ATTACHMENT 3

OPERATION STANDARDS AND RECOMMENDED GUIDELINES FOR GENERATING ASSET OWNERS

OPERATION STANDARDS AND RECOMMENDED GUIDELINES For Generating Asset Owners

Adopted by the California Electric Generation Facilities Standards Committee on October 27, 2004

California Electric Generation Facilities Standards Committee

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INTRODUCTION

On October 27, 2004, the California Electric Generation Facilities Standards Committee ("the Committee") adopted these Operation Standards in compliance with the requirements of Section 761.3 of the California Public Utilities Code, established by Senate Bill 39xx (Burton, Speier). The California Public Utilities Commission ("the Commission") is responsible for implementation and enforcement of these standards. By law, the Committee is composed of one member of the Commission, one board member of the California Independent System Operator ("the CAISO"), and a third member chosen by the first two.

The Relationship of the Operation Standards to Maintenance Standards Previously Adopted by the Committee

The first eleven standards (and associated guidelines) are similar to several of the Maintenance Standards adopted by the Committee in May 2003. These standards address areas that are common to both operation and maintenance, such as training, management, and problem resolution. Standards 12 through 28 are new standards specifically tailored to the operation of power plants.

Use of Terms Related to GAO Personnel

References within the Standards and Guidelines to "employees," "operators," "operations personnel," "personnel," "temporary workers," "management," or other staffing descriptions are not intended to require a GAO to follow any particular organizational structure, or to dictate whether work should be performed by the GAO's own employees or contractors. Rather, a GAO is free to organize its work force in the manner it deems most appropriate.

Whether or not it employs contractors, the GAO is solely responsible for complying with these Operation Standards. The GAO is required to take reasonable and prudent steps to assure that contract employees are held to equally stringent performance standards as GAO employees, and that contract employees receive comparable training and safety protections related to their duties. Some standards and guidelines specifically mention contractors or temporary workers and some do not. The GAO's duties regarding contractors and temporary workers, as discussed above, apply to all standards and guidelines when contractors or temporary workers are involved in compliance-related activities, whether or not such workers are specifically mentioned in relevant standards and guidelines.

Guidelines

In addition to the Operation Standards, the Committee adopts a set of recommended Guidelines for all but one standard. We intend these guidelines to assist GAOs in developing plans, procedures and training programs that comply with the Operation Standards, as well as to assist Commission staff in implementing the standards through audits or other implementation activities.

The Committee does not intend these guidelines to be enforceable. There may be reasonable ways of meeting a particular standard that do not follow every provision of the associated guidelines. On the other hand, the guidelines may not be an exhaustive list of the actions required by a standard, because at particular plants there may be special conditions not contemplated here.

GAOs should consider the guidelines in reviewing or reformulating their own policies, operating procedures, and implementation schedules, to ensure that the concerns raised by the guidelines are addressed, where relevant, at each power generation unit. We anticipate that that Commission staff will use the guidelines as indicators of the kinds of GAO activities that are sufficient to meet standards. Failure to meet guidelines under a particular standard may of course raise questions about the completeness of a GAO's program. Failure to meet a guideline, in combination with other evidence, may indicate a violation of the Standards. However, failure to meet a guideline should not be taken, per se, as a failure to meet the associated standard.

Finally, the Equipment and System Operating Standard (Number 28) has particularly extensive guidelines addressing 28 separate critical systems in operation at various power plants around the state. We recognize that not all of the systems are in operation at each generation unit (hydroelectric units will contain only a few of these systems). However, where the systems are in operation, they are critical to plant reliability and safety.

Implementation

The Commission has indicated that it will incorporate the Operation Standards into General Order (GO) 167, along with the Maintenance and Logbook Standards previously adopted by this Committee. Therefore, we assume and intend that the general implementation provisions of the GO will also apply to these Operation Standards. We are not adopting an implementation plan for the Operation Standards, because that is the Commission's role, not the Committee's. Comments have suggested that we address such topics as confidentiality and penalties, yet those are implementation issues that are already addressed in GO 167.

