intermittent generation may be the most economic option available to manage the constraint. The constraints on these boundaries will be impacted by planned transmission outages, connection of generation under the Connect and Manage regime and insufficient transmission capacity to cater for the available generation and prevailing demand.
- 4.13 Given these trends, the System Operator needs to consider whether it will be able to continue to efficiently manage the Transmission System with the data flows it is currently entitled to receive as defined in the Grid Code and subsequently provided by intermittent generation. The remaining sections of this report address the terms of reference of this Workgroup.

5 Specific Issues for the System Operator

- 5.1 This section describes 3 challenges to the System Operator's ability to efficiently manage the Transmission System. These are:
- Awareness of head room from intermittent generation when curtailed;
 - The provision of frequency response from intermittent generation; and
 - For MEL and PN data, the difference between data submitted and the actual physical outturn.
- 5.2 The System Operator performs a residual balancing role and the costs of actions it takes to ensure that the system is operated in a safe, secure and economic manner are recovered from consumers through the Balancing Services Use of System (BSUoS) Charge.

Headroom from Intermittent Generation

- 5.3 Headroom, as used in this report, is the capacity of a Generator to increase its output from its current operating point. Typically, headroom is created following an earlier BOA Acceptance to reduce output or where a Generator is part loaded in response to market conditions.
- 5.4 As noted in section 3, the System Operator may require generation to reduce or increase output by Bid Offer Acceptances in the Balancing Mechanism. At present, this occurs infrequently for intermittent generation and typically only behind an export constrained boundary. However, given the anticipated growth in wind generation, the System Operator expects such actions to become more common in future. Generally, the System Operator does not receive an indication of whether wind generator reductions can be reversed, i.e. whether they have headroom. This lack of visibility of headroom from wind generators can lead to other plant types being despatched to increase output, which may be less economical and more carbon intensive than despatching a wind farm. Similar considerations may apply to other forms of variable generation.
- 5.5 In discussing the lack of visibility of headroom from wind farms, the example below illustrates the case that, after a Bid/Offer Acceptance (BOA) to reduce a generator's output, PN and MEL do not give an indication of its headroom. As noted in paragraph 4.3, any discrepancies between these data flows and the actual positions they are intended to represent create errors and uncertainties which, in aggregate, can lead to wider imbalances between generation and demand, less optimal management of system reserve (headroom), frequency response and constraints with consequential increased costs passed on to end consumers.

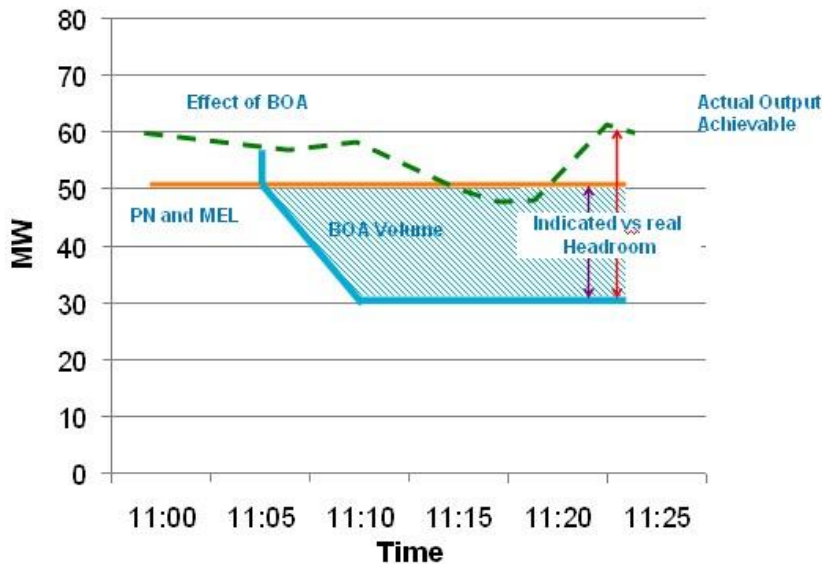


Figure 2: Illustration of the limitation in using PN and MEL data submitted to determine actual headroom

Frequency Response from Intermittent Generation

- 5.6 Under the Grid Code, the majority of Generating Units² or Power Park Modules installed within a Large Power Station are required to have a frequency response capability. In the operational phase, a number of these Generators will be instructed to operate in Frequency Sensitive Mode and be required to provide frequency response to help ensure that the system frequency is maintained within specific limits should there be a loss of Generation or change of Demand. As the instruction process relies on forecasted output through the combination of Maximum Export Limits (MELs) and PNs, it is important to ensure that the MEL and PNs remain accurate to set the baseline for such balancing services. Without this, the System Operator cannot be certain of the frequency response capability at a point in time.
- 5.7 The requirement for Power Park Modules forming part of a Large Power Station (which includes wind farms) to contribute to and have the capability to provide frequency control was introduced into the Grid Code in June 2005 following consultation H/04. Whilst wind generation is not widely used for contributing to primary and secondary frequency response at present, this is likely to change as greater volumes connect and displace plant with controllable power sources. Experience to date has demonstrated that, if the wind resource is sufficient, wind farms can deliver very good and fast acting response capabilities. Figure 3 below provides an example of how a wind farm can provide low frequency response.

² The obligations on Generating Units and Power Park Modules within a Large Power Station to provide frequency response are dependent upon size, type, location and Completion Date and defined in CC.6.3.7(e) and CC.6.3.7(f) of the Grid Code.

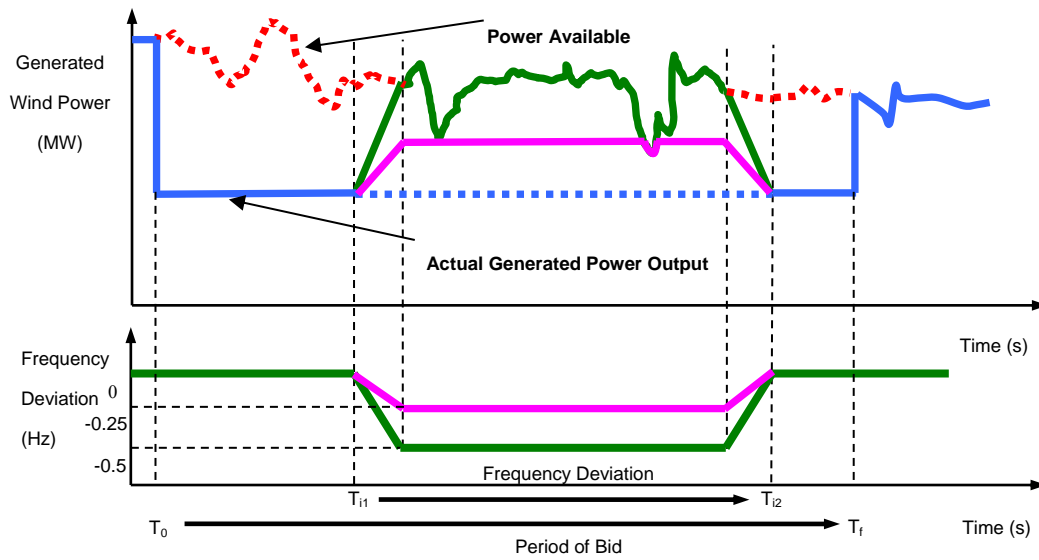


Figure 3: Example of low frequency response from wind generation

5.8 The actual performance of a wind farm in its ability to provide frequency response is shown in Figure 4 below. This was recorded during a Grid Code Compliance test.

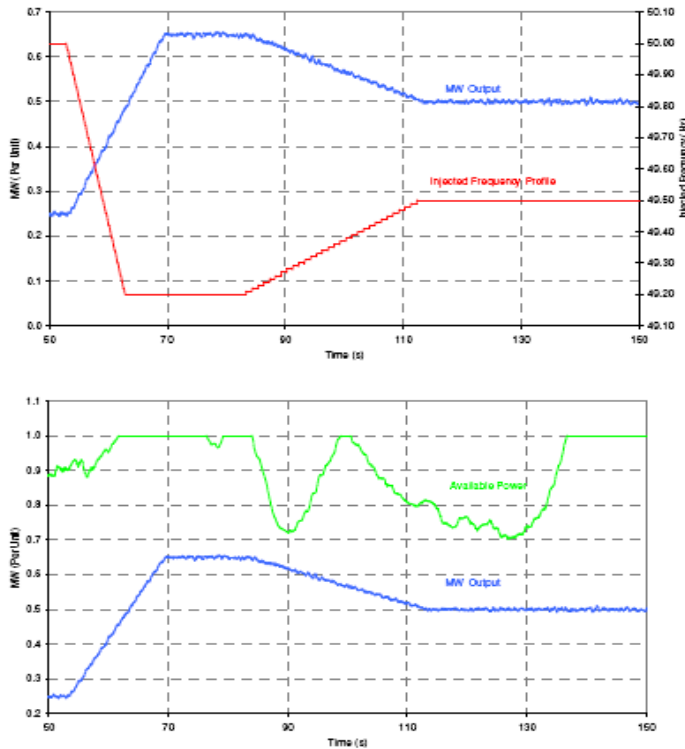


Figure 4: Example of frequency response from wind farm during a Grid Code Compliance test

Physical Notification and MEL accuracy

- 5.9 This is discussed in more detail in section 5, however the accuracy of the Physical Notification at gate closure and the actual outturn does vary between different generation types. For example, PNs from generators with a variable primary energy source such as wind may not be as accurate as those from thermal or hydro generation.
- 5.10 There is an observed variation in PN accuracy between wind generators with some generators relying on default data.
- 5.11 PNs are submitted for each half hour trading period and the output from a generator with a variable primary energy source is likely to vary within a trading period.
- 5.12 It is challenging for wind generators to provide a highly accurate PN for two reasons. Firstly, day ahead PN submissions may be subject to significant forecasting errors. Secondly, hour ahead PN resubmissions for a whole half hour trading period are an estimate of the average output for that trading period and while the PNs may be subject to less forecasting error over the whole trading period (compared to day ahead), the PNs ignore the reality that wind power may vary significantly within that period.
- 5.13 The average PN following error is described in more detail in section 6.6, however, this error means that the System Operator cannot always make operational decisions based on PN data submitted from wind generators.
- 5.14 As noted in the preceding paragraphs, MEL is used by the System Operator to determine the level of frequency response that a generator is capable of providing and the head room that is available. MEL is interpreted in a number of ways by wind farm operators and updated with varying frequency from hourly to monthly. At present, the System Operator cannot reliably use MEL data for the calculation of frequency response and head room.

6 Current Information Provision and its use

6.1 To help define the scope of the issues, the Workgroup discussed what information and data was currently being provided by wind generators and how this was used by National Grid. The objective was to consider whether the current data was sufficient for the System Operator and to ascertain whether new items were required. The main data items are set out below:

Pre Gate Closure Data

- Physical Notifications
- Bid/Offer data

Post Gate Closure Data

- Operational Metering Data
- Maximum Export Limits (MEL)
- Dynamic Parameters
- Wind speed and direction on a Power Park Module basis rather than from individual turbines.

Historic Recorded Data

- Recorded information received from data loggers such as Dynamic System Monitoring and Ancillary Services Monitoring equipment
- Historic recorded data from Compliance Tests including a Power Available Signal for frequency response testing purposes and test results

Planning Code Data

- Static data received under the Grid Code used for offline modelling and analysis purposes (Power Park Module MW, MVA and Performance Chart, Power Park Unit data including Control System Parameters and Power output / wind speed curves).

6.2 The generator licence requires the generator to comply with the Grid Code.

Physical Notifications (PN)

6.3 Under BC1.4.2 of the Grid Code, generators are required to provide the best estimate (Physical Notification or PN) of their output for each half hour of the following day, which may then be revised up to an hour before real time (Gate closure). This then becomes their Final Physical Notification which is then used by the System Operator to determine the current generator output and forecast output going forward.

6.4 The Grid Code defines the PN as:

“Data that describes the BM Participant’s best estimate of the expected input or output of Active Power of a BM Unit and/or (where relevant) Generating Unit, the accuracy of the Physical Notification being commensurate with Good Industry Practice.”

A PN can be profiled within a settlement period.

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- 6.5 A recent Grid Code change, C/11, removed the obligation for wind generators to follow their Physical Notification (PN), provided that they follow good industry practice i.e. submit PNs that are a reasonable attempt to forecast output based on the best information available at the time. This was introduced because wind generators can find it difficult to follow PNs due to the variable nature of their primary energy source. However, if the generator participates within the BM, in times of system stress, a £0 BOA may be issued to the generator to return to their PN.
- 6.6 Currently, in operational timescales, National Grid control engineers can elect to use either Physical Notifications (PNs) from a wind farm or existing MW metered output from the wind farm in calculating expected total generation between four hours ahead and real time. The reason for this is partly historic in that in the early days of wind power in 2005 and 2006 there was little enthusiasm from wind farms at that time to submit PN data. Many chose to submit nothing and others chose to submit zero. It was at this stage that it was decided that an internal wind power forecasting capability would need to be developed within National Grid. Over the subsequent years there has been a vast improvement in the quality and frequency of the data being submitted by wind farms.
- 6.7 In terms of timing, National Grid requires accurate PN data 90 minutes ahead of real time in order to plan the system effectively. There are three critical decision points where accurate information is important. At the day ahead stage (24 hours ahead of real time) National Grid requires accurate information to enable assessment of margins and headroom on the system. The critical point for deciding whether extra generation is needed to be warmed up and made ready to generate is 4 hours ahead of each cardinal point³ on the demand curve. After gate closure (1 hour ahead) adjustments are performed by Engineers at the Electricity National Control Centre to manage frequency and constraints. These adjustments and the settlement of them are performed relative to the PN submitted.

Current accuracy of PNs at Gate Closure compared with actual outturn from intermittent generators

- 6.8 Figure 5 below highlights the lower accuracy of wind generation PNs compared with other generation types up to October 2013.

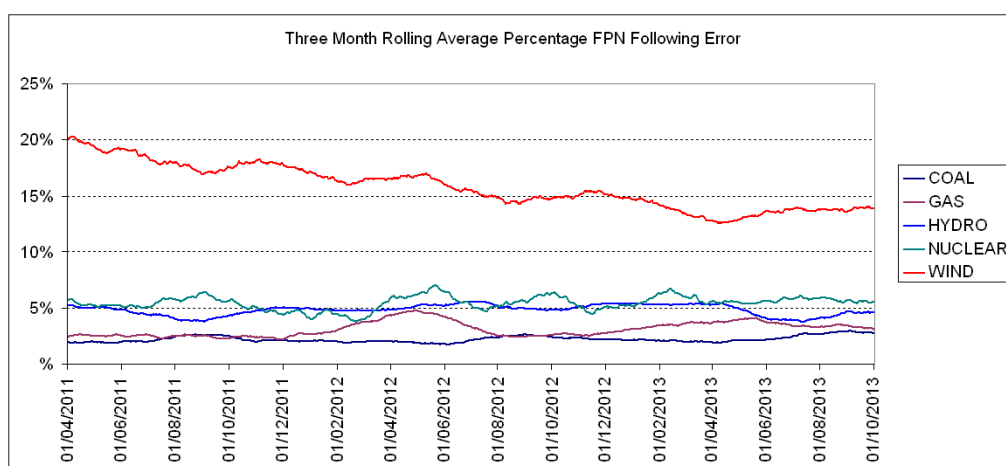


Figure 5: Comparison of PN following error between generator types.

³ Cardinal points are peaks and troughs in the national electricity demand across the day that the System Operator uses to pre plan transmission and generation actions

6.9 Percentage PN Following Error is defined as:

$$PN_{accuracy}(\%) = \frac{Average(ABS(PN_{GateClosure} \pm BOAs - MeteredOutput))}{MaxMeteredOutput}$$

6.10 The PN accuracy is defined as the average absolute difference in MWh per settlement period between the expected value (PN at Gate Closure modified by BOAs) and actual metered output, divided by the maximum metered output from the BMU. For example, a 100MW BMU that submitted a PN of 25MW with double that (50MW) for the metered output would yield an accuracy of 25%.

6.11 The analysis has been based on data from 1st January 2011 to September 2013 giving a 3 month rolling average from the start of April 2011 of the absolute difference in MW between expected (PN at Gate Closure) and actual metered output divided by PN at gate closure (FPN). The analysis was done for all BMUs with a maximum metered output greater than 10MW.

6.12 Figure 6 below illustrates the average PN following accuracy by Balancing Mechanism Unit (BMU) individual wind BMUs above 10 MW between January 2011 and September 2013.

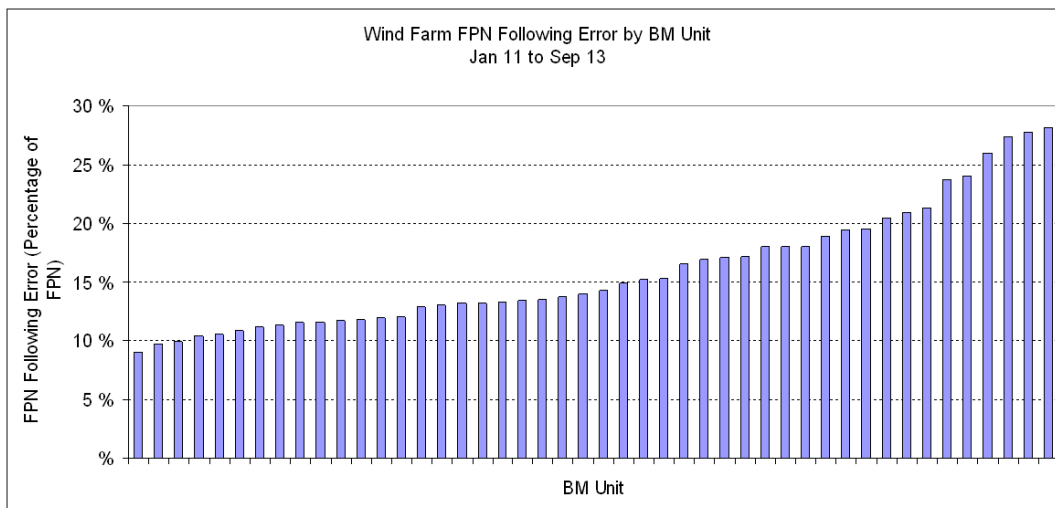


Figure 6: PN following accuracy by Wind BM Unit (Jan 2011 – Sept 2013)

6.13 The mean PN following error for wind BMUs over this period is 15.9%. This compares with 2.9% for coal, 3.1% for gas, 4.9% for hydro and 5.5% for nuclear over the same period.

Maximum Export Limits (MEL)

6.14 In addition to providing PNs, BM Participants (generators) also submit Maximum Export Levels (MELs) for each settlement period. This is the maximum power that a BM Unit chooses to make available via the Balancing Mechanism during the settlement period. The MEL is used by NGET to determine the amount of power available to the System Operator over and above that indicated by PNs and is used in the despatch of frequency response and to determine reserve levels provided by the market.

6.15 The MEL indicates the amount of capacity that is available on a particular unit and is submitted by a generator in order to help the System Operator with reserve scheduling. This may be submitted within gate closure and can be different from a generator’s PN. It is defined in the Grid Code as:

“A series of MW figures and associated times, making up a profile of the maximum level at which the BM Unit may be exporting (in MW) to the National Electricity Transmission System at the Grid Entry Point or Grid Supply Point, as appropriate.”

6.16 For wind generation, MEL can be interpreted as being based on actual or predicted wind speed in order to calculate the actual or forecast maximum capacity respectively. However, this would require frequent updates to MEL which may not be practical compared to submissions from generation with controllable energy sources.

6.17 The Workgroup acknowledge that, across the wind industry, there are different practices for submitting MEL; some parties put in MEL as installed capacity, some set MEL to PN and others provide a more dynamic MEL (i.e. a MEL dependent upon the actual availability and output of the plant at a particular time).

6.18 MEL is very important to provide National Grid with an indication of how much capacity margin is available on the system. For a marginal power station with a controllable fuel source, the difference between the PN and the MEL gives an indication of the headroom or spare capacity that is available to be instructed if needed by the SO.

6.19 On the basis of the analysis carried out using data up to September 2013, 1.4% of MEL submissions by Power Park Modules are changed between gate closure and real time. This compares to 1.3% for nuclear, 2.2% for CCGT and 3.8% for coal.

6.20 The graph below shows the percentages of MEL submissions that are changed (y axis) for each fuel type over various time frames. The data relates to the period April 2012 to September 2013. Generally, wind MELs were changed less frequently than other fuel types across all timescales, with the exception of hydro.

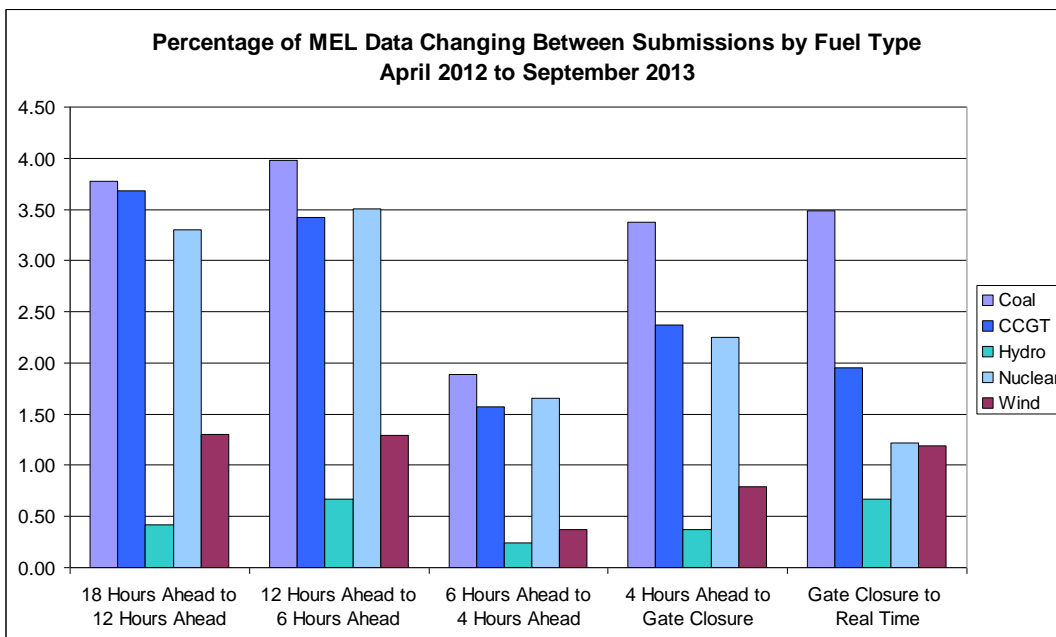


Figure 7: Percentage of MEL data changing between submissions by fuel type (April 2012 – Sept 2013)

6.21 If the submitted MEL was dependent on wind output, there would be a greater variation whereas, if MEL was based on the available capacity, there would be less variation. Figure 7 suggests that the MEL data was generally submitted on the latter basis.

Bid / Offer data

6.22 Bid / Offer data specifies MW operating points and the costs associated with deviating generation from its current operating point as indicated by its Physical Notification. These are very important in the decision making process at the National Electricity Control Centre. When Bids and Offers need to be accepted to manage system issues they are taken in cost order with the cheapest option taken before more expensive options, unless system constraints dictate otherwise. In this way, the need to optimise the geographical distribution of plant on the electricity transmission system is achieved in the most economic way.

Wind speed / direction

6.23 Wind Speed and Wind Direction is currently received from 50% of the BMU wind farms. This is around 45 sites at the present time. This information is used for two purposes. Firstly to verify the quality of the wind speed and direction forecasts provided by our weather forecast provider. If these forecasts are found to be inaccurate relative to the measured wind speed and direction at the wind farm site, then adjustments are made to the forecasting models to take this into account in the short term and feedback is given to the weather companies so that improved weather forecasts can be received in the longer term. Secondly the wind speed and wind direction measurement data is used to build more accurate models that enable more accurate forecasting by the System Operator.

Operational Metering

6.24 National Grid as System Operator, requires Operational Metering Data which is used for control of the Transmission System in real time. At the present time, National Grid requires aggregated wind speed and direction (amongst other operational metering signals e.g. MW, MVAR's, Voltage, tap position and frequency) for each Power Park Module, the requirements for which are specified in the Bilateral Agreement. At the present time if a fault occurs to the operational metering, National Grid would generally require it to be repaired within 5 days of notification of the fault unless otherwise agreed.

