

**Balancing Authority/Transmission Operator  
Reliability Readiness Evaluation Report**

**Avista  
Spokane, Washington**

**June 18–21, 2007**

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## **Introduction and Evaluation Process**

The North American Electric Reliability Corporation (NERC) Reliability Readiness Evaluation and Improvement Program is one of the commitments of NERC and the industry to strengthen the reliability of the North American bulk power system. The program conducts independent evaluations of balancing authorities, transmission operators, reliability coordinators, and other key entities that support the reliable operation of the bulk power system to assess their preparedness to meet their assigned reliability responsibilities. The evaluations identify strengths and areas for improvement in an effort to promote excellence in operations among these organizations.

Since its inception in 2004, NERC and the industry have been working collaboratively to enhance the program. The evaluation process is based on fundamental aspects of reliability: culture, operations, maintenance, planning, and training. The document [\*NERC Readiness Evaluation Procedure\*](#) describes and defines the process used for reliability readiness evaluations. This document and other documents related to the program are available at <http://www.nerc.com/~rap/>.

The reliability readiness evaluation teams, each led by a NERC staff member and a regional co-leader, include industry volunteers with considerable expertise selected to provide representation from other interconnections, other regions, and neighboring operating entities. The teams also typically include representatives from the Federal Energy Regulatory Commission (FERC) staff.

The public version of the reliability readiness evaluation report contains the majority of the evaluation team's findings. Any discussion of findings pertaining to critical infrastructure will be contained in Appendix 1, a confidential appendix to the report that is sent privately to the evaluated entity and is not included in the public version of the report.

An evaluation team met on-site with Avista Corporation dba Avista Utilities (Avista) representatives on June 18–21, 2007. This report reflects the views and recommendations of the evaluation team regarding the readiness of the Avista to meet its responsibilities as a balancing authority and transmission operator.

## **Evaluation Team**

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Paul Rice*	WECC
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\*Team co-leader

## **Organization Profile**

Avista Utilities is a 1,250-employee operation headquartered in Spokane, Washington. The company serves as a transmission owner/operator and balancing authority providing energy to portions of Washington, Idaho, and Oregon. Encompassing 30,000 square miles, Avista's service territory includes approximately 325,000 electric customers and 300,000 natural gas customers.

Energy demands in the Avista footprint have included a winter peak of 2,132 MW and a summer peak of 2,014 MW. Avista owns 1,814 MW of generation. Guaranteed contracts account for the balance of capacity resources and ensure required operating reserves. Avista owns and operates 625 miles of 230 kV and 1,539 miles of 115 kV transmission lines, while having an 11 percent ownership of the Colstrip 500 kV transmission. Avista also operates over 17,500 miles of distribution line.

Avista operates 230 kV and 115 kV interconnections with the Bonneville Power Administration, Idaho Power Company, Northwestern Energy Montana, Grant County Public Utility District, Chelan County Public Utility District, and Pacificorp. Although Avista does not operate any WECC designated paths, it does have ownership in three paths, identified as West of Hatwai, Montana-Northwest, and Idaho-Northwest.

## **Executive Summary**

The evaluation team found no significant operational problems and concluded that Avista has adequate facilities, processes, plans, procedures, tools, and trained personnel to perform the balancing authority/transmission operator functions necessary to maintain the reliable operation of the bulk power system.

Throughout the readiness evaluation, the Avista employees interviewed displayed a culture committed to reliability. In each level of management, the team sensed that support for the system operators was given priority in decision making. This culture of engagement was exhibited by the management group and system operators.

During the evaluation, the team noted a potential example of excellence along with several positive observations. The Avista *Energy Emergency Power Curtailment Coordination and Communication Plan* stood out as a potential example of excellence for its comprehensive scope and completeness of actions to be taken under various emergency scenarios. Important positive observations, discussed at length later in this document, include the Voice Mailbox, the morning “square-table” discussions, and the localized load shedding screen.