GO 167 states that these standards will not modify, delay or abrogate any deadline standard, rule or regulation imposed by other agencies. While we have not tried to

identify or reference every applicable requirement, we do note that failure to follow certain requirements imposed by other agencies may threaten the safety and reliability of a power unit. Therefore, behavior that constitutes a violation of another agency's requirements may also constitute a violation of these operation standards.

Although the Committee's task is to adopt standards, not to implement them, we offer the following implementation recommendations to the Commission for consideration in its implementation proceeding. The Committee recommends that the Commission implement the standards in a way that provides GAOs considerable flexibility in meeting the standards while retaining accountability. Accordingly, the Committee recommends that the Commission require GAOs to file for each power generation unit an Operation Plan detailing how the generation owner meets (or plans to meet) the Operation Standards. The Committee recommends that this Operation Plan should include, at a minimum:

1) A brief Unit Plan including the expected years the plant will remain in operation, whether the plant is regarded as a baseload plant or peaking plant (or some intermediate designation), what level of availability the GAO intends for the plant, whether the plant will operate year-round or only seasonally, and whether the GAO views the plant as a long-term resource that requires continued maintenance and investment.
2) A general description and timetable of how the GAO meets or plans to meet the provisions of each Operation Standard at each unit (or identical groups of units), identifying by title (and location) and summarizing the various operating policies, procedures, training programs and routines the GAO has in place (or will put in place) to demonstrate compliance with the Operation Standards.

The Committee recommends that the Commission 1) require the Operation Plans to be updated appropriately, and 2) use the Operation Plans during audits of power generation units.

We request that the Commission insert appropriate implementation language into its general order to effectuate the recommendations in this section.

OPERATION STANDARDS COMMON WITH MAINTENANCE STANDARDS

Standard 1: Safety

(Similar to Maintenance Standard I A)

The protection of life and limb for the work force is paramount. GAOs have a comprehensive safety program in place at each site. The company behavior ensures that personnel at all levels of the organization consider safety as the overriding priority. This is manifested in decisions and actions based on this priority. The work environment and the policies and procedures foster such a safety culture, and the attitudes and behaviors of personnel are consistent with the policies and procedures.

Guidelines for Standard 1: Safety

A. Personnel at all levels in the organization contribute to the safety culture of the work environment through:

1. Demonstrating a great respect for safety in all actions and decisions.
2. Demonstrating a questioning attitude by challenging existing conditions, considering the potential adverse consequences prior to proceeding, and willingness to stop work in the face of uncertainty.
3. Demonstrating a willingness to identify problems and ensure they are corrected.
4. Accepting accountability for their own performance, including recognizing shortfalls and acting to improve their performance.
5. Holding their co-workers accountable for their performance.
6. Using peer checking as a means of protecting themselves and others.

B. Managers in the organization contribute to the safety culture of the work environment through:

1. Establishing standards and clearly communicating expectations that safety is the highest priority.
2. Maintaining an environment that welcomes identification and communication of problems.
3. Reinforcing individual behaviors that promptly and forthrightly identify problems.

C. Work practice norms in the organization promote the safety culture in that:

1. Appropriate defenses, such as technical accuracy, precautions, cautions and notes, are explicitly embedded in procedures, processes, and equipment configuration to minimize the occurrences and consequences of inappropriate actions.
2. Clearly defined responsibility and authority for implementing a conservative approach with respect to stopping activities and seeking assistance or guidance when faced with uncertain conditions are

communicated to all personnel. This expectation is reinforced frequently.
3. Safety concerns are promptly identified and resolved.
4. Training reinforces safety practices and expected behaviors.

Standard 2: Organizational Structure and Responsibilities

(Similar to Maintenance Standard 1B)

The organization with responsibility and accountability for establishing and implementing an operation strategy to support company objectives for reliable plant operation is clearly defined, communicated, understood and is effectively implemented. Reporting relationships, control of resources, and individual authorities support and are clearly defined and commensurate with responsibilities.

