

Metering Dispensation D/515 – Ffestiniog (Pumped Storage) Power Station

Imbalance Settlement Group

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Summary **First Hydro Company has applied for a lifetime Metering Dispensation (D/515), against Code of Practice (CoP) 1, with some temporary aspects, for the Metering Equipment associated with Ffestiniog (Pumped Storage) Power Station. We invite the ISG to approve D/515 on a temporary basis until 31 December 2025.**

1. BSC requirements

- 1.1 Section L¹ 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 is confidential. However, we have confirmed that the content of the application form itself is not confidential and that the applicant has requested that we only keep the detailed metering single line diagram (Attachment D) confidential for commercial reasons. This is to prevent Elexon making these details public on the BSC Website.

3. Background to Metering Dispensation D/515

- 3.1 Ffestiniog (Pumped Storage) Power Station is connected to the Transmission System at 275kV. It currently comprises four 90 MW (95MVA) Generator/Motor Units (GMUs). Each GMU is connected, in pairs, to the Transmission System by a 275/16kV Supergrid Transformer (SGT) and each pair has a shared 16kV connected Station Transformer (STx) (Attachments C and D).
- 3.2 The GMUs and STxs are metered at 16kV (the Actual Metering Points (AMPs)) and not at the higher voltage (HV) side of the SGTs (the Defined Metering Points (DMPs)). The Metering Equipment is currently subject to a

¹ 'Metering'

² 'Metering Dispersations'

Metering Dispensation, D/288³. D/288 allows for the GMUs to be metered to [Code of Practice \(CoP\) 2](#)⁴ standards, and the STxs to be metered to [CoP3](#)⁵ standards, away from the DMP. The ISG approved D/288 on a lifetime basis at its meeting (ISG 37/415) on 24 February 2004.

- 3.3 The GMU Meters are compensated for a share of the (relatively constant) no load losses of the associated SGTs and the load losses in the associated SGT caused by operating each GMU. The load losses in the SGT caused by load drawn via the Station Transformers are not compensated for.
- 3.4 The GMUs are each comprised in their own BM Units (T_FESS-1, T_FESS-2, T_FESS-3 and T_FESS-4) and, as such, can be despatched separately by the National Grid Electricity System Operator (NGESO). If the Ffestiniog Power Station Metering Equipment was located at the DMP, to [CoP1](#)⁶ standards, this would not be possible to do. The two STxs' are in their own single BM Unit (T_FFESST1).
- 3.5 **GMU refurbishment** - Ffestiniog Power Station is currently going through a period of major refurbishment where the four GMUs are due for replacement. Replacement of GMUs 1 and 2 (from 95MVA to 107MVA units) is underway and replacement of GMUs 3 and 4 is due to commence in January 2023, for a period of approximately two years.
- 3.6 First Hydro Company (FHC) has discovered that the existing set of 3000/5A class 0.5 current transformers (CTs), for each GMU, are not compliant with CoP2 as stated in D/288. These have been uprated for GMUs 1 and 2 to 4000/1A class 0.2s and now comply with CoP2 however, because the GMUs are now rated above 100MVA, all the Metering Equipment should comply with CoP1 standards (apart from location):

GMU 1 and 2 Metering Equipment	Existing (CoP2 compliant) – following CT upgrade	Required (CoP1)
Current Transformers (CTs)	class 0.2s (1 set)	class 0.2s (2 sets)
Voltage Transformers (VTs)	class 0.5 (2 sets)	class 0.2 (1 set or 2 sets)
Meters	class 0.5s (main and check)	class 0.2s (main and check)

- 3.7 As the project is in the commissioning phase, any disruption would now incur major financial penalties from the Principle contractor. It is therefore not feasible to currently incorporate the design requirements to upgrade the CTs, VTs and Meters, for GMUs 1 and 2, to CoP1 standards. If GMUs 1 and 2 are both running they would be limited to 95MVA each as SGT1 is rated at 190MVA. If only one GMU is running it could run at 107MVA.
- 3.8 FHC proposes to add another set of CTs, upgrade the VTs and upgrade the Meters, to CoP1 standards, at the next outage for GMUs 1 and 2 in three years' time (October 2024). FHC will also upgrade the Metering Equipment for GMUs 3 and 4 to CoP1 standards (apart from location) during their outage, which is due to commence in January 2023 and take about two years. The refurbishment of GMUs 3 and 4 should be completed in 2024/2025.
- 3.9 **New excitation system** - A new excitation system is also being added to the GMUs to enable faster synchronisation to the Transmission System. The excitation system is moving from a permanent magnet type excitation system to a static one, whose supplies will be provided by new 620kVA, 16/0.26kV, excitation transformers (ETxs). These connect to the Power Station's 16kV distribution system.
- 3.10 The ETxs come as a package with a set of class 0.2s current transformers and will be metered at 16kV, to [CoP5](#)⁷ standards (albeit with a non-compliance). Due to the limited space available for dedicated VTs for the ETxs, FHC propose to connect the ETx Meters (i.e. two main Meters, only⁸) to the VT secondary winding that currently serves the main Meter of each STx. The STxs' check Meters are connected to their own separate secondary winding on each STx VT.
- 3.11 The ETx Metering Equipment is therefore non-compliant with CoP5 due to the use of a shared VT rather than dedicated VTs and due to location (AMP not at DMP).