In cooperation with Avista representatives, the team identified two key recommendations. These key recommendations encourage Avista to focus on identified items associated with the backup control center and the amount of detail in specific operations documents.

Overall, the evaluation team identified 10 positive observations and one potential example of excellence. In addition, the team offers nine recommendations that, if implemented, will enhance Avista’s readiness to operate reliably and maintain the reliability of the bulk power system.

## **Potential Examples of Excellence**

The evaluation team identified the following potential example of excellence in its reliability readiness evaluation:

1. Avista's *Energy Emergency Power Curtailment Coordination and Communication Plan* details multiple scenarios and defines responsibilities and duties to nearly all job classifications within the organization (Section 2.4).

## **Positive Observations**

The evaluation team noted the following positive observations during the reliability readiness evaluation process:

1. The Avista "Voice Mailbox" provides an excellent method of communicating operational issues especially in an environment built around rotating shifts (Section 1.2.5).
2. The Avista corporate culture is focused on safety and reliability (Section 1.1).
3. The morning square-table meeting, held in the operations control room, provides a forum to talk about current conditions and address any situational awareness needs (Section 1.2.5).
4. Avista has multiple frequency monitoring points to increase system awareness (Section 2.1).
5. Avista maintains a real-time reactive reserve — unit status overview screen to inform operators of the amount reactive reserves available (Section 2.1).
6. Avista has developed a real-time localized load shedding screen that shows load shed capability at each defined shed point (Section 2.4).
7. System operators are trained on current seasonal studies using PowerWorld Simulator (Section 5.1).
8. Both the energy management system (EMS) support personnel and the transmission engineer reside within the control center and report to system operations (Section 3.2.1).
9. All Avista's system operators, the chief system operator, and the trainer are NERC certified (Section 5.1).
10. Confidential information on the backup control center redacted from the public report. See discussion in Appendix 1.

## **Recommendations**

The evaluation team offers the following recommendations:

1. Confidential information on backup control center redacted from public report. See discussion in Appendix 1.\*
2. Confidential information on procedures redacted from public report. See discussion in Appendix 1.\*
3. Improve the operator training program (Section 5.1):
  - a. Document personnel training records;
  - b. Expedite, to the extent possible, the development of a comprehensive plan for initial and ongoing operator training;
  - c. Perform a training gap analysis;

- d. Include the trainer as part of the budgeting process;
- e. Provide the trainer with outside training opportunities.
- 4. Confidential information on physical security redacted from public report. See discussion Appendix 1.
- 5. Replace the handwritten logs with an electronic operations shift logbook to provide consistent, legible, and searchable records (Section 1.2.5).
- 6. Provide advanced tools training to the operators so they can perform real-time system studies when the operations planner is not on-site (Section 5.1).
- 7. Update the *Operator Letter of Authority* to remove any language other than explicit references of full authority to take action to eliminate the possibility of misinterpretation (Section 2.2.3).
- 8. Develop a plan to routinely update and track control room documents and procedures to ensure operators are provided with current information (Section 2.2.3).
- 9. Update all operating procedures and documents to reflect recent terminology changes in the industry (Section 2.2.3).

\*Jointly identified by the company and lead evaluator as a key recommendation

## **Discussion**

The reliability readiness evaluation team examined the following key areas during the evaluation. The detailed discussion that follows provides the foundation for the recommendations, positive observations, and potential examples of excellence that the team identified. The report uses the generic term “system operator” to refer to all on-shift operating personnel responsible for executing the functions necessary to operate reliably and maintain the reliable operation of the bulk power system. This term will be used for the discussions unless additional specificity is required, such as the *balancing* system operator, or *transmission* system operator.

### **1. Culture**

#### **1.1 General**

*The corporate organization provides the necessary leadership and management for system operations to sustain high levels of safe, reliable operation.*

Noted as a positive observation, Avista, in its entirety, displayed a corporate culture focused on safety and reliability. Whether the interviews focused on upper management, middle managers, system operators or support staff, the importance of both safety and reliability remained the same. Avista system operators stated that they have sufficient resources available to support safe, reliable system operations.

