

# ISG210/05 – METERING DISPENSATION D/490 - SELLINDGE

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<b>MEETING NAME</b>	ISG 210
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<b>Date of meeting</b>	23 October 2018
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<b>Paper number</b>	210/05
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<b>Owner/author</b>	Mike Smith
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<b>Purpose of paper</b>	Decision
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<b>Classification</b>	Public
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<b>Summary</b>	National Grid Interconnectors Limited (NGIC) has applied for a lifetime Metering Dispensation (D/490) from Code of Practice 1. This is to continue using the Fibre Optic Current Transformers (FOCTs) on the Anglo French Interconnector. The existing temporary Metering Dispensation (D/480) is due to expire on 30 December 2018. We invite the ISG to approve D/490 on a lifetime basis subject to the conditions set out in this paper.
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## 1. BSC requirements

1.1 Section L 'Metering' 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; or
- be the subject of, and comply with, a Metering Dispensation.

1.2 Section L allows the Registrant of a Metering System to apply for a Metering Dispensation if, for financial or practical reasons, the 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 'Metering Dispositions'.

## 2. Background to Metering Dispensation D/490

2.1 In October 2009, National Grid Interconnectors Limited (NGIC) applied for a lifetime Metering Dispensation (D/358) against CoP1 to use non-standard Fibre Optic Current Transformers (FOCTs), instead of wound CTs<sup>1</sup>, on the DC side of the Anglo France Interconnector (IFA) at the Sellindge AC to DC converter station.

2.2 The IFA consists of four poles or two bipoles (BP1 and BP2). Poles 1 and 2 are associated with BP1 and poles 3 and 4 with BP2. Each pole is capable of conveying up to 500MW of power in either direction (Import or Export). The signals from the FOCTs (main and check) on each pole are fed via interface cards, along with signals from the voltage dividers (main and check) on each pole, to the DC Meters (main and check).

2.3 The table in Appendix 1 represents a summary of the original Metering Dispensation application (D/358) and subsequent applications relating to the use of the FOCTs associated with the IFA Metering System.

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<sup>1</sup> As required by clause 5.1 of CoP1.

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2.4 In December 2017 the ISG ([ISG200/06](#)) approved the current Metering Dispensation (D/480). This was on a temporary, one year, basis until 30 December 2018 and was subject to the condition that:

- NGIC provides the following information to the ISG at its meeting in October 2018:
  - the results of the 'As Found' [calibration] testing of BP1 and BP2;
  - the results of the [DC] offset testing; and
  - the proposed plan to ensure a final accurate DC (or AC) metering scheme.

### 3. Metering Dispensation application D/490

- 3.1 In September 2018 NGIC applied for a lifetime Metering Dispensation (D/490) from CoP1 (Attachment A). This is to continue using the FOCTs, installed at the Sellindge (AC/DC) converter station, to measure the Imports and Exports on the IFA. Attachment B details the outcomes of the tests undertaken on BP1 and BP2. Attachment C is an electrical single line diagram showing the location of the voltage dividers and FOCTs for BP1 at Sellindge (the location of the voltage dividers and FOCTs for BP2 is identical to that of BP1).
- 3.2 The results of the 2018 'As found' tests show that there is still a minor error (i.e. the error is outside IEC 60044-1<sup>2</sup> limits<sup>3</sup>) on the accuracy of the current metering solution at loads under 100MW (i.e. below 20% rated current) whilst the Interconnector is importing only. Using a materiality figure of £50/MWh<sup>4</sup> NGIC estimates that the total error, at loads below 100MW, for 2017 is £4,800 and, for 2018 (to May), this figure is as low as £700. NGIC believes that, although the level of below 100MW flows may vary year on year, the increase and reliance of renewables on the Grid should mean that flows below 100MW will become more infrequent.
- 3.3 The FOCT errors are impacting the overall accuracy of the main Settlement Meter readings (only) for poles 1 and 2, at low loads - i.e. at 5% (25MW) rated current, for pole 1, and at 5% and at 10% (50MW) rated current, for pole 2. Below 5% rated current, for pole 1, and below 5% and above 5% and below 10% rated current, for pole 2, the errors are within CoP1 overall accuracy limits<sup>5</sup>. The check Settlement Meter readings for poles 1, 2, 3 and 4 are within CoP1 accuracy limits at all loads.
- 3.4 NGIC acknowledge that although the error identified on the FOCTs is outside the tolerance set under the BSC, it believes the significance to be minor, particularly in the context of the overall metering solution and operation of the Interconnector. Therefore, NGIC believes it not to be cost-effective to implement a DC (or AC) metering solution at the cost of millions of pounds.
- 3.5 NGIC therefore requests permission from the ISG for a permanent Metering Dispensation for the FOCTs, including an obligation on NGIC to carry out four-yearly calibration checks of the FOCTs (including offset testing) on all four poles in association with its Meter Operator Agent (MOA).

