PSMG – consultation Amendments to the Power System Model Guidelines

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Over arching this consultation needs to be careful consideration of the role of the electrical supply industry and whether or not the push to include loads within the market and require EMTP models is justifiable. The impact of current requirement for PSCAD modelling from generators is causing significant delays to generation projects with exorbitant costs in the connection process. It is delaying site upgrades to existing generation, as they endeavour to avoid making "changes" that trigger the 5.3.9. Experience has shown that very often the cost of dealing with the modelling exceeds the capital cost of site changes being proposed.

Applying the same obligation to any load will have a significant impact on the ability of industry and business to effectively grow, develop and pursue a decarbonisation pathway. Whether this is intentional or not, asking loads to provide a detailed model when this has never been a requirement in the past will stop or delay significant industry investment and apply excessive costs on to any future business activity that impacts on their electricity demand. It is not at all clear how the additional cost and complexity that would arise from the implementation of these proposals can be justified relative to the perceived risk that is being managed, particularly given the underlying obligations contained within the NEL and the electricity market objective.

Further, it is not clear that there is a sound engineering justification for the proposed requirements as electrical power engineers have ALWAYS been able to make reasonable modelling assumptions as to the characteristics of loads in order to study the power system and control it.

Since the establishment of numerical modelling techniques over 50 years ago it has been well understood that it is not possible (nor reasonable) to model everything, particularly given the processing effort required to undertake such modelling. It is only now that advances in computing processing, and commensurate reductions in computing costs that the discipline associated with measured, risk based, assessment of appropriate model development appears to have been lost. This is leading to a situation in which the system model is so complex it is that the cumulative impact of the added detailed actually reduces certainty in the model outcomes. Experience has shown systems have collapsed in the past due to excessively detailed models failing to provide the necessary indicators due to complexity, the users probably cannot analyse the volume of output and critical elements have been overlooked. The NEM modelling exercise is replicating this error, for example; application of 3 phase faults on 500 kV beyond primary clearing time ignores the critical clearing time of a region, yet applied in PSCAD wide area model as if such a fault is reasonable. This ignores power system control theory.

Furthermore, the NEM 4 state PSCAD is **a single operating case** and as such it is not suitable for use as a tuning tool. Tuning of control systems on generators requires parameters that are assessed for their response and damping over a wide range of operating conditions. This is done through using frequency domain analysis and other well know control methods that do not take 8 hours of computing time to run a single case.

The continued reliance on time domain models, and simply expanding the detail contained within them is resulting in a loss of awareness and familiarity appropriate control engineering practices that ensure controls are damped for all known system and local modes across a wide range of operating conditions. Transfer function analysis, impedance scans, Bode and Nyquist plots to mention a few necessary methods.

The only condition in which a business customer may need modelling is when they intend to participate in providing primary control responses for a market / power system "service" in which case the performance of that control action is like a battery. Even then the size of the load would need to be approximate to the largest generator in the region to really matter.

Most loads need to undertake their core business and this includes being able to decarbonise without being treated as an object of modelling curiosity. Load characteristics, whether voltage or frequency dependent, electronic or not are managed through composite load models and it is an obligation on system management to adjust these models using their observation and analysis of the system.

It is already evident that the current modelling regime is leading to a complex and expensive imposition on generators, once this is extended to customers, it will no longer be economic for loads (industry) to do business in Australia. The overarching aim of the market is to make energy affordable. It is clear from the experience of the last 5 years that modelling extreme detail is being pursued as an answer in a system that no longer has sound basis in philosophical or theoretical control practice.

Loads draw electrical power from the system and have always done this as it is the purpose of the power system! All loads can "disturb" the voltage waveform as they use power. Arc furnaces, rolling mills, rock crushers, variable speed drives, rectifiers, all impact the system . Claiming there is a system "strength" problem is group think that loses sight of the role of the power system and power engineers who ought to know how to correct, support and control the power system so that loads can be productive.

The imposition of requiring a model from a load should ONLY apply to DER/ Load participants who intend to provide a control response to the power system for commercial gains.

This requirement MUST not impact on existing customers, businesses, mining loads or other productive economic activity as it will cause significant costs that are not justifiable under the NEL objective.

Protection inclusion in models – the requirement to model protection in the dynamic model for the power system creates a model in which you are studying the protection and not the actual dynamic response of machines. The dynamic model of the power system is intended to be used to set the transient stability limit of the system, enabled protection schemes in a model will not produce a complete understand of the system stability boundaries. It will produce a model that supposedly does it all. As noted earlier this does not provide good model outcomes.

Consultation questions

1. What is the threshold (if any) for deciding when to model a traditional large power system load in detail for power system simulations, be it megawatt-based, location-based or otherwise?

.If this rule is to be applied in any meaningful way, it must be driven by good engineering practices and risk assessments. To not do so risks significant impact on future development of business and industry. Just as applying the 5.3.9 (and causing PSCAD modelling) to be reversed onto existing generators causing delays in site upgrades.. The cost of modelling exceeds the

capital cost of the site upgrades. This requires significant rethinking by the PMWG. Requiring any load to provide a PSCAD is not justified. The power engineers that operate the system should be talented enough to develop approximate generic models. The only time a load model ought to be developed would be if it is a fully controllable load that intends to participate in the market and provide "services".

This is not a size or location decision. It can only reasonably be thought of within a risk framework.

2. Is the IEEE or Composite and DER Load models suitable for these types of loads or is more detail required?
   IEEE composite models are sufficient. Use conservatism in modelling and engineering reason and judgement and stop placing obligations on industry to suit the pursuit of "accuracy".

3. Are there any other types of large loads that have not been considered here? NO. As noted previously, the basis of the thinking rests on a flawed understanding of the problem attempting to be solved and the solutions available. One of the best things we can do to increase the robustness of of our power system is to increase demand. This proposal will do the opposite and should not be expanded to further sectors.

4. Is the Composite and DER Load model sufficient to model data centres in RMS and EMT domains?

Yes – composite models are all that is required and site specific modelling should not be necessary.

5. What additional protection and control systems are expected to be required in the models?

None

Other questions are not answered as they assume that detailed load modelling is applicable.

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