SSG Setting Schedule Consultation Response

Re: SSG Setting Schedule Consultation 11/01/2017

07/06/2017

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1. INTRODUCTION

1.1 The purpose of this paper is to detail comments from stakeholders on the SSG Setting Schedule Consultation which was published on the 11th January 2017.

1.2 NIE Networks have reviewed these comments and where appropriate have amended the Setting Schedule

1.3 A final version of the Setting Schedule accompanies this document alongside a copy highlighting any changes. These files are:

- SSG Setting Schedule 7 – Amended Following Consultation.docx
- SSG Setting Schedule 7 –Amended Following Consultation – with Markup.docx

1.4 No comments were received on the proposed amendments to the Distribution Code set out in Section 4 of the consultation document and our proposed amendments have not changed.

1.5 NIE Networks intends to combine these amendments with those from the recent RoCoF consultation and update the D-Code in one single step later this year.

2. COMMENTS & RESPONSES

2.1 In this section correspondence received from stakeholders on the consultation shall be referred to as the comment or comments. NIE Networks considered reply shall be referred to as the response.

2.2 For some points an excerpt from the stakeholders correspondence has been taken to improve the readability of this document. A full copy of each comment has been submitted as a separate .zip file..

2.3 Minor comments and corrections relating to spelling, punctuation, grammar and formatting have not been included in this section.

2.2 Section 3.3.3 Analogs

2.2.1 Original Text:

Analog accuracy shall be **±1%** or better.

2.2.2 Comment:

There is no reference for the 1%. Is it 1% of the mA's of e.g. 20mA or is it 1% of the range of values? E.g. if I submit a voltage feedback. Is it 1% of that voltage range?

2.2.3 Response:

NIE Networks have clarified the accuracy requirements for 4-20mA analog signals in the updated document.

2.3 Section 3.3.3 Analogs

2.3.1 Original Text:

Type 2 RTUs

The scan rate of analogs and any deadband that is applied or can be configured shall be detailed by the Generator, reporting at least once per rolling hour and report by exception on excursion outside of a configurable deadband of between **1% and 10%.**

2.3.2 Comment:

There is no reference for the 1% to 10%. Is it a % of the mA's of e.g. 20mA or is it a % of the range of values? E.g. if I submit a voltage feedback. Is it a % of that voltage range?

2.3.3 Response:

Deadbands will not normally be applied. If a deadband is required, detail will be given in the SCADA connection process addressing the issues raised in this comment. The Setting Schedule has been updated to reflect this.

2.4 Section 3.3.3 Analogs

2.4.1 Original Text:

Type 2 RTU – Mode A

The RTU shall be capable of logging analog values periodically. This period shall be configurable for each data point with a minimum resolution of 1 second. The DNO will inform the generator of the data log interval during the SCADA installation process. These values will be logged and timestamped.

2.4.2 Comment:

There is no accuracy requirement for the time stamps. E.g. an excerpt from the Danish grid code: All set point changes or orders for production changes must refer to UTC and be time stamped with accuracy and a precision of maximum 10 ms.

2.4.3 Response:

The Setting Schedule has been updated to address these comments on timestamping.

2.5 Section 4.1 & Section 4.2

2.5.1 Original Text:

Points A, B, C, D are defined by the capability declared by the Generator following energisation. The Power Station is also required to declare its Reactive Power capability at 0% Registered Capacity;

2.5.2 Comment:

These points are not specifically requested during the application process on the Small-scale-generator-questionnaire-1st-Oct-2015.

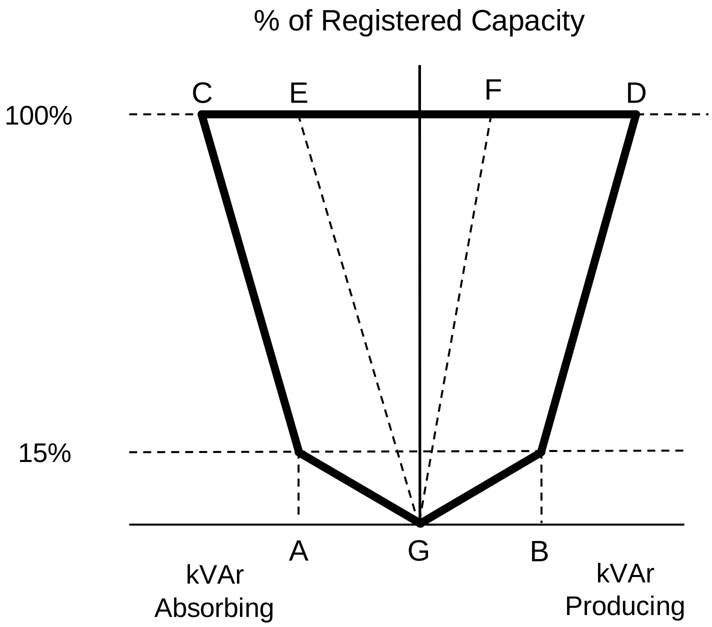
They are also subject to change as complex customers add or remove equipment to a site. It is the reactive limits for the overall power station rather than just the generator.

