



24.2.2026



Fingrid modelling instructions update - webinar

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A photograph of a high-voltage power line tower in a forested area. The tower is a lattice structure with multiple cross-arms supporting several power lines. The background shows a dense forest of green trees under a clear blue sky. The text "Introduction and Agenda" is overlaid in white, bold, sans-serif font across the center of the image.

Introduction and Agenda



Fingrid – Grid models unit

Model instructions and model assessment

- Model instructions
- PSCAD model assessment
- PSS/E model assessment
- Synchronous machine modelling
- Customer model integration to system model

Fingrid model maintenance

- Up-to-date digital twin in ODMS
- Real-time estimator in ODMS
- PSS/E planning models
- Full scale PSCAD model
- Customer model libraries

Software development

- PSS/E automation
- PSCAD automation
- PowerFactory automation

In case of modelling questions please reach out to models@fingrid.fi / mallinnus@fingrid.fi

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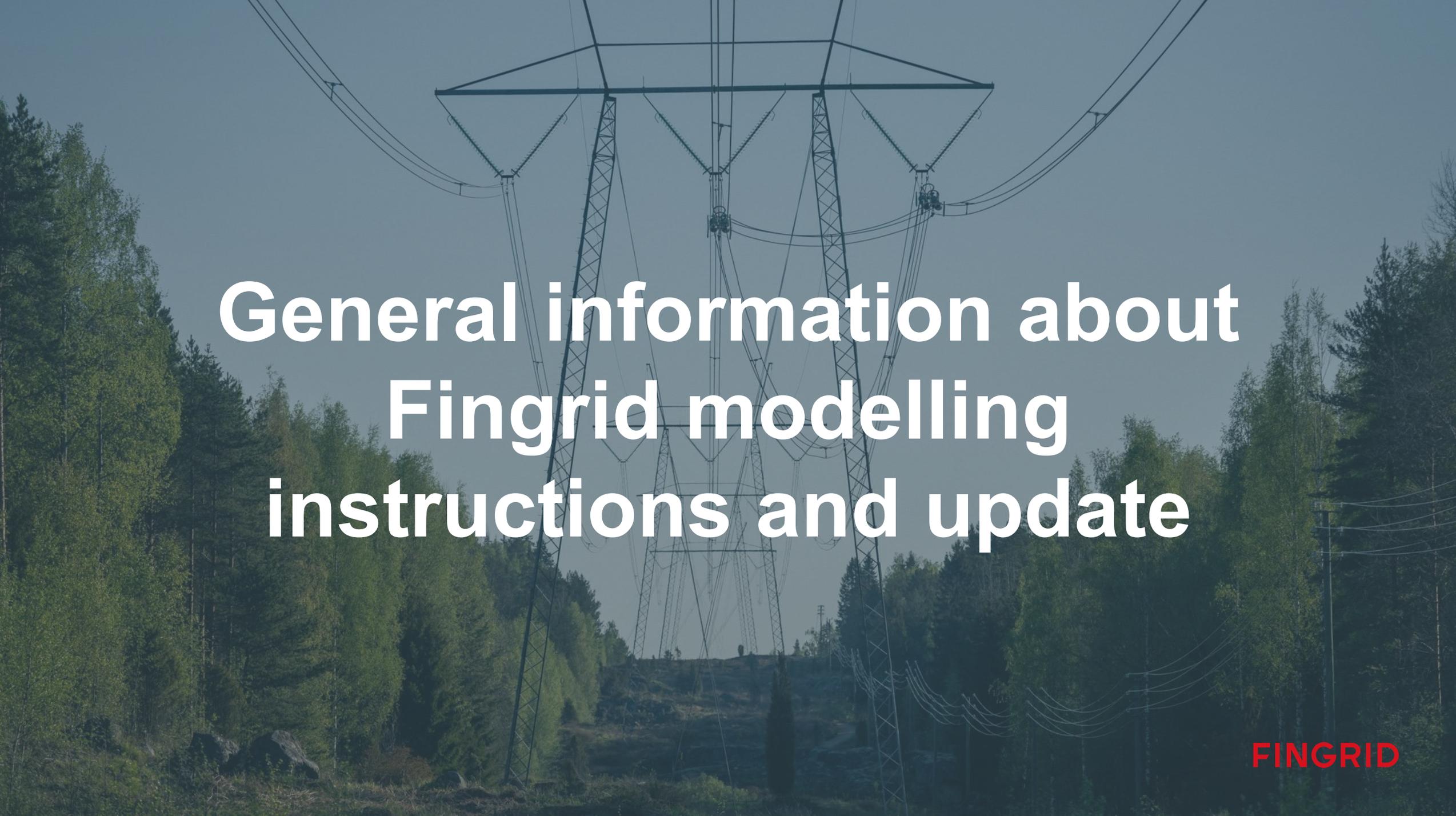


Agenda

1. General information about Fingrid modelling instructions and update
2. Updates in PSS/E modelling instructions
3. Updates in PSCAD modelling instructions
4. Q&A

Materials presented today will be published at Fingrid's website and webinar record will be available two weeks after publication.