³ See Appendix 1 for more details about the Metering Dispensation applications related to Ffestiniog Power Station.

⁴ 'Code of Practice for the metering of circuits with a rated capacity not exceeding 100MVA for Settlement purposes'

⁵ 'Code of Practice for the metering of circuits with a rated capacity not exceeding 10MVA for Settlement purposes'

⁶ 'Code of Practice for the metering of circuits with a rated capacity exceeding 100MVA for Settlement purposes'

⁷ 'Code of Practice for the metering of energy transfers with a maximum demand of 1MW for Settlement purposes'

⁸ CoP5 does not require a check Meter.

- 3.12 As a result of all the changes to the Metering Equipment at Ffestiniog Power Station, FHC proposes to withdraw Metering Dispensation D/288 and replace it with a new Metering Dispensation, D/515, which has several aspects to it.

4. Metering Dispensation application D/515

- 4.1 FHC has applied for a lifetime Metering Dispensation (D/515), with some temporary aspects, against CoP1, for the Metering Equipment associated with the Ffestiniog Power Station (Attachment A).
- 4.2 The lifetime aspects the Metering Dispensation application seeks to cover are:
- the AMP not being at the DMP for the Metering Equipment related to all the GMU, STx and ETx circuits; and
 - the ETx Metering Equipment not having their own dedicated VT as they share the main Meter secondary winding of the STx VTs.
- 4.3 A temporary Metering Dispensation from CoP1 is also required for the GMU Metering Equipment. This is to meter to CoP2 standards due to the following:
- GMUs 1 and 2 – following the GMUs' uprating to 107MVA, only one dedicated set of (upgraded) class 0.2s CTs are currently available at the AMP (main and check Meters on same set of CTs), the VTs are to class 0.5 and the Meters are to class 0.5s – CoP1 requires two sets of class 0.2s CTs, with one set dedicated to the main Meter, one VT with two class 0.2 secondary windings or two VTs with a class 0.2 secondary winding and class 0.2s Meters;
 - GMUs 3 and 4 – currently these GMU are rated at 95MVA and only one dedicated set of class 0.5 CTs are currently available at the AMP (main and check Meters on same set of CT) – CoP2 requires class 0.2s CTs.
- 4.4 For GMUs 1 and 2, this temporary aspect of the application is required until the next outage (October 2024).
- 4.5 For GMUs 3 and 4, this aspect of the application is required until 2024/2025 so that refurbishment work can be completed on GMUs 3 and 4 to upgrade the GMUs from 95MVA to 107MVA, upgrade the GMU Metering Equipment (to CoP1 standards) and add new ETxs (and its Metering Equipment).

5. MDRG comments

- 5.1 We circulated the Metering Dispensation application (and attachments) to the MDRG for comments (Attachments A - D).
- 5.2 Two out of three MDRG members responded. One MDRG member is the appointed Meter Operator Agent and did not comment. The other two MDRG members support the application on the following bases:
- They are now satisfied that the proposed compensation methodology is sound. Their only remaining query is around proving the low materiality to support the decision not to include power transformer copper losses in the STx and ETxs Meters.
 - They agree with the other MDRG member who supports the application, although as a principal, they would prefer to see the SGT copper losses included within the losses for the station and excitation metering. Although, if they are deemed to be so small, then they are content.

6. NETSO comments

- 6.1 We circulated the Metering Dispensation application (and attachments) to the National Electricity Transmission System Operator (NETSO) for comments (Attachments A - D).
- 6.2 The NETSO has no objection to the ISG granting a Metering Dispensation.

7. ELVA

- 7.1 We circulated the Metering Dispensation application (and attachments) to the Electrical Loss Validation Agent (ELVA) for comments (Attachments A - D).
- 7.2 The ELVA agreed, at an SGT level, with the proposed compensation factors provided with the original loss compensation proposal (not attached), but deemed them unsuitable for applying to the GMU Meters.
- 7.3 Although the ELVA was unable to replicate the figures provided, it also agreed that the losses calculated for the 12m of busbar (42.84W @ 190MVA), the generator supply cables (5.84W), 23m of STx cables (1.51mW @ 1000kVA) and 20m of ETx cables (0.6mW @ 620kVA) would suggest that the loss is not significant to have an impact the overall accuracy of the Metering System. The ELVA noted that, based on the relative rating of the

STx (1000kVA) and the ETxs (620kVA) vs the rating of the SGT (190MVA), the load losses they cause in the SGT could be considered negligible at 0.5%.

- 7.4 We circulated the current proposed compensation factors (Attachment B) to the ELVA for validation. The ELVA is now satisfied that the current proposed compensation factors are suitable to be applied to the GMU 1 and 2 Meters.

