Public

Frequently Asked Questions on Root Mean Square (RMS) and Electro-Magnetic Transient (EMT) Model Requirements

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NESO
National Energy System Operator

Foreword

This Frequently Asked Questions (FAQ) document has been prepared by the National Energy System Operator (NESO) to give the clarification to Users on RMS and EMT model requirements including modelling requirements, model submission timelines, model validation process and timelines, model exchange or sharing, and future requirements.

This document is prepared, solely, for the assistance of prospective Users connecting directly to the National Electricity Transmission System. In the event of dispute, the Grid Code and Bilateral Agreement documents will take precedence over this document.

Feedback and queries should be directed to the NESO through following emails:

For RMS model queries: Box.rmsmodelreview@neso.energy

For EMT model queries: box.emtmodelreview@neso.energy

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Contents

Abbreviations

This section includes a list of the abbreviations that appear in this document.

Abbreviation	Description
BCA	Bilateral Connection Agreement
BESS	Battery Energy Storage System
DLL	Dynamic-Link Library
ECP	European Compliance Process
EMT	Electro-Magnetic Transient
FAQ	Frequently Asked Questions
FFCI	Fast Fault Current Injection
FON	Final Operational Notifications
FRT	Fault Ride Through
FSM	Frequency Sensitive Mode
GC	Grid Code
GCST	Grid Connection Simulation Tool
HVDC	High Voltage Direct Current
IBR	Inverter-Based Resources
ION	Interim Operational Notifications
IP	Intellectual Property
IT	Information Technology
LFSM-O	Limited Frequency Sensitive Mode Over Frequency
LFSM-U	Limited Frequency Sensitive Mode Under Frequency
LON	Limited Operational Notifications
ms	milli seconds
RMS	Root Mean Square
NDA	Non-Disclosure Agreement
NESO	National Energy System Operator

NETS	National Electricity Transmission system
OEM	Original Equipment Manufacturer
PC	Planning Code
PF	PowerFactory
PSCAD	Power Systems Computer Aided Design
PV	Photovoltaic
SLD	Single Line Diagram
STC	The System Operator Transmission Owner Code
TO	Transmission Owner
TOV	Transient Overvoltage
TSO	Transmission System Operators

Frequently Asked Question on RMS and EMT Model Requirements

This document provides answers to frequently asked questions (FAQ) regarding RMS and EMT model requirements for users connecting to the National Electricity Transmission system (NETS). It is intended to support users in understanding the technical, procedural, and compliance aspects of model submission, validation, and exchange as required under the Grid Code.

The FAQ covers key topics including modelling requirements, submission timelines, validation processes, model sharing procedure, and future requirements. It aims to clarify NESO's expectations for model compatibility, performance, and documentation, and to address common queries raised by users during project development and compliance assessment.

By consolidating guidance and best practices, this document seeks to facilitate a transparent and efficient process for model submission and approval, ensuring that user models meet the necessary standards for system integration and operational reliability. Users are encouraged to review the information provided and engage with NESO for further clarification or feedback on modelling requirements.

Modelling Requirements & Submission Timelines

1. **What are the software and compiler requirements for RMS & EMT model compatibility?**

   RMS Model:

   RMS models shall be developed in the versions used by the Company at the time the submission is due; the current company production version for PowerFactory is Version 2025 Service Pack 4.

   EMT Model:

   EMT models must be compatible with PSCAD version 5.0 or later, using Intel Fortran Compiler version 19.2 or higher, and Visual Studio 2019 or newer. Users connecting from Jan 2026 shall provide the EMT model compatible with both 32–bit and 64-bit versions of Intel Fortran Complier.

   The NESO will be clearly communicated during the initial meeting with the customer, specifically regarding the timelines for NESO upgrades, ensuring that customer has

sufficient time to prepare ahead of model submissions. User can also refer their Bilateral Connection Agreement (BCA) related to software versions using by NESO at that time.

2. **What are the simulation time step requirements for RMS & EMT models?**

   RMS Model:

   It is essential that the RMS model runs with an integration step size of 10ms. In addition, according to PC.A.9.8.5.2, the models must not include algorithms that require use of a particular integration step size (for example the control system model should not fail to solve, or the response be materially different for an integration step size of 0.005 s). Currently, NESO tests the model at 10ms, 5ms and 1ms, and the response with the different timestep shouldn't be materially different. i.e., if the user model performs correctly using only a specified integration step size, this will not satisfy the grid code requirements. The model should be Grid Code compliant at 10ms, 5ms and 1ms timesteps.