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General information about Fingrid modelling instructions and update

Fingrid modelling instructions in general

- Grid code specifications for grid energy storage systems (SJV) and for power generating facilities (VJV) sets requirement to provide PSS/E and PSCAD models for D- and C-type projects as part of the grid compliance process.
 - The simulation models shall reproduce the main functionalities and characteristics of the facility realistically
- Fingrid has created instructions for modelling:
 - Very first version was published on 2022, second release came on 2024 and now profound update of the instructions has been published on 10.2.2026.
 - The updated instructions are applicable for power park modules as well as for grid energy storage systems. Regarding synchronous machines the information needed can be found in Grid code specification for power generating facilities.

Where to find instructions

- Modelling instructions have [own site](#) at Fingrid's website. From Attachment list you'll find:
 - Independent instructions for both PSS/E and PSCAD
 - Test templates to be provided as part of the delivered model package
 - Separate lists for PSS/E and PSCAD and for each grid code (*VJV2024/*SJV2024)
 - Documentation template for PSCAD models
 - Information when and for which projects to apply new instructions and when you can use still refer to the old ones.
 - Information about implementation of PSSE 36 version (not part of the update, but still valid!)

Grid ▾ Electricity market ▾ Open data ▾ Investors ▾ About Fingrid ▾ News ▾

Home / Grid / Connection to the main grid / Grid code specifications / Modelling instructions

Modelling instructions

As part of the grid compliance monitoring process, simulation models for C and D type power generating facilities and energy storage systems shall be provided. Models shall be provided for PSS/E and PSCAD software. Up to date instructions for modelling are found from attachment. Previous versions can be found on the *Archive* page.

For demand connections, modelling will be agreed together with Fingrid for each project.

ATTACHMENTS

- ⌵ Application of modelling instructions
- ⌵ Fingrid modelling instruction for PSS/E models
- ⌵ Fingrid Modelling instruction for PSCAD models
- ⌵ Implementation of PSSE 36 version in Fingrid
- ⌵ PSCAD model documentation template
- ⌵ PSCAD test template SJV2024
- ⌵ PSCAD test template VJV2024
- ⌵ PSS/E test template SJV2024
- ⌵ PSS/E test template VJV2024

***VJV = Grid code specifications for power generating facilities**
***SJV = Grid code specifications for grid energy storage systems**

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Application of updated modelling instructions

- The updated modelling instructions for PSS/E and PSCAD shall be used as the reference for
 - Those Stage 1 projects, for which specific study requirements are given after 10.2.2026.
 - Those Stage 1 projects, for which the model is submitted to Oma Fingrid platform first time after 1.9.2026. To be considered as submitted before 1.9.2026, the model shall be accompanied with test list that shows that the model fulfils the relevant grid code specification functional requirements.
 - Those Stage 2 projects, for which the model is submitted to Oma Fingrid platform first time after 1.10.2026. To be considered as submitted before 1.10 2026, the model shall be accompanied with test list that shows that the model fulfils the relevant grid code functional requirements. Please note, that the Stage 2 model can be submitted only after the commissioning tests.

.. In case you need the previous versions of modelling instructions

- Please visit our [Archive!](#)

The screenshot shows the Fingrid website's navigation and content. The top navigation bar is red with 'FINGRID' in white and 'Contacts' on the right. Below it is a secondary navigation bar with links for 'Grid', 'Electricity market', 'Open data', 'Investors', 'About Fingrid', and 'News'. A breadcrumb trail reads 'Home / Grid / Connection to the main grid / Archive'. On the left, a sidebar menu lists various topics, with 'Archive' highlighted in red. The main content area is titled 'Archive' and lists several documents, many of which are marked as 'EXPIRED'. A red dashed box highlights a group of these expired documents. Below the list, there are sections for 'General connection terms' and 'Connecting a three winding transformer to a 110kV line owned by Fingrid'.

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Connection to the main grid

- [Examine grid connections on a map](#)
- [Send a connection enquiry](#)
- [General connection terms](#)
- [Connection agreement and grid connection fees](#)
- [Main grid contract and service fees](#)
- [Grid code specifications](#)
- Archive**

Archive

The Main Grid Contract consists of grid service, supply of reactive power, maintenance of reactive power reserves and information exchange between a customer and Fingrid.