Guidelines for Standard 2: Organizational Structure and Responsibilities

A. The organizational structure and the responsibilities and authorities of each organizational position are clearly defined and communicated to plant personnel as required by their assignments.
B. Interfaces with supporting organizations, including company work groups such as transmission and distribution, fuel suppliers, contractors, and temporary workers, are clearly defined and understood.
C. Decisions are made at the appropriate level within the organization, considering:
    1. The understanding of the effect on personnel safety and equipment reliability.
    2. The value added to, and the potential adverse effects on, plant operation under all conditions.
    3. The effects on other work groups.
D. Technical and managerial support is readily available.
E. Administrative controls such as policies, procedures, and schedules are implemented for activities affecting safe and reliable plant operation, including personnel fitness for duty.
F. Processes that contribute to safe and reliable plant operation are designed, managed, and improved.
G. The GAO ensures that personnel have appropriate training on and follow any necessary policies, procedures, standards and controls applicable to their scope of work.
H. Personnel are adequately trained and equipped to mitigate the consequences of normal or emergency conditions and to manage reasonably anticipated emergency situations.

Standard 3: Operations Management and Leadership

(Similar to Maintenance Standard 1C)

Operations management establishes high standards of performance and aligns the operations organization to effectively implement and control operations activities.

Guidelines for Standard 3: Operations Management and Leadership

A. Leadership and Accountability

1. High standards of performance are established and reinforced for operations activities. Personnel are held accountable for implementing these standards. Shortfalls in meeting expectations are evaluated, understood, and addressed promptly.
2. Operations management demonstrates a broad knowledge of their areas of responsibility and effectively integrates operations organization actions with the functions and activities of other appropriate station and company organizations.
3. Operations managers encourage communication across organizational lines.
4. Personnel throughout the organization understand organization-wide goals.
5. By example, operations management consistently demonstrates its commitment to improve plant performance and to achieve plant goals and objectives.
6. Operations management is accountable for the training, qualification, and performance of operations personnel.
7. Operations management is trained on and effectively implements skills that result in improved teamwork, collaboration, and motivation.
8. Personnel are actively encouraged to admit errors, seek help when they are faced with uncertainty, and assume responsibility for their decisions.

B. Management Direction and Expectations

1. Operations management's directions, such as goals, initiatives, expectations, and priorities, are effectively used to enable personnel to make decisions, take actions, and implement changes that contribute to safe and reliable plant operation.
2. Goals are established to challenge the organization to continually improve. Results are measurable and are periodically evaluated to determine effectiveness.
3. Strategic direction for improving performance is established and clearly communicates the priorities for long-term and near-term performance to operations personnel.
4. Priorities for daily activities are clearly communicated to affected personnel.
5. Operations management reinforces individual ownership through delegation of authority. Personnel are actively encouraged to admit

errors, seek help when needed, assume responsibility for their decisions and actions, and develop methods to improve safety, reliability, quality, and productivity.

6. Administrative controls are implemented for activities that affect safe and reliable plant operations. Examples of activities that should be controlled include job turnovers, use of procedures, use of special tools and lifting equipment, and use and traceability of measuring and testing equipment.

7. Personnel working in the operations area have appropriate training on and follow necessary policies, procedures, standards and controls applicable to their scope of work.

C. Planning and Implementing

1. Operations management ascertains that plant staffing and resources are sufficient, including that operations personnel have requisite knowledge, skill, proficiency, and familiarity with the operations of the plant(s) where they perform operations to accomplish tasks to achieve safe and reliable plant operation.

2. The GAO's organizational structure for operations is clearly defined. Responsibilities and authorities of each position are understood.

3. Personnel tasks, responsibilities, authorities, expectations for performance, and interfaces with contract and temporary personnel are clearly defined and understood.

4. Responsibilities for communicating and coordinating between organizational groups are clearly defined and understood.

5. Future resource needs, such as personnel, capital, equipment and parts, and information, are identified and integrated into business plans.

6. Changes to plant equipment, procedures, and processes are planned and implemented systematically to improve safe and reliable station operation. Changes to objectives, responsibilities, and implementation schedules are clearly communicated to affected personnel, and appropriate training is provided.

