NERC

NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

# Reliability Readiness Evaluation Report

## Transmission Operator

## Constellation Energy Control and Dispatch

## Houston, Texas

to ensure the reliability of the bulk power system

**October 8–11, 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 Constellation Energy Control and Dispatch (CECD) representatives on October 8–10, 2007. This report reflects the views and recommendations of the evaluation team regarding the readiness of the CECD to meet its responsibilities as a balancing authority.

# Evaluation Team

| | |
|---|---|
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| Richard Spyker | Altalink Management, Ltd. |
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# Organization Profile

Constellation Energy Control and Dispatch (CECD), formerly Duke Energy Control Area, LLC (DECA), is an energy service provider for the 10 balancing authorities listed in Table 1. CECD is a part of Constellation Energy, which owns several subsidiaries, including a large traditional electric utility, energy supply companies (generation), and Constellation Energy Commodities Group. CECD leverages the services and expertise from the Constellation organization to supplement its operation as appropriate. This report uses the acronym CECD to refer to the specific Constellation Energy Control and Dispatch operations and the term Constellation to refer to other company departments.

Constellation acquired DECA from Duke Energy in February 2005, which involved moving and upgrading the operation at the current control center in July 2005. The previous readiness audit on record was of DECA. While CECD is the successor organization to DECA and the services provided are similar in scope, customer base, organizational, and location changes have changed the operation.

Constellation Energy Commodities Group has a contract with each of the load balancing authorities to obtain energy for them and interfaces closely with CECD on a daily basis. The generation-only balancing authorities market their energy using marketers other than Constellation. Each CECD customer is individually registered with one of the NERC regional reliability organizations and NERC as a balancing authority. CECD has been delegated responsibility in accordance with their individual the services agreements for meeting the requirements of most balancing authority functions for these customers, and this readiness evaluation reflects the review of all 10 balancing authorities through the evaluation of CECD balancing authority services. Table 1 lists each of the balancing authority customers with its NERC acronym, load, generation, transmission provider, number of interconnection points, and reliability coordinator.

CECD oversees 6,714 MW of generation located in 7 of the 10 balancing authorities. Five of the customers are generation-only balancing authorities with no load. (All generators in the generation-only balancing authorities are natural-gas combined-cycle units that cycle off at least 95 percent of the time during off-peak hours). Three of the customers are balancing authorities with load and generation on their distribution systems. Two of the balancing authorities have both load and generation. Each of the customers has an interconnection agreement with its transmission operator, and most customers are connected to only a single transmission operator. The customers maintain their individual interconnection agreements with the transmission provider and they are responsible for distribution-level operations, including operation of underfrequency load shedding and voltage support. The balancing authorities do not own or operate any transmission facilities other than a step-up transformer that leads to the transmission operator substation in some of the balancing authorities.

## Table 1: CECD balancing authorities

| Balancing authority | Peak load (MW) | Generation (MW) | Transmission provider | Ties | Reliability coordinator |
|---|---|---|---|---|---|
| Western Interconnection | | | | | |
| Dynegy Arlington Valley (DEAA) | - | 580 | SRP | 1 | RDRC |
| Gila River Power (GRMA) | - | 2140 | APS | 3 | RDRC |
| New Harquahala Generating Company (HGMA) | - | 1278 | SRP | 1 | RDRC |
| Eastern Interconnection | | | | | |
| City of Benton, AK (BUBA) | 70 | - | EES | 4 | SPP |
| City of Conway, AK (CNWY) | 207 | - | EES | 7 | SPP |
| City of North Little Rock, AK (DENL) | 266 | 40 | EES | 13 | SPP |
| City of Ruston, LA (DERS) | 75 | 78 | EES | 1 | SPP |
| City of West Memphis, AK (WMUC) | 94 | - | EES | 5 | SPP |
| Batesville Balancing Authority (BBA) | - | 558 | EES/TVA | 3 | SPP |
| Union Power Partners (PUPP) | - | 2040 | EES | 2 | SPP |

SRP = Salt River Project
APS = Arizona Public Service Company
EES = Entergy
TVA = Tennessee Valley Authority
RDRC = Rocky Mountain Desert Southwest Reliability Coordinator
SPP = Southwest Power Pool

# Executive Summary

The evaluation team found no significant operational problems and concluded that the balancing authorities serviced by CECD — through CECD processes plans, procedures, tools and personnel — have adequate facilities, processes, plans, procedures, tools, and trained personnel to perform the balancing authority functions necessary to maintain the reliable operation of the bulk power system.

