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Submission for consultation of the draft determination of the power system model guidelines

Dear Sir or Madam,

Senvion welcomes the opportunity to make a submission to AEMO's Power System Model Guidelines, version 0.2.
Senvion is a leading global manufacturer of onshore and offshore wind turbines. The company develops, produces and markets wind turbines for almost any location – with rated outputs of 2 MW to 6.33 MW and rotor diameters of 82 metres to 152 metres.

We have the following comments:

Terminology

Please ensure consistent use of the terms as defined in the NER in order to distinguish and intentionally use "generating unit", "generating system" and "generating plant" as best as applicable. There is for example no definition of "plant" or "Plant element". Examples for a wind farm would be helpful to understand the differences between "generating system" and "generating plant".

EMT - model release to other registered participants

Senvion requests AEMO not to apply section 7.4 on models which were submitted to both AEMO and NSPs before the date of publication of the Final Report and Determination of this POWER SYSTEM MODEL GUIDELINES.
Black–boxing of EMT models does not remove all sensitive information (e.g. switching patterns) and therefore shall not be shared with other market participants directly. In case of sharing EMT models with market participants is required then an independent third party shall be engaged to receive the confidential information.

Multiple voltage disturbances

Section 4.3.4: Remove “if applicable” from the bullet points and put it into the introduction as each of the items is subject to the technology in use.

Source Code submission
In chapter 4.3.9 of the power system model guidelines it is written that “AEMO accepts RMS model source code natively developed in FORTRAN 90 or higher.”

There is no reason to insist on FORTRAN code and for other open source code submissions to undergo alternative processes as stipulated in section 8 (with increased uncertainty) as long as the source code can be used in AEMO’s simulation environment to perform the required analysis.

Additionally alternative source code format should undergo a cost benefit analysis for their usage considering requester pays for this evaluation.
Source code assessment and acceptance should not hold up the connection process as all GPS analysis can be performed.

Model validation
Model validation previously commented and not considered: “It is proposed to base model validation requirements on international standards, such as “IEC 61400-27-1: Wind turbines – Part 27-1: Electrical simulation models – Wind turbines”. This standard proposes in chapter 6 detailed methods for demonstrating the quality of model validation by following international standards (such as data sampling methods from IEC 61400-21) and at the same time opens up the possibility to define accuracy limits through the system operator. This standard also includes to judge model validation errors based on per unit data rather than on the specific change of quantity. The proposed method in the Power System Model Guidelines is concerning when evaluating very small changes (getting into numerical issues) - while the effect on system stability is very low”

EMT models for harmonic analysis
SSCI and potential resonances are to be analyzed via state of the art analysis tools and methods. E.g. Senvion performs harmonic impedance scans (considering different operational states and controls) and can make those scans available on request. Resonances exist in any power system and are generally independent from discussions around “SCR”.

EMT PSCAD models for power system studies are not intended for harmonic analysis in time domain i.e. it cannot be used to evaluate if harmonic limits are fulfilled at the grid connection point. This option has been discussed within the international expert community and found as not feasible. One main reason is that, following the relevant standards, harmonic level assessment is done over several minutes (typically 10 minutes) and active power levels through power quality measurements.
Additionally within a wind farm the different wind turbines are exposed to different wind speed leading to different operational points. These different operational points are very difficult to model adequately due to the poor quality of wind turbine specific wind measurements (working again with averages over 10min). Therefore it is impossible to accurately validate a

wind farm model for its harmonic contribution and it would be invalid to compare this with harmonic measurements.
The costs and effort involved in creating and validating such a model are too high compared to the gain in knowledge and accuracy, in particularly as cheaper methods exist. As such internationally it is accepted, that for power system study purposes, the accurate representation and assessment of harmonic levels is not included within an EMT (time domain) model.
Senvion therefore proposes to exclude the EMT model for Power Quality assessment.

In Section 4.6.1 bullet point 6 and foot note 38 is says "*This is not a general requirement and will be determined on a case-by-case basis and only when the conventional harmonic analysis techniques fail to achieve the required level of accuracy*". It is to be noted that the required level of accuracy is not defined for frequency domain analysis (*conventional harmonic analysis techniques*).

If harmonic studies are excluded from the EMT studies scope, than the switching algorithm/pattern of semiconducting devices may not be required, making the simulation mach faster.

EMT data provision from NSPs
Senvion request AEMO to include a clause (for example within 2.2) in the Power System Model Guidelines that guarantees the data provision from the NSPs to Generators. This is based on Senvion's experience of NSPs failing its data provision commitments under the NER.

Numerically stable up to a simulation time of up to five minutes
EMT models are not made for such a long simulation time. Senvion proposes to limit the EMT simulation time to two minutes.

Non-linearities
Non-linearities such as transformer saturation may lead to time steps below 1µs to avoid instabilities.

Required model output quantities (Table 4)
The internal quantities described in Table 4 are not specified in Appendix D as indicated in sentence "*Table 4 outlines the output quantities required to demonstrate model performance for a variety of dynamic analysis scenarios. Quantities used to determine model accuracy are typically a sub-set of these quantities, and are described in Appendix D*."

The internal quantities mentioned may not be applicable to the relevant technology.

Frequency control
Please remove EMT–models from table 5 for S5.2.5.11 Frequency control studies because the time frame exceeds the 5 minutes.

Please feel free to contact us in case you require further information.

Yours sincerely,

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