Development of Attribute Preserving Network Equivalents
Project Lead: Tom Overbye, Ray Klump

Objective: The overall objective of the proposed work is to develop and demonstrate algorithms to construct equivalent system models that preserve desired attributes and behaviors of a large portion (or entire portion) on an interconnected electric power grid. An equivalent is a model of a system that consists of fewer nodes and branches than the corresponding full model. The purpose of an equivalent is to enable more efficient computer simulation of the system, without unduly sacrificing the accuracy of the simulation's results.

Major Technical Accomplishments for This Year: As described in the proposal, this year we have focused on development of attribute preserving network equivalents. The key contribution has been the development of an algorithm that preserves the network transmission line limits in the equivalent. A journal paper should be submitted to IEEE Transactions on Power Systems by early August 2012.

Deliverables and Schedule for FY2012 Funding: The key deliverables for the project will be papers. During the remaining project time frame (until March 31, 2013) the schedule is for the existing graduate student to continue working on attribute preserving network equivalents. Our hope is to have the algorithm that preserves the transmission line limits ready for commercialization, including demonstrations on the North American Eastern and Western Interconnects. A follow-up paper to the August 2012 one is planned.

Risk Factors: The major risk factor associated with this project is unexpected loss of project personnel. This has already occurred when in Spring 2012 the co-PI for this project (Ray Klump) unexpectedly left UIUC. We have been able to compensate for this, but additional personnel losses could have an impact. Of course research, by its nature, involves risk. But we don't except any unusual risks.

Follow-on Work: An area for future interest is to build on the work performed so far, and also to move into the area of dynamic equivalents. Increasingly the economic operation of the grid is being constrained by transient stability limits. More computationally effective means for determining these limits is an area for future research.