CECD continuously improves its processes to increase reliability on behalf of the balancing authority customers it services. For example, CECD is working with the host transmission providers for a group of balancing authorities to provide access to remote generation resources via dynamic transfers. CECD, as part of its service, is improving its backup computer systems and processes. Management listens to system operators and encourages them to provide ideas to improve operations. The operators know they have a stake in the reliable operation of the 10 balancing authorities. CECD employees from the vice president to the operators and the support staff believe that the CECD reputation as a service provider depends on successfully maintaining reliable services for, and in coordination with, customers. This attitude fosters a culture of reliability and encourages ongoing improvement in reliability services.

The CECD backup control center and associated disaster recovery plans are a potential example of excellence. CECD has its primary and backup control systems set up to interface with the operator computer profiles so that the operators can log onto the system from any location, with a secure virtual private network (VPN) connection on assigned operator laptops or a remote desktop, applying appropriate user authentication protocols. This unmatched flexibility allows for extremely thorough disaster recovery plans that cover all conceivable scenarios, including organizational assistance for meeting personal and family requirements of operators.

While the scope of CECD registered entity services are currently limited to the balancing authority functions, the operation of 10 balancing authorities simultaneously adds some unique intricacies that require creative solutions and tools. CECD uses an up-to-date energy management system (EMS), which has been customize to handle multiple balancing authority customers and is effective in alerting operators to circumstances requiring attention. Ten balancing authority areas, some of which contain large merchant plants, can generate a significant volume of schedules each hour. CECD has developed software applications interfacing with its EMS and tagging systems so that extensive scheduling changes can be routinely implemented. CECD meets it obligations with its own internal qualified staff, but they also leverage the personnel and assets of Constellation where appropriate.

CECD is implementing plans to meet its frequency support obligations for balancing authorities that have no internal generation on automatic generation control or that are seeking to ensure adequate levels of regulation are established. This is made more difficult by complex requirements, including requirements to secure network transmission service to provide regulation support. Additional improvements such as a more formal training on interconnected systems, such as diagrams to aid in visualizing a wider area would enhance the operators' ability to recognize broader system-wide events. The evaluation team and CECD agree that these are key recommendations to implement.

Overall, the evaluation team identified 11 positive observations and one potential example of excellence. In addition, the team offers 11 recommendations that, if implemented, will enhance CECD's readiness to operate reliably and maintain the reliability of the bulk power system. The recommendations are listed in order of importance.

# Potential Examples of Excellence

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

1. CECD's robust and flexible backup and disaster recovery plans for balancing authority services have multiple options for interim and long-term operations, which include plans to meet personal and family requirements for operators due to temporary relocation. See further discussion in Appendix 1.

## Positive Observations

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

1. CECD has an open culture that encourages communications and operator engagement for identifying and helping resolve operating issues (Section 1.2.5).
2. CECD utilizes tools and technology to integrate information between various applications (Section 2.3).
3. CECD leverages corporate assets and expertise to support CECD operations (Section 1.2.1, 3.1, 9, and 10).
4. Confidential information on the communications system redacted from public report. See discussion in Appendix 1.
5. The daily "tailboard" and quarterly "all hands" meetings include management, operators, and support staff to encourage and enhance open communication (Section 1.2.5).
6. CECD has comprehensive operating procedures (Section 2.2.2).
7. CECD utilizes a standard vendor program to enhance communication and data sharing between staff (Section 2.2.3).
8. Confidential information on disaster recovery plan redacted from public report. See discussion in Appendix 1.
9. Confidential information on communications redacted from public report. See discussion in Appendix 1.
10. CECD does not provide a marketing function, which gives CECD the freedom to organize its operations to meet the customer's reliability requirements (Section 1.2.1).
11. Operators can quickly access documents using CECD's electronic document system (Section 2.2.2).