   A flat start time domain simulation (no disturbances) lasting at least 50 seconds shall be carried out to demonstrate the numerical stability of the model.

   EMT Model:

   Simulation time steps must be suitable for accurately representing the switching algorithms used in the Plant and Apparatus and must align with study time steps ranging from 10µs to 20µs. The simulation time step must not be hard-coded; instead, users should have the flexibility to adjust it. Any limitations in model accuracy at a 20µs time step must be clearly highlighted in the documentation provided to NESO.

   EMT model should be numerically stable and accurate for a minimum 100 seconds following any set point changes or system incidents/faults.

3. **What are the initialisation and performance requirements for RMS & EMT model for simulations?**

   RMS Model:

   The RMS model shall initialise correctly with no errors and warnings. The model shall require only the steady state condition delivered by the load flow to initialise correctly. External software or automation routines shall not be used to integrate and/or initialise the model. Also, avoid internal scripts, if possible, to minimise potential issues arising

from PowerFactory upgrades. The RMS model flat start shall not deviate from the load flow solution for the entire simulation.

The model shall calculate correctly all the state variable derivatives on initialization and be within the range which DIgSILENT PowerFactory considers equivalent to zero.

EMT Model:

EMT Model must be capable of self-initialisation, with initialisation to user defined terminal conditions within 4 to 6 seconds of simulation time. Additionally, it should be capable of completing a simulation run of 20 seconds within a 15-minute timeframe.

4. **Can you explain why NESO mandates RMS model submissions without associated DLL files?**

   DLLs are compiled as binary format in an operating platform environment unknown to NESO, such as the use of external libraries as dependencies, versions, potential vulnerabilities etc, which pose significant security risk to NESO's IT systems and major challenges to maintain compatibilities in future upgrades. It is for these reasons, the use of DLLs that are not accepted unless they are included as part of the PowerFactory software distribution.

   Grid Code PCA9.8.2.2 states: The use of any "black boxes" encrypted code or external DLLs is not acceptable. An additional RMS model with these features maybe provided for comparison but for the avoidance of doubt does not meet the requirements of PC.A.9.

5. **Can we look at considering the simulation time step requirements in EMT analysis for the longer duration simulations like LFSM and FSM as 10uS becomes difficult?**

   No, to ensure consistency across various users, NESO advises conducting the LFSM and FSM tests in accordance with the actual time step used for the EMT model. Please refer to question 2 on time step requirements.

6. **Why must all plant and control system models be contained with in a single EMT project case rather than across a simulation set?**

   All plant and control system models should be contained within a single EMT project to ensure consistency and compatibility within simulation environment. Methods that split a single plant's model components across multiples projects commonly used in SMIB studies to improve processing speed; however, this approach may not be compatible when integrated into a wider network EMT case. Since NESO is integrating all User plant models in wider network, if each User plant EMT model comprises multiple projects, it

necessitates significant computational resources (such as number of cores required). Users must consult NESO if they are not able to meet these requirements.

7. **What are the requirements of encryption of the EMT model?**

   According to Grid Code PC.A.9.9.2, EMT model may be encrypted. NESO recommends encrypting only the parts of an EMT model that require intellectual property protection. It is expected that Onshore, offshore power circuit elements i.e., AC network, interface transformers, and DC cables, transmission lines/ cables essential for connecting the Plant to grid interconnection point (POI) should not be encrypted. NESO must have access to enable or disable transformer saturation for different analysis purpose.

8. **What protections should be included in the User EMT model?**

   NESO recognizes the sensitivity of user data and is committed to protecting their privacy. NESO may accept that protection functions be modelled as black boxes. However, access to certain indicators/flags that show if any protection devices have been triggered under specific conditions is mandatory.

   Synchronous Generators:

   The model must include at least the following protection schemes applicable to both balanced and unbalanced fault conditions, such as:

   - Overvoltage and undervoltage protection
   - Under/Over Frequency protection
   - Under/over excitation limiters
   - Stator current and V/Hz limiters
   - Run-back schemes or any special protection schemes in which the generator or plant actively participates.