8. Elexon's view

- 8.1 We do support the application on a lifetime basis for the AMPs not being at the DMP for the metering for the four GMUs, two STx and four new ETx circuits. This is because it is not practical to meter at the DMPs and despatch each GMU separately unless each GMU, STx and ETx has its own connection to the Transmission System.
- 8.2 The current proposed loss compensation factors (Attachment B) will be applied to the GMU Meters to compensate for the losses GMUs 1 and 2 cause in SGT1, from their AMPs to the DMP.
- 8.3 We asked the applicant to provide an estimate of the materiality of not compensating the GMUs 1 and 2 STx and ETxs, for the load losses they cause in SGT1. The applicant has provided an assessment of the materiality of not compensating the GMUs 1 and 2 STx only (Attachment E). On this basis and on the basis that loads on the ETxs are only present when the GMUs are generating, motoring or spinning⁹, we agree that the losses are not material and neither the STx Meters nor the ETx Meters need to be compensated for the load losses they cause in SGT1.
- 8.4 We do support the use of the STx main Meter VT secondary winding to feed the new CoP5 ETx Meters on a lifetime basis as they will be separately fused and the low overall burden on the VT will not impact its accuracy. The [Issue 87](#)¹⁰ Working Group are looking at a similar proposal (i.e. sharing VTs) for Offshore wind farms and also extending this to include onshore sites.
- 8.5 We also support a temporary three year Metering Dispensation, until October 2024, for the use of class 0.5s main and check Meters, one set of class 0.2s CTs and the existing two class 0.5 VTs for GMUs 1 and 2 as the GMUs cannot be run above 100MVA as pairs (the SGTs are rated at 190MVA) and individually are limited to run at 90MW, @ 0.85 Power Factor, with Apparent Power at 105MVA¹¹.
- 8.6 However, as the Metering Equipment for GMUs 3 and 4 will remain non-compliant with CoP2 until 2024/25, we recommend the ISG approves a temporary Metering Dispensation until 31 December 2025 for all the Ffestiniog Metering Equipment and let the applicant come back to seek a lifetime Metering Dispensation for AMP not at DMP, and the use of shared STx VTs for the ETx Meters, once all the GMU Meters, CTs and VTs are made compliant with CoP1, apart from location.

9. Recommendation

- 9.1 We invite the ISG to:
- a) **APPROVE** Metering Dispensation D/515, for Ffestiniog (Pumped Storage) Power Station, on a temporary basis until 31 December 2025.

Attachments

Attachment A – Metering Dispensation application (D/515)

Attachment B – Ffestiniog GMU Meter compensation

Attachment C – Simplified metering single line diagram (SLD) for Ffestiniog Power Station

⁹ Based on operating average values from 2018, these are the operating hours for a single unit at Ffestiniog: Generating – 304 hrs; Spinning – 3010 hrs; Pumping – 551 hrs. Based on a 365 day year, the remaining time where a unit does not operate in any form is approx. 4,895 hrs.

¹⁰ 'Busbar voltage transformer metering for Offshore wind farms under OFTO arrangements'

¹¹ The applicant confirmed that the limits are set on the governor where at unity power factor the generator is limited to generate 90MW. The new units are designed so they can operate to vary the power factor down to 0.85 to support the capacity market therefore Apparent Power capability can go to 105MVA.

Attachment D (CONFIDENTIAL) – Detailed SLD for Ffestiniog Power Station metering

Attachment E – Applicant's materiality estimate of not compensating the STx Meters for load losses the STx causes in SGT1

Appendix

Appendix 1 - Historic Metering Dispensations

For more information, please contact:

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Appendix 1 – Historic Metering Dispensations

- 1.1. **D/15** - In September 1991, NGC Pumped Storage Business applied for a Metering Dispensation (D/15) to allow the existing metering arrangement to be left in commission, though not complying with the metering Code of Practice E (CoPE) of the Pooling and Settlements Agreement (P&SA), for the Final Metering Scheme arrangement at Ffestiniog (Pumped Storage) Power Station. D/15 was sought for the refurbishment period of the station, being within the next 10 years from 1991. At the Metering Sub-Committee (MSC) meeting on the 9 January 1992 the MSC considered that no Metering Dispensation was necessary in this case and that the application should be withdrawn until such time as the new metering Codes of Practice were approved. The Voltage Transformers (VTs)/CTs complied with CoPE, with compensation applied to the GMU Meters to achieve overall accuracy at the Commercial Interface on the higher voltage (HV) side of the SGTs. D/15 was withdrawn.
- 1.2. **D/288** - In 2004 the lower voltage (LV) switchgear, with integral VT/CT units, were upgraded to an accuracy class of 1.0 and 0.5 retrospectively (i.e. a material change to Metering Equipment). As a result the generator (First Hydro Company (FHC)) applied for a Metering Dispensation (D/288) to meter to Code of Practice (CoP) 2 standards (for the GMUs) and CoP3 standards (for the STxs). New Meters were also installed and equally compensated for the transformer losses to meet the accuracy requirements of metering CoPs 2 and 3 at the Defined Metering Point (DMP), which is the HV side of the SGTs.