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Metering Dispensation D/556 – Heysham 2 Power Station (Unit 8)

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Summary

EDF Energy Nuclear Generation (EDF) has applied for a lifetime Metering Dispensation (D/556) from Code of Practice (CoP) 1. EDF wishes to use a capacitive voltage transformer (CVT), instead of a wire wound VT (as required by CoP1), for the Generator Transformer 8 (Unit 8) circuit, at Heysham 2 Power Station. The brand new CVT is to replace the failed CVT, which is measuring Reactive Energy only. We invite the ISG to approve Metering Dispensation D/556 on a lifetime basis, subject to a condition.

1. BSC requirements

1.1 Section L[1] of the Balancing and Settlement Code (BSC) requires all Metering Equipment to either:

- comply with the requirements set out in the relevant Code of Practice (CoP) at the time the Metering System is first registered for Settlement under the BSC (L3.2.2); or
- be the subject of, and comply with, a Metering Dispensation (L3.4).

1.2 Section L allows the Registrant of a Metering System to apply for a Metering Dispensation if, for financial or practical reasons, Metering Equipment will not or does not comply with some or all the requirements of a CoP.

1.3 The process for applying for a Metering Dispensation is set out in BSCP32[2].

2. Confidentiality

2.1 BSCP32 allows the Metering Dispensation applicant to request confidentiality via the application form (BSCP32/4.1).

2.2 In this case, the applicant has noted on the application form that the application itself is not confidential. However, the applicant has requested that we keep certain related documents (Attachments C - D) confidential because they are commercially sensitive.

3. Background to Metering Dispensation D/556

3.1 Heysham 2 Power Station was constructed in the 1980s and began generating in 1988. There are currently two 400kV generator circuit connections (via Generator Transformer 7 and Generator Transformer 8) and two 132kV station transformer connections (via Station Transformer 7 and Station Transformer 8) (Attachments C and D).

3.2 The Metering Equipment for Heysham 2 Power Station was first registered under the Pooling and Settlement Agreement for England and Wales in the 1990s.

[1] 'Metering'
[2] 'Metering Dispensations'

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3.2.1 For the generator circuits:

- Active Energy Metering Equipment is installed on the lower voltage side (23kV) of the generator and unit transformers against the Alpha Codes of Practice (1990-1993) and compensated for losses (Generator Transformer only) to the Commercial Interface on the higher voltage side (400kV) – no Metering Dispensation was/is required to do this under Code of Practice (CoP) E[3].
- Reactive Energy Metering Equipment is located on the higher voltage side (400kV) of the generator transformers and the Reactive Energy Meters are fed by capacitive voltage transformers (CVTs). The generator circuit Reactive Energy Metering Equipment is compliant with CoP1[4] Issue 1 (1993-2006) and was deemed acceptable under CoP1 Issue 1, paragraph 5.1.3.(i), at the time:

> *"5.1.3 Measurement Transformers Installed on Existing Circuits*
>
> *Where circuits, other than those newly installed, are to be metered to this Code of Practice and where the installed measurement transformers do not comply fully with clauses 5.1.1 & 5.1.2, then such measurement transformers may be used providing the following requirements and those in clause 4.2.1 are met.*
>
> *(i) Where subsequently a significant alteration to the primary plant (eg a switchgear change) is carried out, new measurement transformers as detailed in clauses 5.1.1 and 5.1.2, shall be provided."*

3.3 For the station transformer circuits, Active and Reactive Energy Metering Equipment is installed on the lower voltage side of the 132/11kV station transformers to the Alpha Codes of Practice (CoPE) and are compensated for losses to the 132kV side – again no Metering Dispensation was/is required to do this under CoPE.

3.4 **Issue** - In October 2022, issues began with the CVT feeding the Reactive Energy Meters for the 400kV connected Generator Transformer 8 (Unit 8) circuit. The CVT is located at National Grid Electricity Transmission's (NGET's) Heysham 400kV substation. Subsequent investigations with NGET discovered a failure of this original CVT.

4. Metering Dispensation D/556 – Heysham 2 Power Station

4.1 EDF Energy Nuclear Generation (EDF) has applied for a lifetime Metering Dispensation (D/556) from CoP1 Issue 3 (Attachment A). This is to use a CVT, instead of a wire wound VT[5], to replace the failed CVT measuring Reactive Energy, for the Generator Transformer 8 (Unit 8) circuit, at Heysham 2 Power Station.

4.2 EDF wish to use a new CVT because:

- it is unable to procure a wire wound class 0.2 VT to meet the requirements of CoP1 within reasonable timescales. Whilst the replacement is a class 0.5 CVT, Reactive Energy metering requires ±4% accuracy as per section 4.3.1 of CoP1, which will be met with this proposed replacement CVT;
- the next scheduled outage commences in early January 2023, with a return to service scheduled for mid to late January 2023. Any delay in installation of the replacement CVT would require waiting for the next scheduled outage (circa 12 months plus). To plan an outage to specifically carry out these works would be commercially unviable;
- the original factory calibration test certificate for the replacement CVT is provided (Attachment B). The CVT complies with BS EN/IEC 61869-5[6] and the accuracy limits set out in BS EN/IEC 61869-3[7]; and
- it proposes to carry out periodic testing (every three to four years during scheduled planned outages) of the replacement CVT for Unit 8, and every four years for the recently replaced CVT for the Unit 7 Reactive Energy metering (under a condition of Metering Dispensation D/543), to ensure accuracy. If any of these results are outside the accuracy limits of the standard BS EN/IEC 61869-3, the applicant will notify the ISG (via Elexon) and seek resolution.

