

Central Hudson Gas & Electric Corporation
Local Transmission Plan

Analytic Tools
(as of October 1, 2011)

GE's Positive Sequence Load Flow (PSLF) software is the main tool used to analyze Central Hudson's local transmission system. Central Hudson uses PSLF for thermal and voltage analyses of its local transmission system. For these analyses, Central Hudson's local transmission system may be viewed as a group of smaller local areas and as an entire system.

Thermal & Voltage Analyses

Local Areas

Local areas typically are those areas where, following a contingency, the transmission system is radial in nature. The ability of each area to serve load typically is determined by the rating of a single facility or the voltage at a single bus. As such, PSLF is not needed to determine if any local area thermal limits would occur within the planning horizon.

To determine if any local area reinforcements are needed within the planning horizon, each local area's load is projected to the end of the planning horizon and compared to the calculated rating of the limiting facility. If the load exceeds the limiting facility's rating, or an area voltage is unacceptable (as determined with PSLF), the need for a reinforcement is identified.

Central Hudson's transmission system local areas are listed in the table below. These may change from time to time.

<u>Summary of Local Areas</u>
Northwest 69 kV
Southwest 69 kV
Southern Dutchess 115 kV
Mid-Dutchess 115 kV
Ellenville 69 kV
Newburgh Area
Eastern Dutchess 69 kV
Kingston-Rhinebeck

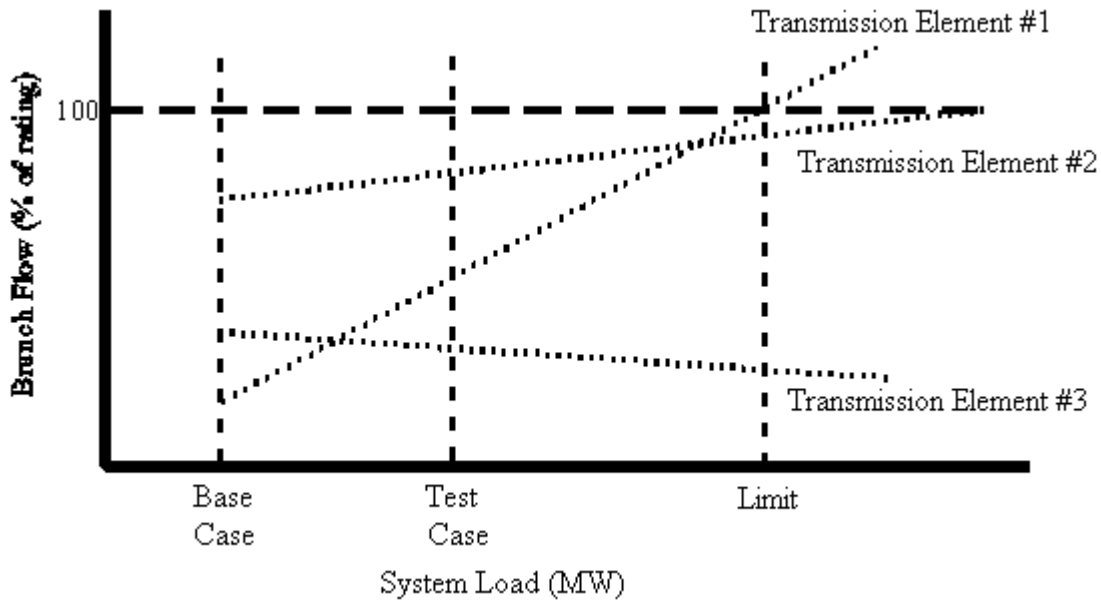
System

The need for any system reinforcements within the planning horizon is identified differently than for local areas. For these analyses, the load levels at which system reinforcements are identified for thermal violations are first determined and then the

years that those load levels would be reached are calculated. To identify the load levels for system reinforcements, the network's load serving capability is established utilizing the 'actr' function of GE's PSLF software and a post-processing program.

The basic premise of 'actr' is that the transmission system can be approximated to behave linearly for small changes and that the change in flow on any particular network facility is proportional to a change in transfer between two areas, a change in generation or a change in load.

To implement this linear approximation 'actr' uses two load flow case solutions, a "base" and a "test" case, and a contingency list to estimate the changes required to bring each transmission network facility's loading to 1.0 pu of its selected rating for each contingency. Using these two load flow solutions, the calculation performed by 'actr' for a single contingency is illustrated in the figure below:



The contingency list used with 'actr' is based on Central Hudson's "Transmission Planning Guidelines." These analyses are repeated for various levels of generation within the local transmission system.

To determine if any voltage violations exist, the system load is set to the load forecast for the end of the planning horizon and a load flow solution is produced for each contingency.

Short Circuit Analyses

Central Hudson utilized the Aspen One-Liner program for all short circuit analyses.

These analyses are used to:

- Assist in the coordination of protective relaying systems
- Assess the capability of circuit breakers to interrupt fault currents

- Assess the ability of all equipment to withstand the mechanical forces associated with faults currents
- Assess the thermal capability of equipment during faults.

Dynamics Analyses

Central Hudson does not have the capability in-house to perform these analyses. When necessary, dynamics analyses would be performed by a consultant.

Transient Switching Surge Analyses

Central Hudson does not have the capability in-house to perform these analyses. When necessary, transient analyses would be performed by a consultant.