6.25 All the operational metering signals are generally treated in the same way within the Bilateral Connection Agreements, and it is usual practice for the generator to provide the specified operational metering signals to the Grid Supply Point. National Grid would then take these signals and provide the communications routes back to the National Electricity Control Centre at Wokingham. In terms of ongoing maintenance, National Grid will pay for the communications infrastructure from its Control Centre to the Grid Supply Point and the Generator will pay for the communications infrastructure from the Grid Supply Point to the Power Park Modules.

6.26 An example setting out the Bilateral Connection Agreement schedule and its description of the communication routes is described in Annex 3.

Power Available signal for testing frequency response

6.27 Generators are required to provide a power available ("Avail") signal to National Grid for compliance testing purposes only. These requirements are detailed in OC5.A.1.3 (c) and CC.6.6.2 of the Grid Code but in summary when a wind farm is undertaking compliance testing for frequency response testing

purposes, they will be required to supply a power available signal with a sampling rate of typically 10Hz. This signal however should not be confused with operational metering signals which are provided to National Grid for the purposes of operating the Transmission System.

Frequency Response

- 6.28 As noted in section 4.7 above, Frequency response from wind is despatched by instructing a generator to operate in Frequency Sensitive Mode (FSM). The volume of response provided is calculated using the de-load point from MEL and making reference to a frequency response capability matrix for the generator concerned.
- 6.29 The Workgroup noted that some wind farms (through operation of individual wind turbines) are capable of providing frequency response in two ways:
- Maintaining a set de-load from the maximum operating output given the prevailing wind conditions (i.e. the wind turbine output would follow the wind output less a fixed headroom); some wind turbines can operate in this way;
 - Operate at a fixed specified loading point below the maximum (i.e. the level of headroom and hence reserve would vary depending on wind speed in reference to the fixed loading point of the wind farm) varying output because of frequency changes only); all wind turbines can operate in this way;
- 6.30 The latter mode of operation is used in the GB. There is no suggestion that this will change, however it is worth noting that either mode of frequency response requires the same data flow to calculate the frequency response capability that is provided.

Wind Farm Data Collection and Signal Processing

- 6.31 In terms of data and signal processing, the required operational metering data is currently limited to aggregated wind speed and direction for each Power Park Module with a refresh rate of 5 seconds or better. The wind farm developer determines how to derive these signals either from a met mast or via transducers from the wind turbines themselves. It should be noted that such signals may already be available from the Wind Farm SCADA system which the wind farm owner and manufacturer will use for operational purposes. Presently, there is no standard for the provision of wind speed and wind direction operational metering other than the refresh rate.

Data Communications between wind farms and the System Operator

- 6.32 The System Operator receives data from all generators via Electronic Data Transfer (EDT), Electronic Data Logging (EDL) and Supervisory Control and Data Acquisition (SCADA). These are described in more detail in Annex 3 however the key characteristics are as follows:
- EDT – Generator data received from the Trading Point responsible for the wind farm. PN's and Bid Offer data are provided to the System Operator via this medium.
 - EDL – communication between the System Operator and Generating Unit or Power Park Module control point where BOA acceptances are issued and ancillary services instructions given such as frequency response and reactive power. Dynamic parameters such as MELs may also be communicated by this medium.
 - SCADA – all operational metering data and in the case of wind farms, wind speed and direction.-

- Contingency communications (e.g. fax)

How is current data used to derive System Operator forecast output?

6.33 The Workgroup questioned how current data on wind speed and PNs from wind farms was used to help derive a forecast of output and whether this had a large margin of error.

6.34 In the timescale 0 to 6 hours ahead, the aggregate wind forecast is a combination of the metered output (Persistence forecast) and the wind power forecast that has been derived from the weather forecast. The two results are combined together in a linear way. At the real time point (0 hours ahead) the forecast and the metered values are equal. At 3 hours ahead the result is 50% metering and 50% forecast. At 6 hours ahead the result consists of 100% of the wind power forecast and 0% metering. This is shown in Figure 8 below.

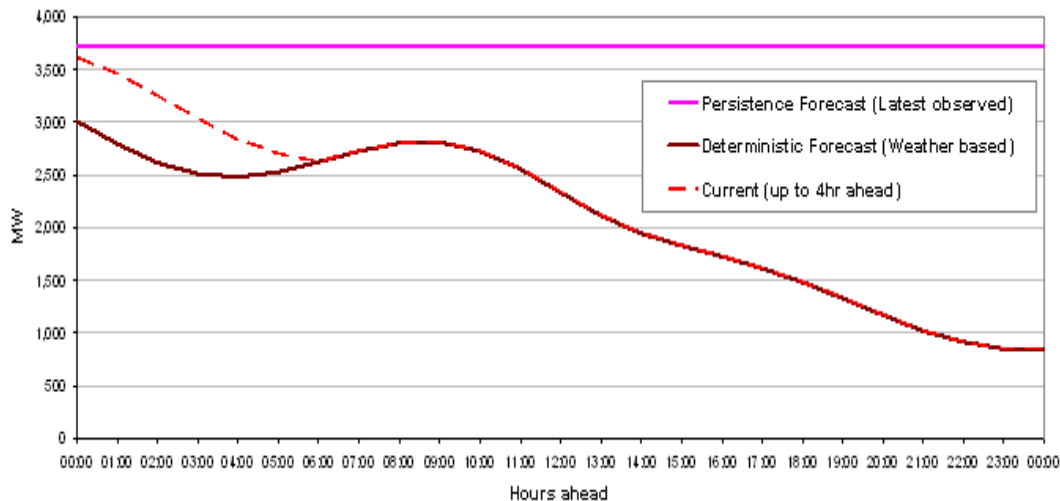


Figure 8: Wind Power forecast combining deterministic and persistence methodologies

6.35 The forecast output is constantly updated on a rolling basis as new metering data is received by the System Operator.

Wind Farm Operators' Wind Forecast Data

6.36 It was noted that wind farm operators that are party to the BSC require forecasting data flows for both trading purposes and the calculation of PNs. Some parties use a common forecasting system and data set for both trading and operational purposes whereas other parties take a separate approach.

6.37 At gate closure two data streams are submitted by, or on behalf of Wind Farms:

- Notifications from parties representing aggregated traded positions (MWh/Settlement Period) are submitted to the Energy Contract Volume Aggregation Agent (currently Elexon)
- Physical Notifications for each BMU are submitted to the System Operator

6.38 For wholesale energy trading, Trading Parties submit Notifications to the Energy Contract Volume Aggregation Agent (ECVAA, one of the agents mandated by the BSC) prior to gate closure and any differences between the Notified position and metered outputs (MWh / Settlement Period) are cashed out at the prevailing cash out price. For physical parties (i.e. generators), the Notified position in effect represents a forecast output at gate closure for the settlement periods concerned.

6.39 Any Bid Offer Acceptance (BOAs) volumes (MWh/SP for a BMU) accepted by the System Operator in the Balancing Mechanism are calculated with reference to the Physical Notification at gate closure and these volumes are added (or subtracted) to the Notified positions. This means that, assuming PNs are accurate; any imbalance exposure associated with BOAs is removed. BOAs are paid at the rates (£/MW) submitted by the Generator's Trading Point into the Balancing Mechanism. The following Figure 9 helps to explain this.

**Trading Party Account
(BSC data)**

**BMU data for SO (Grid
Code data)**

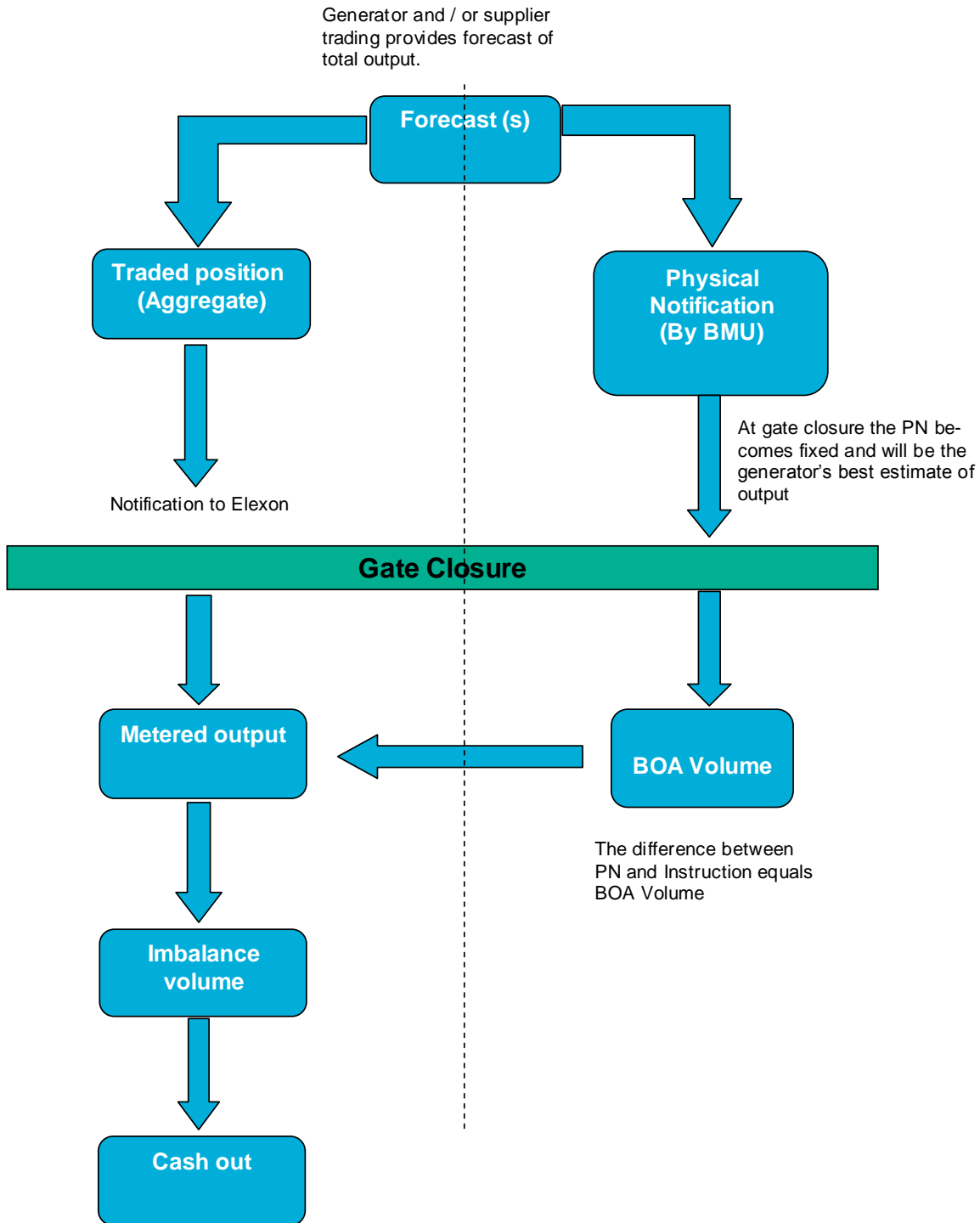


Figure 9: High Level Illustration of BSC and Grid Code data flows

7 Perceived Deficiencies

- 7.1 The identified deficiencies fell into two broad categories: operational data necessary for the System Operator to operate the Transmission System in an economic and efficient manner; and accurate settlement of Bid Offer Acceptances (BOAs).

Required Operational Data from Intermittent Generation

- 7.2 Assuming that no changes to wind power output need to be taken, the System Operator is currently able to undertake many of its overall activities where PNs and other data would ordinarily be used by using a combination of forecasting wind power output and wind output metered data. This assumes that wind output is maximised to harness the available wind.
- 7.3 Within Gate Closure, where an intermittent generator is requested to deviate from its preferred operating point (assumed to be maximised to harness the available resource) to a specified output via a BOA, the System Operator is uncertain what the potential output that Power Park Module could return to, should the need arise. This data would enable the System Operator to manage reserve levels and frequency response capability more efficiently.
- 7.4 For generation with a controllable power source, this is indicated by the Maximum Export Limit; however the current definition of MEL and the subsequent data that is provided from intermittent generation (e.g. wind) does not allow the System Operator to establish the level of headroom that is available for the reasons set out in sections 6.146.14 to 5.210. That is, there is a variation in the interpretation of the definition of MEL by wind farm operators and the level of accuracy that can be achieved.

Bid Offer Acceptance volume (MWh) accuracy

- 7.5 As already noted, the Grid Code defines the PN as:

“Data that describes the BM Participant’s best estimate of the expected input or output of Active Power of a BM Unit and/or (where relevant) Generating Unit, the accuracy of the Physical Notification being commensurate with Good Industry Practice”

A PN can be profiled within a settlement period. Inherently then, the PN data contains forecast data going forward.

- 7.6 BOAs can be issued to deviate intermittent generation to specific operating points, however the cost of taking a BOA is calculated with reference to the Physical Notification and submitted price. Any significant discrepancies between actual output and PN may therefore lead to an uneconomic decision by the System Operator and the incorrect settlement of a BOA.
- 7.7 Balancing and Settlement Code (BSC) modification proposal P197 (‘Erroneous Calculation of Bid Offer Acceptance Volume’) previously considered how BOA volumes could be calculated for a BMU where MEL was re-declared below its PN. P197 was focused on the scenario of thermal plant that re-declared its MEL below its PN, but still had its BOA volume calculated from PN. Similarities were noted with variable fuel source generation (e.g. wind farms) whose power output deviates from PN but their BOA volumes continued to be calculated from PN. P197 was understood to be rejected on the basis that, although it was an issue, this was not sufficiently material to warrant making changes to systems. It was noted that it may be appropriate for a BSC change to be considered addressing both the P197 issue and the deviation of variable fuel source generation from the declared PN, for example by calculating BOA volumes from an updated baseline.

- 7.8 The Grid Code Workgroup concluded that it was possible to use any of the options that were considered to address operational considerations (through the Grid Code) and to also calculate BOA volumes for Settlement (through the BSC). However, the Workgroup expressed different views on whether BOA volume settlement accuracy was an issue that needed addressing and, if it were, whether implementation of any BSC changes needed to be aligned and coincident with Grid Code changes. Therefore, the Workgroup considered it sensible to describe the potential settlement issues impacting the BSC that were apparent within this Workgroup report and then focus solely on progressing relevant Grid Code changes to address operational issues. Accurate settlement of Bid Offer Acceptances (BOAs) would be taken forward separately through BSC governance arrangements if this was considered necessary by BSC parties.
- 7.9 Although, from a practical perspective, it is possible to address 1) operational considerations through the Grid Code and 2) BOA volume settlement accuracy through the BSC separately (and with different implementation dates), differences of opinion were expressed over whether it was appropriate to implement any proposed changes to the Grid Code before any potential corresponding BSC arrangements were concluded.
- 7.10 The Workgroup recognised that the margin of error was higher within intermittent generation compared to other generation however the materiality was not thought to be currently significant but may increase in the future as intermittent generation volumes increase and the System Operator takes more balancing actions on intermittent generation. The following table shows the volume of BOAs in MWh taken between 1st Oct 2012 and 30th Sept 2013 by generator fuel source.

	CCGT	COAL	GAS	HYDRO	OCGT	OIL	WIND	Total
Volume of Offers	3,438,367	2,643,013	13,223,389	1,351,042	32,896	11,442	1,078	20,701,227
Volume of Bids	-2,680,321	-9,177,284	-9,657,549	-619,899	-4	-952	-467,835	-22,603,844
Percentage of Offers	16.6	12.8	63.9	6.5	0.2	0.1	0	
Percentage of Bids	11.9	40.6	42.7	2.7	0	0	2.1	

- 7.11 It was noted that any developments that may have implications on settlement of BOAs may affect Power Purchase Agreements that underpin investments in wind farms. Consequently, concern was expressed over any proposals that may affect settlement. As noted, further consideration of the terms of reference by this Workgroup concluded that settlement implications would be most sensibly progressed under BSC arrangements.

Benefits of addressing these perceived deficiencies

- 7.12 At a high level, overcoming these deficiencies will facilitate the efficient integration, participation and operation of renewable generation to supply electricity to GB consumers.
- 7.13 It would facilitate the opportunity for generators with a variable primary energy source to participate in the provision of Balancing Services (e.g. reserve, BOAs and frequency response) and earn additional revenues.
- 7.14 It would help avoid the necessity of taking actions on out of merit alternatives.
- 7.15 Where automation is possible, additional operational burden on renewable generation operators should be reduced.

- 7.16 It would improve the efficient operation of the system and potentially reduce BSUoS costs
- 7.17 Facilitating the provision of Balancing Services from intermittent generation will also enhance system security particularly in regions where less generation with controllable fuel sources are present.
- 7.18 In the long-term it is likely that the changes proposed in the provision of additional data items to solve these deficiencies should lead to a review of the existing data requirements under BC1 and BC2 of the Grid Code. However, this would have to also consider the extent to which any changes implemented applied only to new connectees going forwards or to all parties.

8 Description of Proposed Solutions

8.1 In considering the issues highlighted by National Grid, the Workgroup discussed whether or not changes were required to the existing processes or whether solutions could be sought which were outside of the current Grid Code obligations. Three options were found worthy of consideration during the workgroup discussions prior to consultations taking place and are described below

- Option 1 - Standardisation of MEL where the update frequency was a variable to be determined by the Generator;
- Option 2 - Dynamic MEL (Power Available signal used to calculate MEL), with an update frequency of [10 minutes]; and
- Option 3 - Power Available Data Feed to the National Grid Control Centre via SCADA data connections; MEL used to indicate connected capacity

8.2 At the heart of all of the options is the Power Available signal. Power Available is an indication of the maximum achievable output which could be delivered by a wind farm under the current prevailing weather conditions when, for example, the current output may have been reduced for the provision of balancing services to the system operator. It is defined as:

A value / signal prepared in accordance with good industry practice, representing the instantaneous sum of the potential **Active Power** available from each individual **Power Park Unit** within the **Power Park Module / BM Unit** calculated using any applicable combination of meteorological (including wind speed), electrical or mechanical data measured at each **Power Park Unit**. The **Power Available** shall be a value of between 0MW and **Registered Capacity** which is the sum of the potential **Active Power** available of each **Power Park Unit** within the **Power Park Module / BM Unit**. A turbine that is not generating will be considered as not available.

Option 1 - Standardisation of MEL

8.3 There is currently inconsistency in BM data provided by wind farm operators. Some BMUs set their MEL to be the Registered Capacity, or some other high fixed value, while others set their MEL equal to their PN.

8.4 Under this option, PNs would continue to be provided by wind farm operators through the BM. BC1.A.1.3.1 is modified to ensure a consistent definition of MEL is used by all wind farms. The MEL would provide the forecast maximum output profile expected forward from real time through the BM. It would be recalculated and submitted periodically and potentially may be provided manually.

8.5 A standard methodology for calculation of MEL would be agreed and would be expected to vary with forecast wind output.

8.6 This may improve the accuracy of total headroom calculated from the sum of synchronised MELs, but may not resolve the problems associated with wind headroom and provision of frequency response following a reduction in output via a BOA. This would depend on the accuracy achieved which would be influenced by the frequency of update.

8.7 Settlement of any BOAs would continue to be against PN.

8.8 Wind farm operators would have to modify their systems to send the data.

Option 2 - Dynamic MEL (Power Available signal is used to calculate MEL)

- 8.9 Under this option, PNs would continue to be provided by wind farm operators through the BM as now. BC1.A.1.3.1 is modified to ensure a consistent definition of MEL is used by all wind farms. In addition, each wind farm periodically recalculates its current MEL, and re-submits its MEL profile forward from real time through the BM. It is anticipated that this would occur every ten or fifteen minutes and follow a standard methodology for calculation of current MEL. Given the frequency of MEL revisions, persistence modelling could be deployed to generate the profile forward from real time through the BM by the operator. It is anticipated that this will be an automated solution.
- 8.10 Settlement of any BOAs would continue to be against PN.
- 8.11 This option could allow National Grid to calculate headroom provided by any wind farms operating below MEL, and could allow wind farms to provide low frequency response, as National Grid would be able to calculate the volume of response currently being provided by a wind farm.
- 8.12 This option would result in an increased volume of data flowing through the BM and Elexon systems. Wind farm operators would have to modify their systems to send the data, and National Grid would have to modify their systems to make use of the frequently updated MEL data.

Option 3 - Power Available Data Feed to National Grid Control Centre

- 8.13 Under this option, wind farms would submit PNs as now and, following a standard definition, MEL which would indicate the total connected capacity. However, rather than providing a periodic update of MEL, wind farms would provide a separate periodic value for Power Available, at [X time] intervals direct to National Grid's Electricity National Control Centre. This value would be the maximum output that could be delivered by the wind farm with the current wind conditions, and would be calculated using an agreed standard methodology. The System Operator would use this data, persistence modelling and forecast data to make operational decisions for reserve and frequency response based on its forward projections.
- 8.14 This signal could potentially be fed over the existing SCADA data connections used to provide operational metering. National Grid would use the data internally for operational purposes, but the settlement process would not be affected.
- 8.15 As a general comment, discussions held with manufacturers support the view that if a signal is already available within the wind farm SCADA system, it should not be difficult or costly to provide to the System Operator provided such requirements are specified with such signals when requested at the design stage. However, additional work would need to be undertaken to determine whether this signal could be used for the provision of an operational signal to the System Operator.
- 8.16 Settlement of BOAs would be against PNs as now.
- 8.17 This option would allow National Grid to calculate headroom provided by any wind farms operating below their current maximum possible output, and could allow wind farms to provide low frequency response, as National Grid would be able to calculate the volume of response currently being provided by a wind farm.
- 8.18 Providing the total connected capacity through MEL would also assist in the System Operators wind forecasting process. It also has the advantage of allowing the System Operator to have greater visibility of all wind farms not

just those which are BM Units in their own right and subject only to Central Volume Allocated (CVA) metering.

- 8.19 This option does not impact on BM systems. Wind farm operators would have to modify their SCADA systems to send the data, and National Grid would have to modify their systems to make use of the additional information. It was noted that wind speed and direction were already transmitted via SCADA systems at a 5 second interval and it may be no more onerous to provide 5 second interval data rather than, for example, 10 – 15 minute interval data.

Further Refinement of Options

- 8.20 The Workgroup noted that the main difference between the “Standardisation of MEL” and “Dynamic MEL” options was the frequency of data update as that it would be expected to vary with forecast wind output.
- 8.21 The table below summarises the differences between the three options and describes the features, advantages and disadvantages of each.
- 8.22 It was noted by the Workgroup that the costs for implementing any of these solutions needs further consideration and would benefit from seeking wider views as they vary between Generators and wind farm designs.

Other Considerations

- 8.23 It was noted by the Workgroup that the accuracy of PNs might be improved if the period between gate closure and real time was reduced; however this was not the case for MEL data as this data flow can already be varied within gate closure irrespective of the gate closure period. Consequently, the Workgroup *did not* consider that a shorter gate closure would address the deficiencies identified for MEL.
- 8.24 Following submission of the draft workgroup consultation to the November 2013 GCRP, one member was interested to understand the implications of the options with respect to Licence Exempt Embedded Medium Power Stations (LEEMPS). So far as Power Available is concerned, Option 1 (Standardisation of MEL) and Option 2 (Power Available signal is used to calculate MEL) would not be applicable to LEEMPS or indeed Generators which do not participate in the wholesale electricity market as they are not bound by the market rules and hence products such as MEL. Option 3 (Power Available Data Feed to National Grid Control Centre) could equally be applied to BM and non-BM participants as this option is based on the operational metering requirements specified at the connection application stage rather than a commercial product required as a consequence of operating in the Balancing Market.
- 8.25 It is acknowledged that in respect of LEEMPS, the operational metering arrangements are generally based on an internet based mobile telephone technology system rather than that applied to conventional large power stations which have direct and duplicated communications channels. Whilst it is technically possible to add Power Available to the suite of signals available from LEEMPS based wind farms the costs of this additional functionality would need to be understood but are likely to be significant.
- 8.26 National Grid has no intention of requiring a Power Available signal to be provided by Small Embedded Power Stations. The only exception to this requirement would be where a Small Embedded Power Station is required to provide a set of Operational Metering Signals. It is recognised that the issue relating to Operational Metering in respect of Small Embedded Power Stations which have registered as a BM Unit is still an issue for debate and as such falls outside the scope of this report.