### 4. MDRG comments

- 4.1 In September 2018 we circulated the Metering Dispensation application D/490 (Attachment A) and its attachments (Attachments B and C) to the Metering Dispensation Review Group (MDRG) and the Transmission Company for comment.

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<sup>2</sup> 'Instrument transformers, Part 1: Current transformers'

<sup>3</sup> For a class 0.2 CT the percentage current (ratio) errors at percentage of rated current are:  $\pm 0.75\%$  at 5%,  $\pm 0.35\%$  at 20%,  $\pm 0.2\%$  at 100% and  $\pm 0.2\%$  at 120%.

<sup>4</sup> This figure is intended to represent the typical cost of Imbalance.

<sup>5</sup> At unity power factor the CoP1 overall accuracy limits are:  $\pm 1.5\%$  for below 5% to 1% rated current;  $\pm 0.7\%$  for below 10% to 5% rated current; and  $\pm 0.5\%$  for 120% to 10% (inclusive) rated current.

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- 4.2 All five MDRG members responded. One MDRG member did not provide any comments as they are the appointed MOA for the IFA Metering System at Sellindge. Three MDRG members support the Metering Dispensation application on a lifetime basis. They gave the following rationale and/or condition for their support:
- accuracy is within CoP tolerance for a large proportion of time and there will be ongoing checks on the optical CTs which are still not proven to have stable errors. The MDRG member would like to see a review of the Metering Dispensation if the loads flowing through the interconnector regularly drop below 100MW;
  - subject to the appropriate testing to ensure that overall accuracy continues to be maintained at the DMP;
  - subject to accuracy of the Metering System being maintained within CoP1 limits at the DMP. The MDRG member also believes that Metering Dispensation should be subject to periodic testing of the FOCT's to be certain that overall accuracy is maintained within the limits specified in CoP1 and also that the FOCT errors remain stable. The MDRG member suggests that staggered testing is a more appropriate way to carry out testing, e.g.: Pole 1 in Year 1, Pole 2 in Year 2, Pole 3 in Year 3, Pole 4 in Year 4; or Pole's 1 & 2 in year 1 and Pole's 3 & 4 in Year 3. Should any abnormalities be noted then further action may be taken to confirm the accuracy on the other pole's metering.
- 4.3 One MDRG member does not agree with the Metering Dispensation application because:
- the metering was not installed in compliance with the BSC metering CoPs;
  - there have been problems and difficulties with the metering throughout its life;
  - the accuracy has been a concern which has resulted in extra costs to stakeholders, including ELEXON/BSC Parties to achieve assurance;
  - ideally, the metering should be replaced with compliant metering or the BSC changed to accommodate this type of Metering Equipment. Until one of the two is applied then the continual testing and assurance should continue; and
  - there is no evidence to demonstrate that the metering accuracy will remain stable into the future.

### 5. Transmission Company comments

- 5.1 The Transmission Company has no issues with or objections to the Metering Dispensation application (D/490).

