

Reference number(s)	019 – Measuring Transformers and Burdens
Relevant clause(s)	<p>Clause 28(4)(b) and (i) of Schedule 10.7 Requirements for a metering installation incorporating measuring transformer</p> <p>Clause 31(7) of Schedule 10.7 Measuring transformer burden and compensation requirements</p> <p>Clause 2(1)(c) of Schedule 10.8 Measuring transformer certification requirements</p>
Problem definition	<p>Metering installations are only accurate within certain parameters. If the electrical load on a metering installation is too low, or too high, the metering installation can measure electricity less accurately than permitted by the Code.</p> <p>The same limitation applies to the accuracy of measuring transformers. If the load (burden) on a measuring transformer is less than, or more than, the design burden, the measuring transformer may not meet the accuracy requirements set out in the Code.</p> <p>The Authority has identified a number of problems with the Code provisions relating to measuring transformer burdens.</p> <p><u>Problem 1</u></p> <p>Under clause 28(4)(i) of Schedule 10.7, the ATH who certifies a metering installation that includes a measuring transformer must ensure the total burden on the measuring transformer is not too high. Under clause 31(7) of Schedule 10.7, an ATH must, before it certifies a measuring transformer, ensure the in-service burden is not too low.</p> <p>These requirements would be easier to track and follow if they were contained within the same clause.</p> <p><u>Problem 2A</u></p> <p>Clause 31(7) of Schedule 10.7 requires an ATH certifying a measuring transformer to ensure the in-service burden on the measuring transformer is within the requirements of the standards specified in Table 5 of Schedule 10.1. This obligation incorrectly relates to certifying a measuring transformer. The obligation should instead relate to certifying a metering installation.</p> <p>This is because Schedule 10.7 deals with the requirements for metering installations, while Schedule 10.8 deals with the requirements for metering components.</p> <p><u>Problem 2B</u></p> <p>Clause 2(1)(c) of Schedule 10.8 requires the ATH who certifies a measuring transformer to confirm the accuracy of the measuring transformer at the in-service burden, if the in-service burden is lower than a specified test point. However, many measuring transformers are certified by an ATH in a test laboratory prior to being installed in the metering installation. An ATH certifying a measuring transformer in a test laboratory will not know what the actual in-service burden will be for that measuring transformer.</p>

A better approach would be for the ATH certifying:

- a) a measuring transformer, under clause 2(1) of Schedule 10.8, to specify the applicable burden range of the measuring transformer in the certification report for the measuring transformer, and
- b) a metering installation with a measuring transformer, to ensure the in-service burden on the measuring transformer is within the range specified in the measuring transformer's certification report.

Problem 3A

Clause 31(7)(b) of Schedule 10.7 permits a class A ATH to confirm by calibration that the accuracy of a measuring transformer will not be adversely affected by the in-service burden being less than the lowest burden specified by the manufacturer.

Clause 2(1)(c)(ii) of Schedule 10.8 permits a class A ATH to calibrate a measuring transformer at the in-service burden if the primary voltage of the measuring transformer is greater than 1 kV.

The two clauses are slightly different. Clause 2(1)(c)(ii) of Schedule 10.8 is limited to measuring transformers with a primary voltage greater than 1 kV. However, this limitation was accidentally omitted from clause 31(7)(b)(i).

The policy intent of the Code amendment that incorporated these two clauses into the Code was to only permit a class A ATH to calibrate a measuring transformer if the primary voltage of the measuring transformer is greater than 1 kV.

The reasons for this policy intent were:

- To mitigate the risk of damage to the measuring transformer and other components in the metering installation should burden resistors fail on high voltage current transformers. This risk is mitigated if a class A ATH can confirm accuracy at the in-service burden as then burden resistors will not need to be installed.
- The difficulty and cost of sourcing new measuring transformers for high voltage equipment, especially older such equipment.

Problem 3B

The Authority has received a request to amend the Code to permit class B ATHs to calibrate measuring transformers that have a lower burden than specified by the manufacturer. The benefit the requestor has identified from making this Code change is to lower the cost of the metering installation in such circumstances. If the requested change is made, an MEP can elect to get a class B ATH to calibrate the measuring transformer instead of installing burden resistors.