#### **1.2 Organizational Effectiveness**

##### **1.2.1 Foundation for System Reliability**

*The organization’s values and behaviors—modeled by its leaders and practiced by its members—serve to make system reliability a top priority.*

Avista system operators and first-line management displayed confidence that the organization is dedicated to continuous performance improvement, citing efforts made in the backup control center and the decision to keep the EMS and support staff as part of the operations group and located within the system operations control room.

##### **1.2.2 Leadership and Management**

*Managers, by leadership, commitment, and example, establish and reinforce high standards of performance and align the organization to achieve safe, reliable system operation.*

Avista encourages an open-door policy between its management staff and its system operators, and corporate-level management routinely visits the control center for informal discussions. These visits, which occur almost daily, are part of the morning “square-table” informal meetings held in the control room. The team believes this availability of upper-level management to the system operations personnel provides an excellent basis for the high level of engagement by Avista employees (cited in Section 1.2.5 as a positive observation).

### **1.2.3 Corporate Oversight and Monitoring**

*Line management is used to strengthen reliability and improve performance. System reliability is kept under constant scrutiny through techniques such as self-assessments, performance indicators, and periodic management meetings.*

The team was pleased with the knowledge, sharing of information, and overall commitment to continuous improvement in the daily oversight of the system operators and support staff. Daily square-table and quarterly operations meetings are examples of the desire to strengthen reliability.

### **1.2.4 Human Resources**

*Personnel resource needs are anticipated and individuals are systematically recruited, developed, and assigned positions in the system operations organization.*

Avista maintains a relief system operator position designated to fill any shift vacancy until the vacated operator position has been filled. In extreme cases, the trainer can and will fill the vacant position. The Human Resources department can conduct interviews within two weeks. Typically, positions are filled in-house.

### **1.2.5 Corporate Communications**

*System operations communications inform and engage both corporate and system operations employees so they can contribute to the strategic priorities of the organization.*

Avista's system operators expressed a high level of satisfaction with corporate communications that have an effect on their work. The evaluation team observed examples of corporate directives related to new initiatives and found the tone to be professional and respectful. As mentioned previously, the operations control center holds a daily (morning) informal information sharing session called the square-table tailboard. A majority of these "chat" times are attended by someone from corporate management. Information relevant to current-day operating conditions, system events requiring special attention, and some pending corporate strategies are discussed. The evaluation team considers this a positive observation.

Consistent with the square table tailboards, Avista utilizes an information sharing system called the "Voice Mailbox." Every employee has access to this system. Any important actions taken or information deemed necessary to share with other operators is put into their voice mailbox. Employees can access their information from home, and the operators stated they check for updates often, even during time off. That unique desire to stay informed was consistently echoed throughout the various interviews. The team cites the "Voice Mailbox" as a positive observation for the information it brings to the operations group.

In addition, all system operators meet quarterly to discuss operational issues; express concerns with technical information needed, and suggest updates for enhancing communications.

Currently, shift logs are handwritten and filed. The team recommends that Avista replace this method with an electronic process. An electronic operations log would provide consistent, legible, and searchable records.

## 2. Fundamentals of Operations

### 2.1 General

*Operations personnel monitor and control the system in a manner that ensures safe, reliable operation.*

Avista system operators have adequate communications mechanisms in place for both normal and emergency communications. Established communications protocols are in place for internal information exchange as well as for communications with neighboring systems and reliability coordinators. The control room tools and displays provide operators with adequate information to effectively operate the system. The Avista operators are confident that they have the necessary information and visual equipment to manage the footprint reliably.

The evaluation team met with representatives of the Avista marketing operations, which is located in the same building as the control room. The team feels comfortable that a proper degree of attention is paid to standards of conduct with regard to allowable discussions and topics. Avista reinforces standards of conduct with annual training.

