

## CP Progression Paper

### Defining the Requirements for Minimum Burden and CT ratios

#### Contents

1.	Summary	2
2.	Why Change?	4
3.	Solution	6
4.	Impacts and Costs	8
5.	Implementation Approach	10
6.	Proposed Progression	11
7.	Recommendations	12



#### Committee

Imbalance Settlement  
Group (ISG) and  
Supplier Volume  
Allocation Group (SVG)

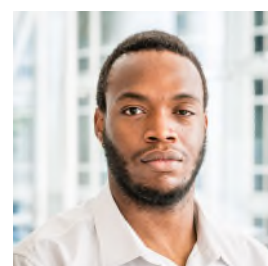


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#### About This Document

You can find the definitions of the terms and acronyms used in this document in the [BSC Glossary<sup>1</sup>](#).

This document provides information on a new Change Proposal (CP) and outlines our proposed progression timetable for this change, including when it will be issued for CP Consultation in the next suitable Change Proposal Circular (CPC) batch.

We are presenting this paper to the ISG on 7 November 2023 and the SVG on 7 November 2023 to capture any comments or questions from Committee Members on this CP before we issue it for consultation.

There are three parts to this document:

- This is the main document. It provides a summary of the solution, impacts, anticipated costs, and proposed implementation approach, as well as our proposed progression approach for this CP.
- Attachment A contains the CP proposal form.
- Attachment B contains the proposed redlined changes to deliver the CP solution.

ISG271/05, SVG273/04

CP

CP Progression Paper

7 November 2023

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Page 1 of 12

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<sup>1</sup> <https://www.elxon.co.uk/glossary/?show=all>

# 1. Summary



## What is a CT?

A Current Transformer (CT) is a device used to transform high currents from power lines into a lower, measurable current for safety and accurate measurement purposes.

## What is a CT Ratio?

The CT ratio represents the relationship between the primary current input and the secondary current output. For example, a CT ratio of 1000:1 means that when 1000 amperes flow through the primary winding, 1 ampere will flow through the secondary winding, which is used for measurement and monitoring.

## Why change?

In some cases, the Current Transformer (CT) ratios for the maximum current of the circuit is not appropriately selected, even though these ratios are vital for accurate energy settlement as they ensure safe and precise current conversion, maintain metering equipment within its optimal operating range, and uphold regulatory compliance standards.

This oversight becomes particularly problematic when the load conditions of a circuit typically operate below 1% of the rated primary current ( $I_r$ ), compromising the accuracy of the Active Energy data. This could lead to miscalculations in energy billing, discrepancies in energy consumption records, and potential challenges in balancing supply and demand for Active Energy. Furthermore, there are cases where Metering Systems function outside the specified error limits or stray from the 25%-100% rated burden range, introducing potential inaccuracies into the system, which could also lead to inaccurate billing.

## Solution

This CP will amend [Codes of Practice \(CoPs\) 1: The Metering of Circuits with a Rated Capacity Exceeding 100 MVA for Settlement Purposes<sup>2</sup>](#), [Code of Practice 2: The Metering of Circuits with a Rated Capacity not Exceeding 100 MVA for Settlement Purposes<sup>3</sup>](#), [Code of Practice 3: The Metering of Circuits with a Rated Capacity not Exceeding 10 MVA for Settlement Purposes<sup>4</sup>](#), and [Code of Practice 5: The Metering of Energy Transfers with Maximum Demand of up to \(and Including\) 1MW for Settlement Purposes<sup>5</sup>](#) to establish specific criteria for selecting appropriate CT ratios and setting boundaries for load conditions. This ensures that the Metering System's overall accuracy remains within the specified limits set out in the CoPs.

This CP will also clarify the need to choose a suitable rated value of primary current for the CT, ensuring that the Rated Measuring Current neither falls below 1% nor exceeds 120% under all running conditions. Additionally, this CP specifies that designers can add an additional burden to the secondary side of the measurement transformers, helping to maintain the overall accuracy of energy measurements. This adjustment ensures the total burden stays within the 25% to 100% range of the rated output, in line with the limits of ratio error and phase displacement specified in the relevant standards ([BS EN/IEC 61869-2<sup>6</sup>](#) for CTs and [BS EN/IEC 61869-3<sup>7</sup>](#) for Voltage Transformers (VTs)).

