Electromagnetic Transients Program studies are done with the Alternative Transients Program (ATP); see www.emtp.org. Clients with an ATP license will receive a copy of the ATP model at the end of the study. (*N.B.: MelTran does not produce or use ATPDraw files during a study, however, the final report includes a one-line diagram focused on the area of interest.)*

Quality Control

MelTran uses the following procedures during a study, to ensure client satiisfaction:

- Bi-weekly telephone conferences.
- Automated software tools to convert client models to an ATP model, and identify suspicious data (e.g., surge impedance, X/R ratios, reactance, line charging, travel time, topology, phase shifts, generator impedances, etc.).
- Verify the ATP model steady-state voltages and fault current levels against the client's models.
- Perform frequency scans on the ATP model.

The final report ensures client understanding of the study results with:

- Itemized conclusions and recommendations.
- A MelTran-produced drawing that highlights key portions of the ATP model.
- Numbered citations to applicable IEEE and IEC standards.
- Narrative and formula-based descriptions of key results and interactions, using approximations suitable for hand calculation, to serve as a check on the computer simulations.

System-Wide Model Requirements

Most studies require a model of the system outside the area of immediate interest, with less detail. As a rough guideline, for switching surge and TRV studies, the system model should include substations within a distance of 0.3 x Nominal kV [miles], or 0.48 x Nominal kV [km], from the area of interest. For 345-kV systems, this guideline translates to about 105 miles or 165 km. Some types of study, including harmonics and resonant overvoltages, will require a larger system model. MelTran will designate the system modeling distance in a formal proposal.

The client should provide the following data for a system-wide model:

- A system model file, in ASPEN, CAPE, or PSS/E text format that encompasses all substations and lines to be evaluated, and the surrounding area within the distance established for a system model. Zero sequence and line charging data should be included.
- A system diagram, spreadsheet, Access database, or other electronic file that designates the physical length and conductor types of overhead and underground transmission lines in the model.

- Peak load and power factor at each bus, and the system-wide ratio of minimum to peak load at a bus.

MelTran will use typical data and approximations to fill in missing data, for both the system-wide and detailed models

Line Data Requirements

The client should provide physical data for any line that is to be switched or faulted in the study.

- For overhead lines, please provide a sketch or electronic file showing the phase and ground conductor heights and horizontal coordinates at the tower, bundle spacing if applicable, mid-span sag, and typical span length. Also provide the phase and ground wire types.
- For underground lines, please provide a cable cross section showing the layer diameters, the type of insulating material (e.g., XLPE, HPFF), the burial depth, and horizontal spacing between phases. Also provide the core conductor types, any neutral conductor types, and the size and spacing for any cross-bonding.
- For either type of line, please provide typical, minimum, and maximum grounding or tower footing resistances.

Substation Data Requirements

Any substation containing equipment to be studied, such as circuit breakers, transformers, shunt capacitors, shunt reactors, or surge arresters, will require a more detailed model. Please provide the following data for each substation of interest.

- Station one-line diagrams for each voltage level of interest.
- Station layout, elevation, and section diagrams of each substation to be evaluated, adequate for determination of physical distances between equipment.
- Transformers – Copy of the vendor test report.
- Circuit Breakers and Circuit Switchers – Voltage rating, interrupting current rating, and capacitive current rating (i.e., general purpose or definite purpose). Switching surge mitigation (e.g., synchronous closing, pre-insertion impedance) if applicable, with impedance values, pole spans, and insertion times. TRV grading capacitance if applicable. Type of interrupter, vendor name, and model number.
- Shunt Capacitors – Nominal kV and MVA rating of each bank, and type of neutral connection.
- Shunt Reactors – Nominal kV and MVA rating, number and range of taps if applicable.
- Surge Arresters – At each location, please provide the vendor, type (typically metal oxide), IEEE or IEC class, and voltage rating.
- Potential Devices – The type and equivalent capacitance (if known).

- Current-Limiting Reactors – Inductance, and supplemental capacitance if applicable.
- Describe any special switching policies or restrictions.

Other

Sometimes, additional data will be required for static VAR systems, series capacitors, synchronous machines, control systems, harmonic filters, etc. These will be identified in the proposal, or in the project kickoff telephone call.

Lists of switching cases and contingencies will be developed in the proposal, or as the study progresses.

In order to develop a proposal, it is usually sufficient to provide a one-line diagram and a narrative description covering the issues of concern. If any problems are expected in providing the data listed above, please mention that in the request for proposal.