Problem 4A

Under clause 28(4)(b) of Schedule 10.7, an ATH must, before it certifies a metering installation incorporating a measuring transformer, use the fully calibrated certification method to ensure that the ATH uses the measuring transformer's actual accuracy (rather than class accuracy) when calculating the maximum permitted error for the relevant metering installation category.

	<p>However, clause 7(2)(b) of Schedule 10.7 permits an ATH to use the approved comparative recertification method under clause 12 of Schedule 10.7 to recertify a category 2 metering installation. Category 2 metering installations incorporate measuring transformers.</p> <p>Therefore, clause 28(4)(b) of Schedule 10.7 needs to recognise that an ATH may also use the approved comparative recertification method when certifying a category 2 metering installation, because this is a form of calibration performed onsite at metering installations.</p> <p><u>Problem 4B</u></p> <p>Clause 28(4)(b) of Schedule 10.7 refers to using a measuring transformer's actual accuracy rather than class accuracy. This reference is only one of the factors that need to be used to calculate the error. The full requirements are contained in Clause 22 of Schedule 10.7.</p> <p>Clause 28(4)(b) of Schedule 10.7 should instead require an ATH to carry out the error calculation in clause 22 of Schedule 10.7 when calculating the maximum permitted error of the metering installation. This ensures the certification takes into account the actual error on the metering installation, rather than just the measuring transformer's actual accuracy.</p>
Proposal	<p><u>Proposal to address problem 1</u></p> <p>To address problem 1, the Authority proposes to:</p> <ul style="list-style-type: none"> a) amend clause 28(4)(i) of Schedule 10.7 to refer to clause 31(7) of Schedule 10.7 b) amend clause 31(7) of Schedule 10.7 to also require an ATH certifying a metering installation with a measuring transformer to ensure the total burden on the measuring transformer is not too high. <p><u>Proposal to address problem 2A</u></p> <p>To address problem 2A, the Authority proposes to amend clause 31(7) of Schedule 10.7 so that the clause relates to the certification of a metering installation and not the certification of a measuring transformer.</p> <p><u>Proposal to address problem 2B</u></p> <p>To address problem 2B, the Authority proposes to:</p> <ul style="list-style-type: none"> a) amend clauses 28(4)(a)(i) and 31(7) of Schedule 10.7 so that clause 31(7) of Schedule 10.7 requires an ATH certifying a metering installation with a measuring transformer: <ul style="list-style-type: none"> i) to ensure the total in-service burden on the measuring transformer is within the range specified in the measuring transformer's certification report; or ii) to ensure the total in-service burden on the measuring transformer does not exceed the lower of: <ul style="list-style-type: none"> A) the measuring transformer's nameplate rating, and B) an alternative rating lower than the nameplate rating, if specified in the metering installation's design report or the measuring transformer's certification report,

whichever is the lower

- iii) if the primary voltage of the measuring transformer is greater than 1kV, is a burden at which a class A ATH calibrating the measuring transformer certifies the metering installation is accurate.
- b) replace clause 2(1)(c) of Schedule 10.8 with:
 - i) new clause 2(1)(ca) of Schedule 10.8, requiring an ATH certifying a measuring transformer to determine the burden range for the measuring transformer from one of the following:
 - A) the measuring transformer's nameplate rating
 - B) the calibration report for the measuring transformer
 - C) the manufacturer's documentation for the measuring transformer
 - D) the standard the measuring transformer was manufactured to; and
 - ii) new clause 3(c)(vi) of Schedule 10.8, which requires an ATH certifying a measuring transformer to specify the burden range for the measuring transformer on the certification report.

Making these proposed Code changes will:

- a) oblige the ATH certifying a measuring transformer to ensure this metering component meets the accuracy standards specified in the Code, and
- b) enable the ATH certifying a metering installation with a measuring transformer to know the metering installation will be accurate if the in-service burden on the measuring transformer falls within the burden range specified in the measuring transformer's certification report.

Proposal to address problem 3A

To address problem 3A, the Authority proposes to amend clause 31(7)(b)(i) of Schedule 10.7 to limit this provision to measuring transformers with a primary voltage greater than 1 kV.

Proposal to address problem 3B

The Authority does not propose to amend the Code to give effect to the requested Code change described under problem 3B.