7. Changes to initiatives are managed and coordinated.

D. Monitoring and Assessing

Operations management effectively monitors and assesses the performance of operations activities in the following areas:

1. Component Performance

2. Heat Rate (or Steam Rate) Improvement

3. Personnel Development

4. Training Performance

5. Dispatch Response

6. Outage Performance
7. Regulatory Audit Performance
8. Adherence to operation standards, policies and procedures, especially worker safety.
9. Work practices and worker skills and knowledge.
10. Performance of services provided by outside organizations, contractors or temporary workers.
11. Work management implementation, including use of schedules, work packages, documentation of work for work history, and providing work status updates.
12. Equipment Performance and Material Condition
13. General Area Housekeeping
14. Developing and using performance measures to monitor organization performance. Typical measures might include, but not be limited to:
    a. Operations Work Backlogs
    b. Amount of Rework
    c. Work Management Indicators
15. Operations management effectively follows up on issues identified or problems noted and provides feedback to affected parties. Reinforcement of desired behaviors is also provided.
16. Operations management frequently interacts with operations and plant personnel to coach and mentor desired behaviors.

E. Follow-up, Reinforcement, and Feedback

1. Operations management initiates changes and corrective actions to improve the performance effectiveness of personnel, processes, and equipment.
2. Operations management acknowledges the accomplishments of others and the importance of individual contributions to overall performance. Operations management reinforces behaviors that improve performance.
3. Operations management coordinates resources to accomplish goals and objectives safely and reliably. Adjustments are made and corrective actions are taken to accomplish goals. Timely corrective actions are taken when adverse conditions or trends are identified.
4. Operations problems, including events and materiel deficiencies that affect plant operations, are tracked and investigated.

Standard 4: Problem Resolution and Continuing Improvement

(Similar to Maintenance Standard I D)

The GAO values and fosters an environment of continuous improvement and timely and effective problem resolution.

Guidelines for Standard 4: Problem Resolution and Continuing Improvement

A. Self-Assessment

Self-assessment activities are used to compare actual performance to management's expectations, and to identify and correct areas needing improvement. While self-assessments, by definition, are driven from within, they may be used to measure internal performance to external criteria, such as CAISO, EPA or OSHA. Self-assessment is both a discreet activity and a continuous process that may include such activities as:

1. Dedicated teams, with a specific chartered objective to assess certain program(s) or element(s).
2. Management monitoring of on-going performance through performance metrics or problem resolution process monitoring.
3. Discreet event investigations.

B. Problem Reporting, Root-Cause Analysis, and Corrective Actions
A systematic approach and process is used to identify and report problems, determine the cause(s) and establish corrective actions to prevent recurrence. Attributes of successful programs include:
1. Encouraging personnel to report problems at low thresholds of significance.
2. Using a graded approach to significance, and performing more extensive root cause determination to those problems having high significance, and trend and track those with low significance.
3. Trending capability on information such as “cause code” or equipment or process involved.
4. Tracking of corrective actions to closure.

C. Operating Experience
Management processes exist to capture, evaluate, and initiate, required actions to incorporate lessons learned from other departments, stations or organizations (e.g., through a problem reporting/corrective action process, “best practices,” etc.).

D. Benchmarking and Emulation
Managers seek improvement by benchmarking performance or processes against better performers.

Standard 5: Operations Personnel Knowledge and Skills

(Similar to Maintenance Standard II A)

Operations personnel are trained and qualified to possess and apply the knowledge and skills needed to perform operations activities that support safe and reliable plant operation.

Guidelines for Standard 5: Operations Personnel Knowledge and Skills

A. Operations personnel capabilities and aptitude meet established entry criteria for their assigned positions.

B. Operations personnel possess job-related knowledge and skills.

C. Goals of on-the-job training are identified before training begins. Testing and recording of achievement of those goals are completed before personnel are assigned to perform tasks independently.

D. Continuing training is implemented when appropriate to maintain and enhance knowledge and skills and to address areas such as plant equipment and changes in procedures, infrequently used and difficult skills and lessons learned from operating experience.

E. Training and evaluation methods and standards are sufficient to verify trainee competence for assigned functions.

F. Initial and continuing training, including programs to develop and maintain managerial skills, are effectively implemented.