Avista system operators have the ability to observe and monitor voltages across their system. For monitoring reactive reserves, the system operators utilize the Reactive Reserve — Unit Status Overview screen, which displays real-time available reactive resources throughout the footprint. This “zonal” reactive reserve display provides the operator with real-time knowledge of reactive reserves available for deployment. The evaluation team notes this as a positive observation. As a precautionary option, the system operators have the authority to contact the merchant side and have additional units placed on-line for reactive purposes.

Remedial action schemes and special protective relay schemes are visible to the operators. Supervisory control and data acquisition (SCADA) provides screen visibility indicating armed/unarmed status. Operators have the ability to monitor multiple frequency points to help determine the existence of any islanding conditions. The evaluation team considers this capability a positive observation.

### 2.2 Operational Focus

#### 2.2.1 Operational Safety

*System operation activities are conducted in a manner that maintains high levels of safety and reliability for all system conditions.*

Avista operators are well trained regarding safety and reliability. The operators exhibit an acceptable degree of alertness to system conditions; they are aware of the special protection scheme status and understand the operational characteristics and importance of the scheme.

#### 2.2.2 Operational Decision-Making

*Operational decisions are reached using a systematic and thorough approach that supports safe, reliable, and efficient system operations.*

Although Avista does not apply any formal decision-making training classes to its operators, some of the efforts discovered support a desire to use potential events to help prepare the thought process ahead of time. Considered a positive observation and discussed in more detail in section 5.1, we believe that using the current seasonal studies and developing the spring training scenarios in PowerWorld are part of a systematic approach to decision making.

### **2.2.3 Operational Alignment**

*Organizational structure supports safe and reliable system operation.*

Upon review of the Avista documentation, necessary agreements are in place with the neighboring entities and the reliability entities to perform all operations of a balancing authority/transmission operator.

Outage coordination and communications are handled between the operations planner and the Northwest Power Pool (NWPP). Neighboring entities are part of a regional coordinated outage process. Outages are required to be posted as least 45 days in advance. NWPP oversees the process and a second check is built in for communications.

The evaluation team reviewed the wording of the Avista *Operator Letter of Authority*. The team agrees that the operator is granted full authority to take whatever action is required to ensure system reliability, including manual load shedding, but has concerns about some wording in the document. Some sentences may be open to interpretation; therefore, the team recommends that Avista update the *Operator Letter of Authority* to remove verbiage other than explicit references of full authority to take action. The team is confident that the operators understand their authority and will act accordingly.

Throughout much of the industry, control room documents and procedures are commonly left untouched unless utilized in an actual event. At Avista the team discovered several instances where this was the case. The team recommends that Avista develop a plan to ensure routine updates are performed and recorded with respect to control room documents and procedures.

The team also recommends that Avista update the language and terminology of the operating procedures and documents to reflect recent changes in industry structure. This effort will help to better align the current and future processes with industry-wide initiatives.

## **2.3 Managing System Configuration**

*Power system configuration is carefully designed, analyzed, maintained, and controlled throughout the life of the infrastructure, ensuring that system and equipment margins are understood, considered in decision-making, and managed consistent with design and system requirements.*

Avista utilizes Areva dual-redundant master servers that handle SCADA, automatic generation control and calculations, and alarming. The front ends are dual redundant and responsible for telemetry. Avista uses dual-redundant intercontrol center communications protocol, or ICCP, data link computers, and networking is handled through a dual-switched CISCO router. Avista installed additional firewalls with an intrusion detection system for cyber security concerns — all

network traffic within the EMS network is monitored. The last full system upgrade was in 2004, and some software upgrades are planned for the end of 2007. Areva provides service to the contract, and equipment reliability has been 99.85 percent.

Avista uses PowerWorld Simulator as the power system model analysis tool. No real-time simulator representing the Avista system is currently planned. Avista does not have a state estimator program but instead relies on Pacific Northwest Security Coordinator to perform the analysis if necessary.