The key reasons for this may be summarised as follows:

- a) It is not appropriate for a Class B ATH to calibrate measuring transformers with primary voltages greater than 1 kV because Class B ATHs are not required to comply with ISO 17025. While Class A ATHs must comply with ISO 17025, Class B ATHs must comply with the more general quality standard ISO 9001:
 - i) For high voltage ICPs, the effect of any testing error by an ATH is magnified by the compound ratio multiplication factor for the ICP. The best way for an ATH to minimise the

	<p>risk of this type of error is by complying with ISO 17025.</p> <ul style="list-style-type: none"> ii) The management of, and accuracy of, the specialised equipment required to calibrate high voltage measuring transformers are best managed under the specific test laboratory standard ISO 17025. iii) The test accuracy requirements for calibrating high voltage measuring transformers are better managed under ISO 17025. <p>b) We consider the cost for a class B ATH to calibrate a measuring transformer on site will usually be higher than the cost of installing one or more burden resistors. A burden resistor set costs less than \$50.</p> <p><u>Proposal to address problem 4A</u></p> <p>To address problem 4A, the Authority proposes to amend clause 28(4)(b) of Schedule 10.7 so that it also applies to an ATH that uses the approved comparative recertification method when certifying a category 2 metering installation.</p> <p><u>Proposal to address problem 4B</u></p> <p>To address problem 4B, the Authority proposes to amend clause 28(4)(b) of Schedule 10.7 to require an ATH to carry out the error calculation in clause 22 of Schedule 10.7 when calculating the maximum permitted error of the metering installation.</p>
<p>Proposed Code amendment</p>	<p>Schedule 10.7</p> <p>28 Requirements for metering installation incorporating measuring transformer</p> <p>...</p> <p>(4) An ATH must, before it certifies a metering installation incorporating a measuring transformer,—</p> <ul style="list-style-type: none"> (a) ensure that— <ul style="list-style-type: none"> (i) the measuring transformer is connected to a meter through a test facility that has provision for isolation; and (ia) the test facility and the provision for isolation are installed as physically close to the meter as practicable in the circumstances; and (ii) the test facility has a transparent cover that is not obscured; and (b) using the fully calibrated certification method <u>or the comparative certification method</u>, ensure that the ATH uses the measuring transformer's actual accuracy (rather than class accuracy) when calculating <u>calculates</u> the maximum permitted error <u>in accordance with clause 22</u> for the relevant metering installation category set out in Table 1 of Schedule

40.1; and

...

- (i) ensure that the total in-service burden (magnitude and phase angle, where appropriate) on the **measuring transformer** ~~complies with clause 31 does not exceed—~~
 - (i) ~~its name plate rating; or~~
 - (ii) ~~an alternative rating lower than the name plate rating, if specified in the **metering installation** design report.~~

31 Measuring transformer burden and compensation requirements

...

- (7) An **ATH** must, before it **certifies** a metering installation containing a measuring transformer, ~~if the in-service burden is less than the lowest burden test point specified in a standard set out in Table 5 of Schedule 10.1,—~~
 - (a) ensure that the in-service burden on the measuring transformer is within the range specified in the certification report for the measuring transformer, by installing burdening resistors to increase the in-service burden if necessary to be equal to or greater than the lowest test point specified in the standard; or
 - (b) confirm that—
 - (i) if the primary voltage of the measuring transformer is greater than 1kV, a class A ATH has confirmed by calibration that the accuracy of the measuring transformer will not be adversely affected by the in-service burden being less than the lowest burden test point specified in the standard; or
 - (ii) the **measuring transformer's** manufacturer has confirmed that the accuracy of the ~~metering-measuring transformer~~ will not be adversely affected by the in-service burden being less than the lowest burden test point specified in the standard; and
 - (c) ensure that the in-service burden (magnitude and phase angle, where appropriate) on the measuring transformer does not exceed the lower of—
 - (i) the nameplate rating for the measuring transformer; and
 - (ii) an alternative rating lower than the nameplate rating for the measuring transformer, if specified in the design report for the metering installation or the measuring transformer's certification report, whichever is the lower if both specify a different lower rating.