8.27 National Grid has no intention of requiring existing LEEMPS to retrospectively provide a Power Available signal under option 3 if this were subsequently approved by the Authority as part of any future Grid Code modification.

The following tables show the options:

Features	Option 1 Standardised MELs	Option 2 MEL Updated at Regular Intervals	Option 3 Power Available Signal to ENCC outside BM systems
Data Exchange			
MEL	<p>BC1.A.1.3.1 is modified to ensure a consistent definition of MEL is used by all wind farms</p> <p>The MEL would provide forecast maximum output profile expected forward from real time through the BM. It would be recalculated and submitted periodically and potentially may be provided manually.</p> <p>A standard methodology for calculation of MEL would be agreed and would be expected to vary with forecast wind output.</p>	<p>Under this option, PNs would continue to be provided by wind farm operators through the BM as now. BC1.A.1.3.1 is modified to ensure a consistent definition of MEL is used by all wind farms.</p> <p>In addition, each intermittent generator periodically recalculates its current MEL, and re-submits its MEL profile forward from real time through the BM. It is anticipated that this would occur every ten or fifteen minutes and follow a standard methodology for calculation of current MEL. Given the frequency of MEL revisions, persistence modelling could be deployed to generate the profile forward from real time through the BM by the operator. It is anticipated that this will be an automated solution.</p>	<p>MELs manually submitted, reflecting availability of individual turbines in the same way as MEL reflects availability of conventional plant.</p>
PN	<p>No change - under this option, PNs would continue to be provided by wind farm operators through the BM.</p>	<p>No change - under this option, PNs would continue to be provided by wind farm operators through the BM.</p>	<p>No change - under this option, PNs would continue to be provided by wind farm operators through the BM.</p>

Power Avail	A value representing Power Available will be used by the Generator to calculate and submit MELs	A value representing Power Available will be used by the Generator to calculate and submit MELs with a defined update rate.	A Power Available signal will be provided via SCADA to NGET.
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Features	Option 1 Standardised MELs	Option 2 MEL Updated at Regular Intervals	Option 3 Power Available Signal to ENCC outside BM systems
SO balancing actions			
BOA dispatch	This will be done as now with reference to PN data and submitted BOA prices	This will be done as now with reference to PN data and submitted BOA prices	This will be done as now with reference to PN data and submitted BOA prices
Wind forecasting	This will be done as now (set out in sections 5.23 and 5.33 – 5.35)	This will be done as now (set out in sections 5.23 and 5.33 – 5.35)	This will be done as now (set out in sections 5.23 and 5.33 – 5.35)
Frequency response and reserve	<p>Today the headroom between MEL and PN is used to determine the availability of frequency response and reserve; this will continue to be done with reference to MEL.</p> <p>The EBS system will assume that after a BOA the BMU will return to the PN level. It will then calculate headroom, response holding etc from the difference between the BOA level and the assumed position at the end of the BOA, which is the PN.</p>	<p>Today the headroom between MEL and PN is used to determine the availability of frequency response and reserve; this will continue to be done with reference to MEL</p> <p>The EBS system will assume that after a BOA the BMU will return to the PN level. It will then calculate headroom, response holding etc from the difference between the BOA level and the assumed position at the end of the BOA, which is the PN.</p>	<p>Today the headroom between MEL and PN is used to determine the availability of frequency response and reserve; with option 3 instead the Power Available signal will be used in conjunction with the loading point of the generators which will give a more accurate representation.</p> <p>Also with option 3, the EBS system will assume that after a BOA the BMU will return to the Power Available level. It will then calculate headroom, response holding etc from the difference between the BOA level and the assumed position at the end of the BOA, which is the PA.</p>
Data Volumes	No significant change	Significant increase in volume of BM data sent to National Grid and Elexon / BMRA	No increase in BM data systems. Very small percentage increase in the volume of Scada data received by SO.
Costs			

Implementation	Low but will depend on currently adopted practice	Low for wind farms with existing automated process Medium for wind farms installing new automated process	Low for new generators
Ongoing Operation	Low for wind farms adopting automated process , Potentially medium for those adopting a manual process	Low for wind farms adopting automated process; medium for those adopting a manual process	Low to very low – maintenance of single additional analogue signal.
Implementation Timescale	Only limited by Grid Code change	Would require time for wind farms to develop and implement automated system if desired	Would require time for integration of signal to SCADA systems and modification to SO systems.

Features	Option 1 Standardised MELs	Option 2 MEL Updated at Regular Intervals	Option 3 Power Available Signal to ENCC outside BM systems
Changes to Codes and associated documents	Clarify definition of MEL in Grid Code for intermittent generation	Changes to Grid Code to codify frequency of MEL data.	Changes to Grid Code to require data – may be different ways to obtain data for new and existing generators and clarify definition of MEL Changes to Procurement Guidelines to clarify how National Grid would assess the value of services from windfarms where volumes may change in the future.
Settlement	No Change Information provided by Elexon website would need review for consistency	No Change Information provided by Elexon website would need review for consistency	No Change Information provided by Elexon website would need review to ensure that data provided is valuable to market participants
Delivery of Requirement			
Headroom	There is a risk that the SO cannot reliably calculate current headroom provided by any wind farms operating below maximum output because of inconsistent and unknown refresh rates and the triggers for resubmission. The risk is reduced if all adopt the same 'Good Industry Practice' around criteria for updating MEL which would give the SO more confidence.	SO able to calculate better estimate of headroom, depending on frequency of update although potentially same issue of accuracy regardless of refresh rate. The risk is further reduced if all adopt the same 'Good Industry Practice' around criteria for updating MEL which would give the SO more confidence	SO able to calculate headroom subject to operational metering refresh rate

<p>Response Volume</p>	<p>SO cannot reliably calculate current response volume held on any wind farms operating in frequency sensitive mode because of inconsistent and unknown refresh rates and the triggers for resubmission.</p>	<p>SO able to reliably calculate estimate of response volume held on any wind farms operating in frequency sensitive mode, based on consistent and known refresh rate of [10 minutes]. Refresh rate would not improve accuracy necessarily though.</p>	<p>SO able to reliably calculate estimate of response volume held on any wind farms operating in frequency sensitive mode, based on consistent and known refresh rate of [10 minutes]</p>
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Features	Option 1 Standardised MELs	Option 2 MEL Updated at Regular Intervals	Option 3 Power Available Signal to ENCC outside BM systems
ADVANTAGES			
For intermittent Generators	<p>Potentially no system and process changes depending on current practice</p> <p>Potentially low overhead</p> <p>To the extent that the option provides the SO with confidence in capability, there is a greater opportunity for wind generation to earn additional revenues for the provision of services</p>	<p>Some operators would not need to change their systems</p> <p>To the extent that the option provides the SO with confidence in capability, there is a greater opportunity for wind generation to earn additional revenues for the provision of services</p>	<p>For most Generators power available signal is already within control system. For new Generators this would probably be the easiest system to implement.</p> <p>To the extent that the option provides the SO with confidence in capability, there is a greater opportunity for wind generation to earn additional revenues for the provision of services</p>
For System Operator	<p>No system changes</p> <p>Consistent basis on which MEL data is provided. However the refresh rate and triggers for resubmission will be inconsistent and may not provide a reliable indication of headroom and response volume available.</p> <p>Option 1 does not provide a consistent refresh rate. This would introduce greater overall error for the System Operator. One party considered that if common good industry practice is adopted then this may provide a reliable indication.</p>	<p>Minor system changes associated with increased volumes of data</p> <p>Consistent basis on which MEL data is provided and consistent refresh rate.</p> <p>Refresh rate of 10 minutes or less will provide more reliable indication of headroom and response volume available, enabling response and reserve to be used from windfarms rather than curtailing wind and bringing on conventional plant.</p> <p>Functionally, for the SO options 2&3 are identical.</p>	<p>Consistent basis on which Power Available signal is provided and consistent refresh rate.</p> <p>Refresh rate of 10 minutes or less will provide more reliable indication of headroom and response volume available , enabling response and reserve to be used from windfarms rather than curtailing wind and bringing on conventional plant.</p> <p>Functionally, for the SO options 2&3 are identical.</p>

<p>For Consumers</p>	<p>Potentially lower BSUoS costs depending on how reliably the System Operator can calculate headroom and frequency response holding on wind farms. This would depend on the MEL update frequency and consistency across Generators.</p> <p>Improved security of supply due to improved visibility of headroom and response volumes.</p>	<p>Consistent basis of MEL submission and the frequency [10 minutes] of update would allow the System Operator to utilise response and reserve from more economical sources resulting in lower BSUoS costs than Option 1. Subject to data accuracy; if this is no better then outcome is same as option 1</p> <p>Improved security of supply due to improved visibility of headroom and response volumes.</p>	<p>Consistent basis of Power Available submission and the frequency [10 minutes] of update would allow the System Operator to utilise response and reserve from more economical sources resulting in lower BSUoS costs than Option 1. Subject to data accuracy; if this is no better then outcome is same as option 1. The availability aspect would be the same as included in MEL under Options 1 and 2.</p> <p>Implementation cost is likely to be lower than option 2, certainly for new generators.</p>
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Features	Option 1 Standardised MELs	Option 2 MEL Updated at Regular Intervals	Option 3 Power Available Signal to ENCC outside BM systems
DISADVANTAGES			
For intermittent Generators	<p>Would have to pay a share of increased balancing costs due to extra response and reserve holdings. Although this may be less than the status quo against relative wind volume.</p> <p>This assumes that the redefinition of MEL (resubmission rates and triggers) will not improve these matters because of the inconsistent refresh rates that could result.</p> <p>Reduced access to response and reserve markets unless SO confidence can be assured through improved accuracy.</p>	<p>Some operators would incur significant additional operational costs.</p> <p>Increased volume of MEL data could cause system issues</p> <p>Would have to pay a share of increased balancing costs due to extra response and reserve holdings. Although this may be less than the status quo against relative wind volume. [no different than option 1].</p> <p>Reduced access to response and reserve markets unless SO confidence can be assured through improved accuracy.</p>	<p>Some existing generators could incur costs making data available.</p>
For System Operator	<p>Inconsistent refresh rate for MEL submission farms may make operational decisions less efficient and may limit the provision of services from the most economic providers.</p> <p><i>If</i> the frequency of update is longer than [10 minutes] and inconsistent between Generators, the reliability of any calculations for headroom and frequency response may be sub-optimal.</p> <p>Does not capture LEEMPS or Generators which are not party to the wholesale electricity market.</p>	<p>Significant increase in BM data could require system expansion.</p> <p>Does not capture LEEMPS or Generators which are not party to the wholesale electricity market.</p>	<p>Need to modify SCADA system to handle new data.</p> <p>Option 3 will capture LEEMPS (for new plant) as CC.6.4.4 states that operational metering from a LEEMPS station can be requested at the application stage if needed and the requirements of CC.6.5.6 then apply which includes the modified text for a PA signal.</p> <p>For non-BM Participants the operational metering requirements (ie CC.6.5.6) will apply if there is a contractual relationship and they are signatories to the</p>

			Grid Code (ie SVA registered) but will not extend to those parties who have no contractual relationship with the SO (ie Small Embedded Power Stations).
For Consumers	<p>Increased costs due to extra balancing costs being passed through – relative to current penetration, not if GIP emerges.</p> <p>Reduced security of supply due to increased uncertainty in volume of response and headroom. – not if GIP emerges.</p>	<p>Additional costs passed on from those wind farms seeing higher operational costs. – relative to current penetration, not if GIP emerges</p> <p>Reduced security of supply due to increased uncertainty in volume of response and headroom – not if GIP emerges.</p>	Costs incurred by some generators implementing change would be passed on to consumers. This would need to be weighed against the benefits.

9 Power Available Signal

- 9.1 At the heart of both Standardisation of MEL and Power Available Data Feed to National Grid Control Centre options is the Power Available signal. Whilst the means of provision and the frequency of update may be different, the underlying nature of the signal is the same.
- 9.2 The mechanical power which can be extracted from a wind turbine is defined by equation (1):-

$$P = 0.5\rho AC_p(\lambda, \beta)v^3 \quad (1)$$

Where:-

- P = The power available from the turbine (Watts)
- ρ = The air density (Kg/m³)
- A = swept area (m²)
- C_p = Power Extraction Coefficient which is dependent upon the tip speed ratio (λ = blade tip speed / wind speed) and Blade Pitch Angle (β).
- v = Wind Speed (m/s)

More generally, when the term power is plotted against wind speed, the graphical representation results as shown below.

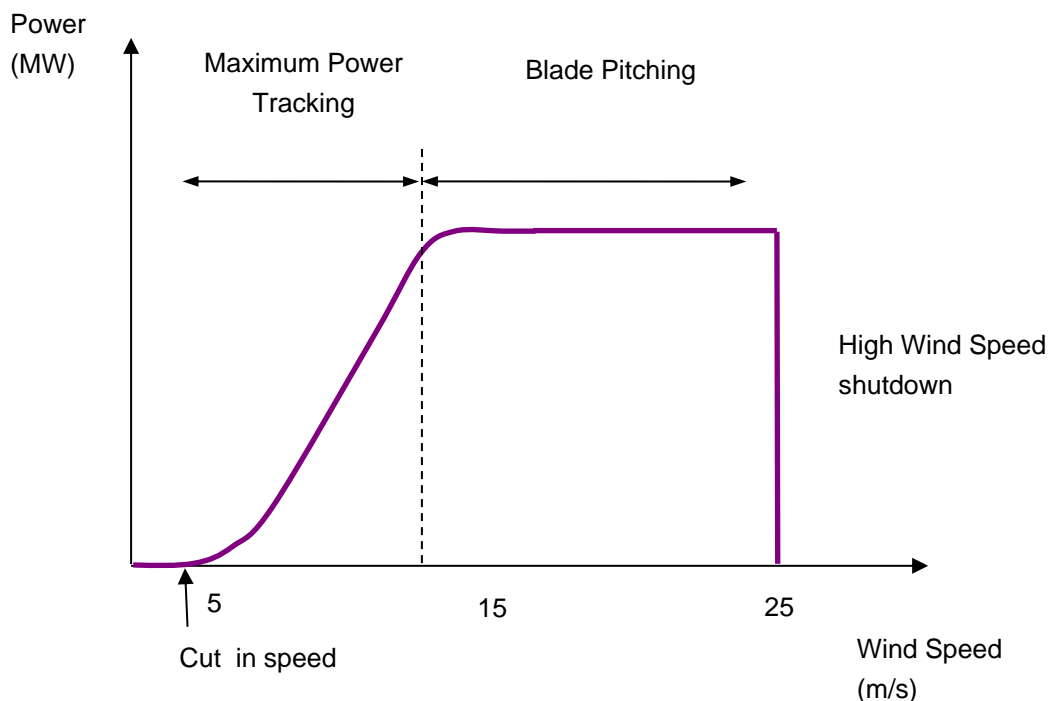


Figure 10: Wind Turbine Power / wind speed curve

- 9.3 Under Maximum Power Tracking mode the wind turbine is operating at peak output for the given wind speed and effectively following equation (1). When the wind speed approaches its rated value, typically between 11 – 14m/s (depending upon manufacturer and turbine type), blade pitching will be initiated which is required to prevent damage to the turbine structure and generator.
- 9.4 Since the wind speed across a wind farm site may vary significantly, and knowing that the power output is heavily influenced by the wind speed, the

best way of determining the Active Power output from the wind farm is to sum the individual Active Power outputs of each wind turbine.

- 9.5 Where there is no curtailment, each wind turbine will generate an Active Power output as described above. Under this mode of operation, the Active Power output from the wind farm should be equivalent to the Power Available from the wind farm.
- 9.6 Where however a wind farm is operating in a de-loaded mode, for example to provide low frequency response, turbines will effectively be spilling wind, in which case PN and Power Available will not be the same. The process in which this is achieved and the actual recorded available power when turbines are de-loaded is complex to determine, largely as a result of the non-linear behaviour of the turbines when they are not operated at peak output.

How should the Power Available signal be calculated?

- 9.7 The Workgroup considered how the signal should be calculated and whether a formulaic definition should be derived, whether a level of accuracy should be specified or other such method.
- 9.8 Information provided at the Workgroup suggests that most operators already have some form of power available signal or similar that is used for testing frequency response capability and to provide a similar signal to National Grid for operational metering purposes would not be too onerous.
- 9.9 However, it was noted that where a wind farm was operating to maximise its output (i.e. it was not de-loaded), the Power Available signal could have a small difference from the metered output because of the basis of the Power Available calculation.
- 9.10 Intellectual property issues were raised with the methods that different manufacturers use to convert raw data into power available. It was noted that these issues can be avoided if data aggregation and conversion into some form of power available signal is done by the wind farm, or at the wind farm control point, rather than by National Grid.
- 9.11 It was also noted for comparison that the Grid Code defines the PN as 'Data that describes the **BM Participant's** best estimate of the expected input or output of **Active Power** of a **BM Unit** and/or (where relevant) Generating Unit, the accuracy of the Physical Notification being commensurate with Good Industry Practice.'
- 9.12 The Workgroup considered that a similar obligation of best estimate commensurate with good industry practice taking into account prevailing wind speed, direction and number of turbines connected could provide sufficient accuracy without transgressing intellectual property issues or potentially introducing an unnecessary burden on wind farms with accuracy obligations. This later point was of particular concern for some Workgroup members who had cited examples of the Irish market requirements on accuracy.

Accuracy required for the provision of data

9.13 The Grid Code defines the PN as ‘Data that describes the **BM Participant’s** best estimate of the expected input or output of **Active Power** of a **BM Unit** and/or (where relevant) **Generating Unit**, the accuracy of the **Physical Notification** being commensurate with **Good Industry Practice**.’ It is envisaged that similar obligations would exist for the provision of a Power Available signal.

How frequently should a signal be provided?

9.14 In assessing the frequency of updates from a potential Power Available signal, the Workgroup noted that it was worth calculating an optimal refresh period. For example, a second by second signal may not provide any additional benefit over a 5 minute signal. As a test of update frequency, actual output, MEL and PN at gate closure from a wind farm BMU, relating to a windy day in February 2013 is plotted below. A possible Dynamic MEL / Power Available signal has been drawn for illustrative purposes only as the value of metered output at the start of the 10 or 15 minute window. It is not intended to suggest that this should form the basis of the calculation of Dynamic MEL or Power Available. These graphs suggest that 10 minutes may be an appropriate refresh period. It was noted that 10 minute data frequencies are typical for SCADA data.

15 Minute Signal

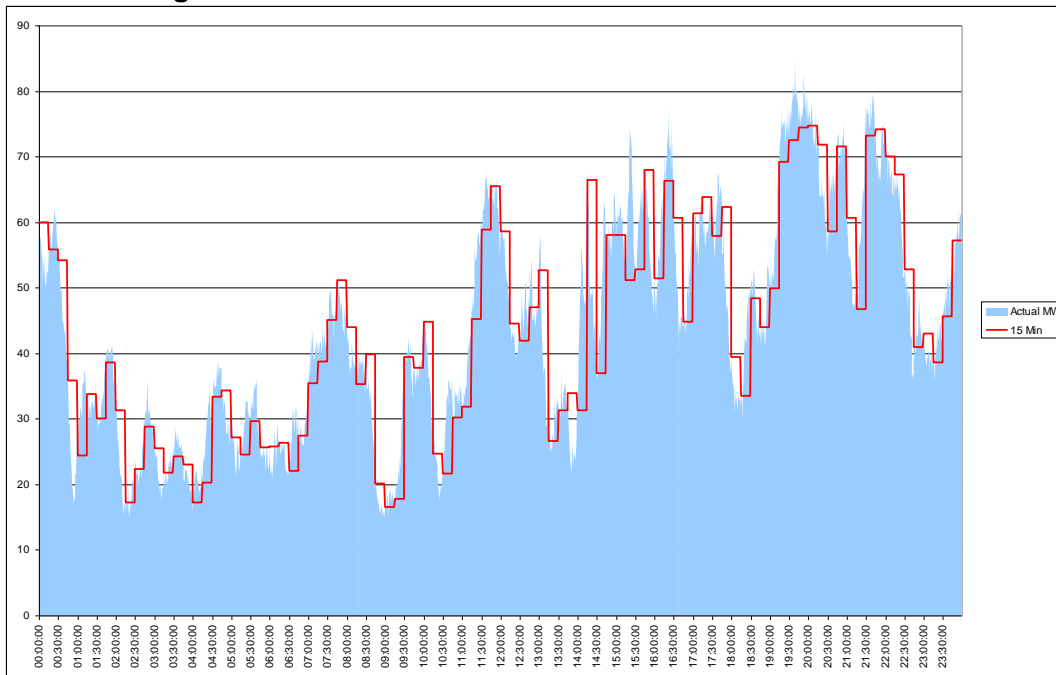


Figure 11: Wind metered output at 15 minute intervals compared with actual

10 Minute Signal

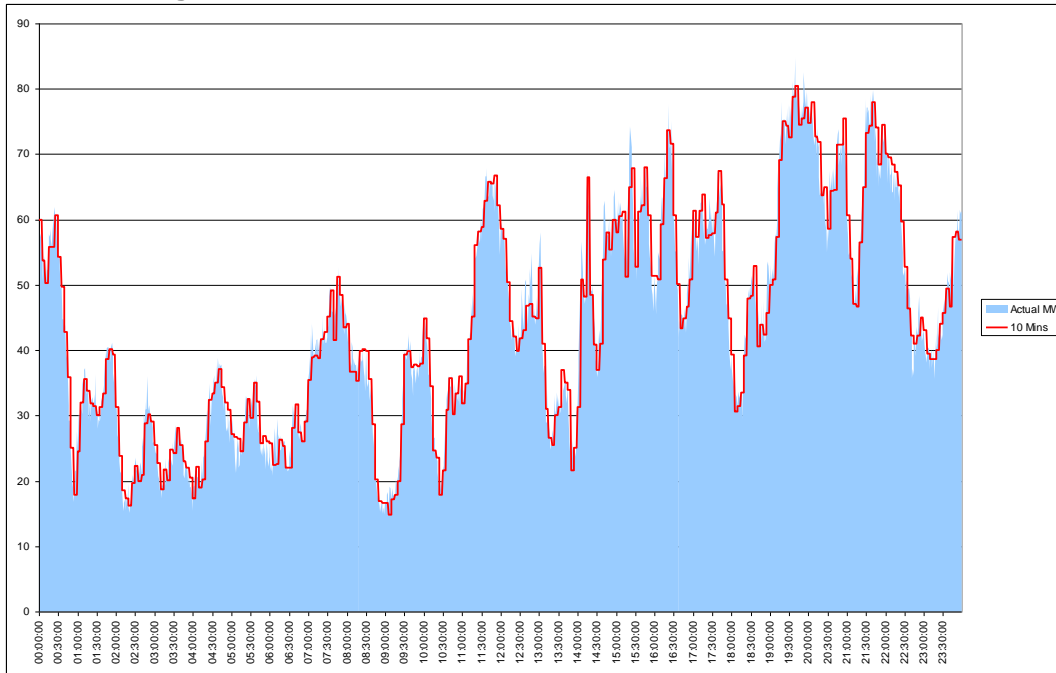


Figure 12: Wind metered output at 10 minute intervals compared with actual

- 9.15 During the Workgroup discussions, it has been highlighted that a MW Availability figure is required in Ireland to facilitate the market. It was agreed by the Workgroup that NGET's requirement for a dynamic MEL or Power Available signal would require a different calculation than the one required in Ireland for Settlement purposes. It was also pointed out that not all turbine manufacturers are currently active within the Irish Market.
- 9.16 Whilst this analysis suggests a 10 to 15 minute interval for recalculation of Power Available could achieve a good level of accuracy from a persistency perspective if, for example, the data was provided via the SCADA system, it may be more efficient to provide data at an automatic refresh rate of 5 seconds as currently applied to wind speed and direction.

Signal Specification

- 9.17 It was agreed by the workgroup that the specification of the signal may need further work following implementation of the Grid Code change. While it is acknowledged that a power available signal is used in compliance testing and is provided by manufacturers on all modern turbines, the specification of this will not necessarily be consistent. Some consistency between the testing signal and the operational metering signal definitions, where relevant, is also appropriate to consider.

Power Available under different scenarios

High wind speed shutdown

- 9.18 It is anticipated that as the Power Available signal would be calculated by the wind farm, it would take account of data from individual turbines as to whether they were shut down.