G. Contract and temporary operations personnel possess knowledge and skills equivalent to those of station operations personnel for their assigned functions and are task-qualified prior to independent work assignment.

H. Facilities, equipment, and tools are provided and maintained to effectively support training activities.

Standard 6: Training Support

(Similar to Maintenance Standard II B)

A systematic approach to training is used to achieve, improve, and maintain a high level of personnel knowledge, skill, and performance. Each GAO provides a site-specific training program including on-the-job training, covering operations, including reasonably anticipated abnormal and emergency operations. Personnel are trained commensurate with their duties.

Guidelines for Standard 6: Training Support

A. Managers are responsible and accountable for the training and qualification of personnel assigned to their work groups.

B. Training administrative controls address the following requirements, as appropriate:

1. Training Program Content

2. Management of Training
3. Qualification of Training Personnel
4. Analysis, Design, and Development of Training
5. Classroom Training
6. In-plant and Laboratory Training
7. Simulator Training
8. Evaluation of Training Effectiveness

C. Training is used to improve personnel performance.
D. Management expectations and standards are reinforced during training.
E. A systematic process is used to develop needed training.
F. Training management supports the organization by maintaining an awareness of current industry training issues, identifying issues relevant to GAO plants and initiating relevant training.
G. A systematic assessment process is used to determine training needs for managers, including leadership, management, technical, administrative, and decision-making skills.
H. Personnel are appropriately trained and task-qualified before they work independently.
I. General personnel training provides personnel with a basic understanding of personnel responsibilities and safe work practices and with the knowledge and practical abilities necessary to effectively implement their work.

Standard 7: Operation Procedures and Documentation

(Similar to Maintenance Standard IV A)

Operation procedures exist for critical systems and states of those systems necessary for the operation of the unit including startup, shutdown, normal operation, and reasonably anticipated abnormal and emergency conditions. Operation procedures and documents are clear and technically accurate, provide appropriate direction, and are used to support safe and reliable plant operation. Procedures are current to the actual methods being employed to accomplish the task and are comprehensive to ensure reliable energy delivery to the transmission grid.

Guidelines for Standard 7: Operation Procedures and Documentation

A. The preparation, review, approval, and revision of procedures and documents are properly controlled and timely.
B. Documents used in lieu of procedures, such as excerpts from vendor manuals, receive sufficient review and approval to verify accuracy needed to support the intended use.

C. New and revised procedures are reviewed for technical accuracy prior to initial use and are verified for correctness and usability prior to/or during initial use.
D. Procedures are clear and concise and contain sufficient information for users to understand and perform activities effectively, through the following elements:
    1. Operating Procedures are grouped by unit and further subdivided by major systems.
    2. Technical details such as setpoints, tolerances, control logic, and equipment numbers are correct and consistent among procedures, drawings, valve lineup sheets, and system descriptions.
    3. Procedures specify portions or steps of other documents that are to be referenced or used when a procedure is performed.
    4. Human factor considerations, such as the sequence of procedure steps and the placement of notes and caution statements, are incorporated into procedures to reduce the likelihood of error.
    5. The level of detail in procedures is consistent with the training and qualification of the users.
    6. Operation procedures and documents should include the generation equipment and all those components owned by the GAO directly connected to the plant that are an integral part of delivering power to the grid including fuel supply systems, electrical switchyards, transmissions lines, penstocks, flumes, exhaust system, etc.
E. Hold points, such as quality checks, are included in procedures as appropriate.
F. Temporary changes to procedures, if used, are controlled, taking into consideration the following:
    1. Appropriate review and authorization prior to use.
    2. User awareness of applicable temporary changes.
    3. Timely incorporation into permanent revisions, when appropriate.
G. Procedures, documents, drawings, and other work-related references are readily accessible, authorized, clearly identified, controlled, technically accurate, and up to date.
H. Operation instructional aids reflect procedure guidance.
I. Procedures are periodically reviewed for technical accuracy, human factors, considerations, and inclusion of lessons learned from operating experience.
J. Procedure users are encouraged to provide feedback to procedure writers to identify such items as inaccuracies, difficulties in use, and suggestions for improvement.

