Suggested PSCAD model requirements

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Specific model requirements for a PSCAD study depends on the type of study being done. A study with a scope covering weak system interconnection, ride-through, voltage control and event response, and islanding performance (for example) would require a model which has the following characteristics. Such a model will also be suitable for classical PSCAD transient studies. Some specialty studies may require other features.

MUST HAVE

The model….

- Represents the full detailed inner control loop of the power electronics. The model cannot use the same approximations classically used in transient stability modeling, and should fully represent all fast inner controls, as implemented in the real equipment. It is possible to create models which embed the actual hardware code into a PSCAD component, and this is the best type of model.
- Represents all pertinent control features (eg. external voltage controllers, plant level controllers, etc). Operating modes that require system specific adjustment should be user accessible.
- Represents all pertinent electrical and mechanical configurations, such as filters and specialized transformers, gearboxes, torsional models. Model can be either a full IGBT representation, or use a voltage source interface that mimics the IGBT operation (unless harmonic studies require full representation of switching dynamics). Current source interface is not recommended.
- Has all pertinent protections modeled in detail. Typically this includes various OV and UV protections, frequency protections, DC bus voltage protections, and overcurrent protection. There may be others.
- Has control or hardware options which are pertinent to the study accessible to the user.
- Initializes as quickly as possible (<1-3 seconds) to user supplied terminal conditions.
- Is capable of running at a minimum time step of 20 us, unless specific control parameters require smaller. The smallest we have seen in terms of genuine control limits are 10 us. Most of the time, requiring a smaller time step means that the control implementation has not used the interpolation features of PSCAD, or is using inappropriate interfacing between the model and the larger network. Lack of interpolation support introduces inaccuracies into the model at higher timesteps. Depending on the size of the system being modeled in the actual study, this could be a firm requirement.
- Supports multiple instances of the model in the same simulation.
- Documentation and a sample implementation test case should be provided
- Supports the PSCAD “snapshot” feature.
- Supports the PSCAD “multiple run” feature.

NICE TO HAVE (Recommended but may not be required)

The model…

- Is compiled for both Compaq Fortran, and the most recent version of Intel Fortran. The compiler requirement depends on what other custom models are being used in the composite

system model. Sometimes flexibility for compiler options is very helpful (ie. Ability to quickly recompile models). Intel compiled code is a minimum requirement. Alternatively, the model can use DLLs which are compiler independent.

- Is written in PSCAD version 4.2.1. This older version of PSCAD is upward compatible with version 4.5, but 4.5 is not backward compatible. This can become important where many manufacturers and compilers are contributing to a composite model. This is a preferred feature, but not always required.