Grid code specifications for power generating facilities

Specifications for the Operational Performance of Power Generating Facilities VJV2013

- [VJV2013 Tables](#)
- [VJV 2013 Tables Appendix A](#)
- [Modelling Instruction for PSS/E and PSCAD models to be delivered to Fingrid 2022 OLD VERSION](#)
- [Guidance on ESCR values and voltage control tuning-expired](#)
- [VJV2018](#)
- [SJV2019](#)
- [PSS/E test template EXPIRED](#)
- [PSCAD test template EXPIRED](#)
- [PSSE test template VJV2024 EXPIRED](#)
- [PSCAD test template VJV2024 EXPIRED](#)
- [PSSE test template SJV2024 EXPIRED](#)
- [PSCAD test template SJV2024 EXPIRED](#)
- [Modelling instruction for PSS/E and PSCAD models EXPIRED](#)

General connection terms

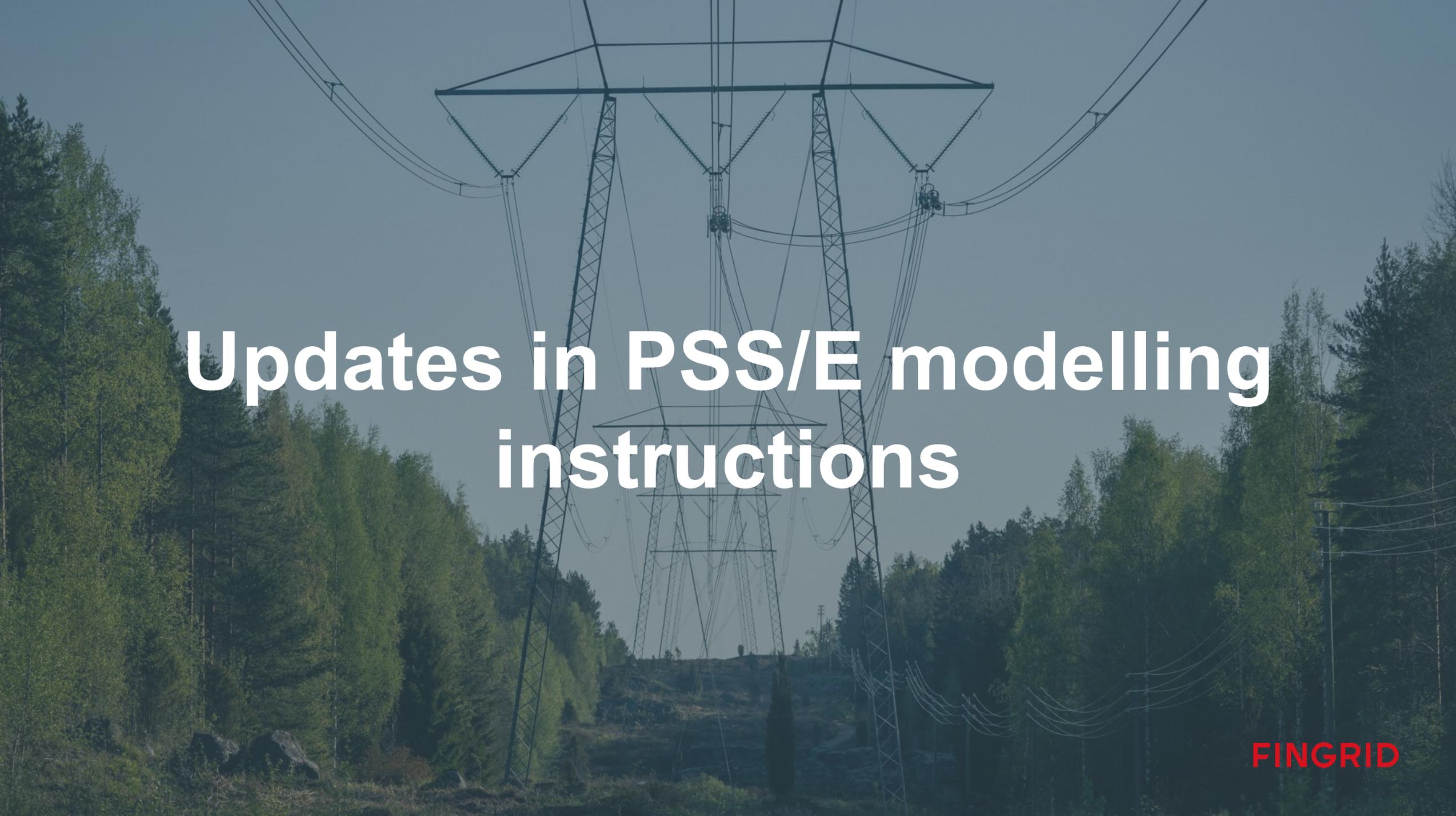
- [General Connection Terms YLE2017](#)
- [General Connection Terms YLE2013](#)
- [Connecting a three winding transformer to a 110kV line owned by Fingrid](#)
- [Main Grid Service Terms and Conditions Appendix 1_Expired](#)

And more to come..