Standard 8: Plant Status and Configuration

(Similar to Maintenance Standard V B)

Station activities are effectively managed so plant status and configuration are maintained to support safe, reliable and efficient operation.

Guidelines for Standard 8: Plant Status and Configuration

A. Plant Status Control

1. Personnel are cognizant of the status of plant systems and equipment under their control and of the nature of work being performed.
2. Personnel authorize activities that affect the status of installed systems and equipment.
3. Personnel maintain a focus on important plant parameters during maintenance situations and identify and address conditions that may be affecting plant parameters as a result of the work activities.
4. Personnel assess the operability of important equipment. Information about equipment deficiencies, existing plant configuration, and the design bases for the equipment is used in the assessment. Personnel have adequate training on, or receive adequate support in those areas as necessary to support the assessment such as engineering, maintenance, or chemistry, and other technical support.
5. Policies and procedures for controlling plant status are effectively implemented. Provisions for special situations, such as extended outages, and post trip recovery, are included.
6. Controls for infrequently performed tests and evolutions maintain the plant within the design basis. Procedures used to control infrequently performed tests and evolutions are reviewed for operational impacts and safety concerns before each test or evolution. Prior training and walkthrough of procedures by the affected personnel verify the controls and identify appropriate contingency actions. Pre-evolution briefings are conducted.
7. The position of valves is important to operation and are known and accurately recorded.
8. Independent (or concurrent, if appropriate) verification of component position is performed for equipment important to safety and/or critical to reliable plant operation.
9. Checklists or other comparable means are used to verify that proper conditions are established for each mode of plant operation and for mode changes.
10. Procedures are implemented to control the placement of caution, warning, information and other similar tags on plant equipment and operator aids in the plant.
11. Procedures are implemented to control the placement, removal, and periodic review of temporary modifications for equipment, such as electrical jumpers, lifted leads, mechanical jumpers, hoses, pipe blanks, and spool pieces.

B. Configuration Control

1. Authorities and responsibilities related to the design control process are defined and communicated and are understood by affected personnel.

2. Operational specifications and restrictions imposed by the plant design are appropriately communicated and incorporated into plant programs, procedures, practices, and training.
3. Plant design and status documents are accurate and accessible to plant personnel.
4. Lessons learned from user feedback, maintenance history, and operating experience are used to improve configuration control processes.
5. Modification designs undergo interdisciplinary technical reviews, and the results are incorporated into the plant design basis.
6. Each modification is planned, scheduled, and tracked throughout design, installation, testing, turnover to operations, training of affected personnel, and completion of document revisions.
7. Temporary modifications are controlled and periodically reviewed for continued need. The number of temporary modifications is minimized. Those needed on a permanent basis are converted in a timely manner.
8. Designs and supporting information, including computer software and special or unique calculations are verified and approved prior to use.
9. Design field changes receive technical reviews and approvals similar to the original.
10. Documents affected by plant modifications such as drawings, procedures, and equipment indexes commonly used for system operation, tagouts, and maintenance, are updated before the modifications are turned over to operations. Documents need not be completed until after post-modification testing.
11. The as-built configuration of modified systems is verified.
12. Personnel are trained on changes prior to operating or maintaining modified equipment. Affected procedures, operational drawings, and work documents are revised before modified equipment is operated or maintained. Documents need not be completed until after post-modification testing.
13. Station simulators and/or training materials should be updated before personnel are trained on modified equipment.

Standard 9: Engineering and Technical Support

(Similar to Maintenance Standard VIIB)

Engineering activities are conducted such that equipment performance supports reliable plant operation. Engineering provides the technical information necessary for the plant to be operated and maintained within the operating parameters defined by plant design. Engineering provides support, when needed, to operations and maintenance groups to resolve operations and maintenance problems.

Guidelines for Standard 9: Engineering and Technical Support

A. Appropriate engineering support is provided for plant operational activities, such as identifying, analyzing, and resolving conditions that can impact the plant design bases.