2.5.3 Response:

The Setting Schedule has been updated to address these comments. The reactive power envelope shall be submitted following energisation. Although not specified in the Setting Schedule, this will normally be requested prior to controllability testing. NIE Networks considers that this may change in the future and it would not be appropriate to define the exact process within the Setting Schedule.

2.6 Section 4.2 – Reactive Capability of Non Induction Power Stations

2.6.1 Original Text:



2.6.2 Comment:

For a solar inverter the apparent power (S) it produces is depending directly on the amount of solar irradiation that falls on the solar modules connected to it. Once a solar inverter is producing power, it is quite flexible to divide this between P (active power) and Q (reactive power). Hence a typical inverter reactive power performance chart looks quite different than the one on page 14 of the document. See for example file 'Huawei – reactive performance chart' attached. The inverter in the chart has a Rated power of 36 kVA and a maximum power of 40 kVA. So in this case the maximum power > rated power and the inverter can produce reactive power when its active power is equal to the rated power. But it's important to know that not for all type of inverters the maximum power > rated power. For some inverters maximum power = rated power. In this case when the inverter is producing at full power (P = rated power) it has no apparent power left to convert into reactive power and it cannot produce any reactive power. And so the requirements in Figure 2 on page 14 of the document cannot be attained.

See pdf sketch attached for more details (reactive power performance chart solar inverter.pdf)

2.6.3 Response:

The inverter reactive power performance chart included with this comment indicates how the active power output of the inverter can be restricted to increase the reactive capability at P_{max}. This datasheet describes how the inverter is restricted to 36kW as the "default value". NIE Networks considers this to be the appropriate configuration for this inverter to meet the reactive capability chart in the Setting Schedule.

The power station is expected to be capable of operating entirely within this P/Q envelope which may require additional reactive power compensation or configuring generating units as described above.

2.7 Section 5.1.1 Speed of Response – Power Stations ≥1MW and Connected at 33kV

2.7.1 Original Text:

For **Power Stations** connected to the **Distribution System** at 33kV with a **Registered Capacity** greater than or equal to 1MW, **Fast Acting** with regards to Reactive Power Control response is considered as being:

- The speed of response of the control system following a change in the phase angle set-point or voltage set-point at the **Connection Point** by the **DNO** via SCADA shall be such that the **Power Station** shall achieve 90% of its steady-state **Reactive Power** response within 1 second.
- The change in **Reactive Power** commences within 0.2 seconds of the application of the step injection
- Any oscillations settle to within 5% of the change in steady state **Reactive Power** within 2 seconds of the step injection.
- The final steady state reactive value is achieved within 5 seconds of the step injection. Steady state is deemed to have occurred when VAr oscillations settle within ±0.02pu of the new reactive power target.

2.7.2 Comment:

Quite some inverter types only communicate via RS485 (bus communication). Some of these inverters can interpret a broadcasting signal, but others don't, meaning we have to address them one by one. This combined with the fact that on some sites there might be literally hundreds of inverters means that in some situations it might be impossible to reach these kind of response timings. In the 2 solar parks where we provide power control we can apply the broadcast. Tests will need to prove if the required response times will be achievable. It might be possible but it's going to be tight.

2.7.3 Response:

These response times match the requirements in the Wind Farm Power Station Setting Schedule. Developers with projects in this category have generally used the same hardware for these power stations as they do for their >5MW sites.

In our discussions with PV developers each one has raised concern about these speed of response requirements. PV farms are generally arranged with the Power Station Controller (PSC) at the Connection Point measuring the power flow and calculating the reactive power output required. The PSC then dispatches each inverter with a new VAr target over a comm link. Once the inverter has received a new instruction it is our understanding that the change in reactive power easily meets these speed of response requirements. The concern raised by developers is that it may take more than 200ms for this to begin due to the comms delay between the PSC and the inverters. NIE Networks are willing to take a pragmatic approach to this provided the power station is able to achieve 90% of the steady state Reactive Power response within 1 second.