Fingrid is currently preparing the very first version of modelling instructions for Data Centers to be published in March 2026



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Updates in PSS/E modelling instructions

General and structural updates

- All references to PSCAD removed – now separate instructions for PSS/E and PSCAD
 - All references to the modelling of synchronous machine power plants removed
 - New section: "Intended use" for describing the context where models are used
- Changes in the wordings and structure, but not that many changes in the actual content

FINGRID PSSE modelling instruction for power park modules and grid energy storage systems

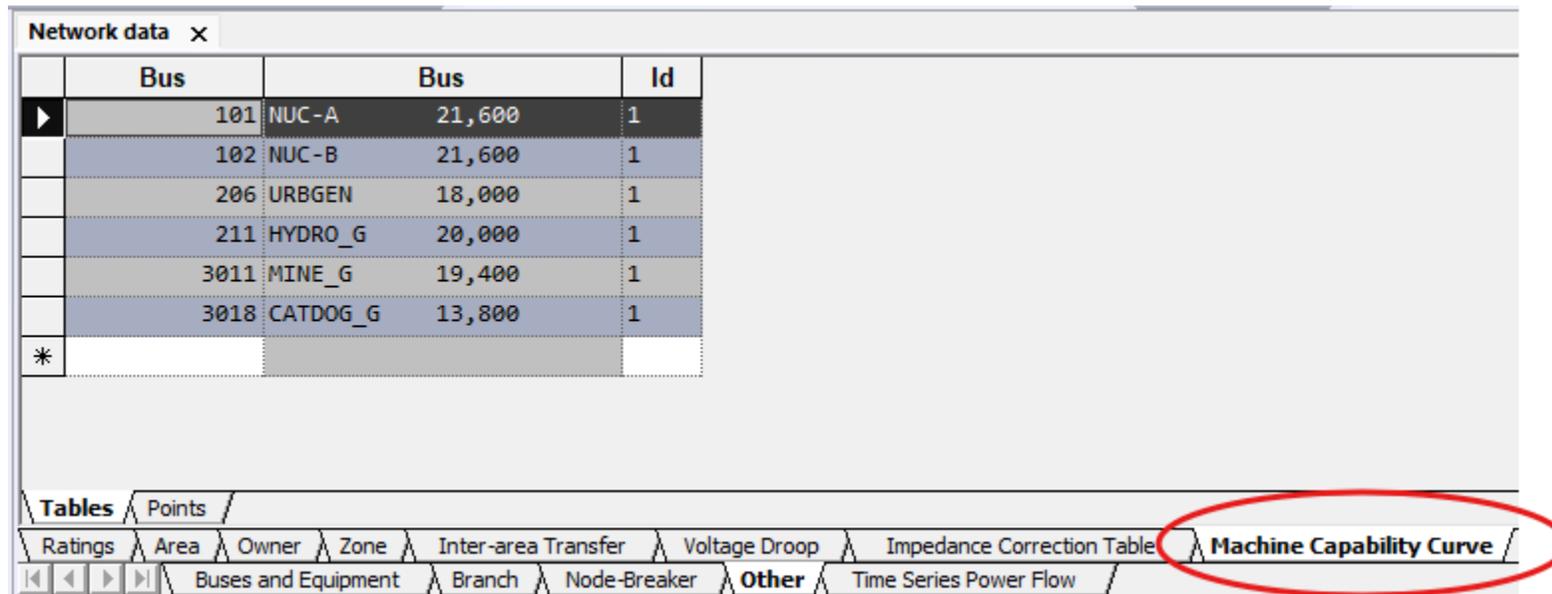
10.02.2026 2 (13)

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New instructions for the load flow model

- Modelling of PQ capability in power flow using Machine Capability Curve (.gcp file)



Network data x

	Bus	Bus	Id
▶	101	NUC-A 21,600	1
	102	NUC-B 21,600	1
	206	URBGEN 18,000	1
	211	HYDRO_G 20,000	1
	3011	MINE_G 19,400	1
	3018	CATDOG_G 13,800	1
*			

Tables Points

Ratings Area Owner Zone Inter-area Transfer Voltage Droop Impedance Correction Table **Machine Capability Curve**

◀◀ ▶▶ Buses and Equipment Branch Node-Breaker Other Time Series Power Flow

New instructions affecting the DLLs

- The model shall be able to write its data correctly into a DYR file (implementation of MODE 6)
 - Good model writing practice, but often neglected
 - New test for this added in the template

Save / Show Dynamics Data

Snapshot Data Dynamics Model Data Dump Output Channels Machine Parametric Source Data

Destination

Data file C:\Program Files\PTI\PSSE36\36.5\EXAMPLE\savnw.dyr ...