Avista uses TELCO microwave, radio, and fiber. Communication to the backup control center is by fiber. Data at the backup site are updated at the scan rate of the primary system. If the main source is lost, the last available data scan will remain available to the operator.

Avista does not experience a great deal of system congestion. Issues are dealt with jointly between the system operator, adjacent path operators, and the reliability coordinator.

Load and generation balance is handled by the EMS, and sufficient ramping capability is provided to meet required projected load changes.

## **2.4 Emergency Preparedness**

*The organization is prepared to manage and mitigate the impact of system emergencies in order to preserve the reliability of the system and to protect the interests of the public.*

Emergency preparedness is critical for ensuring proper response when events occur. Avista system operators have the authority to perform all activities needed to support reliability up to and including the shedding of firm load. A real-time localized load shedding screen displays the current load shed capability at each defined load shed point. This tool provides the system operator an option to designate a localized load shed to resolve issues, which the team cites as a positive observation.

The evaluation team reviewed Avista's *Energy Emergency Power Curtailment Coordination and Communications Plan*, and recognizes it as a potential example of excellence. The all-encompassing emergency plan details multiple scenarios, including capacity and energy emergencies. Employee responses and duties for those scenarios are well defined — responsibilities and duties are assigned to nearly all job classifications in the organization and not just to the system operations group, which is unique compared to what team members have previously seen. The user-friendly plan is used by all levels of the organization, and implementation is dependent upon the type of emergency. Decision makers for each category of emergency are identified in the opening section "Procedural Steps." Locating "your duties" for any of the potential emergencies is simple. The plan is reviewed and updated annually.

Avista utilizes the plan in conjunction with the Northwest Power Pool *Energy Emergency Plan* to address regional energy emergencies. The integrated plan contains the following distinct but coordinated activities and responsibilities:

- system operations integrity

- key contact lists
- area manager responsibilities
- maximizing generation output
- removal of generation constraints
- fuel switching plan
- cogenerator/independent power produces appeals
- state tariffs
- outages
- special contracts (curtailments)
- NERC Emergency Energy Alerts
- state curtailment plans
- load curtailment
- corporate communications plan
- customer contact center plan

The Avista *Transmission Operations Restoration Guidelines* document, dated July 2006, includes a blackstart plan required of all NWPP members. During an actual restoration event, the Pacific Northwest Security Coordinator (PNSC) is responsible for directing system restoration activities as documented in the NWPP System Restoration Program.

Avista system operations utilize a contingency reserve screen that displays contingency reserve obligation, current spin and non-spin obligations, and the most severe single contingency. The system automatically sends the information to the PNSC. The screen also shows what spin was bought or sold (interruptible import) and totals the information in a field called “What is our excess.”

### **3. Fundamentals of Maintenance**

#### **3.1 General**

*Maintenance is conducted by skilled personnel to achieve safe, reliable control center equipment and system performance.*

Internal staff performs maintenance activities related to the control center and communication system equipment. Staff personnel responsible for providing continuous support for EMS and SCADA equipment are located within the control center itself. Support personnel are available 24 hours a day, 7 days a week, and may be called by system operations personnel or alerted automatically if a need occurs.

An EMS display provides the system operators with a listing of on-call support personnel and details how support personnel can be contacted if needed.

## **3.2 Equipment Reliability**

### **3.2.1 Equipment Performance**

*The organization achieves high levels of equipment reliability. Equipment problems that impact reliability are resolved in a thorough and timely manner.*

Avista EMS reliability is nearly 100 percent. EMS support personnel and the transmission engineer reside within the control room itself and report directly to system operations. This close proximity and availability to the system operators is noted as a positive observation by the team.

### **3.2.2 Work Management**

*Work activities, including corrective, elective, and preventive maintenance, surveillance testing, and modifications, are managed effectively to support safe, reliable operation during both outage and routine periods.*

Avista does not have real-time contingency analysis (RTCA). Power-flow studies are performed using PowerWorld Simulator, and in the event that RTCA were required it would be done by the Pacific Northwest Security Coordinator.