Turbine faults

- 9.19 The turbine is available if it is available to produce energy unless curtailed for O&M/performance reasons.

Signal Failure

9.20 In the event of a failure of the Power Available signal, it is anticipated that the generator in question would be unable to participate in the frequency response and reserve market until it was restored. There would not be a reversion to the use of MEL.

Additional items of information which could be of benefit

9.21 The provision of wind speed, direction and MW data on an individual turbine basis could assist National Grid in developing more sophisticated wind power forecasting models, but the Workgroup agreed that this was not necessary to address the issues that the Power Available signal sought to address.

Turbine capacity is greater than Transmission Entry Capacity (TEC)

9.22 The Power Available signal should reflect the action of any wind farm active power control excluding BOA action.

10 Impact Assessment

10.1 The Workgroup considered the areas that might be impacted by each of the options under consideration.

- Code changes
- Wind Farm data management / SCADA configuration
- Impact on current data signals between Generation and System Operator
- Communications
- Operating Procedures
- Dispatch and control systems
- Settlement
- Testing, validation and compliance
- Regulatory Considerations
- Cost of implementation
- Retrospective Application

Option 1 Impact (Standardisation of MEL)

Code changes

10.2 Grid Code BC1.A.1.3.1 would need to be modified to ensure a consistent definition of MEL. The Grid Code would also need to specify which forms of generation this would apply to and when it would become applicable. BC1.4 -Submission of Data would need to be reviewed.

Wind Farm data management

10.3 A wind farm would need to produce a MEL based on wind speed and other parameters to calculate and submit a profile going forward. This may require a new process to be implemented if parties are not already doing so.

Communications

10.4 No additional communication channels would need to be established as existing arrangements could be used, however the volume and frequency of data may necessitate upgrades to current systems in order to transmit and process the data.

Operating Procedures

10.5 If the MEL data provided is sufficiently robust, the System Operator would be able to enact procedures already established for existing generation with regard to frequency response and calculation of overall reserve.

Dispatch and Control Systems

10.6 If the MEL data provided is sufficiently robust, no changes would be needed to dispatch and control systems. Data received could be used in a similar way to other forms of generation.

Settlement

10.7 No changes would be needed to the settlement systems.

Testing, validation and compliance

10.8 No additional validation is expected although the System Operator would monitor the performance of MEL data.

Regulatory Considerations

10.9 Consideration would need to be given to whether there were sufficient benefits to justify different treatment for particular generators.

Cost of Implementation

10.10 Anticipated to be low, as essentially this option is based on improving existing provisions.

Option 2 Impact (Dynamic MEL)

10.11 The workgroup noted that the impacts for option 2 were similar to option 1 however an update frequency of 10 minutes would have a greater impact on wind generator data management and therefore a more significant cost of implementation. Depending on the extent to which any changes to MEL were made manually, there would also be overheads associated with altering submissions and in enhanced Trading Point/Control Point obligations.

Option 3 Impact (Power Available Signal via SCADA)

Code changes

10.12 Grid Code BC1.A.1.3.1 will be modified to ensure a consistent definition of MEL. The Grid Code will also need to specify which forms of generation this would apply to, and when the requirement will be applicable. It is the intention for this modification to apply to new plant with completion dates from 1st April 2016, although the SO may wish to pursue the provision of this signal from some existing Generators by mutual agreement; equally some existing parties may wish to provide the signal to allow their participation in response and reserve markets BC1.4. - Submission of Data and CC.6.5.6 – Operational metering will also need to be reviewed.

Transmission Licence Condition C16 changes (Procurement Guidelines and Balancing Principles Statement)

10.13 There may also be changes to Licence Condition C16 documents which would need to be reviewed.

Power Park Module data management

- 10.14A Power Park Module would need to produce a MEL based on the wind turbines available. This will require a new process to be implemented.
- 10.15A new Power Available signal would be required from the Power Park Module to the System Operator. Section 6.27 describes the existing requirement for a Power Available signal for the purposes of compliance testing. Initial investigations suggest that it is possible to route an additional Power Available signal into the suite of operational signals already provided to National Grid.

Communications

- 10.16If existing SCADA systems can be used to convey the Power Available signal, no additional communication links would need to be established, however the SCADA system would need to be amended to accommodate the Power Available signal. Data is currently communicated at 5 second intervals and so the addition of another data item is not thought to be onerous.

Operating Procedures

- 10.17The system operator would be able to enact procedures already established for existing generation with regard to frequency response and calculation of overall reserve.

Dispatch and Control Systems

- 10.18An additional, intermediate data processing step would need to be introduced to receive the Power Available signal and MEL data and subsequently create a profile that mimicked the MEL profile data received by other generation. This could then be used by existing dispatch and control systems.

Settlement

- 10.19No changes would be needed to the settlement systems.

Testing, validation and compliance

- 10.20A testing and compliance process would need to be developed to ensure adherence to the Grid Code. It is anticipated that this could be combined with the current process for testing generator frequency response and reactive capability.

Regulatory Considerations

- 10.21Consideration would need to be given to the appropriateness of specific requirements on wind farms or other forms of generation where the primary fuel source cannot be controlled.

Cost of Implementation

- 10.22The Workgroup recognised that this was likely to be different for parties depending on the systems and processes adopted. However, costs for new generators are anticipated to be minimal.

11 Implementation Considerations

11.1 The Workgroup considered the aspects of implementation should the proposals be taken forward.

- Retrospective application
- When should new requirements apply from
- Which generation should this apply to?
- Should other renewables be taken into account
- European Network Code implications
- Significant Code Review on Balancing

Retrospective application

11.2 National Grid as the System Operator noted its preference for option 3; however, it noted that it was not the intent to apply the requirements retrospectively unless it could be reasonably demonstrated that such a Generator had a significant impact on the Transmission System and that progressing this would be by mutual agreement. It was noted that the implementation of a Power Available signal was expected to be relatively inexpensive if implemented at the build stage however the costs of retrofitting such a signal would require further analysis if any retrospective requirement was proposed or agreed bilaterally.

11.3 It was acknowledged that both Option 1 and Option 2 would apply equally to new and existing generators from an agreed date post-implementation as they affect the way in which data is submitted to National Grid as part of the Balancing Mechanism. Option 3 however would only by default be applied to new Generators from a defined connection date.

Application of Option 1 (Consistent MEL)

11.4 It was noted that in order to achieve a consistent MEL from wind farms this would need to apply to both existing and new wind farms. The requirement would apply from an agreed date.

Application of Option 2 (Dynamic MEL)

11.5 It was noted that, in order to achieve a Dynamic MEL from wind farms, this would need to apply to both existing and new wind farms. The requirement would apply from an agreed date. However, some distinction could be made between obligations on existing and new generators (e.g. frequency of update)

11.6 It was noted that the implementation of a Dynamic MEL approach was expected to be relatively inexpensive if implemented at the build stage but that the cost of retrofitting such a signal would require further analysis. This would have a bearing on how and whether it was applied to existing generators.

Application of Power Available Signal via SCADA (Option 3)

MEL Data

11.7 The Power Park Module MEL associated with a Power Available signal via SCADA option (option 3) represents the connected capacity applicable and would not need to be updated frequently. This may be implemented easily and therefore it may not be necessary to distinguish between existing and new wind farms as implementation may be low impact and therefore this could be uniformly applied to existing and new wind farms.

Power Available Signal

11.8 It was noted that the implementation of a Power Available signal was expected to be relatively inexpensive if implemented at the build stage, but that the cost of retrofitting such a signal would require further analysis. The cost of such a retrofit would have a bearing on whether it was considered appropriate to be applied to existing generators.

11.9 If a key business need were identified to apply the requirement for a Power Available signal to existing as well as to new wind farms, then this would need to be justified for the specific existing wind farms from which it was to be required. Such a decision would require further analysis.

11.10 It was noted that the benefits to a wind farm from providing a Power Available signal (e.g. facilitation of participation in response and reserve markets) may mean that wind farm operators may choose to provide a Power Available signal at their wind farms in any event.

When should new requirements apply from?

11.11 A likely time frame would be 12 to 24 months from any approval date to allow the necessary changes to be implemented for new generators; any requirements for existing generators would need to be assessed separately.

Which generation should this apply to?

11.12 It is anticipated that the proposals would apply to those generators to which Grid Code BC1 and BC2 applies. These generators are currently required to submit MEL data. It was noted by the Workgroup that further information should be obtained to understand whether there were particular technology constraints in meeting any new obligations.

Should other renewables be taken into account?

11.13 Whilst the discussions to date have so far concentrated on the requirements from wind generation, consideration also needs to be given as to whether there is a need for a Power Available signal from other forms of generation.

11.14 For renewable sources of generation powered by a variable primary energy source, such as wave, tidal and solar, the Workgroup considered that they should be treated in the same way if they meet certain criteria e.g. size (either individually or in aggregation). For other forms of renewable generation such as hydro or cascade hydro and forms of generation with controllable fuel sources such as coal, oil, gas or nuclear the requirement for a Power Available signal is less clear cut, but would need to be supported by their ability to meet their declared PN's, be capable of achieving their declared MELs and demonstrated through past performance.

International practice and approach taken in European Code development

11.15A presentation was given by a representative from the System Operator for Northern Ireland (SONI) who provided insight into how they manage wind generators through the use of a MW Availability signal. The definition of MW Availability is as follows:

“The amount of Active Power that the Controllable WFPS [Windfarm Power Station] could produce based on current wind conditions, network conditions and System conditions. The MW Availability shall only differ from the MW Output if the Controllable WFPS has been curtailed, constrained or is operating in a Curtailed Frequency Response mode, as instructed by SONI via the SCADA interface”

11.16 When a Power Park Module is constrained off (output 0MW) in the SONI and EirGrid regions they are considered as available and financial settlement is based on the active power the Power Park Module would have produced.

11.17 In Northern Ireland, wind farms larger than 5MW are always in a frequency sensitive mode and will constantly modulate the active power in response to frequency changes. This can be run in 2 ways: With no curtailment (turbines free running) where high frequency response only is provided; or in MW curtailment mode when SONI will instruct the wind farm to run at a MW curtailment set point between 50% and 100% to provide both high and low frequency response (analogous to Frequency Sensitive Mode). The curtailment set point is set via an analogue input to the farm transmitted by SONI via SCADA.

11.18 In summary the research and discussions held to date indicate that the requirement for a MW availability signal is based on the type of wholesale electricity market and the size of the power system. In GB for example where a forwards market is used (ie Generators and Suppliers strike contracts in advance and the System Operator simply balances the differences in real time – ie self-despatch) certain information and data can be achieved through the signals of the wholesale market (ie PN's and MEL).

11.19 On the other hand a number of other markets use the “Pool” type system in which Generation is scheduled at the day ahead stage on the basis of the total system demand and Transmission System Constraints. On this basis the requirements and operational metering signals required for managing wind generation are very different to that of the forwards market described above where trading position can be used to provide an indication of the Available Power.

11.20 The size of the Power System, its interconnection with other nations and the plant mix all has an impact on the ability of an operator to manage wind generation. For example, Denmark was one of the first countries to embrace Wind Generation on a large scale against a comparatively modest demand. Owing to the large number of interconnectors to the wider European System and the large volume of hydro generation in Norway, integration of wind power into the Danish Power System has been possible. If these facilities had not been available, control of system frequency would have been more challenging.

European Network Codes

- 11.21 As part of the Third Energy Package which became European Law in 2009, a new set of European Network Codes (ENCs) are being written with the intention of helping to meet the 3rd package objectives of enabling single European energy markets for gas and electricity, promoting the connection of renewable energy sources and enhancing security of supply.
- 11.22 The ENC Requirements for Generators (RfG) was the first network code on electricity developed by ENTSO-E. It is also the first of the connection codes (the others being the Demand Connection and HVDC codes) which together set out the technical requirements upon parties connecting to the transmission and distribution systems. The RfG code is seen as one of the main drivers for creating harmonised solutions and products necessary for an efficient pan-European (and global) market in generator technology. The purpose of the code is to bring forward a set of coherent requirements in order to meet these challenges of the future and to help provide crucial tools for all network operators to plan and operate the system against the background of a rapidly changing energy mix, while delivering security of supply for consumers.
- 11.23 The European Commission anticipate taking the code through the process of comitology and writing it into European Law during 2014. The code sets out that it is to apply to all new generators, defined as those which are not connected to the system 2 years after its entry into force (so probably during 2017) and for projects under construction that have at this point also not let contracts for major plant items. All parties will be required to comply with the code by 3 years after its entry into force.
- 11.24 So far as RfG is concerned, the issue of Power Available is not mentioned however this would not preclude a Power Available signal from being specified at National level as the latest Commission draft dated 14th January 2014, Article 9 (5) (d) states “With regard to information exchange: 1) Power Generating Facilities shall be capable of exchanging information between the Power Generating Facility Owner and the Relevant Network Operator and/or the relevant TSO in real time or periodically with time stamping as defined by the Relevant Network Operator and/or the Relevant TSO whilst respecting the provisions of Article 4(3).” In addition, the above draft version of ENTSO-E RfG Code continues “2) The Relevant Network Operator in coordination with the Relevant TSO shall define while respecting the provisions of Article 4(3) the contents of information exchanges and the precise list and time of data to be facilitated.”

Significant Code Review for Balancing

- 11.25 The Workgroup noted that a Significant Code Review (SCR) was being carried out by Ofgem in the area of Electricity Balancing. As this Workgroup had discussed issues which may be covered by the SCR such as PN accuracy for settlement, it was worth keeping abreast of such developments. For example, potential charges for information imbalance. However, the Workgroup recognised that the discussions around a Power Available signal should still continue in parallel whilst being mindful of the SCR to avoid any duplication of work.

12 Workgroup and Consultation Conclusions

- 12.1 There is a need to undertake a change to the Grid Code to allow the System Operator to have better visibility of the headroom available from intermittent generators that could then be used for the provision of reserve or frequency response services.
- 12.2 This will allow better market participation of renewable generators by allowing them to provide such ancillary services and would also enhance system security. As the generation portfolio connected to the system changes to include more intermittent generation this will be of increasing importance.
- 12.3 While this view was not unanimous, a majority of the Workgroup members and respondents to the Workgroup and Industry Consultations, and also National Grid, concluded that option 3 (the Power Available Data Feed to the National Grid Control Centre via SCADA data connections) would best address the deficiencies identified. The recommendation is that, other than in exceptional circumstances, this option would only apply to New Generators with a Completion Date on or after 1st April 2016 to avoid imposing additional requirements upon projects at an advanced stage of construction.
- 12.4 An associated issue is the accuracy of BOA settlement. The Workgroup, and the majority of consultation respondents, agreed that any of the proposed solutions could be used to improve this. While the governance of BOA settlement would need to involve the BSC panel, it is the view of National Grid that the Grid Code changes associated with option 3 as described in this report could be effected prior to the finalisation of any attendant BSC modification. Option 3 is essentially a hardware solution and, while offering potential for use in a future BSC modification, does not in itself impact BOA settlement on implementation.

Impact on the Grid Code

13.1 GC0063 as proposed in this report being option (ii) as set out requires amendments to the following parts of the Grid Code:

- Glossary & Definitions
- Connection Conditions
- Balancing Code 1

13.2 The text required to give effect to the proposal is contained in Annex 1 of this consultation.

Impact on Grid Code Users

13.3 The impact on Grid Code Users is covered in detail in section 9.

Impact on National Electricity Transmission System (NETS)

13.4 The proposed changes will allow the System Operator to more efficiently manage the electricity system by enabling the efficient use of wind farms in balancing the system. Specifically, this will enable efficient management of reserve and frequency response that is not viable with the current data flows.

Impact on Greenhouse Gas emissions

13.5 The proposed modification will facilitate the efficient growth of renewable generation which will reduce greenhouse gas emissions from alternative forms of generation.

Assessment against Grid Code Objectives

13.6 National Grid considers that the proposed changes would better facilitate the Grid Code objective:

- (i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;

Enabling wind farms to provide Balancing Services (e.g. reserve, BOAs and frequency response) will permit a more efficient and economic transmission system by avoiding the necessity of taking actions on out of merit alternatives. The proposed changes will also allow the System Operator to utilise the most economic provider of Balancing Services given the prevailing system conditions.

- (ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);

The proposed changes will facilitate competition by supporting the efficient growth of renewable generation to supply electricity to GB consumers by providing the System Operator with access to a wider range of providers for Balancing Services given the prevailing system conditions.

- (iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and

The reasons outlined in (i) are also applicable to the whole electricity system.

- (iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.

The proposal is neutral on this objective.

Impact on core industry documents

13.7 The proposed modification does not impact on any core industry documents

Impact on other industry documents

13.8 The proposed modification may have an impact on Mandatory Service Agreements that describe the frequency response capability of BMUs. The capability is determined by calculating the difference between operating point and MEL.

Implementation

13.9 The Workgroup proposes that, should the proposals be taken forward, the proposed changes be implemented on the 1st of January 2015 or 10 business days after an Authority decision, whichever is later.

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14 Workgroup and Industry Consultations

14.1 A Workgroup Consultation was held ending on 27th January 2014. The report was revised on the basis of the responses received and was followed by an Industry Consultation which ended on 7th April 2014. A total of 12 responses were received, with five parties responding to both of the consultations. An overview of the responses is given in the table below. Full copies of each of the responses are included in annex 4.

Ref	Company	Supportive	Main Comments
Workgroup Consultation			
CR-01	Scottish Power	Yes	<ul style="list-style-type: none"> The Power Available proposals should only be progressed once the BSC arrangements have been put in place. No preference over the implementation options expressed – each could broadly deliver the benefits described. Some points of clarification on each of the options required.
CR-02	DONG Energy UK Wind Power	Yes	<ul style="list-style-type: none"> Any of the options will deliver benefits for Users and will result in more accurate data. Preference expressed for option 3 although benefits of either of options 1&2 also recognised. Considers it appropriate to wait until the BSC Workgroup has concluded its review before implementation. Also considers that the use of balancing actions on intermittent generation in the future could be reviewed in either the BSC or a Cross Code working group.

Ref	Company	Supportive	Main Comments
Workgroup Consultation			
CR-03	RWE	Yes	<ul style="list-style-type: none"> Option 3 is preferred as User systems are already largely in place and therefore this would provide the lowest cost option with the least User disruption. An associated change to the BSC arrangements is required to ensure that the GC0063 proposals better facilitate the Grid Code objectives. While any of the proposed solutions would provide the basis for more accurate BOA settlement, this is not a matter solely for BSC governance arrangements and defining the appropriate data to be used for both operational and settlement purposes can be done under Grid Code governance. Any of the proposed solutions need to ensure that the same data is used for BOA instruction and BOA settlement purposes rather than using PN data for BOA settlement. Therefore, the GC0063 proposals within the Grid code should be implemented only when corresponding BSC arrangements are concluded.
CR-04	SSE Generation	Yes, broadly	<ul style="list-style-type: none"> The proposed modification to the Grid Code could be carried out separately only where indicating headroom during a BOA to curtail a wind farm. For any other purpose a simultaneous change would be required with the BSC. Option 3 is preferred as if specified in the project design stage of new projects costs would be minimal and it best addresses the issue of confidence in the headroom available when a wind farm BMU is subject to BOA. If data accuracy under any of the options is not improved then replacing an inaccurate PN with an inaccurately derived PN doesn't make sense. Option 3 could be used for BOA settlement if the level of accuracy was subject to grid code compliance.

Ref	Company	Supportive	Main Comments
Workgroup Consultation			
CR-05	EON	Yes, broadly	<ul style="list-style-type: none"> Any of the options could be taken forward independently of subsequent BSC changes. A consistent approach should be taken by all parties to calculating, and keeping up to date, MEL and PNs from Generators with an Intermittent Power Source and therefore Option 1 is supported. This is because in principle its sets the requirement for MEL to be calculated, submitted and updated on a consistent basis; also as it retains consistency of data items across all generation technology types. Option 2 is in practice similar to option 1. The SO has not sufficiently justified the need for an additional data item under option 3. It is also unclear how this data differs from the properly derived MEL under Option 1. The conclusion of the Workgroup to support option 3 was not unanimous and the benefits comparison table needs revision to ensure an even assessment of the options is enabled.

Ref	Company	Supportive	Main Comments
Industry Consultation			
CR-06	DONG Energy UK Wind Power	Yes	<ul style="list-style-type: none"> Proposes trial period of option 1; existing arrangements could be made to work better. Supports option 3 as this will be relatively straightforward. BOA/BSC points do complicate a full assessment. Questions what the enduring requirements for PN data will be once a Power Available signal is established.
CR-07	EdF	Yes	<ul style="list-style-type: none"> Option 3 appears the simplest long-term solution. Implementation can be independent of a BSC mod although a cross-code workshop would be useful. Would like to understand how a Power Available signal and forecast PNs would be used by the SO. Feels that the extent to which PA addresses objectives may not be known until completion of BSC mods. Reservations expressed around the implementation time for existing generators.
CR-08	EON	No	<ul style="list-style-type: none"> Prefers option 1 and also feels that accuracy of existing PNs could be improved. Thinks that option 3 puts additional costs on PPMs and also questions potential for retrospectivity. Any of options could be progressed independently of a BOA mod, although not clear how option 3 would be used for BOA settlement.
CR-09	RES Ltd	Yes	<ul style="list-style-type: none"> Wanted another Workgroup meeting before the Industry Consultation. Either of options 2 or 3 could address operational data deficiencies. Implementation date (1 April 2015) is too soon for option 3. Could take forwards independently of BOA settlement issues but this would be unwise and thinks that BSC panel should consider options. Thinks consultation should have asked respondents for cost information although believes that the cost for new windfarms of option 3 will be negligible.

Ref	Company	Supportive	Main Comments
Industry Consultation			
CR-10	RWE	Yes	<ul style="list-style-type: none"> Prefers option 3 as the user systems for this are largely in place so will be lowest cost. Suggests delaying application to April 2016. Thinks BSC mod should be carried out before implementation. Questions what purpose PN data will serve going forwards. Need to reconsider total data submissions in light of new data requirements.
CR-11	Scottish Power	Yes	<ul style="list-style-type: none"> Supports option 3. Believes date should be later – suggesting Sept 2015. Provision of PA signal can be addressed independently of BSC changes.
CR-12	SSE	Yes	<ul style="list-style-type: none"> Supports option 3. Existing generators should be allowed to provide a PA signal if they wish. Can be taken forwards separately to BSC issues. Believes application of changes to windfarms under the BSC could be discriminatory.

National Grid Comments on Consultation Responses

14.2 National Grid wish to thank all of the respondents for their comments regarding GC0063 and their support during the Workgroup process.

14.3 The responses received were all broadly supportive of the need to improve the accuracy of availability data for intermittent generation and from this to allow the System Operator to better assess the available headroom and to allow better participation in the response and reserve markets by intermittent generators.

14.4 There was no absolute consensus on the way forward. A majority of respondents supported option 3, the provision of a Power Available signal via SCADA, and believed that this would be the simplest and lowest cost solution, while EON support option 1 (standardisation of MEL) in the belief that this better achieves a more accurate and consistent calculation of MEL while not requiring any additional data items and RES Ltd support either of option 2 (dynamic MEL) or option 3.

14.5 Several parties felt that the application to new generators from 1st April 2015 was too soon to reasonably be incorporated for projects that were already well advance in construction; this was therefore revised to 1st April 2016.

14.6 All respondents agreed that an associated change to the BSC is required. In their response to the Industry Consultation, DONG believe that this complicates a full assessment. Scottish Power, SSE, EdF, RES and EON believe that a BSC change can be taken forwards independently of Grid

Code changes, although EdF believe that a cross-code workshop would be useful and RES Ltd think that the BSC panel should consider the options available. RWE feel that any BSC changes should be concluded before the Grid Code changes are implemented.