Report window

Output

List Models by subsystem Model type All models

Load model output

All subsystem models Selected subsystem models

Miscellaneous Other models

All model instances

Select model instance 1

Select

All buses

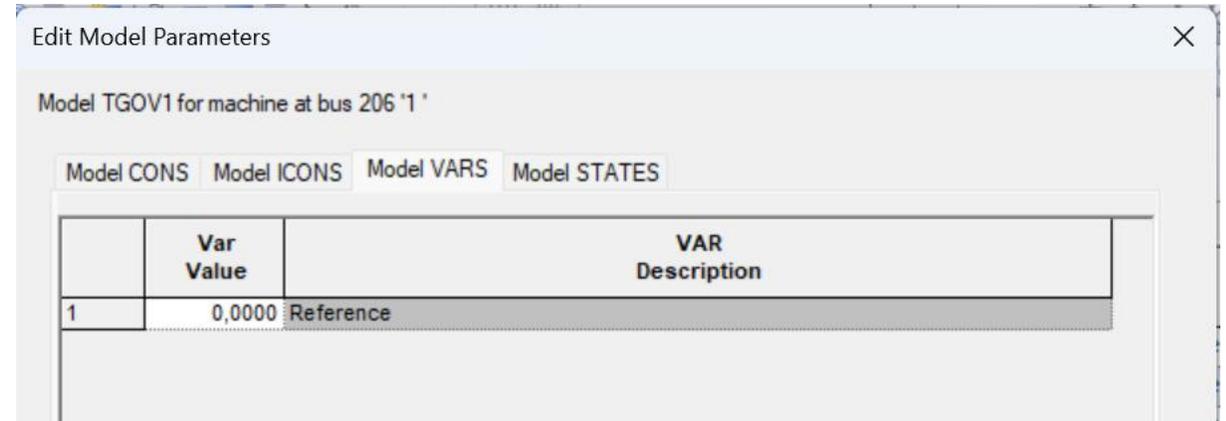
Selected bus subsystem Select...

The following buses

OK Close

New instructions affecting the DLLs

- The descriptions of CONs, ICONs, **VARs** and **STATES** shall be visible withing PSS/E GUI (implementation of MODE 8)
 - Note: For STATES and VARs, this is possible from version 36.1 onwards
 - New item added to the documentation check list on the template



	Var Value	VAR Description
1	0,0000	Reference

Key changes in the test template

The following items of the documentation checklist have been left out:

- minimum SCR
- model bandwidth and observable oscillation frequencies

The following tests have been left out:

- model run with different decimal separators
- LVRT and HVRT activation tests – these are sufficiently validated in other tests (and for grid-forming BESS, not even relevant).

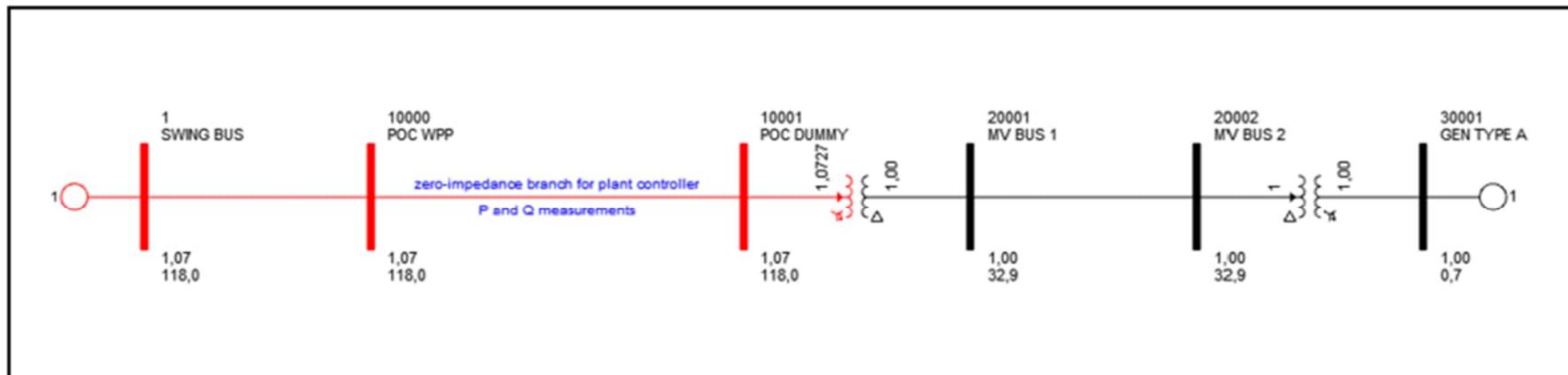
New tests in the template

- vector shift tests
- island operation (for grid-forming BESS)

