

STC Modification Proposal Form

CM097:EMT and RMS Model Submission for TOs

Overview: As Great Britain’s (GB) power system moves towards a net zero carbon operation; the number of Inverter-Based Resources (IBR) is expected to increase, with the amount of synchronous generation in the grid to decline which will significantly change the characteristics of the GB network. These changes give rise to the need for more accurate dynamic modelling and the need for analysing the effect of potential control interactions between the devices across the network leading to risks of oscillations and inverter stability. This modification seeks to require Transmission Owners (TOs) to provide the ESO with Electromagnetic Transient (EMT) and Root Mean Square (RMS) models to carry out the required analysis.

Modification process & timetable



Status summary: The Proposer has raised a modification and is seeking a decision from the Panel on the governance route to be taken.

This modification is expected to have a: High impact

Transmission System operators, Transmission System Owners (onshore & Offshore)

Proposer’s recommendation of governance route	Standard Governance modification with assessment by a Workgroup	
Who can I talk to about the change?	<p>Proposer: Frank Kasibante Frank.kasibante1@nationalgridest.com 07812774066</p>	<p>Code Administrator Contact: Elana Byrne Elana.byrne@nationalgrideso.com 07749 576706</p>

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What is the issue?

As Great Britain’s power system moves towards net zero carbon operation, the network is transitioning from large synchronous generators to a large number of smaller Inverter Based Resources (IBR) which are causing new and varying challenges to the power system, for example control interactions, low fault level, inverter instability, ToV, etc. The ESO requires Root Mean Square (RMS) and Electromagnetic Transient (EMT) models from Transmission Owners (TOs) so that it can analyse and understand how these interactions affect the network under different system conditions. There are currently no requirements in the System Owner Transmission Owner Code (STC) for TOs to submit EMT and RMS models of their assets to the ESO and for the ESO to share these models with relevant Users as well as enabling the ESO to share Users’ EMT and RMS models to TOs. This restricts the ability for the ESO to perform system studies, modelling and post fault analysis.

Why change?

For an evolving system with a high penetration of IBR and thus due to a high penetration of asynchronous generation, EMT and RMS models are required to perform more detailed analysis. This will provide more certainty in the studies and analyses outcomes which will benefit the ESO in meeting its legal obligations.

What is the proposer’s solution?

The proposed solution is to

1. Mandate the collection of the EMT and RMS models from TOs and provide for a possibility to share these TO models with relevant Users, as well as permit the ESO to share Users’ EMT and RMS models to TOs to carry out studies. These models will feed into a wider GB Model enabling investigations, post fault studies and planning studies. This will help to enable safe and reliable operation of the system and enhance the security of GB electricity supply.
2. Create a new STCP (12-2) to specify the model exchange process between Transmission Owners and the ESO.

Draft legal text

Please see Annexes 1 and 2

What is the impact of this change?

Proposer’s assessment against STC Objectives	
Relevant Objective	Identified impact
(a) efficient discharge of the obligations imposed upon transmission licensees by transmission licences and the Act	Positive The ESO and TOs will have the ability to meet their licence obligations relating to operating the system securely.

<p>(b) development, maintenance and operation of an efficient, economical and coordinated system of electricity transmission</p>	<p>Positive</p> <p>EMT and RMS models for TO assets, for assets with Power Electronic Devices, will facilitate system analysis and enable to operate the evolving and future system with anticipated high penetration of IBR resources. This will enable achievement of an efficient, economical and coordinated electricity transmission system</p>
<p>(c) facilitating effective competition in the generation and supply of electricity, and (so far as consistent therewith) facilitating such competition in the distribution of electricity</p>	<p>Neutral</p> <p>NA</p>
<p>(d) protection of the security and quality of supply and safe operation of the national electricity transmission system insofar as it relates to interactions between transmission licensees</p>	<p>Positive</p> <p>EMT and RMS models of TO assets will help the ESO to analyse the interactions between different plants and assets and operate the system securely.</p>
<p>(e) promotion of good industry practice and efficiency in the implementation and administration of the arrangements described in the STC</p>	<p>Neutral</p> <p>NA</p>
<p>(f) facilitation of access to the national electricity transmission system for generation not yet connected to the national electricity transmission system or distribution system;</p>	<p>Positive</p> <p>The availability of EMT and RMS models from TOs will help the ESO to analyse the impact of potential new connections to the system. This will identify any modifications and / or control measures required to operate the system.</p>
<p>(g) compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency.</p>	<p>Neutral</p> <p>NA</p>

Proposer’s assessment of the impact of the modification on the stakeholder / consumer benefit categories

Stakeholder / consumer benefit categories	Identified impact
Improved safety and reliability of the system	<p>Positive</p> <p>When Transmission Owners provide EMT and RMS models to the ESO, The ESO will be able to carry out pre-fault and post-fault analysis studies, the outputs of which will lead to accurate operational decisions in the interest of safety and reliability of the system which could ultimately lead to lower operational costs for the benefit of the end consumer.</p>
Lower bills than would otherwise be the case	<p>Neutral</p> <p>When RMS and EMT models are submitted to the ESO, The ESO could carry out boundary analysis with good accuracy and this could translate into reduced constraint costs, which in turn could lead to reduced consumer costs</p>
Benefits for society as a whole	<p>Neutral</p> <p>Click or tap here to enter text.</p>
Reduced environmental damage	<p>Neutral</p>
Improved quality of service	<p>Neutral</p>

When will this change take place?

Implementation date

10 working days after Ofgem Decision

Date decision required by

June 2025

Implementation approach

No systems will have to change because of this modification

Proposer’s justification for governance route

Governance route: Standard Governance modification with assessment by a Workgroup

The proposed change is material, and a robust solution needs to be developed through Industry participation.

Interactions

- Grid Code
- BSC
- CUSC
- SQSS
- European Network Codes
- Other modifications
- Other

There are no anticipated consequential changes to other codes, however an STCP Proposal will be raised in the future.

Acronyms, key terms and reference material

Acronym / key term	Meaning
BSC	Balancing and Settlement Code
CM	Code Modification
CUSC	Connection and Use of System Code
EMT	Electromagnetic Transient
STC	System Operator Transmission Owner Code
SQSS	Security and Quality of Supply Standards
GC	Grid Code
IBR	Inverter Based Resources
RMS	Root Mean Square
ToV	Transient over Voltage
T&Cs	Terms and Conditions

Reference material

Annex	Information
Annex 1	Section D – Planning Coordination – Clause 2.2 and 2.1
Annex 2	Schedule 3 Information and Data Exchange Specification – Clause 2.3