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15 GCRP Discussion

- 15.1 The results of the Consultation and a draft of this report to the Authority were discussed at the Grid Code Review Panel meeting held on 21st May 2014. An extract from the minutes is presented in annex 5.
- 15.2 In summary, the 3 options developed by the workgroup were related to the panel plus the majority workgroup view in support of option 3 as written into the draft report. The outcome of the GCRP discussion was that National Grid took an action to update the report with further narrative to reflect the points made, consider further how to progress this and provide updates at future panel meetings.
- 15.3 Option 3 was recommended to the panel as the best compromise to address the deficiencies identified on the basis of the workgroup findings and consultation responses. National Grid were however comfortable with all of the options. Option 2, redefinition of a 'dynamic' MEL, could be equally appropriate and has the advantage that it seeks merely to improve the accuracy and consistency of an existing data item and that it applies to all plant. This option was however unpopular in the workgroup and ensuing consultations, with a majority view being in favour of option 3 on the grounds that this would be cheaper and would not be applied unilaterally to existing plant given the costs associated with retrofitting.
- 15.4 In the GCRP minutes, the points raised with respect to the appropriateness of the choice of option 3 as the preferred way forward focussed on the requirements for:
- More information on the defect that the Power Available Workgroup sought to address.
 - Greater confidence in the costs that would be incurred.
 - Clarity on any retrospective application.
 - Further consideration of the contingent need for a BSC modification.
- 15.5 It was also clear, however, that there was firstly a need for further stakeholder engagement and discussion of the issues. With this in mind, a special session of the Generator Services Group, facilitated by RenewableUK, was arranged on 16 September 2014 and a further meeting of the workgroup on 8 October 2014. A summary of the opportunities given to stakeholders for engagement during the consultation and GCRP discussion phase is given in annex 6.
- 15.6 A further two variations on option 3 were proposed during the final workgroup meeting being:
- Option 3(a) - Similar to option 3 but without the redefinition of MEL. So purely the provision of an additional Power Available signal; and
 - 3(b) Retrospective application of option 3, so applying to all wind farms
- Finally, the option of instead doing nothing was also discussed. However, this was discounted as the defect had been clearly defined and was accepted by the Workgroup.
- 15.7 The view of the workgroup as expressed in the last workgroup meeting was that option 3 was still the favoured way forward.

16 Final Conclusions

16.1 Subsequent to these discussions, the report has been revised to address the points made at GCRP and a new executive summary has been included to improve the narrative. The recommendation of the workgroup as set out in this report is still Option 3, the provision of a new Power Available signal, for the following reasons:

- Option 1 does not provide a consistent answer to the required improvements in MEL accuracy.
- Both of options 1 and 2 can only apply unilaterally as they redefine MEL, so imposing a potentially significant cost burden upon existing generators.
- Option 3(b) likewise applies to existing generators with the same cost proviso.
- For Option 3(a), which excluded the minor redefinition of MEL from option 3, it was agreed that it was preferable to leave this in as the provision of connected capacity data to the market and System Operator would support more effective wind forecasting.
- Option 3 delivers the means by which the System Operator can better predict intermittent generator headroom and therefore will allow the selection and participation of intermittent generators in the frequency response and reserve markets.

16.2 The particular points made in GCRP and expanded on in the subsequent meetings are answered specifically below.

Summary of the defect

16.3 The concept of Power Available is concerned with achieving a more accurate view of the available headroom for intermittent generators between their actual and potential output within Balancing Mechanism timescales. This will allow the System Operator a better view of possible frequency response or reserve actions for these generators, enhancing efficiency of operation and system security. It will also better facilitate market participation of intermittent generation in enhancing their provision of and recompense for response and reserve services.

16.4 The defect that the Workgroup sought to address is that currently the potential maximum output of an intermittent generator is not accurately known by the System Operator, when that generator is operating de-loaded from its maximum output. This presents the System Operator with an increasing operational challenge which will become more prevalent as the penetration of wind generation increases in that the capability of intermittent generation to provide frequency response and reserve services is not accurately known. This will lead to the inefficient scheduling of services with potentially more expensive providers and the loss of associated revenues to wind farms.

16.5 Two items of data are used to provide a measure of potential generator output:

Physical Notification (PN) *Generators are required to provide the best estimate (Physical Notification or PN) of their output for each half hour of the following day, which may then be revised up to an hour before real time (Gate closure). This then becomes their Final Physical Notification which is used by the System Operator to determine the current generator output and forecast output going forward. The accuracy of PN-following for wind farms has been assessed to have an average deviation of 15% compared to a*

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maximum of 5% for other generation types (see report item 6.8) owing to the difficulty in predicting possible output. A recent Grid Code change, C/11, removed the obligation for wind generators to follow their Physical Notification (PN), provided that they follow good industry practice i.e. submit PNs that are a true and accurate reflection of their estimated output at the time they were produced. This was introduced because wind generators can find it difficult to follow PNs due to the variable nature of their primary energy source. However, if a generator that participates in the BM is over-generating relative to its PN, in times of system stress BOAs issued to the generator to reduce output can result in zero payments to the generator for such volumes of over-generation.

Maximum Export Limit (MEL) BM Participants (generators) are required to submit Maximum Export Limit (MEL) data to indicate the maximum power that a BM Unit could export onto the transmission system. The MEL is used by NGET to determine the amount of power available to the System Operator over and above that indicated by PNs and is used in the despatch of frequency response and to determine reserve levels provided by the market. For wind generation, MEL can be perceived as being based on actual or predicted wind speed in order to calculate the actual or forecast maximum capacity respectively. However, this would require frequent updates to MEL which may not be practical compared to submissions from generation with controllable energy sources. Across the industry, there are different practices for submitting MEL; some parties put in MEL as installed capacity, some set MEL to PN and others provide a more dynamic MEL (i.e. a MEL dependent upon the actual availability and output of the plant at a particular time). A very low proportion of windfarms (1.4% - see 6.19) revise their MELs between gate closure and real time, however, indicating that this 'dynamic' view of MEL is far from prevalent.

- 16.6 Inaccurate MELs mean that the System Operator cannot reasonably instruct windfarms to provide frequency response or reserve services, as the level of delivery will be far from certain.

Costs

- 16.7 The costs that would be incurred in providing a Power Available signal for new plant are extremely low since it has been confirmed by workgroup members that this facility is already available in new wind turbines and is used regularly in commissioning activities (including compliance). Retrofitting would be more expensive but is not proposed. By contrast, provision of a dynamic MEL (option 2) would apply across the board and where applied to existing generators could result in substantial additional costs making Option 3 (Data Feed via SCADA) more appropriate.

Retrospectivity

- 16.8 Retrospectivity is confirmed to not be a feature of the option 3 proposal. Both Options 1 and 2 would apply equally to new and existing generators as they affect the way in which data is submitted to National Grid as part of the Balancing Mechanism. Option 3 however would only by default be applied to new Generators.
- 16.9 The date of application to new plant has been moved from April 2015 to April 2016 in response to feedback from the industry consultation and there are no plans to extend this.
- 16.10 Existing generators being BM participants, if they wished to take part in the frequency response and reserve markets, could contact National Grid to arrange retrofitting to facilitate provision of a Power Available signal but this would be non-mandatory and by bilateral agreement only. Equally, National Grid could initiate such discussions if an operational need was identified.

Trialling

- 16.11 Trialling was discussed in detail at the final workgroup meeting of 8 October 2014. It could be used to demonstrate functionality and to prove that the end-to-end process could work.
- 16.12 NGET's opinion was that it was unclear what questions would be answered by trialling; from the use of a power available signal in testing, and the ability of manufacturers to provide and use a similar power available function in Ireland, it is already known to be feasible.
- 16.13 In terms of the process or system changes that would be required by NGET as the System Operator to use the Power Available signal, a clear methodology was presented to the workgroup in the last workgroup meeting.
- 16.14 Some stakeholders were of the view that trialling could answer questions and that it would be helpful to know before a Grid Code change was implemented that the solution worked and was effectively defined.
- 16.15 Trialling would add additional time delays to the effective implementation and roll out of Power Available signalling. On the grounds that the additional benefits of trialling are not clear and that the trialling approach did not have support from the majority of the workgroup it is not proposed to take this forward as part of the solution.

BSC Settlement Accuracy

- 16.16 An associated issue for the outcome of this Workgroup and the proposed way forward is the accuracy of BOA settlement. The Workgroup, and the majority of the consultation respondents, agreed that any of the proposed solutions could be used to improve this through more accurate data submissions. While the governance of BOA settlement would need to involve the BSC panel, it is the view of National Grid that the Grid Code changes associated with any of the options described in this report could be effected prior to the finalisation of any attendant BSC modification. Option 3 is essentially a hardware solution and, while offering potential for use in a future BSC modification, does not in itself impact BOA settlement on implementation.
- 16.17 National Grid recognises that an accuracy standard could be used rather than reliance on a best estimate commensurate with good industry practice; however it was concluded that the approach adopted for PN accuracy should similarly apply to MELs. It remains the case that an accuracy standard could apply to options 1 and 2 while the solution proposed in option 3 effectively makes greater accuracy achievable by referencing the Power Available signal but does not by itself change any of the existing BOA settlement arrangements.
- 16.18 Any changes to the BOA settlement process will need to be taken forwards under the Balancing and Settlement Code and the associated BSC Panel. The Power Available workgroup agreed that while a Power Available signal could help to facilitate such changes it was not necessary to progress work under the BSC in advance of the implementation of the proposed Power Available solution.

Power Available TERMS OF REFERENCE

Governance

1. The Workgroup was established by Grid Code Review Panel (GCRP) at the July 2012 GCRP meeting.
2. The Workgroup shall formally report to the GCRP.

Membership

3. The Workgroup shall comprise a suitable and appropriate cross-section of experience and expertise from across the industry, which shall include:

Name	Role	Representing
Michael Edgar	Chair	National Grid
Robyn Jenkins	Technical Secretary	National Grid
Graham Stein	National Grid Representative	National Grid
Tony Johnson	National Grid Representative	National Grid
Steve Lam	National Grid Representative	National Grid
Andrew Kensley	National Grid Representative	National Grid
	Industry Representative	Transmission Users
	Industry Representative	Wind Turbine Manufacturers
	Industry Representative	Wind Industry Experts
	Authority Representative	Ofgem
	Observer	

Meeting Administration

4. The frequency of Workgroup meetings shall be defined as necessary by the Workgroup chair to meet the scope and objectives of the work being undertaken at that time.
5. National Grid will provide technical secretary resource to the Workgroup and handle administrative arrangements such as venue, agenda and minutes.
6. The Workgroup will have a dedicated section on the National Grid website to enable information such as minutes, papers and presentations to be available to a wider audience. The link to the Grid Code Workgroups page is:

<http://www.nationalgrid.com/uk/Electricity/Codes/gridcode/workinggroups/>

Scope

7. The Workgroup shall consider and report on the following:
 - Clearly define the defect that Power Available attempts to resolve by:

- Quantifying the current accuracy of FPNs from intermittent generators
 - Quantifying the volume of energy curtailed from intermittent generators
 - Identify how the concept of Power Available can be implemented by:
 - Creating a technical standard to calculate Power Available across different turbine manufacturers
 - Identify the method by which data will be collected
 - Identify the obligations on wind farms to collate data
 - Identify how data will be aggregated and converted into a Power Available signal
 - Assess the accuracy (based on time intervals) required for the provision of such data
 - Identify the technical equipment required
 - Examine any required information systems changes
 - Quantify the benefits to wind farms that can be gained from Power Available by:
 - Examining the potential volumes of generation that can utilise such a signal for settlement purposes, within both current and future connections
 - Review the information that is currently available to wind farm operators and assess the value of this to National Grid as National Electricity Transmission System Operator (NETSO).
 - Take into account any analysis carried out by the high wind speed shutdown Workgroup
 - Identify additional items of information which could be of benefit and assess the value of providing these to National Grid as NETSO
 - Take into account any analysis carried out by the high wind speed shutdown Workgroup
 - Assess the investment required to implement a minimal Power Available signal versus a highly accurate signal aggregated on a per turbine basis
 - Examine how Power Available will operate under different scenarios such as:
 - high wind speed shutdown
 - turbine faults
 - Assess whether retrospective application of Power Available will be appropriate
 - Assess whether other renewables should be taken into account
8. The Workgroup will also:

- Take account of and feed into the "high wind speed shutdown" work being carried out under a Grid Code Workgroup
- Take account of the work in C/11 – BM Unit data from Intermittent Generation. This proposed a concept of calculating a generator's Maximum Export Limit (MEL) based on predicted/actual wind speed
- Take account of relevant international practice and the approach taken in European Code development.

Deliverables

9. The Workgroup will provide updates and a Workgroup Report to the Grid Code Review Panel which will:
 - Detail the findings of the Workgroup;
 - Draft, prioritise and recommend changes to the Grid Code and associated documents in order to implement the findings of the Workgroup; and
 - Highlight any consequential changes which are or may be required,
 - Provide a recommendation on how to progress the solution(s)

Timescales

10. It is anticipated that this Workgroup will provide an update to each GCRP meeting and present a Workgroup Report to the January 2013 GCRP meeting.
11. If for any reason the Workgroup is in existence for more than one year, there is a responsibility for the Workgroup to produce a yearly update report, including but not limited to; current progress, reasons for any delays, next steps and likely conclusion dates.

Annex 2 - Proposed Legal Text

This section contains the proposed legal text to give effect to the proposed Grid Code modification as set out in option 3 of this report. The proposed new text is in red and is based on Grid Code Issue 5 Revision 5.

Option 3– Legal Text

PA via SCADA, Redefined MEL – Option 3

SCADA Data

Glossary and Definitions

Power Available A signal prepared in accordance with good industry practice, representing the instantaneous sum of the potential **Active Power** available from each individual **Power Park Unit** within the **Power Park Module** calculated using any applicable combination of meteorological (including wind speed), electrical or mechanical data measured at each **Power Park Unit** at a specified time. **Power Available** shall be a value between 0MW and **Registered Capacity** which is the sum of the potential **Active Power** available of each **Power Park Unit** within the **Power Park Module**. A turbine that is not generating will be considered as not available. For the avoidance of doubt, the **Power Available** signal would be the **Active Power** output that a **Power Park Module** could reasonably be expected to export at the **Grid Entry Point** or **User System Entry Point** taking all the above criteria into account including **Power Park Unit** constraints such as optimisation modes but would exclude a reduction in the **Active Power** export of the **Power Park Module** instructed by **NGET** (for example) for the purposes selecting a **Power Park Module** to operate in **Frequency Sensitive Mode** or when an **Emergency Instruction** has been issued.

Headroom The **Power Available** (in MW) less the actual **Active Power** exported from the **Power Park Module** (in MW).

Connection Conditions

CC.6.5.6 Operational Metering

CC.6.5.6 (d) In the case of a **Power Park Module**, ~~an~~ additional energy input signals (e.g. wind speed, and wind direction) may be specified in the **Bilateral Agreement**. For Power Park Modules with a Completion Date on or after 1st April 2016 a Power Available signal will also be specified in the Bilateral Agreement. The signals ~~would may~~ be used to establish the potential level of energy input from the **Intermittent Power Source** for monitoring pursuant to CC.6.6.1 and **Ancillary Services** and will, in the case of a wind farm, be used to provide **NGET** with advanced warning of excess wind speed shutdown and to determine the level of Headroom available from Power Park Modules for the purposes of calculating response and reserve. For the avoidance of doubt, the Power Available signal would be automatically provided to NGET and represent the sum of

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the potential output of all available and operational **Power Park Units** within the **Power Park Module**. The refresh rate of the **Power Available** signal shall be specified in the **Bilateral Agreement**.

Balancing Codes

BC1.A.1.3.1 Maximum Export Limit (MEL)

A series of MW figures and associated times, making up a profile of the maximum level at which the **BM Unit** may be exporting (in MW) to the **National Electricity Transmission System** at the **Grid Entry Point** or **Grid Supply Point**, as appropriate.

For a **Power Park Module**, the Maximum Export Limit should reflect the maximum possible **Active Power** output from each **Power Park Module** consistent with the data submitted within the **Power Park Module Availability Matrix** as defined under BC.1.A.1.8. For the avoidance of doubt, in the case of a **Power Park Module** this would equate to the **Registered Capacity** less the unavailable **Power Park Units** within the **Power Park Module** and not include weather corrected MW output from each **Power Park Unit**.

Extract from Bilateral Agreement

Appendix F5 - Schedule 2

Site Specific Technical Conditions - Operational Metering (CC.6.5.6)

Description	Units	Type	Provided by	Notes
MW and MVA _r for each Balancing Mechanism Unit and Station Supplies derived from Boundary Point Settlement Metering System	MW MVA _r	Signals to have 0.5 second update rate or better and provide input to the Ancillary Services Monitoring equipment	User.	The functionality, performance, availability, accuracy, dependability, security, delivery point, protocol and repair times of the equipment generating and supplying the signals (ie the meters and communication links) shall be agreed with The Company at least 12 months before the Completion Date. User to provide Single Line Diagram showing location of CT/VT equipment and nomenclature of HV Apparatus. The Company will use this information to notify the User of which HV circuit breaker and disconnector positions (ie status indications) are required. The nomenclature of Users equipment should be in accordance with OC11 of the Grid Code.
Voltage for each generator bay connection to The Company [XXXX] kV substation.	kV	Signals to have 0.5 second update rate or better	User. Note the User shall also make this signal available at its own Control Point for responding to Voltage Control Instructions from The Company	
Frequency	Hz	Signals to have 0.5 second update rate or better and provide input to the Ancillary Services Monitoring equipment	User	
Generator circuit HV circuit breaker(s) and disconnector(s) as agreed with The Company	Open / Closed Indication	Status Indication	User.	
Each User transformer Tap Position Indication (TPI) at the Grid Entry Point	TPI	Tap Position Indication	User.	
Representative wind speed and direction of each Power Park Module	m/s Degrees from North in a clockwise direction	Signals to have a 5 second update rate or better	User.	
Power Available	MW	Signals to have [5 second] update rate or better	User	

Electronic Data Transfer (EDT)

CC.6.5.8 (a) of the Grid Code places an obligation on BM Participants to ensure appropriate electronic data communication facilities are in place to permit the submission of data required by the Grid Code to NGET for use in the Balancing Mechanism. The principle method by which this is achieved is through Electronic Data Transfer (EDT) which is specified in the Bilateral Connection Agreement and enables key settlement data to be submitted such as PN's and BOA's. For full details of EDT, additional information can be obtained from National Grid's website which is available at:-

<http://www.nationalgrid.com/uk/Electricity/Codes/gridcode/ges/ewelecstandards/>

Electronic Data Logging (EDL)

CC.6.5.8 (b) of the Grid Code places an obligation on i) any User who intends to participate in the Balancing Mechanism or ii) any BM Participant who is required to provide all part 1 Ancillary Services specified in CC.8.1 of the Grid Code to have appropriate automatic logging devices installed at the Control Point of its BM Units to submit and receive instructions from NGET as required by the Grid Code. The principle method by which this is achieved is through Electronic Data Logging (EDL) which is specified in the Bilateral Connection Agreement and enables instructions to be issued from NGET to the Generator, for example BOA's or Ancillary Services Instructions. Equally the User will need to respond to instructions from NGET in addition to submitting dynamic parameters such as run up / run down rates or Maximum Import Limits (MIL) or Maximum Export Limits (MEL). For full details of EDL, additional information can be obtained from National Grid's website which is available at:-

<http://www.nationalgrid.com/uk/Electricity/Codes/gridcode/ges/ewelecstandards/>

Supervisory Control and Data Acquisition (SCADA)

Supervisory Control and Data Acquisition (SCADA) is the principle way in which NGET receives operational metering data at its control centre for the purposes of operating the Transmission System in real time. In general, User's of the Transmission System will need to provide operational metering signals (in respect of their plant) in accordance with the terms of the Bilateral Agreement. For a wind farm this would include data such as MW's, MVAR's, voltage, tap position, wind speed and wind direction. These signals will then interface to the nearest Transmission substation from where the Transmission Owner will provide the SCADA outstation interface equipment. These operational metering signals, together with additional transmission system data signals are then routed back to the National Electricity Control Centre.

Operational Metering Schedule

Appendix F5 - Schedule 2

Site Specific Technical Conditions - Operational Metering (CC.6.5.6)

Description	Units	Type	Provided by	Notes
MW and MVA _r for each Balancing Mechanism Unit and Station Supplies derived from Boundary Point Settlement Metering System	MW MVA _r	Signals to have 0.5 second update rate or better and provide input to the Ancillary Services Monitoring equipment	User.	The functionality, performance, availability, accuracy, dependability, security, delivery point, protocol and repair times of the equipment generating and supplying the signals (ie the meters and communication links) shall be agreed with The Company at least 12 months before the Completion Date. User to provide Single Line Diagram showing location of CT/VT equipment and nomenclature of HV Apparatus. The Company will use this information to notify the User of which HV circuit breaker and disconnector positions (ie status indications) are required. The nomenclature of Users equipment should be in accordance with OC11 of the Grid Code.
Voltage for each generator bay connection to The Company [XXXX] kV substation.	kV	Signals to have 0.5 second update rate or better	User. Note the User shall also make this signal available at its own Control Point for responding to Voltage Control Instructions from The Company	
Frequency	Hz	Signals to have 0.5 second update rate or better and provide input to the Ancillary Services Monitoring equipment	User	
Generator circuit HV circuit breaker(s) and disconnector(s) as agreed with The Company	Open / Closed Indication	Status Indication	User.	
Each User transformer Tap Position Indication (TPI) at the Grid Entry Point	TPI	Tap Position Indication	User.	
Representative wind speed and direction of each Power Park Module	m/s Degrees from North in a clockwise direction	Signals to have a 5 second update rate or better	User.	

