DRAFT
Visibility Enhancements
September 11, 2006

Overall Goal:

Enhance the monitoring, modeling, analysis, and data exchange during real-time (current hour), pre-operating hour (next hour), day-ahead (24 hours prior to operating hour), and planning periods to improve operations within ColumbiaGrid while maintaining regional reliability and security.

Problem:
The inability to accurately forecast powerflows on the transmission system during real-time and pre-schedule can result in Transmission Service Providers accepting too many non-firm and firm schedules. As a result, congestion problems cannot be identified and solved prior to the operating hour. The RC has a similar inability to forecast power flows on the transmission system leading to the inability to accurately foresee system reliability problems before they occur. The inability to accurately forecast powerflows is caused by a lack of specific information regarding what generation and loads are going to do during pre-schedule and real-time, which makes it impossible to analyze and use proactive tools (both for the reliability coordinator and the transmission operator). Further, NERC requirements[1] for day-ahead and hour-ahead reliability assessments are unable to be achieved.

Because a significant portion of business is not transacted until the near real-time time frame (less than an hour-ahead to in-the-hour), it is difficult to accurately assess the transmission system for potential reliability problems and for placing limits on commercial activity. Forecasting generation and loads for future hours and for tomorrow is critical for an accurate assessment from both a commercial management perspective and from a reliability perspective. Transmission Service Providers (TSPs) need to place limits on commercial activity if that activity negatively impacts reliability of the transmission system. Transmission Operators (TOPs) and Reliability Coordinators (RCs) need to be aware of current and developing situations that may place the system at risk.

1. Load and generation information gaps both inside ColumbiaGrid footprint and outside ColumbiaGrid (interchange schedules)

    a. Many tags do not provide enough information on sink and source to allow for an accurate assessment of the impact of a particular transaction to the transmission system, e.g., it is impossible to identify the exact generator on a single interchange transaction (i.e., an e-Tag) when a "system" of generators are being dispatched together to meet a net interchange

[1] For example, IRO 004-0, requirement 1 – RC shall conduct next-day reliability analyzes; IRO 005 – need to develop and implement mitigation action plans and coordinated pending maintenance outages – TOP 002, requirement 15 – provided forecast output; 003, requirement 1 – provided planned outage information)

requirement. Similarly, native load within a Balancing Authority (BA) area maybe geographically dispersed across the transmission system, yet be served by a single dispatch of resources.

b. Lack of information about how transmission rights in the future will be used, such as:

    1) How much of reserved capacity will the transmission customer use later today or tomorrow?

    2) How much firm transmission is going to be used or be redirected to alternate PORs and PODs?

c. Many times, generation located within a BA's area that is serving load within that same BA area is not tagged.

Solution:

To help resolve this problem, the following four steps will be taken. First, create a robust database that will help forecast how the transmission system could be used in the short-term (pre-operating hour out to pre-schedule). Second, obtain better information from those using the transmission system about how they anticipate they will operate in the short-term. Third, work with regulators and policy makers to help modify procedures to mandate better data flow from those using the transmission system to the transmission operators. And fourth, ensure that the transmission operators deploy supplied data to better operate their systems.[2]

Data Support, System Modeling, and Regulatory and Procedure Review/Modification[3]

1. Work to develop a common central database or clearinghouse ("ColumbiaGrid portion of the WSM Database"). The critical aspects for the database are data accuracy, maintenance, security, format, confidentiality, and redundancy.

    a. Become involved in the WECC's West-Wide System Model project. Participate in the data model development process on behalf of participating entities. WSM is currently scoped as follows:

[2] This paper assumes generators and loads remain obligation to submit and adhere to balanced schedules.
[3] With respect to sharing of any data, model output, ColumbiaGrid will have to develop protocols to provide protection for confidential information as well as address SOC issues (e.g., TOs that are not functionally separated.) To the extent the information released has been processed by ColumbiaGrid (modeling, other?) rather than released as submitted, will still be sensitivities but may not be as significant of confidentiality concerns.

(i) Stage 1 of the WECC West-wide System Model (WSM) will include a complete high voltage (100 kV and above) electric network model of the entire Western Interconnection. This model will be maintained by a suite of advanced modeling tools. This model will provide Reliability and Planning Entities (REs and PEs), Reliability Coordinators (RCs), Balancing Authorities (BAs), Planning Authorities, Transmission Operators, Resource Planners, Transmission Service Providers, and Standards Developers with a common model for utilization by network applications software. This model will be importable and exportable incrementally, in whole, or in part via the Common Information Model (CIM) XML standard. WSM will also export bus oriented planning models and models in various standard formats. The WSM will store the static network topology in a manner that allows the model to be viewed at particular points in time.