## Recommendations

The evaluation team offers the following recommendations:

1. Obtain controllable generation for each load balancing area to provide load control, frequency support, and reserve support (Section 2.1).*
2. Form a training committee to develop an annual training program that includes goals, objectives, and training subject matter designed to meet organizational needs (Section 5.1).*
3. Measure initial and continuing training programs against a "systematic approach to training" model to ensure that the training program is meeting its objectives (Section 5.1).*

4. Provide system displays showing the location of the balancing authorities on the transmission system to give the operators a wide-area view and help them analyze system conditions (Section 2.3).*
5. Provide training on transmission system operations that includes the particular interconnection characteristics for the CECD balancing authorities to help operators understand the effect of system conditions on the balancing authorities (Section 5.1).
6. Confidential information on disaster recovery plans redacted from public report. See discussion in Appendix 1.
7. Change documentation tracking to verify that operators have reviewed new documentation and updates (Section 2.2.3).
8. Post a red-line version of updated documents to make it easier for operators and other support personnel to review changes in the procedures (Section 2.2.3).
9. Modify the existing letter of authority to include shedding of firm load to help make operator authority explicitly clear to the operators and those with whom they interface (Section 2.2.3).
10. Protect training records so that only the supervisor can approve the final record in order to protect the integrity of the official records (Section 5.1).
11. Add voltage indications to EMS substation one-lines so operators can confirm the conditions resulting in voltage requests by the reliability coordinator, transmission operator, or balancing authority operators (Section 2.1).

*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 example 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.*

Reliability performance goals are included for both management and operator personnel. Management establishes performance goals for each operator, and operator performance is measured against NERC's control performance standards and disturbance control standard. Operators also have input into goals that are established for both individual performance and CECD's objectives. Finally, because reliability objectives are central for both operating personnel and their management, management is involved in daily operations and closely monitors operational performance.

CECD is active in regional organizations and NERC. CECD management personnel participate formally in the NERC Operating Committee, SERC Operating Committee, the SPP Operating Reliability Working Group, reserve sharing group committees, SERC Compliance Advisory Group, SERC Board Compliance Committee, the SERC Data Collection Task Force, and various WECC groups.

## 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.*

CECD's primary focus is on maintaining reliable operations that meet the obligations of each balancing authority customer. Due to its separation from Constellation Energy's marketing groups, CECD has no marketing function or involvement with energy pricing. CECD is a separate business unit on a separate floor and in a restricted office space isolated from the rest of the company. Balancing authority operations are the only registered entity function performed by CECD, and CECD puts its entire focus on those operations.

CECD has its own support personnel for operations and the EMS; in addition, CECD leverages Constellation's extensive corporate expertise and support capabilities, which allows CECD to maintain a level of support provided by a larger enterprise. The evaluation team was impressed by the cooperation between CECD and other departments at Constellation. Examples of this cooperation include a Constellation Network Operations Center employed to monitor balancing authority systems and correct problems that arise, the Constellation Security Operations Center monitoring the security of the CECD control center and assisting in any disaster recovery relocation, and the marketing group supplying energy to the load balancing authorities. The personnel at the Security and Network Operation Centers demonstrated their support capabilities during the team visit to the Baltimore area for evaluation of the backup control center operation. CECD invited Constellation compliance representatives to observe the readiness evaluation process, and these personnel accepted. The evaluation team commends CECD and Constellation for fostering the organizational support and cooperation that focuses on reliability.

This focus on reliability is evident in the corporate mission statement as well, which states that Constellation's mission is "delivering power and natural gas safely and reliably to our customer." The evaluation team found that CECD demonstrates this initiative on behalf of its customers by performing to high standards, including previously described reliability goals for individuals that are part of the annual performance evaluations.

### 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.*

CECD management demonstrates its commitment to reliability by focusing solely on reliability and committing significant resources to reliable operations in performing balancing authority services. Reliability is included in both CECD and individual goals. For example, the CECD business unit's performance is graded on whether balancing authority NERC requirements are met.

Goals, objectives, policies, and standards are clearly communicated and reinforced throughout the system operations organization. Management includes operators in its routine meetings and communicates the company vision and goals to them. Management listens to operator concerns and ideas about reliable operation. This open communication with operators and action on operator issues result in the operators' respect and trust of management. This trust and respect was witnessed by the evaluation team during discussion with the operators.