[3] 'Code of Practice for the Metering of Electricity Transfers between The National Grid Company plc and Generating Companies using the National Final Metering Scheme'
[4] 'Code of Practice for the metering of circuits with a rated capacity exceeding 100MVA for Settlement purposes'
[5] From 23 February 2006 CoP1 requires wire wound measurement transformers to be fitted.
[6] 'Instrument transformers – Part 5: Additional requirements for capacitive voltage transformers'
[7] 'Instrument transformers – Part 3: Additional requirements for inductive voltage transformers'

5. MDRG comments

5.1 We circulated the Metering Dispensation application and its attachments to the Metering Dispensation Review Group (MDRG) for comments (Attachments A - D).

5.2 One out of four MDRG members responded. The MDRG member supports the application on the following bases:

- as it is a like-for-like solution where the Metering System accuracy remains within CoP compliance.

6. NETSO comments

6.1 We circulated the Metering Dispensation application and its attachments to the National Electricity System Operator (NETSO) for comments (Attachments A - D).

6.2 At the time of writing, the NETSO could not reach a positive conclusion to support (or no objection) this application. It understands the urgency and difficulty of procurement, and understand this is a like-to-like replacement and it has been done for Unit 7. It had the following considerations in mind:

- Unlike normal Metering Dispensation applications where the CoP limit is easy to check with the inclusion of some extra cables between Actual Metering Point (AMP) and the Defined Metering Point (DMP), here a class of 0.5 CVT will be used while a 0.2 class is needed. From voltage measurement to Q[8] measurement, certain error analysis should be conducted to enhance the argument that CoP limit could be guaranteed.
- For CVTs, it is more popular in power systems due to various advantages compared to conventional PTs[9]. However, it is also found the error in operation seems higher than expected. A period plan of 3-4 years might not be sufficient. The NETSO provided a link to 'Research on the reliability of capacitor voltage transformers calibration result' – access to the full article is restricted and the link does not work in a Word document but can be copied and pasted directly into a web browser.

6.3 In relation to concerns about overall accuracy of Reactive Energy, we have asked the applicant to perform an overall accuracy calculation, and provide evidence, to confirm overall accuracy will be maintained within CoP1 Reactive Energy limits at the DMP. This will be based on Meter and measurement transformer Calibration results (where available) and the burden connected to the measurement transformers (e.g. secondary wiring, any burden resistors[10] and Meters). We are presently waiting for this and will provide a verbal update at the ISG meeting.

6.4 In relation to CVT 'in operation' errors we were unable to read the entire research article. We asked the NETSO, and the Registrant, if NGET has any 'type testing' requirements for CVTs that require testing and consideration of influencing factors (e.g. immunity to electromagnetic interference), when located in substations. We are presently waiting for this and will provide a verbal update at the ISG meeting.

6.5 We are unsure what frequency to recommend for periodic testing of CVTs other than three or four years as we are not aware of any definitive recommendation for periodic testing of CVTs.

7. Elexon's view

7.1 Elexon supports this lifetime, site specific Metering Dispensation application as Reactive Energy accuracy will be maintained for the Generator Transformer 8 circuit Metering Sub-System, within CoP1 limits at the DMP.

7.2 We recommend the Metering Dispensation is approved subject to periodic testing of the new CVT at four year intervals (in line with period the ISG approved for the Unit 7 CVT), during suitable outages, until the relevant Metering Sub-Systems are de-registered at the end of Heysham 2 Power Station's life[11].

[8] We assume this means (Measurement) Quantity or Quadrant (as in Reactive Energy Quadrants). Central Volume Allocation (CVA) registered Metering Systems require total Reactive Import (Q1 + Q2) and total Reactive Export (Q3 + Q4). i.e. irrespective of the flow direction for Active Energy.
[9] Potential Transformer (PT) is another name for a voltage transformer (VT).
[10] Modern electronic Meters (as opposed to older electro-mechanical Meters) can 'present' very low burdens to measurement transformers (e.g. <1VA). Burden resistors are sometimes added to secondary wiring circuits in order to raise the total connected burden to a suitable percentage of the rated burden of the measurement transformers. This is where the accuracy of the measurement transformers is tested in the relevant standard, and known (e.g. 25% -100% of rated burden for range II (i.e. 10, 25, 50 and 100VA), for a voltage transformer, at 0.8 lagging power factor). We understand the new CVT for Unit 8 has a rated burden of 50VA so it is likely that burden resistors need to be added to raise the total connected burden above 12.5VA (25% of 50VA).
[11] According to the applicant, the end of generation date, 2028, is subject to change and may be earlier than anticipated.

8. Recommendation

8.1 We invite the ISG to:

a) **APPROVE** Metering Dispensation D/556 from CoP1, to use a capacitive voltage transformer (CVT) for the Generator Transformer 8 Reactive Energy Meters at Heysham Power 2 Station, on a lifetime basis, subject to EDF Energy Nuclear Generation:

- carrying out periodic calibrations of the CVT, at suitable outages, every four years to ensure accuracy is maintained within CoP1 limits; and
- reporting to the ISG (via Elexon) if the CVT is found to be outside the limits of the relevant standard for CVTs.

Attachments

Attachment A – Metering Dispensation application D/556 – Heysham 2 Power Station

Attachment B – Attachment 3 – Capacitor voltage transformer (CVT) calibration certificate

Attachment C (CONFIDENTIAL) – Attachment 1 – Heysham 2 PS single line diagram (SLD) for the Capacity Market

Attachment D (CONFIDENTIAL) – Attachment 2 – Heysham 2 PS NGET Operational Diagram

For more information, please contact:

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