(ii) Stage 2 includes the addition of observable (real-time) data to the model via ICCP, state estimation, archiving of historic data and State Estimator save cases, and continuous real-time data recording. This Stage also includes the addition of tabular data displays and alarm displays associated with both the State Estimator and real-time data. At this Stage it will be possible to benchmark the system model to ensure model accuracy. The WSM will provide both snapshot (status and analog data captured at a specific point in time) and playback capabilities.

(iii) Stage 3 includes a suite of network analysis tools that can be used by REs and PEs. This Stage will provide methods for utilizing current (real-time) or historical data and network topologies to perform various types of power system analysis, including what-if analysis, using any of the WSM advanced network analysis applications. Analysts will be able to independently utilize these tools on independent copies of the network model that they can modify in any way without impacting other users. These modified model copies can be saved and re-used by the analysts or exported to external planning tools and simulators.

b. Work with the Generator Operators, TOPs, and BAs to obtain load forecasts, generation forecasts, and generator and transmission outage information to populate ColumbiaGrid's portion of the WSM Database; ColumbiaGrid in conjunction with any WECC efforts, will develop protocols to provide protection for confidential information as well as address SOC issues.

2. Become involved in the effort to implement transient and voltage stability tools within the WECC's West-Wide System Model development process on behalf of participating entities.

3. Become proficient running WECC's real-time tools on behalf of participating reliability entities and assist them when needed.

4. Develop a plan to perform system studies and inform participating reliability entities of near real-time and future hour operating issues. Exercise ColumbiaGrid mechanisms, if any, where appropriate to resolve issues.

5. Work within larger evolving framework of new and expanded roles of Reliability Coordinators. Within Stage 1 of the WSM, be prepared to address the following issues:

    i. Threshold issue: Assist the WECC in develop of the population of the WSM to allow the Reliability Coordinators to meet the next day reliability assessment requirement in IRO-004-0.

    ii. Assess the value of using tag information or other information from the WECC Interchange Tool (WIT) in future assessment procedures and mechanisms.

    iii. In conjunction with the WSM effort, develop process for Generator Operators to provide reliability entities with expected for future hour assessments.

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1. Incorporate all critical future hour information (e.g., load and generation forecasts, transmission and generation outage information , etc.), into WSM tools, including transient and voltage stability applications.

2. Provide information to the participating reliability entities so they can develop mitigation plans to avoid potential real-time operating issues and OTC violations.

3. Develop plans to establish the longer-term goal of having ColumbiaGrid develop mitigation plans and mechanisms.

4. Ensure WSM data and tools will support congestion management mechanisms and ATC calculations for future hours. Determine if the Western Interchange Tool (WIT) can supplement these processes.

5. Explore opportunities to improve regional reliability by installing additional monitoring devices on the interconnected system. Some of the devices that

should be considered are: disturbance monitoring and phase-angle measurements, temperature and wind conditions on critical transmission facilities to provide accurate information to calculate dynamic thermal line capacities resulting in increased transfer capabilities. Provide a report 6 months after the completion of WSM Stage 2.

Expected Required FTE *[Further work needed]*

It is expected that to achieve the initial tasks outlined here, ColumbiaGrid will require at least two FTEs (who should be hired as soon possible). The people chosen to fill this position must be able have technical ability required to run, manipulate, and modify the required tools as well as the ability to make presentations to policy makers.

ColumbiaGrid will need to a person to interface with the WSM project, WECC staff, RC Managers, and participating entities to ensure ColumbiaGrid presence in the various activities described above. This "manager role" may not be full time on visibility, but will require a higher level of regional recognition to ensure ColumbiaGrid is taken seriously.

1st FTE - The modeling and data gathering associated with Stage 1 is a coordination effort with participating entities and unique technical skill set. There are ties to planning skills.

2nd FTE - In addition, the development of future hour assessment mechanism with other WECC participants requires the understanding of the tools, power system analysis, and large project negotiating skills.

3rd FTE – 40 hour/week tool operator to begin initial "monitoring" of participants' systems and support participants use of similar tools.