As a balancing authority service provider, CECD diligently follows the applicable NERC and regional compliance standards. It has established a position to monitor compliance and takes action when it believes that performance may be less than desired or required.

### 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 CECD organization has effective processes to maintain awareness of reliability issues. The CECD staff has a daily meeting that includes management, the operators, and support staff where items to strengthen and improve reliability are discussed in addition to current system conditions. CECD's operation is in a separate location from the rest of Constellation, but CECD management participates in teleconferences and visits with the next level of management about every six weeks. The next level of management visits the CECD control center at least quarterly and these visits include discussions with the individual operators.

The physical layout of the control center puts management, supervision, and staff offices around the operating floor. This layout provides an environment for CECD staff to conduct open communications and for management to closely monitor operator performance. CECD has established clear lines of authority that are understood by the operators. The open communication results in common goals and expectations.

CECD does not use benchmarking to any great extent to measure its performance against other balancing authority operators. CECD maintains awareness of balancing authority customer needs and strives to meet those needs to remain the supplier of choice. The customers often suggest ways to better meet their needs. CECD rewards exemplary actions and has used discipline for unacceptable performance, including time off for serious infractions.

### 1.2.4 Human Resources

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

Constellation's human resources department, which has an office in the same office building as CECD, helps CECD in initial screening of applicants. The operators provided feedback that changes in the human resources department have helped fill recent vacant operator positions more quickly than in the past. CECD has a succession plan for its supervisory and management employees but not the system operators. The succession plan is reviewed annually.

CECD tries to carefully match employee skills with job requirements. Candidates for open positions are carefully reviewed to ensure they meet the qualifications. If CECD finds a qualified candidate, the position may be modified to fit the person. CECD believes this scrutiny and flexibility results in a competent and highly motivated staff.

### 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.*

CECD uses many forums to facilitate effective communications. The staff meets at 7:30 a.m. each day in what is called the daily "tailboard" to review impacts on operations and provide an opportunity for management, operations, and support staff to communicate. CECD also holds a quarterly meeting out of the office with the entire staff, including off-duty operators. The on-duty operators teleconference into the meeting. This meeting provides an opportunity to review longer-range goals and recognize superior individual performance. Senior management sometimes attends the quarterly meetings and talks informally with the operators, support staff,

and CECD management. The evaluation team commends CECD for conducting these daily and quarterly meetings that include the operators and support staff.

CECD has an open-door policy with some of the management actually working in an open area adjacent to the operators. Both operators and management believe that communication between the groups is open and spontaneous when appropriate. The evaluation team commends CECD for fostering open communications between its employees.

CECD employees receive all of the Constellation communication material such as newsletters, company newspapers, and other employee material. This practice makes CECD staff feel part of the organization and communicates company vision and safety information.

# 2. Fundamentals of Operations

## 2.1 General

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

CECD's EMS has current software updates and new hardware. The EMS monitors all functions necessary for CECD to perform its balancing area service obligations.

The balancing authorities are registered entities, and these customers have delegated certain requirements to CECD through a balancing authority services agreement. The balancing authorities also have interconnection agreements with their transmission operators, and those agreements contain voltage support and reactive reserve requirements. Those responsibilities remain with the individual balancing authorities and have not been delegated to CECD. Although communications from the transmission operators go through CECD to the balancing authorities, CECD does not have voltage or reactive requirements. CECD receives voltage information from the balancing authorities but does not display it on the substation one-line diagrams on the EMS. The evaluation team recommends that CECD add voltage information to one-line diagrams to aid the operators in understanding system conditions and voltage support requests they may receive from the reliability coordinators or the transmission operators.

CECD monitors and measures frequency at each balancing authority. If the primary frequency device at any of the balancing authorities fails, the frequency measurement will automatically fail over to one of the other frequency meters from an alternate balancing authority in the proper interconnection. As previously described, not all balancing authorities control generation in a manner to provide adequate frequency support; however, none of the balancing authorities serviced by CECD have failed NERC control performance requirements. CECD has worked with the balancing authorities, transmission provider, and appropriate regional representatives to establish plans to mitigate this issue. The evaluation team recommends that CECD expedite plans for obtaining controllable generation for each load balancing area to provide load control, frequency, and reserve support.