Clarifications – the power flow model

Minor things that are now more explicit in the document:

- Model shall include a dummy bus and a zero-impedance branch that are used as a measurement branch by the PPC
- The Thevenin impedance representing the background network shall be a separate branch
- Possible compensation devices control mode in power flow shall be locked
- Machine MBASE, PMAX and PMIN shall not be arbitrary (e.g. 9999 MVA)



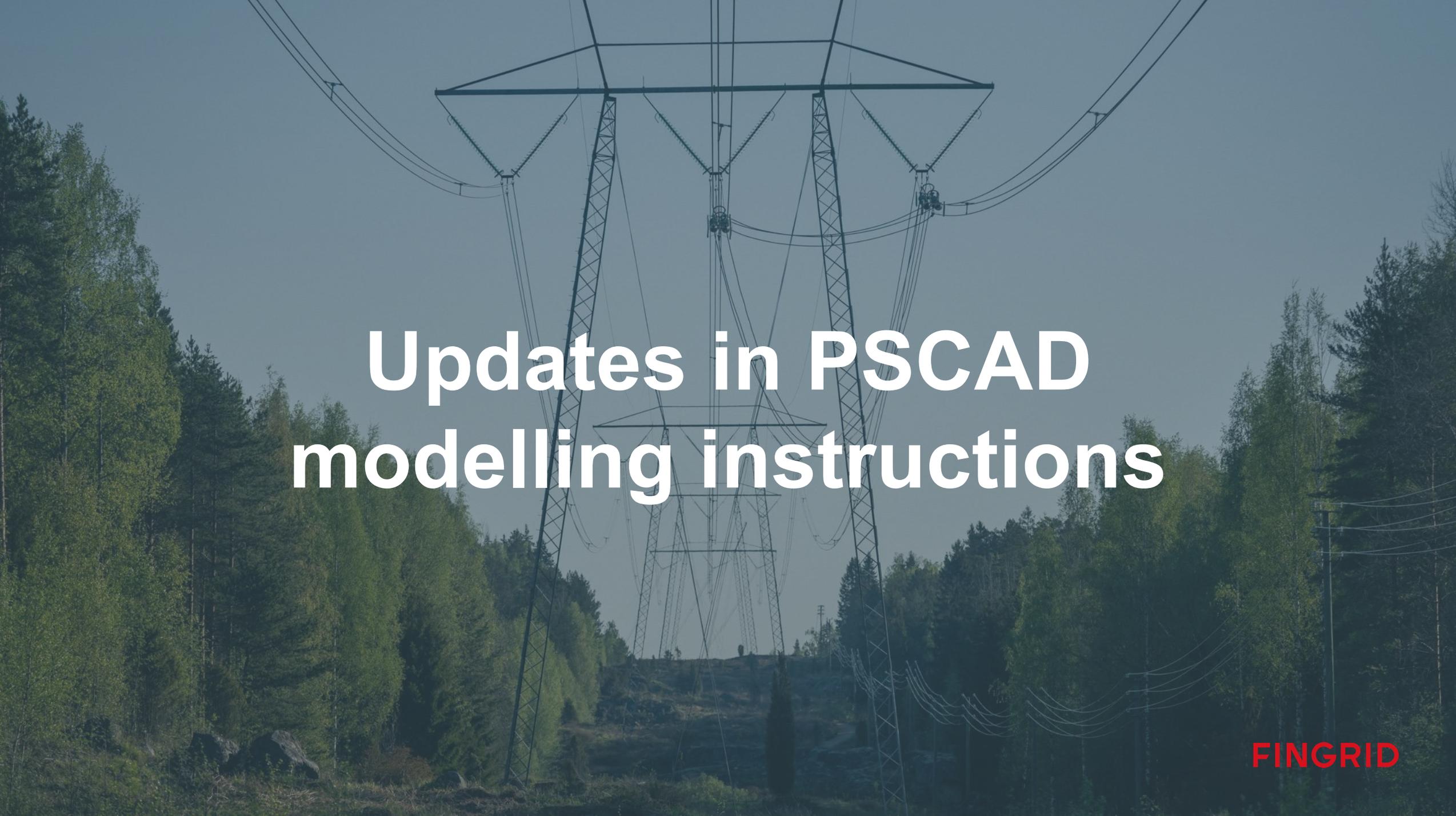
Clarifications – the dynamic model

The model shall **accurately represent the dynamic behavior of the plant** and remain **valid up to the full extent of the bandwidth of positive sequence simulation solvers** (usually 10 Hz around nominal value). In practice, this means that

- the model shall use **a voltage source type grid interface** with the network solver.
- the model shall have representation of the dynamic behaviour of **inner control loops and synchronization elements**.
- all delays that affect plant's performance such as **communication and measurement delays** shall be included in the model.