Addressing specific points raised in the comment, for string inverter Power Stations, the PSC must be capable of broadcasting new set-points to inverters. Addressing each individual inverter in turn would take too long and not be considered an acceptable implementation. All inverters are also expected to communicate with the PSC on a local communications link. Delays caused by jumps between different comms networks to reach separate panel/inverter fields would not be acceptable.

Developers should design their Power Station and communications infrastructure appropriately to minimise these delays.

2.8 Section 5.1.2 Power Stations <1MW or Connected below 33kV

2.8.1 Original Text

For Power Stations connected to the Distribution System below 33kV or with a Registered Capacity less than 1MW, Fast Acting with regards to Reactive Power Control response is considered as being:

- The speed of response of the control system following a change in the phase angle set-point or voltages set-point at the Connection Point by the DNO via SCADA shall be such that the Power Station shall achieve 90% of its steady-state Reactive Power response within 5 seconds.
- The change in Reactive Power commences within 1 seconds of the application of the step injection
- The final steady state reactive value is achieved within 10 seconds of the step injection. Steady state is deemed to have occurred when VAr oscillations settle within ±0.02pu of the new reactive power target.

2.8.2 Comment

The tolerances listed in are extremely wide and the equipment we have already installed for both Type A and Type B generators maintain a much tighter tolerance, typically ± 2.5 kVAr or much better at any load above 15% capacity.

Given the tight tolerances specified in section 6 for class of CTs and VTs which adds a cost of approximately £500 on a new HV installation, it pointless to allow an error margin of 10kVAr when the target is 11kVAr at 15% load or 82kVAr at 100% load.

2.8.3 Response

This is set as a minimum requirement. NIE Networks are reassured that existing installations already exceed this requirement. In the future NIE Networks may amend the Setting Schedule and tighten these accuracy requirements.

With regard to hardware requirements in section 6, the VT accuracy is required primarily due to the sensitivity of Voltage Control where an error of just -0.5% would cause the Power Station to over produce reactive power by more than 33% of Q_{max}.

By using ‘S’ class CTs the impact of instrumentation error is greatly reduced when the power station is operating at lower outputs. This high level of accuracy is required to avoid ambiguity on whether the power station output is not compliant or simply appears non-compliant due to the collective error of measurement devices.

2.9 Section 7.3.1 SCADA Commissioning

2.9.1 Original Text:

The DNO shall complete their RTU installation before the Power Station is energised. Controllability tests will only be performed once the Generator has completed their side of the SCADA installation

2.9.2 Comment:

As this document applies to Power Stations already energised and connected since 1 May 2010. What are the deadlines that apply following approval of this Schedule or are the Power Stations non compliant as already energised more than 12 months.

2.9.3 Response:

NIE Networks have had discussions with the Utility Regulator on an enforcement process for new and existing power stations. This will be a phased approach with power stations selected in batches in order of greatest need. Generators will be given an appropriate amount of time to complete their SCADA installation. For the first batch of enforcement notices the Generator will be given 1 year to complete this. NIE Networks and the Utility Regulator will review this enforcement notice period and future batches may be given shorter lead times.

2.10 Section 8.5.1 Voltage Control Set-Point Test

Voltage set points sent by the **DNO** to the **Power Station** These set points may be adjusted dependant on prevailing system conditions (Sequence 1)		
Test No.	Action	Voltage set point pu
1	The **DNO** will send the **Power Station** a voltage set point. Upon confirmation from the **Power Station** that the set point was received, the **DNO** will engage Voltage Control mode. The **Power Station** will remain at this set point for 1 minute.	0.94

2.10.1 Comment:

The first test step will lead to an Emergency Voltage Control Tests if EVC is not deactivated. If the power station is capable of providing sufficient reactive power to bring the voltage at the point of connection to 0.94pu, the EVC will be triggered at 0.95pu. Maybe it should be mentioned that EVC has to be deactivated for this test. Same for the test step 1.06pu.

2.10.2 Response:

Individual Power Stations less than 5MW are not expected to have enough reactive capability to significantly influence the system voltage. The test sequence described here is a guideline. The Test Engineer may alter the test set-points to avoid triggering EVC if deemed necessary. No changes have been made to the document.

