"Energy Management System Data Acquisition and Performance Testing"
Joe Orth, Tacoma Power

Often simulating power system activity when testing a SCADA system relies on computer simulations that run on the vendor's equipment and a true loading of the system cannot occur until the system has been installed and fully integrated. Using recently available technology,

0-7803-7173-9/01/$10.00 © 2001 IEEE

Tacoma Power developed a 98 RTU, 80,000 plus point tester called "Master Blaster" for the purpose of fully testing data acquisition performance at the vendor's facility on a pre-contract award basis all the way through FAT and possible system upgrades. The purpose of the pre-contract award testing was to utilize similar equipment to that installed in Tacoma Power substations as part of a test to minimize risk by verifying basic data acquisition and data processing would meet Tacoma's performance goals, verify performance of equipment recommended by the vendor (servers, work stations, LAN, etc.), verify required capability for growth and additional applications was available and verify the robustness of the vendor's DNP implementation and compatibility with RTU vendor's DNP implementation. Due to the proliferation of DNP, its acceptance by the IEEE as a standard, the fact that it is an open and published protocol whose subsequent development is controlled by its user group, extensive research and the direction the protocol development was taking, Tacoma Power had determined that it was acceptable to manage the risk of purchasing RTUs and the EMS from different vendors in 1996 when an RTU contract was awarded to then Harris Canada. After awarding the EMS contract, the purpose of subsequent preliminary testing was to resolve DNP over Ethernet communication capabilities, integration and compatibility.

Four scenarios were tested, two of these prior to award a contract. The basic test scenarios included up to 98 RTUs (serial and Ethernet depending on the scenario tested) communicating with the Energy Management System (EMS) front end processors (FEP) using DNP protocol, spread across the 98 RTUs was approximately 40,000 each of status and analog inputs with over 5,000 status alarms generated per minute, 25% of all analog inputs (10,000 points) change every 2 seconds (and scanned at least at this frequency) and 37.5% of all analog inputs (15,000 points) change every 6 seconds.

This paper discusses the benefits gained from the testing, results of the testing and issues that arose during the testing including the use of DNP over Ethernet.