CECD also monitors, maintains, and deploys real power reserves in two reserve sharing groups, one in the Eastern Interconnection and one in the Western Interconnection in accordance with the

customer agreements. Some of the necessary reserves are purchased by customers from other generation providers and then properly deployed when required.

CECD has an alarm system with multiple levels of alarming. The alarm system is monitored by the Network Operation Center, which sends test data to the alarm system to verify that the alarm system is operating properly. The Network Operations Center will pursue corrective action if necessary. The alarm system is monitored independently from the EMS alarm functions. The EMS alarm system is a standard vendor system that will adequately handle the number of alarms for systems much larger than CECD.

## 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.*

The transmission operators handle all switching; including any switching necessary to protect the public safety, and CECD is not responsible for directing or performing any switching operations. CECD participates in the Constellation safety programs.

CECD balancing authority customers do not own or operate any remedial action schemes, but CECD works with facilities that will be separated from the interconnection under predetermined conditions to ensure adequate transmission capacity for a nuclear power plant. The transmission operator operates this remedial action scheme. The CECD operators are familiar with this plan and know when it is armed.

### 2.2.2 Operational Decision-Making

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

The system operators understand their roles and responsibilities in making operational decisions and implementing actions. CECD's operating procedures are clear and complete. The operators have electronic access to the procedures and were able to provide them quickly when the evaluation team requested procedures for specific subjects. The evaluation team commends CECD for its comprehensive operating procedures and use of an electronic format that provides operators with quick access.

The agreements with the balancing authorities clearly define balancing authority and CECD responsibilities. The evaluation team believes that this clear documentation helps the system operators and the balancing authority personnel clearly understand each other's roles and responsibilities. Sometimes, the transmission operators call the balancing authority owner operators directly rather than the CECD operators. The balancing authority owner operators immediately called CECD, and CECD resolved the line of communication issue with the transmission operators.

### 2.2.3 Operational Alignment

*Organizational structure supports safe and reliable system operation.*

CECD has a balancing authority services agreement with each of the 10 balancing authority owners for which it provides services. The contracts clearly define the responsibilities for each company and give CECD the authority to perform its responsibilities. CECD also has an operating agreement with the transmission operators for each of the 10 balancing authorities. The operating agreements detail the day-to-day operating practices between CECD and the transmission operator control centers. According to the agreements, voltage and reactive power support requests are normally routed through CECD but can go directly to the generating plant in an emergency or if communications with CECD are lost. Switching operations and equipment clearance tagging are conducted between the transmission operator and the balancing area operator. Some of the operating agreements are between the transmission provider and the predecessor company to CECD; but the team did not find this to be an issue, since the agreements were transferable to successor companies.

Each of the 10 balancing authorities has an interconnection agreement with its respective transmission operator. These are typical interconnection agreements as defined by transmission tariffs and cover interconnection facilities, operation of the interconnection facilities, NERC and regional standards, voltage and reactive power support, and protective relaying. The transmission operator is generally responsible for operating the interconnection facility equipment.

CECD operates under the reliability coordination of the Southwest Power Pool reliability coordinator in the Eastern Interconnection and Rocky Mountain Desert Southwest in the West. The CECD operators respect the authority of the reliability coordinators and will follow any directives issued.

CECD coordinates outages through the reliability coordinator procedures. When one of the balancing authorities schedules an outage, it informs CECD. CECD enters the outage into the reliability coordinator outage scheduling program in accordance with the reliability procedure and notification time requirements. Neither CECD nor the balancing authority owner evaluates the effects that the outage will have on the electrical system. The transmission owner and reliability coordinator complete any necessary studies. The outages are approved unless the transmission operator or reliability coordinator finds an issue and rejects the request. The automatic voltage regulators and power system stabilizers are included in reported outages.

Each operator and the company officer have signed an individual authority statement, and the operator's authority is defined in operator job description. The individual statement does not include language stating that the operator has authority to take all necessary action up to and including the shedding of firm load. The evaluation team recommends revising the operator authority letter to provide the operator with explicit authority to take any action necessary to ensure reliability.