Schedule 10.8

2 Measuring transformer certification requirements

- (1) An **ATH** must, before it **certifies** a **measuring transformer**,—
- (a) ensure, by testing, that a current **calibration report** sets out the **measuring transformer's** errors at a range of primary values at their rated burdens; and
 - (b) that is a multi-tap current transformer, carry out the **calibration** tests and only **certify** the transformer for the ratios that have been **calibrated** if the test is passed; and
 - ~~(c) if the in-service burden is lower than a test point specified in a standard listed in Table 5 of Schedule 10.1, confirm the accuracy of the **measuring transformer** at the in-service burden by—~~
 - ~~(i) obtaining confirmation of accuracies at the in-service burden from the **measuring transformer's** manufacturer; or~~
 - ~~(ii) if the primary voltage of the **measuring transformer** is greater than 1kV, a **class A ATH** calibrating the **measuring transformer** at the in-service burden; and~~
 - (d) determine the **measuring transformer certification** validity period under clause 3(c)(ii); ~~and-~~
 - (e) determine the highest and lowest values that the in-service burden must fall between to ensure the **measuring transformer** remains accurate, by using one of the following:
 - (i) the **measuring transformer's** nameplate rating; or
 - (ii) the **calibration report** for the **measuring transformer**;
or
 - (iii) the manufacturer's documentation for the **measuring transformer**; or
 - (iv) the standard the **measuring transformer** was manufactured to.

3 Measuring transformer certification report

An **ATH** must, before it **certifies** a **measuring transformer**, ensure that—

- (a) the **measuring transformer** has a current **calibration report** issued by an **approved calibration laboratory** or an **ATH** approved to carry out **calibration** under Schedule 10.3; and
- (b) the **measuring transformer calibration report**—
 - (i) confirms that the **measuring transformer** complies with the standards listed in Table 5 of Schedule 10.1; and
 - (ii) records any tests the **ATH** has performed to confirm compliance under subparagraph (i) and the results of

	<p>those tests; and</p> <ul style="list-style-type: none"> (iii) confirms that the measuring transformer has passed the tests; and (iv) records any recommendations made by the ATH on error compensation; and (v) includes any manufacturer's calibration test reports; and <p>(c) it produces a measuring transformer certification report that includes—</p> <ul style="list-style-type: none"> (i) the date on which it certified the measuring transformer; and (ii) the certification validity period for the measuring transformer which must be no more than 120 months; and (iii) the measuring transformer calibration report; and (iv) whether the certification was based on batch test certificates; and (v) if the certification was based on batch test certificates, confirmation that the manufacturer's batch testing facility is, in the ATH's opinion, of an acceptable standard; and (vi) <u>the highest and lowest values that the in-service burden must fall between; and</u> <p>(d) it confirms that it has inspected the manufacturer's test certificates, and carried out any additional tests it considers necessary, to satisfy itself that the measuring transformer meets the accuracy requirements of this Part.</p>
<p>Assessment of proposed Code amendment against section 32(1) of the Act</p>	<p>The proposed Code amendment is consistent with the Authority's objective, and section 32(1)(c) of the Act, because it would contribute to the efficient operation of the electricity industry.</p> <p>It would do this by clarifying ATHs' obligations in regard to the treatment of the in-service burden during the certification of a measuring transformer and metering installation. This would help ensure the metering is accurate.</p> <p>The proposal would also remove an impossible obligation on ATHs to certify measuring transformers in a test laboratory.</p> <p>The proposed Code amendment is expected to have no effect on reliability of supply.</p>
<p>Assessment against Code amendment principles</p>	<p>The Authority is satisfied the proposed Code amendment is consistent with the Code amendment principles, to the extent they are relevant.</p>
<p>Principle 1: Lawfulness.</p>	<p>The proposed Code amendment is consistent with the Act, as discussed above in relation to the Authority's statutory objective and the requirements set out in section 32(1) of the Act.</p>
<p>Principle 2: Clearly Identified Efficiency Gain or Market or</p>	<p>The proposed Code amendment is consistent with principle 2 in that it addresses an identified efficiency gain, which requires a Code amendment</p>

Regulatory Failure	to resolve.
Principle 3: Quantitative Assessment	Please refer to the assessment of costs and benefits in section 3 of the consultation paper.
Regulatory statement	
Objectives of the proposed amendment	The objectives of the proposal are to clarify: <ul style="list-style-type: none"> a) who must take into account in-service burdens during the certification of a measuring transformer and metering installation b) certification requirements when in-service burdens are outside the burden test point range.
Evaluation of the costs and benefits of the proposed amendment	Please refer to the assessment of costs and benefits in section 3 of the consultation paper.
Evaluation of alternative means of achieving the objectives of the proposed amendment	The Authority has not identified any alternatives to the proposed Code amendment that would meet the objectives of the proposal.