### 6. ELEXON's view

- 6.1 ELEXON supports this lifetime application as accuracy is within CoP1 limits at the DMP at loads that would be materially significant to Settlement if accuracy was not maintained. The materiality of errors outside the limits sets out in the CT standard (IEC 60044-1) for CoP1 and the CoP1 overall accuracy limits is very low.
- 6.2 We believe the approval should be subject to NGIC periodically testing the FOCTs to ensure overall accuracy is maintained within the limits specified in CoP1 and the FOCT calibrations errors (and offsets) remain stable.
- 6.3 ELEXON recommends the following test regime and conditions should apply:
- test both poles of one of the bipoles in 2019 and then on a four-yearly basis;
  - test both poles of the other bipole in 2021 and then on a four-yearly basis;
  - report to the ISG in October 2021 with the results of the testing on both bipoles and then on a four-yearly basis;

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- if any test results show the errors of the FOCT outputs have drifted outside (if not already) or further outside (if already) IEC 60044-1 or CoP1 accuracy limits, then NGIC are to adjust and recalibrate the impacted FOCTs and report to the ISG within two months of doing so; and
- NGIC monitors the Imports (and Exports) across the interconnector, on a rolling six month basis, and reports to the ISG if the number Settlement Periods below 100MW, expressed as a percentage of the total number Settlement Periods in that rolling six month period, exceeds 1%.

6.4 If NGIC fails to comply with the conditions agreed by the ISG then, in accordance with BSCP32 section 1.9, the ISG may withdraw or amend the Metering Dispensation.

## 7. Recommendation

7.1 We invite you to:

- a) **APPROVE** Metering Dispensation application D/490 on a lifetime basis subject to the test regime and conditions set out in section 6.3 of this paper.

## Appendices

Appendix 1 – History of Metering Dispensation extensions related to original application (D/358)

## Attachments

Attachment A – Metering Dispensation D/490 application form

Attachment B – Sellindge accuracy report

Attachment C – Sellindge electrical single line diagram

### For more information, please contact:

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### Appendix 1 – Summary of Metering Dispensation extensions related to original application (D/358)

Dispensation Reference No.	Application Date	Reason/Requested Dispensation Term	ISG Meeting	ISG Paper No.	Outcome/Term Agreed	Reason/Conditions
D/358	Oct 2009	Use optical CTs instead of wound CTs on BP1 and BP2 for the IFA/Lifetime	Nov 2009	ISG106/03	Deferred/-	ISG requested the applicant provides evidence supporting the long term accuracy, stability and reliability of the optical CTs and for MDRG to review it/- Two years granted as application is based on relatively new technology/ISG noted that the applicant should provide clear and comprehensive evidence that the optical CT are functioning as expected when renewing the Metering Dispensation -/-
		Evidence supporting the long term accuracy, stability and reliability of the optical CTs provided plus MDRG comments on the evidence/Lifetime	Dec 2009	ISG107/04 (verbal update)	Approved/ Two years expiring 21 December 2011	
		Project programme delayed by 16 months – extension requested/ 16 months until April 2013 to gather evidence that the optical CT are functioning as expected	Aug 2011	<a href="#">ISG127/06</a>	Approved/16 months until April 2013	
D/389	Nov 2012	BP1 CTs tested in October 2012 (after 17 months in service). 3 out of 4 showed small offset drifts affecting errors at low loads (drifts corrected and CTs recalibrated). Request to extend the Metering Dispensation for another year so further data can be gained by re-testing BP1 (and BP2) CTs in 2013 and a suitable test program can be established for this type of CT and also to consider any changes to any equipment in the metering chain/One year	Jan 2013	<a href="#">ISG141/01</a>	Deferred/-	ISG requested the applicant come back with a plan to resolve the issues and requested that this be submitted to ELEXON by the February 2013 ISG meeting or the March 2013 ISG meeting at the latest/-