Note: For the avoidance of doubt the term 'Boundary Point Metering System' is that as defined in the Balancing and Settlement Code. In the event that any part of the User's Operational Metering equipment, including the communications links to The Company's [XXXX]kV substation fails, then the User will be required to repair such equipment within 5 working days of notification of the fault from The Company unless otherwise agreed. The User shall also provide facilities to allow The Company to monitor the health of the Operational Metering equipment up to the Grid Entry Point

CR-01 ScottishPower

Grid Code Workgroup Consultation Response Proforma

GC0063 Power Available

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by 27th January 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

Respondent:	<i>Simon Reid, simonpeter.reid@scottishpower.com, +44 7702 664 236</i>
Company Name:	<i>ScottishPower</i>
Do you support the proposed implementation approach of 10 business days following an Authority decision?	
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	<p><i>Yes</i></p> <p><i>For reference the applicable Grid Code objectives are:</i></p> <p><i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i></p> <p><i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i></p> <p><i>(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i></p> <p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i></p>

<p>Do you agree with the deficiencies identified?</p> <p>(I.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p>Yes</p>
<p>Do you agree with the conclusions of the report that any of the proposed solutions (options 1, 2 & 3) for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if this was considered necessary by BSC parties?</p>	<p>Yes with appropriate industry consultation.</p>
<p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately or should be progressed only when any BSC arrangements are concluded?</p> <p>[Note that the SO believes that these can be done separately if deemed appropriate, however a Workgroup consensus was not achieved on this point]</p>	<p>The power available proposals should only be progressed when BSC arrangements are in place.</p>
<p>Of the three options outlined again below and detailed in the Workgroup report, which do you think best addresses the deficiencies identified, considering both mitigation of these and implementation?</p> <p>Can you give reasons for your preference?</p> <p>Option 1 - Standardisation of MEL which would require a value that would be expected to vary with forecast wind output, where the update frequency was a variable to be determined by the User;</p> <p>Option 2 - Dynamic MEL (Power Available used to calculate MEL), with an update frequency of [10</p>	<p>All options address the deficiency identified through a combination of cost, ease of implementation, transparency and overall benefits.</p> <p>Option 1 I believe that the SO will gain substantial benefits in terms of calculation of headroom from this option and that these may only be dampened by the refresh rate and triggers for resubmission being inconsistent.</p> <p>Option 2 requires an increase in data flows and the management of them, I do not know if this is significant. However the regularity may not bring any benefits in its own right. Confidence in Option 1 or 2 will be earned and cannot be taken for granted.</p>

<p>minutes); and</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p>	<p><i>Option 3 With Option 3 it is not clear reading the legal text how distribution or transmission constraints would be factored into the calculation of Power Available using the availability of the individual turbines? Would an alternative IT platform like Tib Messaging or something else rather than from SCADA system be a choice for this option?</i></p>
<p>For Option 1: (Standardisation of MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply this option? If necessary, indicate whether this is site/asset age specific. • What process do you envisage to implement this option? For example, how frequently would MEL be updated, or what would initiate a Generator to update? 	<p><i>No costs information available at this time.</i></p>
<p>For Option 2: (Dynamic MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update would you consider to be appropriate? 	<p><i>No costs information available at this time.</i></p> <p><i>Frequency of update appears from the consultation information to be appropriate at 10 minutes.</i></p>
<p>For the SCADA based option 3:</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update do you think appropriate given the existing SCADA data flow update to the system operator and the report assessment of a 10 minute data update frequency? 	<p><i>No costs information available at this time.</i></p> <p><i>Frequency of update appears from the consultation information to be appropriate at 10 minutes.</i></p>

<ul style="list-style-type: none"> • Can you provide an indication of the steps and costs needed to apply a retrospective Power Available signal via SCADA and the costs that this might involve? If necessary, indicate whether this is site/asset specific? 	<p><i>This would need to be considered in light of specific individual site costs and benefits derived</i></p>
<p>Do you agree with the benefits proposed below?</p> <p>Do they apply equally (or at all) to each option? If not, please elaborate.</p> <p><u>Proposed Benefits</u></p> <p>At a high level, the proposals discussed as part of this Power Available Workgroup would help to facilitate:</p> <ul style="list-style-type: none"> • The efficient integration, participation and operation of renewable generation into the energy market; • The opportunity for renewable generation to earn additional revenues from the provision of Balancing Services, for example reserve, Bid Offer Acceptances (BOAs) and frequency response; • Reduction in the need to take actions from out of merit alternatives; • Enhanced system security by providing more options for the provision of balancing services, particularly in regions where less generation with controllable fuel sources is available; • Improved system resilience as penetration of renewable generation increases and therefore capacity for renewable generation; and. • More efficient operation of the system allowing all BSUoS payers to benefit from reduced costs of the balancing mechanism. 	<p><i>Yes, as a broad statement, all of the options could deliver benefits in the areas stated.</i></p> <p><i>It is the responsibility of the SO to utilise the additional information as designed.</i></p>

Do you have any additional comments?	<i>None at this time</i>
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Grid Code Workgroup Consultation Response Proforma

GC0063 Power Available

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by 27th January 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

Respondent:	<i>Hannah McKinney 07818654037</i>
Company Name:	<i>DONG Energy UK Wind Power</i>
Do you support the proposed implementation approach of 10 business days following an Authority decision?	<i>For DONG Energy this timeframe would seem achievable on initial assessment. However, we would reserve the right to reconsider this aspect following more detailed analysis of the costs and the implementation practicalities involved (this is currently underway).</i>
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	<i>For reference the applicable Grid Code objectives are: (I) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity; We support National Grid's comments as described in the consultation. (II) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity); We support National Grid's comments as described in the consultation. (III) subject to sub-paragraphs (I) and (II), to promote the security and efficiency of the electricity generation, transmission and distribution systems</i>

	<p>In the national electricity transmission system operator area taken as a whole; and We support National Grid's comments as described in the consultation.</p> <p>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency. We support National Grid's comments as described in the consultation.</p>
<p>Do you agree with the deficiencies identified?</p> <p>(I.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p>Overall we agree with the deficiencies identified. Firstly, this is on the basis of gaining a more accurate view of MEL, whether this is achieved via a standardisation methodology, as per Option 1 or Option 2, or an explicit Power Available signal direct to NGET; as per Option 3. Either of these would appear to be an improvement on the current situation.</p> <p>A secondary benefit of this would be the potential for more accurate forecasting of operational data such as PNs. Although PN accuracy is perhaps subordinate here, the historical mean PN following error for wind BMUs of 15.9% clearly demonstrates a need for assessment of potential measures for improvement.</p> <p>Please see related comments in this respect under the following two questions.</p>
<p>Do you agree with the conclusions of the report that any of the proposed solutions (options 1, 2 & 3) for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if this was considered necessary by BSC parties?</p>	<p>As above, we agree that a subsidiary impact of the proposed solutions could result in more accurate operational data such as PNs. This should in turn facilitate more accurate BOA settlement and minimise the potential of under or over payment for balancing actions undertaken by intermittent generators.</p> <p>Assuming, as suggested, that the System Operator will increase its use of balancing actions on intermittent generation in the future, and importantly, the implications this may have for PPAs, it would seem appropriate for this to be reviewed via the BSC or a Cross Code working group.</p>

	<i>Please see related comments below.</i>
<p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately or should be progressed only when any BSC arrangements are concluded?</p> <p><i>[Note that the SO believes that these can be done separately if deemed appropriate, however a Workgroup consensus was not achieved on this point]</i></p>	<p><i>We believe it would seem appropriate to wait until the BSC workgroup has concluded its review. This is because operational data and settlement data is inevitably linked and this proposal seeks to introduce new data utilised in balancing actions. Another option may be to run this proposal (as much as can be e.g., leaving out settlement considerations) in parallel to the BSC. Either option should fully consider the implications for those wind projects that have PPAs in place.</i></p>
<p>Of the three options outlined again below and detailed in the Workgroup report, which do you think best addresses the deficiencies identified, considering both mitigation of these and implementation?</p> <p>Can you give reasons for your preference?</p> <p>Option 1 - Standardisation of MEL which would require a value that would be expected to vary with forecast wind output, where the update frequency was a variable to be determined by the User;</p> <p>Option 2 - Dynamic MEL (Power Available used to calculate MEL), with an update frequency of [10 minutes]; and</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p>	<p><i>From a small wind farm operator perspective Option 1 as it is currently proposed would seem to best address the deficiencies identified because it appears the most flexible of the options for generators. It allows the provision of MEL updates to be re-submitted manually as and when appropriate. This flexibility could therefore meet the needs of different sized wind farms. It also doesn't restrict the number of updates such that this can be at the discretion or capability/need of the individual wind farm.</i></p> <p><i>However, we do recognise that Option 1 does not explicitly obligate generators to consider resubmitting their MEL at certain intervals following a change in forecast output. We do believe there should be such a requirement which could take the following form. For example, the wind generator would be obligated to consider resubmitting their MELs at a defined minimum interval but no requirement to update/refresh if there is no significant change to the output in line with good industry practice. We believe this could provide a figure which is sufficiently robust to be reliable but not overly burdensome.</i></p> <p><i>In terms of the costs of implementation we believe that option 1 would appear not to impose disproportionate costs on those smaller wind farm operators whilst providing or allowing larger wind operators to update and/or install automated systems.</i></p> <p><i>For DONG Energy specifically, Option 3 would be the option we would support as this both addresses the deficiencies identified (as noted above) and doesn't appear (based on initial review) to impose</i></p>

	<p>additional costs or systems necessarily. This is on the basis that we would seek to integrate this with the existing data-exchange services between us and the SO for example. Therefore, we believe this should be reasonably straightforward - please also see our comments to question 0.</p> <p>We would however, reserve the right to reconsider this aspect following more detailed analysis of the costs involved (this is currently underway).</p>
<p>For Option 1: (Standardisation of MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply this option? If necessary, indicate whether this is site/asset age specific. • What process do you envisage to implement this option? For example, how frequently would MEL be updated, or what would initiate a Generator to update? 	
<p>For Option 2: (Dynamic MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update would you consider to be appropriate? 	
<p>For the SCADA based option 3:</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update do you think appropriate given the existing SCADA data flow update to the system operator and the report 	<p><i>DONG Energy has in principle an Available Power Estimator (APE) Signal from Siemens on all running turbines. The tag is calculated on a running basis and could be made available on the OPC data stream from the park pilot. The quality of the signal is currently not fully understood but on recent park evaluations (Anholt) we found a very good performance of <2-5% error on average.</i></p> <p><i>Currently, for our Danish operations, we are required to deliver APE once a day with 5min resolution to the TSO. The delivery of the signal</i></p>

<p>assessment of a 10 minute data update frequency?</p> <ul style="list-style-type: none"> Can you provide an indication of the steps and costs needed to apply a retrospective Power Available signal via SCADA and the costs that this might involve? If necessary, indicate whether this is site/asset specific? 	<p><i>could be done more frequently as we already exchange data with the TSO providing direct access to the park pilot OPC data and the data exchanges every 5 minute. The typical park pilots logs data every 10minute. However, the APE signal is currently not logged in the 10min scada system across all software versions.</i></p> <p><i>On the basis of the above and in particular the level of data accuracy currently we can provide this in the UK.</i></p> <p><i>To minimize cost related to exchange this should be integrated with an existing data-exchange services between us as a generator and SO, therefore the system the OFTO SCADA system would require reconfiguring to pick up the online signal and integrate into the applicable real-time system.</i></p> <p><i>Post appropriate tag identification it is estimated (very approx.) that 10-15hrs of IT from Siemens would be required per site/asset to secure the APE signal into the OPC stream of the real-time operation system. We currently do not have a quotes for this work from Siemens - therefore cost information TBC.</i></p> <p><i>Please note that this is our high level preliminary assessment and we are currently collating more detail in terms of costs and implementation considerations for the UK. We therefore reserve the right to reconsider this aspect following more detailed analysis of the costs involved and will provide this to you when complete.</i></p>
<p>Do you agree with the benefits proposed below?</p> <p>Do they apply equally (or at all) to each option? If not, please elaborate.</p> <p><u>Proposed Benefits</u></p> <p>At a high level, the proposals discussed as part of this Power Available Workgroup would help to facilitate:</p> <ul style="list-style-type: none"> The efficient integration, 	<p><i>This benefit could be achieved under all options assuming the redefinition of MEL, including refresh</i></p>

<p>participation and operation of renewable generation into the energy market;</p> <ul style="list-style-type: none"> • The opportunity for renewable generation to earn additional revenues from the provision of Balancing Services, for example reserve, Bid Offer Acceptances (BOAs) and frequency response; • Reduction in the need to take actions from out of merit alternatives; • Enhanced system security by providing more options for the provision of balancing services, particularly in regions where less generation with controllable fuel sources is available; • Improved system resilience as penetration of renewable generation increases and therefore capacity for renewable generation; and • More efficient operation of the system allowing all BSUoS payers to benefit from reduced costs of the balancing mechanism. 	<p><i>Interval rates, provide a sufficiently robust signal and information to the System Operator.</i></p> <p><i>As above, the materiality of this opportunity will of course depend on the System Operator needs in terms of balancing actions over time, in particular utilising intermittent generation for reserve and frequency response in addition to managing specific system constraints, as per the current practice. Please see our related views in the 'Additional Comments' section below</i></p> <p><i>This benefit could be recognised under all options assuming the redefinition of MEL, including refresh interval rates, provide a sufficiently robust signal and information to the System Operator.</i></p> <p><i>As above. We note however, the lack of further information on this perceived benefit (and the others listed) means it is difficult to accurately assess and will rely mainly on the System Operator to feedback this information to industry. Please see our related views in the 'Additional Comments' section below</i></p> <p><i>As above</i></p> <p><i>As above</i></p>
<p>Do you have any additional comments?</p>	<p><i>It would be helpful to understand how the PA signals (revised MEL) and operational data such as forecast PNs would be utilised by the System Operator in terms of those decisions and actions taken in respect of the BM. For example, for frequency response and differences with actions taken for constraint management reasons.</i></p>

Grid Code Workgroup Consultation Response Proforma

GC0063 Power Available

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by **27th January 2014** to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

Respondent:	John Norbury Network Connections Manager RWE Supply & Trading GmbH Windmill Hill Business Park Whitehill Way Swindon SN5 6PB T +44 (0)1793 89 2667 M +44 (0)7795 354 382 john.norbury@rwe.com
Company Name:	RWE group of UK companies, including RWE Npower plc, RWE Npower Renewables Limited and RWE Supply & Trading GmbH
Do you support the proposed implementation approach of 10 business days following an Authority decision?	We agree with the recommendation given in Paragraph 11.9 that the text of the Grid Code changes be implemented within 10 business days following an Authority decision. However our support for this is subject to the recommendation given in Paragraph 10.11 that the date of applicability will depend on the adopted solution and that the likely time frame would be 12 to 24 months.
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	For reference the applicable Grid Code objectives are: <i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i> <i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity</i>

	<p><i>on terms which neither prevent nor restrict competition in the supply or generation of electricity;</i></p> <p><i>(ii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i></p> <p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i></p> <p>In the absence of an associated change to the BSC arrangements we are not satisfied that the proposed change GC0063 better facilitates the Grid Code objectives.</p>
<p>Do you agree with the deficiencies identified?</p> <p>(Le. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p>We agree with the deficiencies identified in Paragraph 6. We also consider that the inherent difficulty in achieving correlation between PN data and output generation (and not lack of "accuracy") for intermittent generation results in PN data, as treated under the Grid Code, that is not always likely to be fit for purpose in terms of the User Informing National Grid of predicted output and as a basis for BOA settlement.</p>
<p>Do you agree with the conclusions of the report that any of the proposed solutions (options 1, 2 & 3) for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if this was considered necessary by BSC parties?</p>	<p>We assume that this question refers to Paragraph 1.8 (Executive Summary) as we are unable to find reference to any conclusions in the report.</p> <p>This being the case, we agree that any of the proposed solutions would provide the basis for more accurate BOA settlement, to a greater or lesser extent. However, we do not necessarily consider that this is a matter solely for BSC governance arrangements. The identified deficiencies demonstrate that PN data is unlikely to be always fit for purpose in respect of intermittent generation and, as such, it is probably appropriate to identify and define the appropriate data to be used for both operational and settlement purposes under Grid Code governance.</p>
<p>Do you have a view on whether</p>	<p>We are concerned that all the proposed solutions</p>

<p>the Power Available proposals within the Grid Code can be carried out separately or should be progressed only when any BSC arrangements are concluded?</p> <p><i>[Note that the SO believes that these can be done separately if deemed appropriate, however a Workgroup consensus was not achieved on this point]</i></p>	<p>produce data to be used by National Grid for BOA instruction purposes whilst PN data continues to be used for BOA settlement purposes. We consider it essential that the same data is used for both purposes. Whilst we are unclear of the extent to which National Grid currently uses PN data for intermittent generation, it is difficult to understand how the preparation and treatment of PN data and efficiency of BOA payments under the BSC would improve should the use of PN data be further marginalised by National Grid.</p> <p>We are therefore of the view that the Power Available proposals within the Grid code should be implemented out only when corresponding BSC arrangements are concluded.</p>
<p>Of the three options outlined again below and detailed in the Workgroup report, which do you think best addresses the deficiencies identified, considering both mitigation of these and Implementation?</p> <p>Can you give reasons for your preference?</p> <p>Option 1 - Standardisation of MEL which would require a value that would be expected to vary with forecast wind output, where the update frequency was a variable to be determined by the User;</p> <p>Option 2 - Dynamic MEL (Power Available used to calculate MEL), with an update frequency of [10 minutes]; and</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p>	<p>Of the three options proposed, we would prefer Option 3 – Power Available via SCADA. We note the current lack of clarity regarding weather correction of MEL data and welcome the proposal that the MEL submission represents the available capacity only.</p> <p>Compared to Options 1 and 2, User systems are already largely in place to provide the necessary data and therefore Option 3 would provide the lowest cost option with least User disruption.</p>
<p>For Option 1: (Standardisation of MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply this option? If necessary, 	<p>Cost information not available at this time but expected to be greater than that for Option 3</p>

<p>Indicate whether this is site/asset age specific.</p> <ul style="list-style-type: none"> • What process do you envisage to implement this option? For example, how frequently would MEL be updated, or what would initiate a Generator to update? 	
<p>For Option 2: (Dynamic MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update would you consider to be appropriate? 	<p>Cost information not available at this time but expected to be significantly greater than that for Option 3</p>
<p>For the SCADA based option 3:</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update do you think appropriate given the existing SCADA data flow update to the system operator and the report assessment of a 10 minute data update frequency? • Can you provide an indication of the steps and costs needed to apply a retrospective Power Available signal via SCADA and the costs that this might involve? If necessary, indicate whether this is site/asset specific? 	<p>Cost information not available at this time but expected to be less than that for Option 1 or 2.</p>
<p>Do you agree with the benefits proposed below?</p> <p>Do they apply equally (or at all) to each option? If not, please elaborate.</p> <p><u>Proposed Benefits</u></p> <p>At a high level, the proposals</p>	<p>We agree that the identified benefits may be realised by the proposed change but any such benefits are likely to be offset by further inefficiencies created in the BOA payment mechanism, which would continue to be based on submitted PN data.</p>

<p>discussed as part of this Power Available Workgroup would help to facilitate:</p> <ul style="list-style-type: none"> • The efficient integration, participation and operation of renewable generation into the energy market; • The opportunity for renewable generation to earn additional revenues from the provision of Balancing Services, for example reserve, Bid Offer Acceptances (BOAs) and frequency response; • Reduction in the need to take actions from out of merit alternatives; • Enhanced system security by providing more options for the provision of balancing services, particularly in regions where less generation with controllable fuel sources is available; • Improved system resilience as penetration of renewable generation increases and therefore capacity for renewable generation; and. • More efficient operation of the system allowing all BSUoS payers to benefit from reduced costs of the balancing mechanism. 	
<p>Do you have any additional comments?</p>	<p>It would be helpful to understand the current / potential usefulness within the balancing mechanism of PN and MEL data submitted for intermittent generation and whether the use of this data category is and is likely to remain fit for purpose with an increasing volume of intermittent generation. It would also be helpful to better understand National Grid's role in forecasting intermittent generation and whether a more formal role of central forecasting would provide a more efficient solution for the industry.</p>

Grid Code Workgroup Consultation Response Proforma

GC0063 Power Available

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by 27th January 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

Respondent:	Campbell McDonald, 01738 453424, 07767 852614, campbell.mcdonald@sse.com
Company Name:	SSE Generation Ltd, Keadby Generation Ltd, Medway Power Ltd, Uskmouth Power Company Ltd and SSE Renewable Holdings Ltd
Do you support the proposed implementation approach of 10 business days following an Authority decision?	No. With respect to Options 1 and 2 the required changes or additions to operational IT systems will take time to go through a change control processes. In that it will need time to specify, procure, implement and commission new or amended systems. Should this requirement be applied retrospectively, implementation time frame should be at least 12 months? With respect to Option 3 we consider this obligation should be applied to new generators connecting after a specified date, suggestion April 2015, allowing time to specify the new requirement in the turbine supply contract.
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	<p>We believe that only part of the objective of GC 0063 better facilitates the grid code objectives improving the confidence of the System Operator in the headroom available to hold frequency response when wind farms are curtailed by the provision of the Power Available data should allow wind farms to compete in the frequency response market and balancing market thus subsequently improving the economics of the system operation and promoting the security of the system.</p> <p>We do not believe the objective to substitute Power Available for PNs for the purposes of calculating BOA volumes in GC0063 better facilitates Grid code objectives as it reduce the emphasis on accuracy of PN for operational purposes and introduces discrimination in market settlement for a group of generators.</p>

<p>Do you agree with the deficiencies identified?</p> <p>(Le. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p>We agree with the identified deficiency relating to the lack of visibility of headroom from curtailed wind farms for the provision of holding reserve and frequency response. This deficiency impacts on the ability of wind farms BMUs to participant in these markets. We disagree with the identified deficiency relating to the accuracy of PNs for the purpose of calculating BOA volumes. The settlement process for all BMUs is based on the submitted PN. We do not agree that wind farm BMUs should be singled out when the accuracy of other BMUs such as Demand BMUs have similar challenges. The accuracy of the PN from wind farms due to the length of the gate closure period imposed contributes significantly to any inaccuracy.</p>
<p>Do you agree with the conclusions of the report that any of the proposed solutions (options 1, 2 & 3) for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if this was considered necessary by BSC parties?</p>	<p>No. We disagree with this conclusion. Data submitted as set out in Options 1 & 2 will still be as inaccurate to a degree; therefore to replace an inaccurate PN with an inaccurately derived PN doesn't make sense. Settlement from periodic or 10 minute updates of MEL may not deliver perceived benefits. MEL updates as per Options 1 & 2 will be required 24/7 only to be used very occasionally for settlement when the BMU is curtailed by BOA. We believe there are inherent problems with these options and considerable administrative burden to continually update MEL. No other BMU would have this cost and liability to constantly track an intermittent power source for settlement of BOA and in addition have the requirement to submit accurate PN for efficient operation of the NETS.</p> <p>Option 3 for the settlement of BOA could be used for BOA settlement if the level of accuracy was subject to grid code compliance. If not governed the level of accuracy is not guaranteed to be better than the PN submission. Similarly with Options 1 & 2 the requirement to submit accurate PNs for the optimisation of the NETS would remain and using Power Available for settlement could detract from the requirement for PN accuracy.</p>
<p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately or should</p>	<p>The proposed power available modification to the Grid Code could be carried out separately only where they were to be used for the purpose of indicating headroom during a BOA to curtail a wind</p>

<p>be progressed only when any BSC arrangements are concluded?</p> <p><i>[Note that the SO believes that these can be done separately if deemed appropriate, however a Workgroup consensus was not achieved on this point]</i></p>	<p>farm.</p> <p>For any other purpose a simultaneous change would be required with the BSC.</p> <p>A change to the settlement of BOAs for wind farms to anything other than PN could be viewed as discriminatory. Especially we believe as the current BSC rules stand other generators would have BOAs settled to their PN even when their MEL was lower than PN.</p>
<p>Of the three options outlined again below and detailed in the Workgroup report, which do you think best addresses the deficiencies identified, considering both mitigation of these and Implementation?</p> <p>Can you give reasons for your preference?</p> <p>Option 1 - Standardisation of MEL which would require a value that would be expected to vary with forecast wind output, where the update frequency was a variable to be determined by the User;</p> <p>Option 2 - Dynamic MEL (Power Available used to calculate MEL), with an update frequency of [10 minutes]; and</p> <p>Option 3 - Power Available Data via SCADA. I.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p>	<p>We believe Option 3 best addresses the issue of confidence in the headroom available when a wind farm BMU is subject to BOA allowing the NETSO to commit to ancillary services provision from wind farms.</p> <p>The Available Power signal delivered via a Scada interface would allow the NETSO refer to data as and when they need it. The implementation of the Available Power signal requirement when included in the functional specification of a turbine supply contract would be relatively inexpensive and manageable. Existing Wind farm BMU operators could chose to implement Option 3 voluntarily where the cost and opportunity to participate in the reserve and frequency markets is acceptable. Full retrospective application of this requirement would be costly to generators.</p>
<p>For Option 1: (Standardisation of MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply this option? If necessary, indicate whether this is site/asset age specific. • What process do you envisage to implement this option? For example, how frequently would MEL be updated, or what would 	<p>Costs would be incurred to develop a mechanism to provide the operator with the defined Available Power figure and significant resource cost of an operator to make the submissions via EDL or the cost of automating the EDL update process. If this is a manual import, there is risk of human error. There would be a cost associated with setting up a database along with the associated maintenance to automate the calculation.</p> <p>The frequency of MEL update would have to be a function of % change of previously submitted MEL; this may require updates very frequently in some</p>

<p>Initiate a Generator to update?</p>	<p>Instances.</p>
<p>For Option 2: (Dynamic MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update would you consider to be appropriate? 	<p>We believe an automated system would be required for every BMU to be in a position to provide the defined Available Power figure required to update MEL every ten minutes. Therefore this option may require additional hardware as well as software and timely to construct on existing and new projects alike. Training, maintenance and on going operation will need to be included in the costs. In some instances gathering the necessary information will be more challenging as the turbine manufactures SCADA systems are not developed to the same level, so the solution and associated costs would be very dependant of the turbine make and model.</p> <p>A dynamic MEL every ten minutes is harder to deliverer as it requires a routine / data manipulation to generate a Power Available MEL. The Power Available MEL would be much more realistic then Option 1, as the information would be sampled every 10mins as opposed to 60-90mins. This option would if automated would remove the majority of risk associated with human error.</p> <p>The frequency of update required would need to be relative to a specified percentage change to the previous submission. Every ten minutes would be a practical position for an automated process but not for a manual update process.</p>
<p>For the SCADA based option 3:</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update do you think appropriate given the existing SCADA data flow update to the system operator and the report assessment of a 10 minute data update frequency? • Can you provide an indication of the steps and costs needed to apply a retrospective Power Available signal via SCADA and the costs that this might involve? If necessary, 	<p>The cost of Option 3 if specified in the project design stage of new projects would be minimal.</p> <p>Power Available via SCADA is believed to be the easiest option going forwards to implement on new projects. The normal sampling time for the SCADA would be 1min. The frequency of update should be the same as the rate specified for the other Scada signals required from a wind farm to avoid confusion and for ease of configuration.</p> <p>New projects it will be much easier to set-up the SDACA requirements to ensure the necessary information is collected. Retro-fitting onto an existing operational project would be exposed to the same challenges as identified for Option 2.</p> <p>Most, if not all turbine suppliers would have to reconfigure the Wind Farm Scada on existing wind farms to produce a signal to meet the definition specified in this proposal at a considerable cost. Any change to a wind farm control system need to</p>

<p>Indicate whether this is site/asset specific?</p>	<p>be carefully managed to ensure Grid Code compliance is not compromised.</p> <p>In Ireland to facilitate a change to the definition of Available Power, SSE agreed a contract with the turbine supplier to reconfigure the wind farm Scada, upgrade software and hardware to deliver the signal on 11 wind farms at a cost of £400K. The internal cost providing resource for testing and submission of data was other £250K.</p>
<p>Do you agree with the benefits proposed below?</p> <p>Do they apply equally (or at all) to each option? If not, please elaborate.</p> <p><u>Proposed Benefits</u></p> <p>At a high level, the proposals discussed as part of this Power Available Workgroup would help to facilitate:</p> <ul style="list-style-type: none"> • The efficient integration, participation and operation of renewable generation into the energy market; • The opportunity for renewable generation to earn additional revenues from the provision of Balancing Services, for example reserve, Bid Offer Acceptances (BOAs) and frequency response; • Reduction in the need to take actions from out of merit alternatives; • Enhanced system security by providing more options for the provision of balancing services, particularly in regions where less generation with controllable fuel sources is available; • Improved system resilience as penetration of renewable generation increases and therefore capacity for renewable generation; and. • More efficient operation of the system allowing all BSUoS payers to benefit from reduced costs of the balancing mechanism. 	<p><i>No not all of them</i></p> <p>Yes if the NETSO use the information efficiently</p> <p>Yes, hopefully as long as the NETSO have a willingness to contract for time periods achievable by wind farm BMUs</p> <p>Yes, hopefully as long as the NETSO have a willingness to contract for time periods achievable by wind farm BMUs</p> <p>Yes</p> <p>Yes</p> <p>Yes in part, by allowing Wind Farms to access ancillary service markets not currently available to them</p> <p><i>No. the substitution of PN for Power available need</i></p>

	<i>to be considered by the BSC panel before any impact on BSUoS could be evaluated</i>
Do you have any additional comments?	SSE has indicated its preference for Option 3, however it should be noted that this is on the assumption that it is not a requirement to be applied to existing wind farms but instead for new connections after a certain date.