   Inverter-Based Resources (IBRs)

   For IBRs, the following protection functions should be modelled for both balanced and unbalanced fault scenarios:

   - Overvoltage and undervoltage protection
   - Over and Under Frequency protection
   - DC bus voltage and current protection

   Additionally, NESO recommends the inclusion of diagnostic flags within the model to indicate which protection function has been activated and to clarify the reason for any model trip during simulation.

9. **What are the model submission timelines and documentation requirements for ION, LON, and FON processes under NESO's Grid Code?**

   Users are required to submit models 3 months ahead of the ION date and 1 month ahead of LON date as a minimum so that NESO can check the user system models are of the minimum level of quality required by the Grid Code before authorising the release of the ION/FON. However, NESO recommends Users to submit them as earlier as possible to minimise the risk of NESO having to withhold operational notifications.

   3 months after the compliance tests results have been accepted by NESO as sufficient to demonstrate compliance Users are expected to submit final models with all relevant associated documentation appropriately updated (refer Guidance Notes for documentation requirements - Guidance Notes (EU Code)).

   The final models must come with all the settings and parameters as fitted on site and validated against the corresponding compliance tests results.

10. **How co-located plant (Hybrid plant) model should be represented in EMT and RMS as per new Guidance Notes?**

    The co-located User shall model the Plant and Apparatus in accordance with the Single Line Diagram (SLD), accurately reflecting the actual as-built configuration. For example, in the case of a co-located Power Park Module comprising Battery Energy Storage System (BESS) and Photovoltaic (PV) plant, the inverters/converters for each plant should be modelled separately as per the SLD. For the avoidance of doubt, it would be acceptable to aggerate the inverters belonging to one plant (for e.g., BESS).

    NESO allowed the User to represent an aggregated model for a generating system with many generating units (Power Park Units) if they are of the same type and size, for example, a wind farm has multiple wind turbines of same type and size. The aggregation method must be clearly documented. Aggregated models should continue to provide access to the LV terminal bus quantities for each aggregate equivalent generating unit, including active power, reactive power, voltage magnitude and phase angle.

    The RMS models for co-located sites (e.g., Wind and BESS or PV and BESS) are expected to include the unencrypted models for each technology type. If a previously existing generation site (e.g., Wind farm) is being co-located with a new technology (e.g., BESS), revised models are expected to be submitted as unencrypted and with no external scripts/DLL/external automation, even if the previous generation (Wind) has passed the compliance process and the RMS model submitted previously. This is because the

control system has undergone modification, therefore as per Grid Code PC.A.5.4.2(g), the RMS model of modified Power Park Module shall be submitted.

Please refer the Guidance Notes for Co-location of different Technologies - download

11. When should Users engage with NESO to understand modelling requirements, and is there an opportunity to provide feedback on guidance documents?

It is important that Users familiarise themselves with the requirements for modelling at an early stage in the project lifecycle. We are always happy to discuss the requirements during the inaugural meeting or subsequent project meetings, to ensure they are clear, prior to model development and submission. We also welcome feedback and suggestions on how we can improve our guidance documents, where there is a view that further clarity would be beneficial.

In the future, NESO is going to bring the Guidance Notes for Model requirements to Grid Code Annexure – in General Conditions.

12. Who are required to submit the EMT/RMS model of their plant to NESO?

As per the current Grid Code PC.A.9.2 specifies to users the type of models required by the Company. The table below summarize the model requirement per user type.