→ the models shall be **manufacturer-specific**.

- For auxiliary models such as OLTC control, PSS/E library models may be still used.
- Stable operation with Network Frequency Dependence flag (NETFRQ) enabled.
- The model shall not print excessively into the PSS/E Progress output during the simulation.
 - Usually this has not been an issue



Updates in PSCAD modelling instructions

PSCAD Modelling instruction update

FINGRID 1 (22)

10 February 2026

Fingrid Modelling instruction for PSCAD models

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- The list of modelling instructions is **developed and harmonized in cooperation with other Nordic TSOs** (Energinet, Svenska kraftnät and Statnett)
 - **Fingrid first to implement** these instructions nationally
 - Other TSOs will implement these to national instructions/requirements later, as the process of updating these documents differ between the TSOs

Key changes

- Clearer format 
 - Sections, sub-headers and more concise individually numbered instruction bullet points
- Models must work with 32-bit **and 64-bit** compilers
- The **real hardware code must be implemented** in the modelling of control and protection of individual active units (wind turbine, PV/BESS-inverter, STATCOM etc.) and for modelling of plant controllers, and **must follow the IEEE/CIGRE DLL standard***
- The model must be able to **represent accurately** the properties of the plant in the **0.2 Hz to 2.5 kHz** frequency range

The document is divided into the following sections:

- Section 2 “Intended use” aims to give an understanding of how Fingrid intends to use the model and describe the areas of study for which the model must be suited.
- Section 3 “Compatibility” defines the model capabilities which allow the model to be integrated to the simulation environment used by Fingrid.
- Section 4 “Usability” defines the model capabilities which ensure that it is practical and efficient for Fingrid to configure the model, execute simulations and analyse results.
- Section 5 “Fidelity” defines the model contents and details to ensure accurate representation of the modelled real-life plant/device/etc.
- Section 6 “Documentation” lists the relevant documents, reports, datasheets, etc to be delivered with the model.

2	Intended use
3	Compatibility
	Simulation environment
	PSCAD functionality
	Encryption and precompiled parts
	Simulation time step and duration.....
4	Usability
	File and model structure
	Model test case
	Parameter accessibility.....
	External references
	Signal accessibility
	Initialization.....
	Scaling
	Diagnostics.....
5	Fidelity
	Frequency range
	Control and protection systems
	Converter units
	Electrical components
	Aggregation
6	Documentation
	User manual
	Further supplementary documentation

*) [5] Cigre Technical Brochure 958, “Guidelines for use of real-code in EMT models for HVDC, FACTS and inverter based generators in power systems analysis,” February 2025. [Online].

Key changes

- The **converter models must have an average representation** of the switching dynamics (=average model)
 - **Documentation of the average model accuracy must be provided** (either against the detailed switching model or real equipment)
 - If the accuracy is not sufficient in the required 0.2 Hz to 2.5 kHz range, the detailed switching model must also be provided (for the converter model)

- All relevant information must be listed in the **model documentation** (user manual) → **single document**
 - Project modelling information, data, etc. must be described in this document
 - Certain descriptions (such as tripping signals of black boxed protection functions) can be in separate document such as vendor manual, but the user manual shall include a reference to this.
 - **Ready documentation template shall be used.** This can be  downloaded from the Fingrid website.

PSCAD model documentation template

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Date	Version	Changes
xx.xx.xxxx	1.0	First official model documentation version
xx.xx.xxxx	1.1	Changed

Key changes

- **Unit model validation** (model vs real equipment for the individual active units such as wind turbine, PV/BESS inverter etc.) **documentation shall be delivered**
 - If a unit model does not have any existing certificate or documentation of unit model validation, or the provided documentation is not accepted, **Fingrid can require that unit model validation to be performed**
- **Plant model validation** (model vs field measurement for the full plant model) must have special attention to the time delays → **reaction time of the plant** for stepwise change in setpoint / grid voltage should be compared