Grid Code Workgroup Consultation Response Proforma

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Please send your responses by 27th January 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

Respondent:	<i>Guy Phillips (guy.phillips@eon-uk.com)</i>
Company Name:	<i>E.ON UK plc</i>
Do you support the proposed implementation approach of 10 business days following an Authority decision?	<i>With the exception of option 1, no. Option 1 can be implemented following 10 business days as it is limited to a change to the legal text of the Grid Code to improve the definition of the requirement. Option 2 involves an information systems lead time, to implement the automated update to MEL, which needs to be considered in more detail. In absence of a more defined requirement, we would suggest this would need to be at least two years following an Authority decision. Option 3 should only apply to generation contracting for its plant or connecting after a specified date. For both options 2 and 3 these aspects are not referenced in the draft legal text contained in the consultation document. If this was clarified in the draft legal text it may be possible to support an implementation approach of 10 business days following an Authority decision.</i>
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	<i>We do not think it appropriate to reply to this question until a final recommendation on which option to take forward is made.</i>
Do you agree with the deficiencies identified? (I.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)	<i>In our view there is scope to improve the information provision to the system operator to enable it to better determine the available headroom for holding reserve and frequency response from wind farms. We also believe that there is scope to improve accuracy of PN submissions from wind farms.</i>
Do you agree with the conclusions of the report that any of the proposed solutions (options 1, 2 & 3) for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through	<i>Options 1 and 2 may improve the current arrangements for BOA settlement through more consistent and accurate data, however it is not clear how any of the options in of themselves alter the way in which BOA volumes are calculated. Although there is a perceived issue with PN accuracy for the purpose of determining BOA</i>

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<p>Balancing and Settlement Code governance arrangements if this was considered necessary by BSC parties?</p>	<p>volumes we note that the working group has concluded that this is outside of its scope.</p>
<p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately or should be progressed only when any BSC arrangements are concluded?</p> <p><i>[Note that the SO believes that these can be done separately if deemed appropriate, however a Workgroup consensus was not achieved on this point]</i></p>	<p>In our view the Power Available proposals, whichever is selected, could be taken forward independently of any subsequent BSC change a Party may seek to bring forward.</p>
<p>Of the three options outlined again below and detailed in the Workgroup report, which do you think best addresses the deficiencies identified, considering both mitigation of these and implementation?</p> <p>Can you give reasons for your preference?</p> <p>Option 1 - Standardisation of MEL which would require a value that would be expected to vary with forecast wind output, where the update frequency was a variable to be determined by the User;</p> <p>Option 2 - Dynamic MEL (Power Available used to calculate MEL), with an update frequency of [10 minutes]; and</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p>	<p>In our view the specific issues for the System Operator described in Chapter 4 of the consultation arise from different approaches taken by different parties to calculating, and keeping up to date, MEL and PN's from Generators with an Intermittent Power Source. If these data items were calculated and submitted on a consistent basis then the System Operator would have more confidence in the data to be able to better use it to address the specific issues it describes.</p> <p>We therefore support Option 1. This is because in principle it sets the requirement for MEL to be calculated, submitted and updated on a consistent basis by different Users. We also support this option as it retains consistency of data items across all generation technology types. Aligned with a common understanding of Good Industry Practice in formulating and updating PN submissions to the System Operator, Option 1 should be given time to determine if it delivers improvements to the data submitted to the System Operator. The System Operator should consider managing individual parties that are outside the scope of the revised interpretation initially through bilateral meetings. This would be to educate parties on their obligations and requirements upon them. However if this does not lead to an improvement from an individual party the System Operator should consider options such as reporting to the regulator and naming and shaming consistent poor performance. Parties should then ultimately consider their wider Industry Code and regulatory rights and duties.</p> <p>We have discounted Option 2 as we do not see how an automated update differs from Option 1</p>

	<p>and that the generator is best placed to determine when MEL would need to be re-declared. It is also not clear under Option 2 what the requirements are, aside from the suggested persistence modelling, for revisions to MEL such that the data is taken forward from real time through the BM. We do not think that the case for Option 3 is sufficiently robust at this time. The System Operator has not been able to quantify or articulate the materiality of their specific issues to justify a new data item to be provided by Generators with an Intermittent Power Source. We are also not clear how the data under Option 3 differs from a properly derived MEL that Option 1 provides.</p>
<p>For Option 1: (Standardisation of MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply this option? If necessary, indicate whether this is site/asset age specific. • What process do you envisage to implement this option? For example, how frequently would MEL be updated, or what would initiate a Generator to update? 	<p>We do not believe this option would impose any additional cost to us as we already take in to account the prevailing wind forecast and turbine availability when calculating MEL. It is possible that other parties may incur some costs in adding this data when formulating and updating their MEL submissions.</p>
<p>For Option 2: (Dynamic MEL option)</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update would you consider to be appropriate? 	<p>We would incur costs to add specific functionality to our IT infrastructure to process the required automated update. We are not in a position to confirm the specific cost and lead time to do this.</p>
<p>For the SCADA based option 3:</p> <ul style="list-style-type: none"> • What costs do you envisage this imposing? • Can you provide an indication of the steps and costs needed to apply? If necessary, indicate whether this is site/asset age specific. • What frequency of update do you think appropriate given 	<p>We are not able to state the specific costs or lead times necessary to implement option 3. Much will depend on what additional cost OEM's will apply for this additional component and data item, alongside the communication infrastructure needed to send the data to the System Operator. In the case of existing sites, if this data item is not readily available then we would expect the implementation cost to increase further.</p>

<p>the existing SCADA data flow update to the system operator and the report assessment of a 10 minute data update frequency?</p> <ul style="list-style-type: none"> • Can you provide an indication of the steps and costs needed to apply a retrospective Power Available signal via SCADA and the costs that this might involve? If necessary, indicate whether this is site/asset specific? 	
<p>Do you agree with the benefits proposed below?</p> <p>Do they apply equally (or at all) to each option? If not, please elaborate.</p> <p><u>Proposed Benefits</u></p> <p>At a high level, the proposals discussed as part of this Power Available Workgroup would help to facilitate:</p> <ul style="list-style-type: none"> • The efficient integration, participation and operation of renewable generation into the energy market; • The opportunity for renewable generation to earn additional revenues from the provision of Balancing Services, for example reserve, Bid Offer Acceptances (BOAs) and frequency response; • Reduction in the need to take actions from out of merit alternatives; • Enhanced system security by providing more options for the provision of balancing services, particularly in regions where less generation with controllable fuel sources is available; • Improved system resilience as penetration of renewable generation increases and therefore capacity for renewable generation; and. • More efficient operation of the system allowing all BSUoS payers to benefit from reduced 	<p><i>At a high level yes, however we do not recognise many of the statements made when assessing the options in the table starting on page 29 of the consultation. Many of the statements and comparisons made are subjective and not supported by robust analysis. The comparison also leads the reader to believe that Option 3 is the best outcome, which, given the veracity of the statements made, is misleading and, in our view, incorrect. This has been constructed by the System Operator to support its conclusion. Given the timescales for working group members to discuss and review the document prior to publication the table has not been properly scrutinised.</i></p>

costs of the balancing mechanism.	
Do you have any additional comments?	We do not support the statement in paragraph 1.16 of the consultation. It is not correct to say that the working group concluded that option 3 would best address the deficiencies identified. As a member of the working group, I would highlight that this was not a unanimous view of the working group.

Grid Code Industry Consultation Response Proforma

GC0063 Power Available

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Please send your responses by 7th April 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

Respondent:	<i>Hannah McKinney Hanmc@Dongenergy.co.uk</i>
Company Name:	<i>DONG Energy UK Wind Power</i>
Do you support the proposed implementation approach of 10 business days following an Authority decision?	<i>We believe more time should be allocated; the duration should be appropriate to the final option implemented.</i>
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	<p><i>For reference the applicable Grid Code objectives are:</i></p> <p><i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i></p> <p><i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i></p> <p><i>(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i></p> <p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European</i></p>

	<p><i>Commission and/or the Agency.</i></p> <p><i>We believe this proposal could better facilitate part of the applicable Grid Code objectives such that competition is facilitated, and therefore more economic dispatch actions, could be taken. This should in turn drive savings on terms of overall balancing costs. However, the related BOA settlement/BSC points (if part of this proposal?) make it difficult to fully assess the benefits of this proposal against all the applicable objectives.</i></p>
<p>Do you agree with the deficiencies identified?</p> <p>(i.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p><i>We agree there are currently deficiencies concerning the visibility of accurate headroom for holding reserve and frequency response from curtailed intermittent generators. However, we note (for the purposes of calculating headroom and frequency response, which the MEL is stated to be used for by the SO) that this could be improved if all intermittent generators were consistent in the calculation and provision (including update frequency/refresh intervals) of this data. The calculation should be based on a standardised definition eg, on a profile derived from Power Available (PA) and not, for example, based on registered capacity.</i></p> <p><i>On this basis it would appear that the existing arrangements could work to better enable intermittent generators to participate in these types of ancillary services in the BM. We therefore see that it is a matter of ensuring all parties formulate and update their MEL submissions, which in turn can be expected to increase the level of accuracy required for headroom calculation etc.</i></p>
<p>While this view was not unanimous, a majority of the respondents to the Workgroup consultation and National Grid concluded that the option as detailed in the report that will best address the deficiencies identified is:</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid</p>	<p><i>Given our comments to the above we would support a trial period for example for Option 1. The standardisation approach offered with Option 1 addresses the deficiencies identified. If it is considered too difficult to mandate (or enforce) in practice (and improvements eg, data accuracy etc do not materialise) then Option 3 would appear an appropriate means.</i></p> <p><i>However, for DONG Energy specifically, Option 3 is an option that we do support; this does address the deficiencies as noted above and wouldn't impose additional costs or systems necessarily for</i></p>

<p>Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p> <p>Do you have a view on this?</p>	<p><i>us. Therefore, we believe this should be reasonably straightforward - please also see our previous comments concerning this aspect under question 9 (previous consultation).</i></p>
<p>The Workgroup recommends that, other than in exceptional circumstances, this option would only apply to New Generators with Boia Completion Date on or after 1 April 2015.</p> <p>Do you have a view on this?</p>	<p><i>Appears reasonable.</i></p>
<p>The Workgroup report concludes that the proposed solution for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if considered necessary by BSC parties.</p> <p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately, which is the view of National Grid and some of the previous respondents, or should they be progressed only when any BSC arrangements are concluded?</p>	<p><i>The subject of this consultation has developed on the basis that the PN is not always adequate for accurate BOA instructions on intermittent generators and, on the back of that, suggests there is a case to review the adequacy of the PN for calculating accurate BOA settlement. We therefore believe there are separate (although related) issues here, one being the introduction of new data (PA) for the purposes of accurate BOA instruction, headroom etc and the other being the appropriate use of the PN (given the accuracy issues) for both BOA settlement purposes and NGET's enduring requirement (see our comments below). Our preference is that BOA settlement should be based on the same data item as that utilised for BOA instructions (ideally).</i></p> <p><i>It would seem appropriate that this latter point is given further consideration and reviewed and/or progressed as appropriate via the BSC arrangements.</i></p>
<p>Do you have any additional comments?</p>	<p><i>As referenced in our previous response it would be helpful to understand NGET's current and enduring requirement for PN data particularly post implementation of a PA signal.</i></p>

Grid Code Industry Consultation Response Proforma

GC0063 Power Available

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by 7th April 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

Respondent:	<i>Mari Toda 07875 116520 mari.toda@edfenergy.com</i>
Company Name:	<i>EDF Energy</i>
Do you support the proposed implementation approach of 10 business days following an Authority decision?	<i>If GC0063 only applies to New Generators with a Completion Date of on or after 1 April 2015, then the implementation approach of 10 business days following an Authority decision seems reasonable. However, the consultation also states in paragraph 1.17 that in exceptional circumstances where National Grid can reasonably demonstrate that a Power Park Module has a significant effect on the National Electricity Transmission System it may require some existing Generators to provide a Power Available signal. These Generators may require more than 10 business days and another implementation approach may be necessary for these Generators.</i>
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives? <i>For reference the applicable Grid Code objectives are:</i> <i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i> <i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to</i>	<i>Broadly speaking, yes. But we suspect that the extent to which GC0063 facilitates the appropriate Grid Code objectives might not be known until the corresponding changes to the BSC are examined.</i>

<p><i>supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i></p> <p><i>(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i></p> <p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i></p>	
<p>Do you agree with the deficiencies identified?</p> <p>(i.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p><i>We agree with the identified deficiency relating to the lack of visibility of headroom from curtailed wind farms for the provision of holding reserve and frequency response.</i></p> <p><i>We also acknowledge that for certain generators, it can be difficult to provide PNs that fully correspond to outturn generation. Whether this is a deficiency is a moot point but we would agree that GC0063 has the potential to create more accurate forecasting of operational data such as PNs.</i></p>
<p>While this view was not unanimous, a majority of the respondents to the Workgroup consultation and National Grid concluded that the option as detailed in the report that will best address the deficiencies identified is:</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p> <p>Do you have a view on this?</p>	<p><i>While we believe that any of the three options considered could address the deficiency highlighted above, Option 3 appears to be the simplest in the long term.</i></p>

<p>The Workgroup recommends that, other than in exceptional circumstances, this option would only apply to New Generators with a Completion Date on or after 1 April 2015.</p> <p>Do you have a view on this?</p>	<p><i>We support this recommendation.</i></p>
<p>The Workgroup report concludes that the proposed solution for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if considered necessary by BSC parties.</p> <p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately, which is the view of National Grid and some of the previous respondents, or should they be progressed only when any BSC arrangements are concluded?</p>	<p><i>To address the deficiency (i.e. lack of visibility of headroom for the purposes of holding reserve and frequency response), we believe this proposal can be carried out independently of the BSC.</i></p> <p><i>Given that operational data and settlement data are inevitably linked it would, however, be useful to have a cross code workshop to examine any unintended consequences, if any.</i></p>
<p>Do you have any additional comments?</p>	<p><i>It would be helpful to understand how the PA signals and operational data such as forecast PNs would be utilised by the SO in terms of those decisions and actions taken in respect of the BM.</i></p> <p><i>We also expect the PA data to be transparent and available to anyone.</i></p>

Grid Code Industry Consultation Response Proforma

GC0063 Power Available

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by 7th April 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

Respondent:	<i>Guy Phillips (guy.phillips@eon-uk.com)</i>
Company Name:	<i>E.ON</i>
Do you support the proposed implementation approach of 10 business days following an Authority decision?	<i>Yes, although note our later comments with regard to the cut-off date for New Generators.</i>
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	<p><i>For reference the applicable Grid Code objectives are:</i></p> <p><i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i></p> <p><i>Yes, as each of the options enable improved information to be provided to the System Operator to enable it to have a more confident and accurate view of available headroom for frequency response and reserve holding purposes.</i></p> <p><i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i></p> <p><i>Under the preferred option 3 we do not believe this objective is achieved. This is because the power available information will not be visible to market participants through the BMRS enabling them to form their own assessment of market conditions. It also creates an additional parameter of information provision on one class of generator that is not</i></p>

	<p><i>required for conventional generators, increasing the costs to Power Park Modules to enter and participate in the market. If there is a potential risk of retrospective application this will also increase the costs to existing Power Park Modules.</i></p> <p><i>(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i></p> <p><i>We have no comments on this objective other than those already given in sub-paragraphs (i) and (ii).</i></p> <p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i></p> <p><i>We think the proposal is neutral to this objective.</i></p>
<p>Do you agree with the deficiencies identified?</p> <p>(i.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p><i>In our view there is scope to improve the information provision to the system operator to enable it to better determine the available headroom for holding reserve and frequency response from wind farms. We also believe that there is scope to improve accuracy of PN submissions from wind farms.</i></p>
<p>While this view was not unanimous, a majority of the respondents to the Workgroup consultation and National Grid concluded that the option as detailed in the report that will best address the deficiencies identified is:</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p> <p>Do you have a view on this?</p>	<p><i>We do not agree that Option 3 is the best option. Whilst we are in the minority, we believe that other market participants would be able to integrate their wind forecast and turbine availability information in to the MEL submission. This information must be available to market participants for their own trading purposes. We would highlight that some participants already calculate MEL on this basis.</i></p> <p><i>We think that Option 1 continues to be the best option as it utilises an existing parameter prepared by the generator and that is made available to all market participants through the BMRS.</i></p> <p><i>Instead of simply requiring another data item from wind farms through the SCADA system, in our view the system operator should be trying to improve the quality of information provided through existing</i></p>

	<p><i>market parameters to derive a common good industry practice standard from relevant market participants.</i></p> <p><i>We also think that the risk of retrospective application with Option 3 is detrimental to existing wind farms, even though there is no provision in the proposed legal text to enable retrospective application. By comparison Option 1 is prospective and would apply to all relevant generators, both existing and new, enabling more complete and accurate total system data to be available to the system operator.</i></p>
<p>The Workgroup recommends that, other than in exceptional circumstances, this option would only apply to New Generators with a Completion Date on or after 1 April 2015.</p> <p>Do you have a view on this?</p>	<p><i>With regard to the cut-off date for new generators; depending on when an Authority decision is made this may not give sufficient time for generators to contract for the provision of the Power Available signal or result in a more costly variation order to existing contracts. It may be more appropriate to push back the cut-off date by one year to April 2016 to give more notice of the change.</i></p> <p><i>We do not think Option 3 can apply retrospectively. There is no provision to do this in the proposed legal text and the consultation document gives no guidance as to what constitutes 'exceptional circumstances' so is a subjective determination by the system operator. As has already been stated, retrospective application could be more costly depending on whether the information is readily available to the generator, sufficient communication infrastructure is in place to provide it and what premium is placed on providing this information to a generator with an existing contract.</i></p>
<p>The Workgroup report concludes that the proposed solution for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if considered necessary by BSC parties.</p> <p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately, which is the view of National Grid and</p>	<p><i>In terms of information provision to the system operator any of the power available options can be implemented separately to any proposal regarding PN accuracy and BOA settlement.</i></p> <p><i>At first instance it is not clear how Option 3 may be used for BOA settlement from wind farms. As the working group concluded that the accuracy of BOA settlement from wind farms is outside the scope of the Grid Code, none of the power available options address the issue of BOA settlement from wind farms. As such, with the conclusions that have emerged from the power available working group the issue of BOA settlement of wind farms would</i></p>

some of the previous respondents, or should they be progressed only when any BSC arrangements are concluded?	<i>have to be progressed separately.</i>
Do you have any additional comments?	No.