User Connection Type	Technology	RMS Model	EMT model
Directly Connected	*Non- Synchronous Generator*	*Yes*	*Yes*
	Synchronous Generator	*Yes*	*Yes (1)*
Bilateral Embedded Generator Agreement (BEGA) - Large	*Non- Synchronous Generator*	*Yes*	*Yes*
	Synchronous Generator	*Yes*	*Yes (1)*
Bilateral Embedded Generator Agreement (BEGA) - Medium	*Non-Synchronous Generator*	*Yes*	*No*
	Synchronous Generator	*Yes*	*No*
Bilateral Embedded Generator Agreement (BEGA) - Small	*Non-Synchronous Generator*	*No (2)*	*No*
	Synchronous Generator	*No (2)*	*No*
Bilateral Embedded Licence Exemptible Large Power Station Agreement (BELLA)	*Non - Synchronous Generator*	*Yes*	*Yes*
	Synchronous Generator	*Yes*	*Yes (1)*
Licence Exemptible Embedded Medium Power Stations (LEMPS)	*Non-Synchronous Generator*	*Yes*	*No*
	Synchronous Generator	*Yes*	*No*

NOTE (1): The company has identified the need for modelling Synchronous Generators in an EMT environment to be able to perform the detailed studies specified in the Company Website. Unless the requirement is in the Bilateral Connection Agreement (BCA), synchronous generators users as identified in table 1 will not be expected to provide an EMT model as a requirement to obtain an ION. However, these users are expected to provide an EMT model to the Company within 6 months of the request being made and will be required to submit a plan to the Company detailing how the delivery date will be achieved.

NOTE (2): The Company does not require Small Embedded Synchronous Generators with Bilateral Embedded Connection Agreement to provide RMS models during the compliance process, it will not be a requirement for the user to obtain an ION. However, the Company might approach the user if the need for more detailed modelling of these small generators arises.

In addition to the above table, Non-Embedded customers (Data centres, Electrolysers) and Network operators are required to provide RMS and EMT model as per GC clause PC.A.6.7 and PC.A.9.

However, NESO is currently progressing Grid Code modification GC0168, which aims to obtain retrospective model submissions from Users whose connections were commissioned prior to September 2022 and provide the list of Users need to submit the EMT & RMS models. More details on GC0168 modification can be found in - https://www.neso.energy/industry-information/codes/gc/modifications/gc0168-submission-electro-magnetic-transient-emt-models

13. Why does NESO require EMT models, and what type of studies NESO will do with these models?

NESO is not requesting the EMT models for the sake of data collection. NESO will integrate those EMT models into wider EMT network (full GB System) and study the variety of studies - Control interaction studies, Transient Over Voltage studies, Sub Synchronous Oscillation studies, Impedance scan analysis, stability analysis and also carries out event analysis, such as oscillation events.

NESO recently conducted Transient Overvoltage (ToV) studies within the EMT domain across one of the England and Wales regions, evaluating various outage scenarios. Based on the analysis and outcomes of these studies, NESO successfully achieved a significant reduction in constraint costs, demonstrating the value of proactive system assessment and modelling.

Model Validation Process and Timelines

14. What type of validation checks would NESO conduct on the RMS / EMT models as a part of the Compliance Assessment?

As part of the compliance assessment process, NESO conducts rigorous validation of both RMS and EMT models using two configurations: a Thevenin source and the wider network. These checks are designed to ensure model accuracy, robustness, and alignment with Grid Code requirements.

Tests conducted with Thevenin Source:

1. Steady-State Performance
   - Flat run validation
   - Model initialisation checks against compliance criteria.
   - Verification of active/reactive power and voltage settling
2. Reactive Power Capability
   - Assessment of Q capability against the PQ curve
3. Voltage Injection Response
   - Step voltage injection test
4. Frequency Sensitivity Tests
   - FSM, LFSM-O, and LFSM-U performance validation
5. De-loading Capability
   - Specific to Battery Energy Storage Systems (BESS)
6. Fault Response
   - Fault Ride Through (FRT) and Fast Fault Current Injection (FFCI) tests

Tests conducted with Wider Network:

1. Integration Checks
   - Flat run post-integration to confirm correct model behaviour within the network.
2. Small Disturbance Stability
   - Voltage step change response
3. Transient Stability Assessment
   - FRT test: Three-phase to ground fault at Point of Connection (POC)
   - Critical line fault with subsequent tripping (credible contingency scenarios)
   - Load rejection event due to internal fault and complete tripping of nearby IBRs

These tests are essential to verify that the model delivers a response that aligns acceptably with the actual behaviour of the User's system when delivering the services mandated by the Grid Code such as voltage control, Fault Ride Through (FRT), Fast Fault Current Injection (FFCI) and frequency response.