## Impacts and costs

This CP will require changes to Codes of Practice (CoP) 1, 2, 3 and 5. The central implementation cost will be less than £2K to implement the relevant document changes.

<sup>2</sup> <https://bscdocs.elexon.co.uk/codes-of-practice/code-of-practice-1-the-metering-of-circuits-with-a-rated-capacity-exceeding-100-mva-for-settlement-purposes>

<sup>3</sup> <https://bscdocs.elexon.co.uk/codes-of-practice/code-of-practice-2-the-metering-of-circuits-with-a-rated-capacity-not-exceeding-100-mva-for-settlement-purposes>

<sup>4</sup> <https://bscdocs.elexon.co.uk/codes-of-practice/code-of-practice-3-the-metering-of-circuits-with-a-rated-capacity-not-exceeding-10-mva-for-settlement-purposes>

<sup>5</sup> <https://bscdocs.elexon.co.uk/codes-of-practice/code-of-practice-5-the-metering-of-energy-transfers-with-maximum-demand-of-up-to-and-including-1mw-for-settlement-purposes>

<sup>6</sup> <https://webstore.iec.ch/publication/6050>

<sup>7</sup> <https://webstore.iec.ch/publication/6051&preview=1>

There is no anticipated impact on Parties or Party Agents as a result of this change. However, there is the overall benefit of enhancing the accuracy and reliability of energy settlements and ensuring consistent compliance with established standards. No BSC central systems changes are anticipated.

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## Implementation

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This CP is proposed for implementation on 29 February 2024 as part of the Standard February BSC Release.

## 2. Why Change?

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### What is the issue

In energy settlement, the selection of CT ratios plays a pivotal role by determining the accuracy of current measurements. A correctly chosen CT ratio ensures that high currents from power lines are transformed to a level that metering equipment can safely and accurately measure.

This precise conversion is essential for reliable energy data, which forms the basis for fair billing, regulatory compliance, and efficient energy distribution and management. However, a recurring issue arises when designers of Metering Systems don't select these ratios with the maximum current of the circuit in mind. Designers could be equipment owners; e.g. Licensed Distribution System Operator (LDSOs) or Meter Operator Agents (MOAs).

This oversight doesn't only represent a procedural lapse; it also impacts the integrity of the energy settlement process. The CT ratios, designed to ensure precise measurements, lose their efficacy when mismatched with the circuit's current. As a result, the very foundation of energy data accuracy becomes unreliable, as the transformed currents no longer reflect the actual conditions of the circuit, leading to potential discrepancies in settlements.

The situation exacerbates when the load conditions of a circuit hover below 1% of the rated primary current ( $I_r$ ). At such low levels, the CT may not operate within its optimal accuracy range, potentially introducing errors into the measurements and making it challenging to capture precise energy consumption or production values. It's not only about slight discrepancies in numbers; it's about ensuring the reliability and consistency of the entire energy settlement process.

Another layer of complexity is added when Metering Systems operate outside their designated parameters. Specifically, when these systems don't adhere to the specified error limits or deviate from the 25%-100% rated burden range, it's a clear indication of potential inaccuracies. Such deviations can't be brushed off as minor technical glitches. They represent systemic issues that can compromise the integrity of the energy settlement process, necessitating immediate attention and rectification.

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### Background

This CP originates from Aspect 17 'Minimum burden requirement and CT ratio vs circuit/agreed capacity' of [Issue 93 'Review of the BSC Metering Codes of Practice'](#)<sup>8</sup> which sought to review the BSC Metering Codes of Practice. Meter Operators from the Issue group believed they would benefit from improvement and/or clarification on a number of aspects to be identified and confirmed by this Issue.

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### What is Issue 93?

The [Association of Meter Operators \(AMO\)](#)<sup>9</sup> raised Issue 93 on 15 January 2021 to review the metering Codes of Practice (CoPs), which have never been reviewed in totality before. The main aim of the review was to improve the CoPs, and where appropriate, remove existing perceived ambiguities and obsolete processes and technology.