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D/427	May 2014	Due to manufacturing problems the supplier of interface cards was unable to deliver in time for the October 2013 outage (BP1). The supplier did modifications in time for BP2 in March 2014. Therefore 6 month delay. NGIL also confirmed it plans to set up a replicated test bed/15 months	July 2014	<a href="#">ISG159/05</a> (Confidential)	Deferred/-	The ISG deferred a decision until more details are provided on the test bed and any initial test results.
		ELEXON requested further detail from NGIC in mid-Aug 2014 and early Sept 2014. NGIC suggested a test regime but could not provide test results from the test bed. In early Sept 2014 it was still struggling to get the test bed set up. ELEXON noted at the ISG meeting that the applicant had just confirmed that there should be test results from the new test bed in the next two weeks. BP2 test data provided showed magnitude and drift of the output offset (i.e. zero load output) has been significantly improved on the revised cards. However, there would appear to be a temperature dependency within the optical CT head that requires further investigation and characterisation	Sept 2014	<a href="#">ISG161/06</a> (Confidential)	Approved/ Until 30 December 2015	-/NGIC provides copies of all test reports (and results) from testing the new interface cards to ELEXON as soon as the tests are completed so that these can be reviewed by ELEXON and the MDRG
D/454	July 2015	NGIC confirmed BP2 CTs tests show errors are within IEC 60044-1 standard limits. Request for a two year extension (end of Dec 2017) to investigate possible voltage divider circuit errors (detected as part of a Trading Dispute) and calibrate voltage dividers (using 150kV voltage source). CoP1 overall accuracy limits maintained despite voltage divider errors.	Sept 2015	<a href="#">ISG173/02</a>	Approved/Until 30 December 2017	-/ The applicant provides a detailed plan for fixing the possible voltage divider circuit errors (detected as part of a Trading Dispute).  Report from NGIC provided in Aug 2016. NGIC has decided to: install revised and stabilised power supplies; install new CAPSU CT heads; and calibrate the voltage dividers in outages in Sept 2016 (BP2) and Oct 2016 (BP1).

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D/480	Sept 2017	<p>NGIC: calibrated the optical CT outputs and, where necessary, corrected offset drifts and then recalibrated the optical CT outputs, at each BP outage; tested the voltage dividers and confirmed all the voltage dividers were found to be well within the specified accuracy requirements of CoP1 for wound voltage transformers; made refinements to the optical CT connections and screening during the BP1 and BP2 outages; following an investigation of the BP1 'As Found' 5% load point error, used the remaining part of the BP1 outage to begin to study the DC Meter offset, which was seen to be the cause of the error at low load points. NGIC proposed to measure and record the offset voltages of both the main and the check DC Meter inputs of any pole CTs at every opportunity throughout 2018 when either the BP1 or BP2 circuits are off load for more than 30 minutes (to ensure a representative set of readings are collected). From this NGIC will then be able to: understand whether the offset is stable or suitably stable; and pass the offset data to the ISG. NGIC also plan to re-check, witness and record the "As Found" results for the BP1 and BP2 optical CTs during its planned outages in 2018. NGIC will report back to the ISG with these results, along with the DC Meter offset readings in October 2018.</p> <p>Cont'd...</p>	Dec 2017	<a href="#">ISG200/06</a>	Approved/Until 30 December 2018	-/Subject to NGIC provides the following information to the ISG at its meeting in October 2018: the results of the 'As Found' testing of BP1 and BP2; the results of the offset testing; and the proposed plan to ensure a final accurate DC (or AC) metering scheme.
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		<p>NGIC will present its preferred solution to the ISG for approval in October 2018:</p> <p>Option A: Request the MOA to compensate the offset within the DC Meters for each of the main and check DC Meters on all four poles (if the BP1 and BP2 optical CT output 'As Found' results are stable compared to the 2017 results and the measured offset results, at 0MW load on the two BP circuits, show stability in the millivolt readings taken during 2017-18). Budget cost = £5,000; Completed by the end of 2018.</p> <p>Option B: Install new optical CT's with a lower ratio i.e. equivalent to 4000/2000-1 not 20,000-1. Using lower ratio optical CTs will improve the resolution of their output (x5/x10) meaning small offset drifts will have less impact on accuracy at low loads (if results are not stable in comparison to the 2017 results. These new CT's will be used solely for metering purposes). Budget cost = £300,000 - £500,000; Completed by the end of 2019.</p> <p>Option C: Install AC metering at each of the BP AC Connections. This would utilise air insulated CT/VT equipment and would need a Metering Dispensation request for a small correction factor incorporated in the metering outputs to allow for the CT/VT units not being installed at the Boundary Point (BP) connection point to the NGET 400kV system. Budget cost = £800,000 - £1,500,000; Completed by the end of 2019.</p> <p>Cont'd...</p>				
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		Option D: Install new AC CTs in the SF6 Switchgear CTs at the NGIC Connection points for each BP in the NGET 400kV substation. Budget cost = £3,000,000 - £4,000,000; Completed by the end of 2020-21.				
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