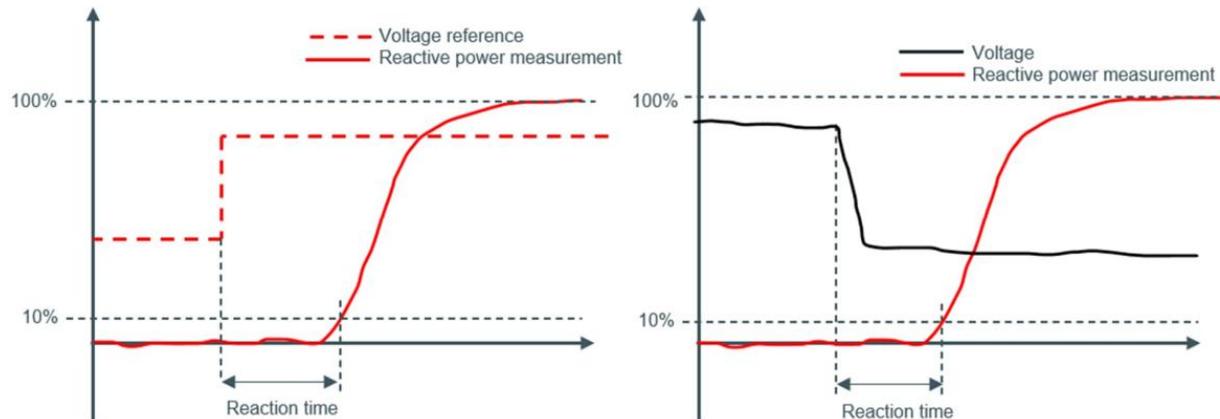


Figure 1: Guideline for signal plotting and reaction time calculation

A photograph of a high-voltage power line tower in a forested area. The tower is a lattice structure with multiple cross-arms supporting several power lines. The background is a dense forest of green trees under a clear blue sky. The text "Questions & Answers" is overlaid in the center in a large, white, sans-serif font.

Questions & Answers

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Thank you!

Fingrid Oyj

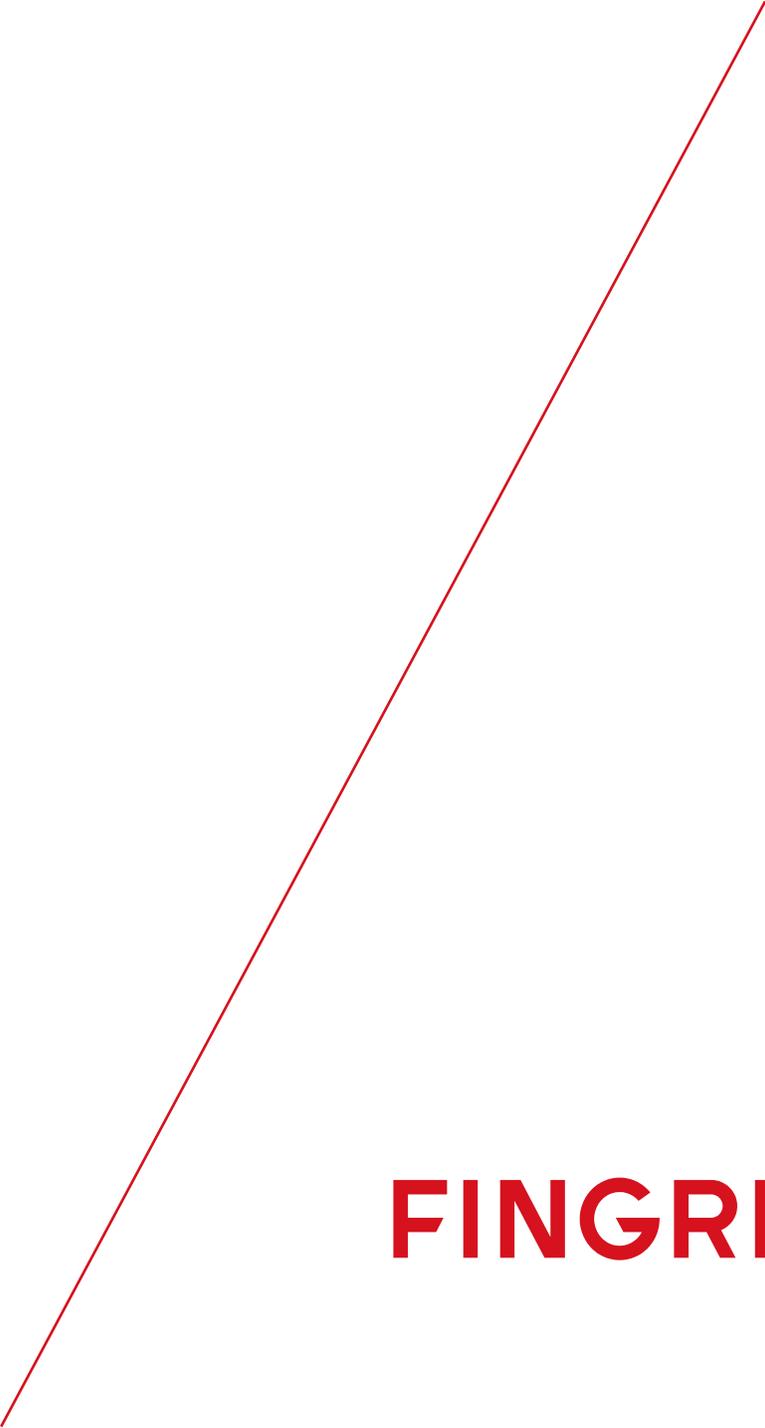
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