While CECD does not have a documented shift-change procedure, it does have a shift-change checklist that the evaluation team found effective in communicating system information to the next shift.

CECD uses a commercial software product for tracking document changes, notifying the operators by e-mail of any changes, and tracking operator review of the document. CECD uses this system for tracking the document update process to ensure that all documents are updated annually, and revision history is maintained on this system. The operators are required to read the changes and then respond that they have read and understood the changes. Management is automatically notified if the review is not completed by the established time. According to data in the tracking system, several documents did not receive a timely review by all the operators. When asked for further explanation of the status of review, the evaluation team could not obtain verification that all operators had reviewed specific documents. The evaluation team believes this is a tracking issue and recommends that CECD change the process to better track the review of new or changed documentation. In addition, the operators receive clean copies of revised documents to review with the revision history available. The evaluation team believes that many document changes may involve minor changes and recommends that CECD provide a red-line document so that operators and other staff can quickly identify the changes.

The operators use this same system for accessing documents. The system is equipped with robust search capabilities and a document index to allow operators to quickly find needed information and retrieve documents. Operators can also use the system to inform management, other operators, and the support staff of any issues that need tracking. The evaluation team commends CECD for its innovative use of this standard software product to enhance communication and data sharing.

## 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.*

CECD has the necessary tools to perform its balancing authority service obligations. Its EMS is an up-to-date system provided by an industry vendor. The EMS does not have advanced applications such as a state estimator or a real-time contingency analysis because these tools are not needed for these balancing authority operations. The EMS has automatic generation control, calculates area control error (ACE), tracks schedules and net interchange, and uses interchange frequency to calculate the frequency component of the ACE calculation. The operators monitor generation, net interchange, and ACE and take corrective action when these parameters are outside of established acceptable bounds. CECD has trending software that can track all points collected for the EMS. The operators also monitor available reserves and the reserve sharing group systems. CECD also has an interchange scheduling system, tagging software, a trending application, weather information, WECCnet, and reliability coordinator messaging systems for both of its reliability coordinators.

CECD staff developed EMS displays to aid the operators. The system status page provides a generator overview and the load, if applicable, for each balancing authority. The EMS also monitors the control performance standard measurements and provides the operators with a display to aid the operators in maintaining proper load and generation balance. The EMS has a one-line diagram for each substation should the CECD operator desire to drill into station specifics. CECD makes extensive use of the historical data software capability to trend specific points and has created a series of trends that are available upon command.

CECD monitors 10 balancing authority areas. Some of these are generation-only balancing authorities for merchant generation, with two of the balancing authorities having over 2,000 MW of generation. CECD can have over 200 concurrent schedules from these balancing authorities. CECD has developed software to interface between the tagging system and the EMS to manage these schedules and potential curtailments. The marketing group develops a load forecast each day for the next five days for each balancing authority. These data are automatically transferred to CECD through a shared network application, where the system operators review for final approval. The evaluation team commends CECD for automating data sharing between applications to help the system operators provide timely management of CECD operations to maintain reliability.

CECD does not have or operate any transmission facilities. It has developed an evaluation process and determined that none of the distribution systems or generation facilities is critical facilities to the interconnection. The reliability coordinators have not indicated that any of the facilities CECD monitors are critical facilities.

While the CECD operators do not have direct responsibility for monitoring system conditions outside of the balancing authorities, the team finds that a transmission map of the area around each balancing authority would be useful in helping the CECD system operators understand current conditions. The evaluation team recommends that CECD provide transmission system overviews showing the location of the balancing authorities to give the operators a wide-area view to help them analyze system conditions.

## 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.*

CECD has complete documentation of its balancing authority emergency plans. The plans are all updated annually, and the evaluation team found that all documents were current. The operators are familiar with the capacity and energy plans. The plans address all applicable steps to respond to a capacity emergency. CECD does not have direct control over the distribution system to implement manual load shedding. This is the responsibility of the balancing authority owner. Each balancing authority has an around-the-clock operation, but two balancing authorities would call out switchmen to operate breakers required for the manual load shedding. The transmission provider can open breakers to achieve the load shedding if time does not allow for the call out and manual opening of the breakers.