15. How long does it take NESO to review EMT and RMS models?

Reviewing models to ensure they are of appropriate quality is a time-consuming task; however, NESO is aiming to provide feedback from the review conducted on the first model submission between 3 to 4 weeks.

If a model does not comply with the Grid Code compliance requirements upon first submission, please note that each re-submitted or revised model will be treated as a new submission. NESO requires three weeks (15 working days) to validate each revised model. While NESO understands the customers' urgency in receiving the ION/FON as soon as possible, it is important to consider that all requirements are clearly outlined in the Grid Code and Guidance Notes documents. If a model is rejected multiple times due to non-compliance, the responsibility for any delays in issuing the ION/FON rests on the customers.

16. Why does the NESO recommend using the IEEE-9 bus system for model validation instead of an infinite busbar?

In accordance with grid code requirements (PC.A.9.9.3 (viii)), Users must demonstrate that their plant models perform reliably when evaluated against a wider network, rather than solely against an infinite busbar. To support this, the NESO has recommended/advised in its Guidance Notes that Users employ the IEEE-9 bus system as a sample network. This model is sufficiently simple for validation purposes and is readily available in both PowerFactory and PSCAD.

NESO also recommends that for RMS model validation, Users can be used publicly available "GB reduced transmission network model" as a wider network model. It can be found in - https://www.neso.energy/publications/gb-36-bus-electricity-transmission-network-model.

However, NESO is currently developing a simulation platform knows as "Grid Connection Simulation Tool", which is to provide the EMT network model to Users (generators) to connect and validate the model. The platform is expected to be available to users from early 2027.

The details of this platform could be found from Grid Connection Simulator tool (GridConnectX) | ENA Innovation Portal

17. What are the model verification and validation requirements to obtain an ION?

Depending on the technology, there might not be a lot of plant measured response to validate models prior to the User connecting to the system. The Grid Code asks for simulations to set the expectation on how the User System will react once connected and tested in the field in response to voltage setpoint changes and simulated system frequency deviations. These are covered under ECP.A.3.6.6 for LFSM-O, ECP.A.3.6.8 for LFSM-U, ECP.A.3.7.2 for FSM, ECP.A.3.7.3 for excitation systems and voltage control.

In addition to the above, the NESO is asking Users to rely on plant measured response should it be available ahead of connection.

For HVDC links:

FAT testing with Hardware in the loop (HIL) setups comprising of the real controllers and the real time simulation models for representing the transmission network are typically used. NESO has been asking Users to rely on this data to verify the models' response for all the performance requirement the connection is required to meet.

18. What are the model verification and validation requirements to obtain a FON?

Following completion and acceptance of the compliance test, within 3 months the User is required to submit a model validation report to demonstrate the models' voltage control and frequency response performance align with the User system response at the point of connection. For excitation system validation, the User shall overlay the model simulated response to a +10% voltage reference step with the generator is offline and the +2% voltage reference step when the machine is online on to the equivalent compliance tests results as detailed in the Grid Code ECP.A.3.7.5.

For PPM voltage control, the User shall overlay the model simulated response to a +2% voltage reference step on the equivalent compliance test results as detailed in the Grid Code ECP.A.3.7.5.

For frequency response validation, the User shall overlay the model simulated response to a frequency profile deviation specified under ECP.A.3.7.2 on the equivalent compliance test results as detailed in the Grid Code ECP.A.3.7.6.

Model Exchange/Sharing between NESO and Users

19. What are the current practices to share the User Models to TOs as per Grid Code/STC/STCP?

In accordance with Grid Code clauses PC.A.9.6.1 and PC.A.9.6.2, NESO is authorised to share user-submitted models, supporting documentation, and associated data with the relevant Transmission Licensees (TOs).

20. What are the current practices to share the User Models to Third Parties as per Grid Code/STC/STCP?

NESO and/or the Transmission Licensees may share these models with contractors or third-party organisations engaged to perform licensed activities on their behalf.

To facilitate compliance activities, users are expected to include a declaration in their compliance statements confirming that their models may be shared with other users. There is already an available RMS and EMT declaration form template, which NESO will ask users to complete during the compliance process. In the absence of such a declaration, NESO will not share the original model with other users. However, the user must then provide an equivalent model that is suitable for sharing. In such cases, the user must demonstrate that the performance of the shareable model is comparable to the original (including encrypted versions, if applicable).