Grid Code Industry Consultation Response Proforma

GC0063 Power Available

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Please send your responses by 7th April 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

Respondent:	Joe Duddy Joe.duddy@res-ltd.com 01923 299 213
Company Name:	RES Ltd.
Do you support the proposed implementation approach of 10 business days following an Authority decision?	Yes we agree with the proposals of section 12.9, provided that the proposals of section 10.12 are also adopted i.e. that the new requirements shall not apply to any User until after 12-24 months after the Authority decision. This is not explicitly provided in the proposed legal text which should be amended accordingly. The legal text presently refers to 1 April 2015 (which is too soon) with respect to Option 3 only.
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	Yes, the proposals better facilitate objectives i, ii and iii below. <i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i> <i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i> <i>(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i>

	<p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i></p>
<p>Do you agree with the deficiencies identified?</p> <p>(i.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p>Yes. However the costs of these deficiencies (or the benefits of their rectification) are not quantified. Therefore it is difficult to assign any significance to these deficiencies.</p>
<p>While this view was not unanimous, a majority of the respondents to the Workgroup consultation and National Grid concluded that the option as detailed in the report that will best address the deficiencies identified is:</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p> <p>Do you have a view on this?</p>	<p>The Workgroup Consultation responses were not considered by the Workgroup before National Grid issued this Industry Consultation, despite the Workgroup Consultation document 20/12/13 which says</p> <ul style="list-style-type: none"> • <i>“The content and views provided by parties in response to this Workgroup Consultation will be captured in a revised Workgroup Report which will then be progressed to Industry Consultation and, following any further amendments, will then be submitted to the Grid Code Review Panel (GCRP).”</i> And • <i>“Responses to this will be reviewed by the Workgroup before a formal Industry Consultation is initiated...”</i> <p>The Workgroup has not met since 29/10/13 and therefore it has not reviewed the Workgroup Consultation responses nor participated in the subsequent preparation of this Industry Consultation. All comments and conclusions on the outcome of the Workgroup Consultation described in this Industry Consultation are therefore those of National Grid and not of the Workgroup.</p> <p>RES does not believe that option 1 provides sufficient standardisation (no resubmission rate specification) to meet the needs of the System Operator for a value which more accurately reflects Power Park Module headroom than the present PN submissions.</p> <p>Options 2 and 3 could both address the operational data deficiencies described in sections 6.2-6.4 and provide the System Operator with a better</p>

	<p>indication of Power Park Module headroom than present PN submissions. RES has no view on which option better addresses the BOA volume accuracy deficiencies described in sections 6.5-6.11 and believes that these should be considered by BSC governance.</p>
<p>The Workgroup recommends that, other than in exceptional circumstances, this option would only apply to New Generators with a Completion Date on or after 1 April 2015.</p> <p>Do you have a view on this?</p>	<p>None of the options should be introduced until a period of 12-24 months after the Authority decision as proposed in section 10.12. This period of delay is necessary to enable Users to adapt their systems accordingly.</p> <p>1 April 2015 has been introduced into the Option 3 draft legal text unilaterally by National Grid and would be significantly sooner than the introductory delay proposed by the Workgroup in section 10.12. The date used in the legal text should be amended to a date in accordance with section 10.12</p> <p>A similar date should be introduced into the legal text for options 1 and 2 if they are proposed for an Authority decision.</p>
<p>The Workgroup report concludes that the proposed solution for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if considered necessary by BSC parties.</p> <p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately, which is the view of National Grid and some of the previous respondents, or should they be progressed only when any BSC arrangements are concluded?</p>	<p>The proposals of this Consultation to improve operational Data from Intermittent Generation could be carried out separately from consideration of accurate BOA settlement issues. However RES believes that this would be unwise and that BSC governance should consider these options (and any alternatives they may devise) before coordinated proposals are presented for approval by the relevant authorities. It is not the place of the Grid Code Review Panel to pre-empt solutions to BSC issues.</p>
<p>Do you have any additional comments?</p>	<p>This proforma concentrates on issues surrounding Option 3 which is clearly favoured by National Grid who is the sole author of the Industry Consultation document, especially its comments and conclusions on the Workgroup Consultation.</p> <p>Option 3 introduces a new Operational Metering signal without corresponding recommendations for</p>

	<p>compliance acceptance criteria. This has the potential to cause disagreement between Users and National Grid. Similarly, a lack of clarity about what constitutes "good industry practice" has the potential to cause disagreement between Users and National Grid with respect to all options. These matters should be clarified with respect to the approved option before the new requirements come into effect.</p> <p>It is surprising that this proforma does not encourage respondents to provide information on cost of implementation as suggested by sections 9.11 and 9.22. RES has no experience of submitting MEL and so cannot comment on the costs of options 1 and 2. RES believes that the cost of providing a Power Available signal in accordance with option 3 is so low that it can be neglected for a new wind farm where the turbine supplier's SCADA system is designed to carry out this calculation.</p>
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Grid Code Industry Consultation Response Proforma

GC0063 Power Available

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Please send your responses by **7th April 2014** to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

Respondent:	John Norbury Network Connections Manager RWE Supply & Trading GmbH Windmill Hill Business Park Whitehill Way Swindon SN5 6PB T +44 (0)1793 89 2667 M +44 (0)7795 354 382 john.norbury@rwe.com
Company Name:	RWE Group of GB companies, including RWE Npower plc, RWE Innogy UK Limited and RWE Supply & Trading GmbH.
Do you support the proposed implementation approach of 10 business days following an Authority decision?	We agree with the recommendation given in Paragraph 12.9 that the text of the Grid Code changes be implemented within 10 business days following an Authority decision. However our support for this is subject to the recommendation given in Paragraph 10.12 that the date of applicability would depend on the adopted solution and that the likely time frame would be 12 to 24 months
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	<i>For reference the applicable Grid Code objectives are:</i> <i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i> <i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i>

	<p><i>(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i></p> <p><i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i></p> <p>In the absence of an associated change to the BSC arrangements we are not satisfied that the proposed change GC0063 better facilitates the Grid Code objectives. Furthermore, the proposed change does not consider the relaxation of other data obligations placed on intermittent generators that might increase the efficiency of the data capture and submissions required under the balancing codes. For example, we remain unclear what operational purpose the submission of PN data by intermittent generators would serve under the proposed change.</p>
<p>Do you agree with the deficiencies identified?</p> <p>(i.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	<p>We agree with the deficiencies identified in Paragraph 6. We also consider that the inherent difficulty in achieving correlation between PN data and outturn generation (referred to as “accuracy” in the consultation) for intermittent generation results in PN data, as treated under the Grid Code, that is not always likely to be fit for purpose, i.e. data submission by which the User informs National Grid of predicted output and which also provides a basis for BOA settlement.</p>
<p>While this view was not unanimous, a majority of the respondents to the Workgroup consultation and National Grid concluded that the option as detailed in the report that will best address the deficiencies identified is:</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with</p>	<p>The consultation proposes three options, all of which would help address the deficiencies identified in the report. We would prefer Option 3 – Power Available via SCADA.</p> <p>Compared to Options 1 and 2, User systems are already largely in place to provide the necessary data and therefore Option 3 would provide the lowest cost option and least disruption to the User. In addition, we welcome the clarification that the MEL submission would represent the available capacity only and would not be weather corrected.</p> <p>However, we recognise that this solution (Option 3)</p>

<p>the redefinition of MEL used to indicate electrically connected capacity.</p> <p>Do you have a view on this?</p>	<p>would then be inconsistent with the balancing code processes applied to other generation technologies.</p>
<p>The Workgroup recommends that, other than in exceptional circumstances, this option would only apply to New Generators with a Completion Date on or after 1 April 2015.</p> <p>Do you have a view on this?</p>	<p>No. Given the passage of time since this issue was discussed by the Workgroup, we would suggest a Completion Date on or after 1st April 2016 would now be more appropriate. An applicable date of 1st April 2015 would now be less than 12 months from any approval date and less than the minimum 12 month time frame envisaged by Paragraph 10.12.</p>
<p>The Workgroup report concludes that the proposed solution for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if considered necessary by BSC parties.</p> <p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately, which is the view of National Grid and some of the previous respondents, or should they be progressed only when any BSC arrangements are concluded?</p>	<p>We consider it essential that the same data is used for both operational and settlement purposes. Whilst we are unclear of the extent to which National Grid currently uses PN data for intermittent generation, it is difficult to understand how the preparation of PN data and efficiency of BOA payments under the BSC would improve should the use of PN data be further marginalised by National Grid in its operational activities.</p> <p>We are therefore of the view that the Power Available proposals within the Grid code should be implemented out only when corresponding BSC arrangements are concluded.</p>
<p>Do you have any additional comments?</p>	<p>We are unclear of what changes, if any, have been made to this consultation since the last public consultation issued 20th December 2013 and if any new information is being requested in this latest consultation.</p> <p>As noted in our previous response, it would be helpful to understand the current / potential usefulness within the balancing mechanism of PN and MEL data submitted for intermittent generation and whether the use of this data category is likely to remain fit for purpose with an increasing volume of intermittent generation. It would also be helpful to better understand National Grid's role in forecasting intermittent generation and whether a more formal role of central forecasting would provide a more efficient solution for the industry.</p>

Grid Code Industry Consultation Response Proforma

GC0063 Power Available

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by 7th April 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

Respondent:	<i>Simon Reid simonpeter.reid@scottishpower.com</i>
Company Name:	<i>Scottish Power Generation Limited South Coast Power Limited Damhead Creek Limited</i>
Do you support the proposed implementation approach of 10 business days following an Authority decision?	<i>Yes</i>
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	<i>Yes, it supports Objective (i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i> <i>For reference the applicable Grid Code objectives are:</i> <i>(i) to permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;</i> <i>(ii) to facilitate competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);</i> <i>(iii) subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole; and</i>

	<i>(iv) to efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency.</i>
<p>Do you agree with the deficiencies identified?</p> <p>(i.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)</p>	Yes
<p>While this view was not unanimous, a majority of the respondents to the Workgroup consultation and National Grid concluded that the option as detailed in the report that will best address the deficiencies identified is:</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p> <p>Do you have a view on this?</p>	<i>Agree. Option 3 appears to be capable of delivering the benefits that National Grid is seeking and addressing the deficiencies identified.</i>
<p>The Workgroup recommends that, other than in exceptional circumstances, this option would only apply to New Generators with a Completion Date on or after 1 April 2015.</p> <p>Do you have a view on this?</p>	<i>We would agree that this should apply to new Generator, but believe that 1 September 2015 or later date would be more achievable. There are at least three areas that need addressing (i) the SCADA Power Available Signal (ii) Wind Direction and (ii) the more specific MEL definition for Power Park Modules.</i>
<p>The Workgroup report concludes that the proposed solution for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if considered necessary by BSC parties.</p>	<p><i>The Power Available proposal, as set out, could be implemented in isolation to meet National Grid's requirements and are not dependent on changes to the BSC.</i></p> <p><i>We believe that there are substantial opportunities to explore for the use of the Power Available Signal to clear up many conflicts between intermittent</i></p>

<p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately, which is the view of National Grid and some of the previous respondents, or should they be progressed only when any BSC arrangements are concluded?</p>	<p><i>generation and the current Balancing & Settlement Code both operationally and in Settlement by relatively small yet fundamental changes that would be best addressed separately at this stage.</i></p> <p><i>It would seem to be inappropriate to suspend the introduction of this operational tool whilst change to the Balancing & Settlement Code was duly proposed, considered and agreed.</i></p>
<p>Do you have any additional comments?</p>	

Grid Code Industry Consultation Response Proforma

GC0063 Power Available

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses by 7th April 2014 to Grid.Code@nationalgrid.com. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

These responses will be included in the Report to the Authority which is drafted by National Grid and submitted to the Authority for a decision.

Respondent:	Campbell McDonald, 01738 453424, 07767 852614, campbell.mcdonald@sse.com
Company Name:	SSE Generation Ltd, Keadby Generation Ltd, Medway Power Ltd, Uskmouth Power Company Ltd and SSE Renewable Holdings Ltd
Do you support the proposed implementation approach of 10 business days following an Authority decision?	No. Implementation should be at a specified future date to allow time for new projects to include the Power Available signal requirement in the tender process for Turbine supply.
Do you believe that GC0063 better facilitates the appropriate Grid Code objectives?	We believe the proposal in GC0063 will better facilitate GC objectives if it is embraced by the System Operator and overcomes the current barriers stopping the utilisation of Wind Farms to provide reserve and frequency response Balancing Services. The introduction of Wind Farms to the Balancing Services market will facilitate competition and
Do you agree with the deficiencies identified? (i.e. lack of visibility of headroom for the purposes of holding reserve and frequency response when wind farms are curtailed and accuracy of PNs for the purposes of calculating BOA volumes)	We agree with the identified deficiency relating to the lack of confidence of the headroom available from curtailed wind farms for the provision of holding reserve and frequency response. This deficiency or confidence level impacts on the ability of wind farms BMUs to participate in Balancing Service markets. We disagree with the identified deficiency relating to the accuracy of PNs for the purpose of calculating BOA volumes. The settlement process for all BMUs is based on the submitted PN. We do not agree that wind farm BMUs should be singled out when the accuracy of other BMUs such as Demand BMUs have similar challenges. The accuracy of the PN from wind farms due to the length of the gate closure period imposed contributes significantly to any inaccuracy.

<p>While this view was not unanimous, a majority of the respondents to the Workgroup consultation and National Grid concluded that the option as detailed in the report that will best address the deficiencies identified is:</p> <p>Option 3 - Power Available Data via SCADA i.e. the submission of a Power Available signal as an operational metering signal which would be fed to the National Grid Control Centre via SCADA with the redefinition of MEL used to indicate electrically connected capacity.</p> <p>Do you have a view on this?</p>	<p>Yes we agree Option 3 best addresses the lack of confidence in the available headroom at the National Grid Control Centre.</p>
<p>The Workgroup recommends that, other than in exceptional circumstances, this option would only apply to New Generators with a Completion Date on or after 1 April 2015.</p> <p>Do you have a view on this?</p>	<p>Yes agree however this should preclude existing wind farms from the Reserve and Frequency response markets. Existing generators should be allowed to voluntarily provide a Power Available signal if they wished to do so.</p>
<p>The Workgroup report concludes that the proposed solution for operational data could equally apply to accurate BOA settlement if required, however this would need to be progressed through Balancing and Settlement Code governance arrangements if considered necessary by BSC parties.</p> <p>Do you have a view on whether the Power Available proposals within the Grid Code can be carried out separately, which is the view of National Grid and some of the previous respondents, or should they be progressed only when any BSC arrangements are concluded?</p>	<p>The proposed power available modification to the Grid Code could be carried out separately for operational data. The application of Power Available for BOA settlement for wind farms to anything other than PN could be viewed as discriminatory. Especially as we believe the current BSC rules permit BOAs on our technologies to have BOAs settled to their PN even when their MEL was lower than PN.</p> <p>Any change to the BSC should only be after an appropriate industry consultation.</p>
<p>Do you have any additional comments?</p>	

Extract from GCRP minute numbers:

3717. Rob Wilson (National Grid) presented pp14/31, the draft Report to the Authority. Mike Edgar (National Grid) was also in attendance in his role as Workgroup Chair to respond to any questions. RW summarised the background; the issue was raised at the July 2012 GCRP meeting and a Workgroup subsequently set up. Two consultations have been held: one as part of the Workgroup process in which the various options were presented, and an industry consultation in which the recommended way forward was set out. The Workgroup reported back to the GCRP in November 2013. A draft Report to the Authority is due to be finalised and submitted to the Authority within the next few weeks.
3718. The issues being addressed by the Workgroup were how accuracy of possible generator headroom could be improved by a Power Available signal. Three implementation options were identified: Standardisation of Maximum Export Limit (MEL); Dynamic MEL or Power Available Data Feed to the National Grid Control Centre. The benefits are that a better view of headroom would enhance security of supply but would also allow more efficient dispatch and would allow wind farms to be selected for frequency response or reserve actions.
3719. The draft Report, based on Workgroup discussions and consultation responses, does not document that a consensus was reached, but a majority recommendation was to progress Option 3, provision of an additional Power Available signal. This would only cover new generators from April 2016 and would not be envisaged to apply to any existing stations unless by specific agreement. The implementation date was originally April 2015 but was changed in response to feedback beginning. There may be a requirement for a future BSC Modification to settle BOAs against Power Available rather than Final Physical Notifications. Some respondents to the consultation felt that the Power Available Grid Code modification was contingent upon and should follow any BSC Modification Proposal. Guy Nicholson (Element Power) asked what a "majority" view means. ME responded that this refers to Workgroup members as well as consultation respondents. Guy Phillips (E.ON) asked for clarification that there is no retrospective application to Option 3, as this was still a possibility at the point of consultation. ME responded that Option 3 does not include retrospectivity, but there is still a question over at what point in the future it would apply. GP asked whether the retrospection is a change between the December 2013 and March 2014 versions of the Report as his recollection was that Option 3 was retrospective. Ian Pashley (National Grid) noted that the Report includes a caveat to say that National Grid may seek retrospective application in exceptional circumstances. ME noted that in a commercial sense there is nothing to stop National Grid approaching a Power Park Module to negotiate provision of a signal. GP referenced the legal text in page 68, CC.6.5.6 d) which includes a caveat to allow NGET to apply the requirements retrospectively. It should be noted that Option 1 and Option 2 would result in retrospective application (reference to para 10.3 of draft report). RW agreed to clarify the text before submission to the Authority.
3720. Sigrid Bolik (Senvion) asked what the discussion was around the 10 and 15 minute frequency of signal and expressed surprise that there still appears to be a lot of choice left in the report at this stage. ME explained that [for option 1] the obligation was designed around PN obligations for accuracy and good industry practice and therefore it would be incumbent on providers to decide the frequency rate.

[added post-meeting]

For completeness, the refresh rates for each of the options are:

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Option 1: refresh rate determined by generator.

Option 2: defines the refresh rate to 10 minutes (This was based on analysis set out in para 8.14 to 8.16 of the report; it is acknowledged that the cost differences between a 10 or 15 minute refresh rate would be negligible and therefore the short duration of 10 minutes was proposed).

Option 3 recognises that 5 seconds in the current SCADA refresh rate norm and, as set out in paragraph 7.19 of the report, would be lower cost implementation at 5 second frequency rate that an aggregated 10 minute refresh frequency).

3721. GP considered that the majority recommendation of Option 3 was based on it being the lowest cost option. GP's view is that Option 1 would bring a benefit of making it more explicit as to windfarms' obligations. John Norbury (RWE) supported this view and felt it was disappointing that after a couple of years, Generators are expected to continue providing PNs to ELEXON for settlement purposes, PNs to NGET for operational purposes and would now have additional obligations for extra data. JN considered this to feel a bit disjointed. ME noted that the conclusions make assumptions around how the market is working and are based on the current market working. Jim Barrett (Centrica) asked whether this is moving away from the original intent of GC0063; the original issue was the inaccuracy of PNs, with the natural consequence of this being cashout. JB noted that this issue has naturally been resolved as companies have expended considerable effort to provide accurate PNs to minimise cashout exposure where bid-offer acceptances are issued. ME acknowledged this, but noted that this was not the case for all parties, particularly for windfarms. JB considered that the proposed changes potentially favour windfarms over thermal plant. JB commented that he does not see the benefits to settlement and believes that commentary on this issue confuses the report. Robyn Jenkins (National Grid) referred to specific comments in the consultation responses which had to be reflected in the Report. ME noted that views differed on whether settlement issues had to be considered. With regard to due or undue discrimination, ME felt that this was an issue for DECC and Ofgem to consider. If parties want to submit a BSC Modification to change the way BOAs are settled, they can do so.

3722. ME clarified that he does not consider this proposal would negate the need to forecast. JB referenced the Ofgem decision on the Electricity Balancing Significant Code Review, which talks about creating sharper incentives on forecasting. GP raised the issue of visibility of information to the whole market, noting that there is currently no intention to include it within BMRS, so the SO could be making decisions on a set of data that is not visible to all market participants. GP also considered that the cost of implementation should not necessarily be the sole determinant as to the correct solution. Campbell McDonald (ScottishPower) agreed with GP on the cost of implementation issue, but noted that the cost could be disproportionate as the signal may be very seldom used by the SO. CMD noted he would like to see more participation but without a huge cost. ME commented that the CUSC work looks at how to make Response Energy Payments work for windfarms as they do not currently. This looks at appropriate remuneration and compensation proposals.

3723. Neil Sandison (SSE) asked whether the Power Available signal would be used for settlement. NS noted that SCADA data was not always accurate. ME noted that there is nothing to say that BOA volumes will be settled on this signal. ME also responded that SCADA data, if timely, would be more accurate.

3724. JN noted a big difference between demand forecasting for PNs and to balance at account level. JN also felt this marginalises the usefulness of PNs, as the Control Centre does not pay any regard to PNs produced by windfarms. ME accepted that for BOAs, the Control Centre does use this data, but for forecasting, it is not accurate

enough. GN noted that if you have to forecast one turbine, it will be wrong, but if you aggregate it up, it will become more accurate. ME noted that the SO does energy balancing as well as constraint management and that this becomes critical during times of minimum demand (18.5GW). GN felt that the SO should be able to create a better forecast than anyone else as it has all the information available to it. GN asked whether parties had been prevented from providing services due to the accuracy of the data and that if there was not consensus, it was a concern. ME responded that he felt there is sufficient consensus and that the lack of consensus was really around uncertainty over the bigger picture. IP asked whether GN's idea of a pilot had been investigated by the Workgroup. ME confirmed that it had not.

3725. IP considered that the Report demonstrates clear benefits to the SO of the proposals and an expectation of low implementation costs, but the main challenge is that the recommendation is not unanimous. IP summarised the recommendations in the report and potential next steps. IP asked for a show of hands as to who would not want the Report to go to the Authority; two GCRP members raised their hand. GN suggested a show of hands for who would want the Report to go to the Authority; other than the NGET representatives, one GCRP member raised his hand. IP asked SB whether the Authority would accept a report on this basis. SB responded that the GCRP's role is to provide an opinion to the Authority and the Authority should not be used as a sounding board with a view to whether the Report would be sent back.

3726. SBo asked whether the BSC Panel had considered the issues. John Lucas (Elexon) responded that it is not in a state yet to be brought to the BSC Panel.

3727. CMD considered that there is not a clear defect to be addressed and therefore it should not be progressed to the BSC Panel. GN and SBo supported this view. GN felt that the Report is interesting, but does not clearly identify the defects and clearly assess if the solutions address the defects. IP disagreed, describing the defect. GN referred to a lack of quantitative data in the Report. ME asked whether things have to be a concrete problem now in order to be addressed and instead whether we should be considering future problems.

3728. Mike Kay (Electricity NW) noted that in the absence of a clear Panel recommendation, it falls to the Licensee to decide how to progress. IP asked for views from the two GCRP members as to why they do not support progressing the Report. GP stated that it is not the right solution for integrating wind into the market; preferring option 1 as it is utilising existing market arrangements. Option 3 represents piecemeal data creep, when accuracy of PNs is the defect, not an additional data item through the SCADA system. GP also has concerns over the drafting which leaves the door open for retrospective application. GN felt that the GCRP would be passing a problem to the Authority and could expect the report to be Sent Back. IP asked whether this was because GN felt the defect was not sufficiently clear and GN agreed that this was the case. GN noted that given the proposals were not retrospective, there would still be a significant section of wind generation that would not be covered by the obligations. GP referenced the Electricity Balancing SCR conclusions which require parties to improve their forecasting and that Option 1, which GP advocates, would provide a vehicle for parties to do this. CMD noted that Options 1 and 2 are about MEL, not PNs, and the cost of implementing these is significant.

3729. JN suggested including more narrative in the report regarding the industry consultation responses and NGET's view on those responses. Alistair Frew (ScottishPower Generation) asked whether there is a temporary solution currently in place. ME noted that the C/11 conclusions allowed wind farms to deviate from their submitted PNs in real time, but that the wording of the Grid Code does not allow for "temporary" solutions. GS suggested that it is time for NGET, as Licensee, to reflect on the responses, GCRP's discussions and additional points raised. IP agreed that further

detail should be added to the report and that NGET should reflect further on issues raised, how to take this forward.

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Annex 6 – Opportunities for Stakeholder Engagement

The material that was circulated to the workgroup and the opportunities for engagement between the pre-consultation workgroup meeting of 29 Oct 2013 and the final workgroup meeting on 8 October 2014 were as follows:

Description	Dates(s)
Draft legal text circulated to workgroup for comment	18/10/13
Draft agenda for meeting 10 circulated	23/10/13
Workgroup meeting 10	29/10/13
Draft report circulated to workgroup	5/11/13
Draft report circulated to GCRP	6/11/13
Presentation of draft report to GCRP	20/11/13
Draft Workgroup Consultation sent to workgroup for comment	9/12/13
Workgroup Consultation published on website	20/12/13
Workgroup Consultation open	20/12/13 – 27/1/14
Draft Industry Consultation circulated to workgroup for comment (includes responses to Workgroup Consultation)	3/3/14
Revised and recirculated	4/3/14
Industry Consultation published on website	7/3/14
Industry Consultation open	7/3/14 – 7/4/14
Draft Report to Authority published on GCRP website and circulated to panel members (includes Workgroup and Industry Consultation responses)	7/5/14
Presentation of draft report to GCRP	21/5/14
Draft minutes of GCRP circulated to panel capturing Power Available discussion	3/6/14
Notice given to workgroup members of 'final' workgroup meeting no 11 on 8/10/14	12/8/14
Notice given to workgroup of special session of Generator Services Group on Power Available 16/9/14	13/8/14
Agenda and slides for Generator Services Group special session on Power Available circulated to GSG and to workgroup members	10/9/14
Generator Services Group special session on Power Available	16/9/14
GSG meeting notes circulated	18/9/14
Agenda and slides for workgroup meeting circulated	3/10/14
Workgroup meeting 11	8/10/14

Annex 7 – Power Available Workgroup Membership

The membership of the Power Available workgroup was as follows. The presence of names on this list does not necessarily equate to attendance at any given meeting. Representation was correct by Company at the time that the individual joined the workgroup.

Name	Company
<i>Meeting 11 attendees:</i>	
Mike Edgar	National Grid (Chair)
Rob Wilson	National Grid (Technical Secretary)
Antony Johnson	National Grid
Jeremy Caplin	National Grid
Leonardo Costa	Ofgem
David Beaumont	Ofgem
John Norbury	RWE
Mick Chowns	RWE
Guy Phillips	E.ON
Isaac Gutierrez	ScottishPower
Campbell McDonald	SSE
Joe Duddy	RES
Konstantinos Pierros	Enercon
Hannah McKinney	DONG
Guy Nicholson	Element Power
Zoltan.Zavody	RenewableUK
Frankin Rodrick	National Grid
Yanik Luenen	Vattenfall
Peter Waghorn	Transpower
Niall Duncan	Senvion
<i>Other workgroup members:</i>	
Alan Mason	REPower
Mari Toda	EDF Energy
Dave Wilkerson	Centrica
Michael Preston	Nordex
James Davis	DECC
Paul Mewse	GDF Suez
Guy Phillips	Eon
Conor O'Doherty	SONI
Chris McCorry	SONI
Michael Stoettrup	Siemens Wind Power
Craig Howarth	Scottish Power Renewables
Gavin Greene	Scottish Power Renewables
Damien McCool	EDPR
Jane McArdle	SSE
Adelina Corre	Vattenfall
Mads Rajczyk Skjelmoose	Vattenfall
Dominik Schneider	
John Lucas	Elexon
Shijun Yi	Centrica
Julian Wayne	Ofgem

Elin Williams	DECC
Graham Stein	National Grid
Steve Lam	National Grid
Andrew Kensley	National Grid
David Lenaghan	National Grid
Robyn Jenkins	National Grid (Technical Secretary)
Jarnail Bansal	National Grid
Sundeep Klair	National Grid