The Workgroup discussed the appropriate CT ratio to specify, what minimum burden needed to be specified in the CoPs, what the overall accuracy limits should be for where prevailing conditions are outside of the limits specified in the relevant CoPs, and if changes

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<sup>8</sup> <https://www.elexon.co.uk/smg-issue/issue-93/>

<sup>9</sup> <https://meteroperators.org.uk/>

to the CoPs should be limited to CoPs 1, 2, 3, 4, 5 and 10. In conclusion, Elexon provided the below recommendations to the Workgroup:

For minimum burden:

- Add text to the relevant CoPs to provide guidance on what factors need to be considered for choosing a typical burden for Settlement purposes; and
- Align across the CoPs that additional burden can be added to maintain overall accuracy.

For CT ratios:

- CTs should be assigned a 'S' accuracy class (e.g. 0.5S); and

A cautionary text will be added to the relevant CoPs to advise where a site can operate outside of specified limits the designer of the Metering System or Registrant should satisfy themselves that Overall Accuracy is still maintained.

The Workgroup noted and agreed to the recommendation. Elexon confirmed that a CP will be raised after the Issue 93 review concludes, to reflect the recommendation.

The recommendations were presented to, and noted by, the BSC Panel on 8 September 2022 ([330/08](#))<sup>10</sup>.



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### What is Minimum Burden?

In the context of CTs, the minimum burden refers to the lowest amount of impedance or load that can be connected to the secondary winding of the transformer while still ensuring that the transformer operates within its specified accuracy limits. It's

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<sup>10</sup> <https://www.elexon.co.uk/meeting/bsc-panel-330/>

## 3. Solution

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### Proposed solution

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To address the identified issues, Elexon proposes specific amendments to the CoPs 1, 2, 3, and 5. The primary focus is on refining the guidelines to ensure the Metering System's accuracy remains consistent under all operating conditions.

Firstly, paragraph 4.3.1 of CoPs 1, 2, 3, and 5 will be revised to offer explicit guidance on evaluating the full range of operating conditions. This ensures that the overall accuracy of the Metering System adheres to the specified limits, irrespective of any variations in operational conditions.

Secondly, paragraph 5.1.1 in CoPs 1, 2, 3, and 5 will be clarified to emphasise the importance of selecting an appropriate rated value of primary current for the CT. The objective is to guarantee that the Rated Measuring Current, when expressed as a percentage, remains within a range of 1% to 120% across all operational scenarios. This is not merely a procedural adjustment but a critical step to ensure the CT, one of the core components of the Metering System, operates at its optimal efficiency.

Lastly, paragraphs 5.1.1 and 5.1.2 in CoPs 1, 2, 3, and 5 will be updated to address the burden in measurement transformers. The amendments will specify that, if required, an additional burden can be incorporated on the secondary side of these transformers. This ensures the overall accuracy of energy measurements by aligning the total burden within the 25% to 100% range of the rated output. This alignment is in accordance with the limits of ratio error and phase displacement as specified in the relevant standards, namely BS EN/IEC 61869-2 for CTs and BS EN/IEC 61869-3 for VTs.

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### Proposer's rationale

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The essence of these proposed changes is to instil a greater degree of clarity and precision in the energy settlement process. By offering clear guidelines on the appropriate CT ratios and rated burdens for Metering Systems, this promotes not just adhering to best practices but actively enhancing the reliability of the entire system as it ensures consistent accuracy in energy measurements. When LDSOs and MOAs have a clear roadmap, the likelihood of errors diminishes.

For instance, without proper guidance, they might select inappropriate CT ratios that don't match the circuit's maximum current, leading to inaccurate energy measurements. They could also miscalculate the required burden for measurement transformers, causing the system to operate outside its optimal accuracy range. Additionally, without a clear understanding of the standards, there's a risk of non-compliance with regulatory requirements, which can result in financial penalties and reputational damage.