21. What are the reasons for sharing the models with another User or Third parties?

NESO and/or the Transmission Licensees may share these models with another Users, contractors or third-party organisations engaged to perform licensed activities.

In certain cases, Users may seek to connect new generators in areas where existing generators or inverter-based resources (IBRs) are already connected. To ensure compatibility and avoid adverse interactions, Users often need to conduct studies to assess the behaviour of their proposed generators. These studies require access to existing generator models.

Accordingly, NESO may share User models with other Users or authorised third parties to facilitate such studies and support the performance of grid code compliance activities.

22. Whether NESO accepts the models from OEMs directly?

Yes, NESO will accept user models provided the manufacturer agrees to enter into the standard confidentiality agreement applicable to users.

23. What measures does NESO have in place to ensure that User EMT models are protected from misuse by third parties?

NESO enforces strict obligations and limitations when sharing original EMT models with third parties. These measures are designed to protect intellectual property and ensure models are used solely for authorised purposes. The following conditions apply:

- **Purpose Limitation:** Third-party users must restrict the use of EMT models to the specific purpose agreed with NESO (e.g., simulation activities to demonstrate compliance with Grid Code clauses ECC.6.3.17.1 and ECC.6.3.17.2, and Bilateral agreement requirements).
- **Controlled Access:** Access to the EMT model must be limited to individuals who are directly involved in executing the agreed purpose.
- **Security Measures:** Robust security protocols must be implemented to prevent unauthorised access or distribution of the model. This may include storing the model on a single secure computer terminal and restricting access to file directories where the model resides.
- **Publication Restrictions:** Any publication must be strictly for demonstrating compliance with the agreed purpose and must not include data directly derived from the EMT model.
- **Non-Disclosure:** The EMT model must not be disclosed to any unauthorised parties under any circumstances.
- **Secure Disposal:** Upon completion of the agreed purpose, all copies of the EMT model and supporting materials must be destroyed in a secure and confidential manner. Written confirmation of destruction must be provided to NESO.

24. Can NESO share open-source RMS models with third parties or sign NDAs with OEMs?

NESO provides a standard Non-Disclosure Agreement (NDA) for Original Equipment Manufacturers (OEMs) to adopt at their discretion. NESO is not in a position to negotiate or execute bespoke NDAs with individual OEMs.

Intellectual property considerations were addressed during the GC0141 Grid Code modification process. As a result, the Grid Code permits users to submit appropriately tuned generic models. NESO encourages users to submit WECC generic model and provide a description to explain linkages between the generic WECC model control block and the OEMs control system.

NESO will not distribute open-source RMS models to third parties without prior authorisation from the relevant user or OEM. Furthermore, the Grid Code allows users to submit an open-source model to NESO/Transmission Owner (TO) for the use of licenced activities, alongside an equivalent encrypted version for NESO to share externally.

25. Is the document "Guidance Notes for Model Exchange for Converter Based Plant Interaction Studies" published in 2021 still valid?

Yes, the document titled "Guidance Notes for Model Exchange for Converter Based plant for Interaction studies" remains valid and applicable for HVDC connections.

At present, NESO provides the RMS network model integrated with dynamic models (subject to User approval on dynamic models) for use in connection studies. It is the responsibility of User to convert the RMS network model into EMT domain and conduct the necessary studies.

However, NESO is actively working on "Grid Connection Simulation Tool," which will enable User to access the EMT network model for their connection studies. Further details about this initiative will be shared with the industry soon. For more information, please refer to the project page:

https://smarter.energynetworks.org/projects/nia2_neso095/

Future requirements

26. Is it required to submit EMT models for legacy plants (connected to the GB system before Sep 2022)?

Yes, under the proposed Grid Code modification GC0168, legacy plant users, those connected prior to September 2022, will be required to submit EMT models to NESO. The modification is currently being progressed and aims to formalise the retrospective collection of models from applicable users. A detailed list of users and model requirements is included in the proposal. More details on GC0168 modification can be found in –

https://www.neso.energy/industry-information/codes/gc/modifications/gc0168-submission-electro-magnetic-transient-emt-models

Once GC0168 is approved by Ofgem, NESO will begin engaging with legacy plant users based on priority areas (specifically regions facing significant system operational challenges across Great Britain). These users will be formally requested to submit EMT models. The model collection process has already been discussed in GC0168 workgroup meetings.