Each of the balancing authorities with load has automatic underfrequency load shedding plans. The evaluation team reviewed the interrupted load to the feeder level for each balancing authority and verified that each met its respective regional requirements. The generation-only balancing authorities have no load and therefore no underfrequency load shedding.

CECD also has restoration plans. Since the balancing authorities do not own or control any transmission and do not have any blackstart units, CECD's primary function is to communicate with appropriate entities when power is restored to a balancing authority, which allows for distribution restoration or generator start-up. The operators participate in all WECC, SERC, and SPP restoration drills.

CECD does not service any balancing authorities that have any nuclear plants and is not responsible for maintaining voltage or providing emergency power for any nuclear plant.

# 3. Fundamentals of Maintenance

## 3.1 General

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

CECD does not own or operate any transmission equipment. It is not responsible for relay or remedial action schemes maintenance or operations, so it does not keep a relay misoperation log. CECD does not have, nor is it required by the regions to have, any disturbance monitoring equipment.

CECD-supported generation does not generally supply long-term firm power; however, CECD operators are aware of system conditions through the reliability coordinator and would suspend any procedures that might impact the availability of generation during critical periods. This is not part of a documented procedure.

CECD has a talented local information system staff that supports and maintains the EMS applications, hardware, and network. This local staff leverages corporate support staff when necessary to provide excellent overall system support.

## 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.*

Redundant computer and communications systems are highly available and meet the system operator reliability requirements. The operators could not cite any recent problem with the system that impacted their ability to complete any aspect of their job.

### 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.*

Enhancements or problem resolution with the EMS or communications systems are monitored and reported through a commercial tracking software package designed for computer systems. The tracking system is effective, and the change process is discussed in Section 9.

## 4. Fundamentals of Operational Planning

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

CECD only provides planning services related to the generation and load with the balancing authorities they service. The balancing authority customers with load provide a 10-year load forecast that CECD reviews and reports to the regional planning authorities. The Constellation Energy Commodities Group has the energy supply contract for each of these balancing authorities and provides a five-day load forecast every weekday to CECD for each city. Forecasts are passed through to the reliability coordinators and transmission operators for the current- and next-day planning. CECD reviews forecasts with the Constellation Energy Commodities Group, with CECD having the authority to provide appropriate modifications and accept the forecast.

In the Eastern Interconnection, on behalf of balancing authorities that serve load, the Constellation Energy Commodities Group purchases capacity above the internal capacity annually for each of the balancing authorities and arranges for network transmission services to deliver the energy. The transmission providers can use the amount of network services along with the estimated peak usage for planning. Constellation purchases network services to allow for the peak delivery, plus an amount for forecast error, plus an amount for delivery of reserves. Actual daily energy deliveries may be from a different source than the annual capacity purchase.

In the Western Interconnection, the generator capacity is determined by capacity tests performed in accordance with regional requirements. The data are submitted to the region, and the region uses the data in developing regional models available to other planning authorities. These tests are performed at the intervals required by the region.

Firm sales are covered by reserves in the Western Interconnection. Energy is sold based on unit availability in the Eastern interconnection, so it is not required to be covered by reserves.

CECD does not have any facilities that could be part of either a system operating limit or an interconnection reliability operating limit.

The Constellation system operators participate in the daily Rocky Mountain Desert Southwest Reliability Coordinator conference call, SERC regional reliability calls, and in Southwest Power Pool Reliability Coordinator calls. If system conditions are tight, CECD reviews the balancing

authority supply to ensure it is adequate and notifies the balancing authorities if there are conditions that may result in energy schedule curtailments.

CECD reports planned outages in accordance with the reliability coordinator procedures. Planned outages are reported far enough in advance to allow the reliability coordinator and transmission operators to conduct next-day studies.

# 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.*

The CECD system operators are well trained and competent. The vice president of operations, who supervises the operators, manages initial training and continuing education for the operators. The initial training consists of on-the-job training supplemented with vendor-supplied courses. CECD has a *Qualification Card* listing tasks and knowledge that the operator must master to be prepared for independent shift operation. While the evaluation team thought the *Qualification Card* was good, it thought more information on the areas covered would increase its value. This is an improvement CECD can make as it moves towards a more systematic and formal training program.