Additionally, by providing guidance on handling situations where operating conditions might deviate from the norm, we are equipping LDSOs and MOAs with the tools and knowledge to navigate such scenarios effectively, ensuring that the integrity of the energy settlement remains uncompromised.

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## Proposed redlining

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The CP proposes to update Codes of Practice (CoP) 1, 2, 3 and 5. The redlining to support this change can be found in Attachment B.

## 4. Impacts and Costs

### BSC Party & Party Agent impacts and costs

This CP is considered to be a document only change and does not materially impact any BSC Party or Party Agent. There are also no anticipated impacts on any BSC systems.

BSC Party & Party Agent Impacts	
BSC Party/Party Agent	Impact
N/A	N/A

### Central impacts and costs

#### Central impacts

The solution in this CP only affects BSC documentation. No BSC Central Systems or Agents will be impacted.

Central Impacts	
Document Impacts	System Impacts
<ul style="list-style-type: none"><li>Code of Practice 1 'The Metering of Circuits with a Rated Capacity exceeding 100MVA for Settlement Purposes'<sup>11</sup></li><li>Code of Practice 2 'The Metering of Circuits with a Rated Capacity not exceeding 100MVA for Settlement Purposes'<sup>12</sup></li><li>Code of Practice 3 'The Metering of Circuits with a Rated Capacity not exceeding 10MVA for Settlement Purposes'<sup>13</sup></li><li>Code of Practice 5 'The Metering of Energy Transfers with Max Demand of up to (and including) 1MW for Settlement Purposes'<sup>14</sup></li></ul>	<ul style="list-style-type: none"><li>None</li></ul>

<sup>11</sup> <https://bscdocs.elexon.co.uk/codes-of-practice/code-of-practice-1-the-metering-of-circuits-with-a-rated-capacity-exceeding-100-mva-for-settlement-purposes>

<sup>12</sup> <https://bscdocs.elexon.co.uk/codes-of-practice/code-of-practice-2-the-metering-of-circuits-with-a-rated-capacity-not-exceeding-100-mva-for-settlement-purposes>

<sup>13</sup> <https://bscdocs.elexon.co.uk/codes-of-practice/code-of-practice-3-the-metering-of-circuits-with-a-rated-capacity-not-exceeding-10-mva-for-settlement-purposes>

<sup>14</sup> <https://bscdocs.elexon.co.uk/codes-of-practice/code-of-practice-5-the-metering-of-energy-transfers-with-maximum-demand-of-up-to-and-including-1mw-for-settlement-purposes>



Impact on BSC Settlement Risks

Impact on BSC Settlement Risks
This CP is anticipated to have a positive impact on reducing Settlement Risks.

Impact on Market-wide Half Hourly Settlement (MHHS)

Impact on MHHS
None

Central costs

The central implementation costs for this CP will be approximately less than £2K.

## 5. Implementation Approach

### Recommended Implementation Date

This CP is recommended for implementation on 29 February 2024 as part of the standard February 2024 BSC Release.

6. Proposed Progression

Progression timetable

The table below outlines the proposed progression plan for this CP:

Progression Timetable	
Event	Date
CP Progression Paper presented to ISG for information	7 November 2023
CP Progression Paper presented to SVG for information	7 November 2023
CP Consultation	13 November 2023 – 8 December 2023
CP Assessment Report presented to ISG for decision	9 January 2024
CP Assessment Report presented to SVG for decision	9 January 2024
Proposed Implementation Date	29 February 2024 (February 2024 Release)

CP Consultation questions

We intend to ask the standard CP Consultation questions for this CP. We do not believe any additional questions need to be asked for this CP.

Standard CP Consultation Questions
Do you agree with the proposed solution?
Do you agree that the draft redlining delivers the proposed solution?
Will this CP impact your organisation?
Will your organisation incur any costs in implementing this CP?
Do you agree with the proposed implementation approach for this CP?

## 7. Recommendations

We invite you to:

- **NOTE** the proposed progression timetable for the CP; and
- **PROVIDE** any comments or additional questions for inclusion in the CP Consultation; and
- **NOTE** that this CP will be presented to:
  - the SVG on 7 November 2023; and
  - the ISG on 7 November 2023.