27. Is the NESO aware that the cost of modelling for legacy plant is driving a halt to plant refurbishment, ultimately leading to lower availability and closure of older generation?

As part of Grid Code Modification GC0168, which is looking at introducing a requirement to obtain EMT models for legacy plant, we are aware of the excessive costs involved and the risk this could have on the viability / investment of these older plants. As part of this modification, we have specifically asked a consultation question regarding views on a cost recovery mechanism.

NESO considers the collection of legacy EMT models essential for conducting more detailed and accurate system studies. This will not only support NESO in fulfilling its legal obligations but also contribute to lower system operating costs and reduced risk of system stability issues. A comprehensive set of EMT models across Great Britain will enable more robust assessments for new generation connections and help mitigate risks such as system oscillations.

Additionally, the availability of EMT models will enhance NESO's ability to investigate system events—particularly in understanding the impact of fast control mechanisms in IBR systems on overall system stability.

28. Is NESO considering any other options to share the Network model to Users to do their connection compliance studies?

Currently, NESO provides RMS network model, integrated with dynamic models (subject to user approval), exclusively for HVDC systems connection studies. It is the responsibility of the HVDC systems owner to convert the RMS model into the EMT domain and carry out the necessary compliance studies. Due to intellectual property (IP) constraints, NESO is unable to share the full EMT network model alongside user models.

To address these limitations and eliminate the need for complex non-disclosure agreements (NDAs) with original equipment manufacturers (OEMs), NESO is actively developing a secure simulation platform known as the Grid Connection Simulation Tool (GCST).

This platform will allow users, particularly generators, to access a designated connection point within the EMT network model and perform compliance and DPS studies, without visibility into the wider network configuration. This approach ensures the confidentiality of proprietary network data and OEM models, while still enabling rigorous system analysis.

The platform is expected to be available to users from early 2027, with further details to be shared with the industry soon. For more information, please refer to the project page: https://smarter.energynetworks.org/projects/nia2_neso095/

29. Is there any rationale behind adding new requirements into the Guidance Notes frequently?

Yes, there is a clear rationale. As Great Britain's electricity system continues to decarbonise, the penetration of Inverter-Based Resources (IBRs) is increasing significantly and adding new technologies like electrolysers, data centres, Grid forming technologies in the system This shift introduces new operational challenges for the system, particularly in areas such as stability, fault response, control interactions and sub synchronous oscillations.

To address these challenges, NESO is actively engaged in:

- Reviewing and refining modelling requirements to ensure they reflect the evolving system needs.
- Consulting with other Transmission System Operators (TSOs) who have experience managing high levels of IBR penetration.

- Continuously updating the Guidance Notes to incorporate lessons learned and best practices, ensuring that models submitted by users are robust and fit for purpose.

These updates are essential to support accurate system studies, maintain operational resilience, and uphold NESO's legal and technical obligations.

30. How is NESO sharing updates on Guidance Notes with the wider industry?

NESO disseminates updates on Guidance Notes through a range of structured and collaborative channels to ensure transparency and industry-wide awareness. These include:

- **Grid Code Forums**: Regularly convened sessions where NESO presents updates, discusses proposed changes, and gathers feedback from stakeholders.
- **Stakeholder Seminars and Compliance Events:** NESO organises targeted seminars, such as the Compliance Seminar, to present updates on modelling requirements, sample networks, and innovation initiatives.
- **Joint Planning Committee (JPC) Meetings**: These forums facilitate technical discussions, including updates on EMT modelling guidance and Grid Code modifications with TO's.
- **Publication on NESO Website**: The latest versions of Guidance Notes are published on the NESO website, ensuring public accessibility and version control.
- **Stakeholder Engagement with OEMs and TOs**: NESO maintains direct engagement with Original Equipment Manufacturers (OEMs), Transmission Owners (TOs), and other industry participants through meetings, emails, and collaborative working groups.

This multi-channel approach ensures that updates are communicated effectively, fostering industry alignment and compliance with evolving Grid Code requirements.