The senior system operators evaluate the trainee and recommend to the vice president of operations that the trainee be placed on independent shift operation when they think the trainee is ready. The vice president of operations has the final approval authority.

The vice president of operations develops the training program and tracks the individual training progress. Training goals are included in the operator individual performance goals and the training program. A high-level description of the training is provided in the *Training Policy — Goals and Objectives* document and the *Training Procedures and Guidelines* document describes how CECD will meet training objectives. Neither document provides details of the CECD training but effectively outlines responsibilities for CECD and the trainees.

The detailed individual training for each operator is listed in the *Training Plan 2007* and the *Training Plan 2008*. The individual employees and the vice president of operations develop these plans. CECD uses training provided by vendors, WECC and SERC regional training, reliability coordinators restoration drills, and PJM operator training courses. The operators also visit the balancing authorities to learn more about balancing authority operations and to develop better relationships.

While these plans are acceptable and meet the ongoing certification training requirements, the evaluation team believes that more content could be included to meet specific CECD needs. The evaluation team recommends that CECD form a training committee to develop an annual training program that includes goals, objectives, and training subject matter designed to meet organizational needs.

Most of the courses offered are from a NERC-approved provider of continuing education hours and include course objectives, training records, and testing to verify that the operators learned the material. The evaluation team believes that CECD should evaluate the training provided to determine if it is helping to meet company objectives. The evaluation team recommends that CECD measure initial and continuing training programs against a systematic approach to training model to ensure that the training program is meeting its objectives both effectively and efficiently.

After completing a training course, the employee enters the course information into the training database. The vice president of operations then approves the entry before it is entered into the permanent records. The file is unprotected, and the trainee could perform the vice president's final approval and move the training data into the final database without the official approval. While CECD trusts employees to not take this unauthorized action, the evaluation team recommends that CECD protect training records so that only the supervisor can approve and enter the final record to protect the integrity of the official records.

CECD maintains at least one certified operator on shift at all times. While it has two personnel on the shift, a single operator can complete the work requiring certification. The team finds this acceptable. CECD strives to get all operators certified to increase flexibility between the two operators on the shift. In addition, CECD tries to keep an extra operator on staff to ensure an adequate staff of certified personnel. CECD also encourages support personnel to participate in training and become NERC certified. These support personnel are then available to fill operator positions that become available, providing an option for staff succession.

The team reviewed the list of certified personnel and the shift schedule to verify that the lead operator was always certified. CECD uses a five-shift rotation with the fifth week used for relief and training. Between vacation and other scheduled time off, time allowed for training is tight, but the schedule provides enough time for training with the current staff. The CECD staff averages about three weeks of vacation per year.

CECD is adding a staff position with trainer responsibilities to its operations. The evaluation team believes this added position will greatly assist CECD in meeting Recommendations 2 and 3 and is probably necessary to successfully achieve the recommended improvements.

CECD does not have a simulator, and for the balancing authority operations performed the evaluation team does not believe a simulator is needed. CECD has done a commendable job of leveraging other resources to provide this type of training for its operators. For example, the operators attend simulator training offered by the regions and PJM.

As stated previously, the evaluation team recommends that CECD provide a wide-area transmission map to aid the operators in understanding of system conditions. The operators have not been widely exposed to transmission operations, so they are not as familiar with transmission operations as those working closer to the transmission system. More knowledge of the transmission system would help the operators better understand the events happening around them. The evaluation team recommends that CECD provide training on transmission system operations that includes the particular interconnection characteristics around the CECD

balancing authorities to give them more knowledge of the effects of system conditions on the balancing authorities.

## 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.*

CECD operators look at repetitive data transfers and try to automate the process to reduce the probability of errors. Management stresses reliability and includes reliability as a significant part of the operator's evaluation. The CECD business unit is separated from the market function so that its staff can focus on reliability and not compromise the unit's mission with energy cost considerations. Both the supervisory staff and the operators are qualified and focus on reliability.

# 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

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

# APPENDIX 3: Documents Reviewed

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