## **4. Fundamentals of Operational Planning**

*Operational planning provides the technical information and support necessary for safe, reliable system operation.*

Planning activities for Avista are performed by internal staff and coordinated as necessary with neighboring systems and reliability coordinators. The operations planner resides within the control room and supports current-day events, next-day studies, and short-range outage oversight.

Avista monitors real-time SCADA well into the Bonneville Power Administration system. Avista performs seasonal studies per the WECC Operating Transfer Capability process. Summer studies are performed for three time frames — early, middle, and late summer — and take into account projected hydro capacity. Somewhat uncommon, but applicable to the Avista system, is the reversing of transmission flows depending on hydro capacity.

## **5. Fundamentals of Training**

### **5.1 General**

*Training in both specific job-related skills and broader technical fundamentals is used to provide highly skilled, knowledgeable personnel for safe, reliable operations, and to achieve performance improvement.*

Control center operations training is a key to maintaining highly skilled personal responsible for system operating requirements. The Avista training program defines the necessary plan for new hires (initial) and seasoned qualified operators (ongoing). Initial training consists of six weeks reliability desk fundamentals. Online training is scheduled to help the trainee pass the NERC

operator certification testing. Once the operator is NERC certified, he or she begins on-the-job training with a seasoned operator and continues until the experienced operators reach a consensus that he or she is ready to operate independently. On occasion, a non-NERC certified operator may work the desk, but is supervised at all times by a NERC certified operator. There is no documented record of training completed by the operator or test results.

Ongoing training is not readily defined. The 32 hours of emergency training is mostly completed through in-house simulator training with the PowerWorld powerflow program (16 hours) and through a vendor, using online courses and simulation. Some training opportunities exist at PNSC; Avista sends two to four operators annually to the PNSC training. Future training plans include a partnership with Gonzaga University to develop a simulator training program and computer-based training to supplement in-house efforts. Avista plans to perform a job task analysis and implement a continuing education hour tracking program to supplement its current training program.

Avista system operators do not utilize any advanced tools to perform their own studies in real time; however, the PNSC will run real-time estimates upon request. The team believes that each operator should understand how to perform system studies when the operations planner is not on-site and recommends that Avista provide advanced applications training to the system operators.

The entire system operator training program could be improved. The team recommends that Avista implement a systematic approach to training supported by applicable documentation:

- Document personnel training records;
- Expedite, to the extent possible, the development of a comprehensive plan for initial and ongoing operator training;
- Perform a training gap analysis;
- Include the trainer as part of the budgeting process;
- Provide the trainer with outside training opportunities.

All system operators, the chief system operator, and the trainer are NERC certified. The team notes this broad certification as a positive observation.

Also identified as a positive observation is the decision to utilize the most recent seasonal study, develop scenarios in PowerWorld Simulator, and have the operators operate in a simulation environment to those scenarios. Operators interviewed expressed that this training has been valuable in helping them to prepare for the most likely system emergency events by providing probable solutions for mitigation of the events.

## **5.2 Organizational Effectiveness**

### **5.2.1 Human Performance**

*Personnel select and apply appropriate human error prevention techniques commensurate with the importance of assigned tasks to minimize the frequency and consequences of events.*

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Although no specific human error prevention technique training is provided, several indicators represent Avista operations' desire to ensure an error-free operating environment. Examples of this include the three-person review of switching orders, the power flow simulation exercises using the most recent seasonal studies, the use of the Voice Mailbox for relaying information to all operators, and the morning square-table tailboard. Avista displays a desire to continually improve wherever it can.

## **APPENDIX 1: Critical Infrastructure**

The following discussion will be presented under private letter to the evaluated entity only and will not be included within the public version of the report.

## **APPENDIX 2: Entity Participants**

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### **APPENDIX 3: Documents Reviewed**

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