2.11 Section 8.5.1 Voltage Control Set-Point Test

2.11.1 Original Text:

The Power Station will hold the required Connection Point voltage **to within 1% of the** set point based on nominal voltage if the reactive capability is there to do so.

2.11.2 Comment:

Within 1% is not equal as ±0.5% as an accuracy requirement.

2.11.3 Response:

The test criteria had not been updated to match the requirements set out in Section 5. The Setting Schedule has been corrected.

2.12 Section 8.5.2 Automatic Voltage Control Test

2.12.1 Original Text:

Any oscillations settle to within 5% of the change in steady state Reactive Power within 10 seconds (steady state) of the application of the step injection.

2.12.2 Comment:

This requirement can't be achieved by no [sic] technology for all changes. If a change is very small the accuracy gets even smaller. At some point, the tolerance will be smaller than the ability of the transducers to measure. Also when talking about small values around 0Mvar, the transducer accuracy gets very poor. So even if a change is a bigger change but the final steady state value is at 0 Mvar, the requirement can't be achieved.

2.12.3 Response:

The performance criteria listed in this test do not match those listed in section 5. This has been corrected. Steady state accuracy requirements are now given as an absolute range based on the registered capacity of the power station. This avoids the issues raised in this comment by using relative ranges.

2.13 Section 8.8 Power Station Control System Tests

2.13.1 Original Text:

In event of power station controller failure, plant will shut down and go to zero kVA.

2.13.2 Comment:

Is this as fast as possible or in a controlled way over 1 minute (e.g. registered capacity > 5 MW)?

2.13.3 Response:

The power station should shut down in a controlled manner. The Setting Schedule has been updated to clarify this.

NIE Networks also recognise that 0kVA may be difficult to achieve due to the inherent reactance or capacitance of the user system. The Setting Schedule has been updated to reflect this.

2.14 Appendix A

2.14.1 Comment:

Connection Report for the DNO' refers to 'Fault Ride Through'. Fault Ride Through was not a requirement in the 2010 D-Code

2.14.2 Response:

The outline structure given in Appendix A is only intended as a guide. The requirement for Low Voltage fault Ride Through (LVRT) was introduced in the February 2015 Distribution Code and would not apply to older Type A and Type B Power Stations. A small note has been added to Appendix A that LVRT data is not expected from every site.

This comment has also been brought to the attention of the Distribution Code Review Panel (meeting 14th February 2017) regarding the ability of Type A Power Stations to fulfil LVRT. NIE Networks considers this to sit outside the scope of the Setting Schedule consultation and should be considered by the DCRP as a separate matter.

2.15 Appendix E

2.15.1 Original Text:

Table 1 - Analog Outputs (from Control Centre) to Power Station

No.	Signal	Description	Scale Min	Scale Max	Units
0	Phase Angle Set-Point Instruction	Analog output indicating the new set-point for power factor control mode	-18	12	Degrees
1	Voltage Set-Point Instruction	Analog output indicating the new set-point for power factor control mode	0.96 PU	1.04 PU	TBC

2.15.2 Comment:

The difficulty will likely be when the DNO inputs their set points and how the generator will respond?

…with the voltage set point the generator my not be able to raise the voltage as it will be connected to a rigid grid that will in the main determine what the voltage will be. The generator may attempt to raise or lower the voltage but the output will have little effect on the voltage at the connection point.

This may result in a limited voltage change on the output from the generator? If this is indeed the case, how will the DNO view this?

2.15.3 Response

The power station is not expected to have a significant ability to alter the system voltage. In Voltage control the power station should vary its reactive power output according to the system voltage and the voltage set-point. This is described in detail in section 5.3 of the Setting Schedule.

2.16 SCADA Enforcement Process

Some comments have requested detail on the proposed SCADA enforcement process mentioned in paragraph 5.4 of the accompanying consultation document. NIE Networks does not consider this process to be relevant to the technical content of the Setting Schedule and do not deem it appropriate to discuss this process in detail within this consultation response.

NIE Networks have engaged with key stakeholders on this matter and will endeavour to keep relevant parties informed at all stages of the enforcement process.

3. NEXT STEPS

3.1 NIE Networks now request the Utility Regulator to review these comments & responses and seek approval for this final draft of the Setting Schedule and updated Distribution Code.

3.2 An approved Setting Schedule would provide improved clarity for Generators regarding their D-Code requirements. Avoiding any uncertainty or ambiguity regarding technical issues will be especially important as NIE Networks begins its SCADA enforcement process