B. Engineering activities are performed by or under the direct supervision of personnel who have completed applicable educational and qualification guidance for the tasks to be performed.

C. Engineering support personnel use technical information, such as design analyses, operating experience information, and fundamental engineering principles to provide recommendations on plant operations.

D. Appropriate engineering support is provided to help meet the goals of the unit and plant. Support is provided for planning outages, including determination of their scope, the efficient use of resources, the need for operations support, consideration of risk management, control of configuration, and the needed duration. Long-range planning is effectively used for engineering activities, such as performance of major modifications and the implementation of engineering changes.

E. Appropriate engineering support is provided to monitor and evaluate equipment and system performance by examining and trending the results of condition-monitoring activities, reviewing equipment failure history, analyzing availability/reliability information, and performing system walkdowns. Follow-up actions, based on identified problems, trends and root cause determinations, are timely and effective.

F. Comprehensive post-modification testing is conducted so that equipment necessary for safe and reliable plant operation will perform within established limits. The testing program includes a description of scope and responsibilities, scheduling mechanisms, test procedures, and methods for program updates.

G. Appropriate engineering support is provided for the effective operations of the plant. Engineering is aware of and proactively pursues operations issues.

H. Processes are in place to communicate technical information and recommendations to the operations personnel.

I. Engineering support personnel are familiar with the unit's operating history and use this knowledge to prevent and resolve equipment problems and improve plant performance.

J. Engineering support personnel use outside experts, such as vendor representatives or other utility expertise, as necessary, to resolve plant problems. Appropriate controls are implemented to confirm the quality of the support and products supplied by non-plant organizations.

K. Engineering support personnel evaluate industry advances in technology and practices, and incorporate such advances into the plant to improve or maintain equipment performance and availability consistent with the Unit Plan.

L. Engineering support personnel are cognizant of generic technical issues. These issues are reviewed for applicability at the plant, and appropriate actions are initiated.

M. Engineering support personnel maintain a long-term view of plant performance, anticipate issues that could impact long-term plant performance, and develop strategies to address these issues.

N. Engineering programs, such as those for monitoring flow-accelerated corrosion, in-service testing and inspections, and leak rate testing, are clearly defined and effectively implemented.

Standard 10: Environmental Regulatory Requirements

(Similar to Maintenance Standard VII D)

Environmental regulatory compliance is paramount in the operation of the generating asset. Each regulatory event is identified, reported and appropriate action taken to prevent recurrence.

Guidelines for Standard 10: Environmental Regulatory Requirements

A. Plant activities are managed to comply with all applicable laws, regulations and permits regarding the generation of effluents and emissions.
B. Liquid waste tank levels are monitored periodically to detect unexpected changes.
C. Liquid wastes are identified and segregated during collection according to the treatment specified for each waste stream.
D. Processed waste is sampled and analyzed for impurities prior to release or reuse in plant systems.
E. Established criteria are used to routinely evaluate effluent and emission processing equipment, such as stack gas treatment systems, or filters, demineralizers.
F. Effluent and emission monitors accurately measure, record, and provide alarms for key parameters, as needed. Effluent monitors are properly maintained and calibrated.

Standard 11: Operations Facilities, Tools and Equipment

(Similar to Maintenance Standard IX A)

Facilities and equipment are adequate to effectively support operations activities.

Guidelines for Standard 11: Operation Facilities, Tools and Equipment

A. Facility size and arrangement promote safe and effective work and training activities. Human factors are considered when designing and arranging equipment. Appropriate facilities are provided for work on equipment involving hazardous materials.

B. Work area lighting and other environmental conditions promote safe and effective working conditions. Computer installations and control panels are ergonomically sound.
C. Work areas are maintained in a clean and orderly condition.
D. Tools, equipment, and consumable supplies are available to support work. Appropriate equipment is available for loading, lifting, and transporting equipment.
E. Suitable storage is provided for tools, supplies, and equipment. Necessary tools, jigs, and fixtures are identified and stored to permit ready retrieval.
F. Rigging equipment and scaffolding are identified, tested, and properly stored.
G. Facilities, equipment, and tools are maintained in good repair.
H. Measuring and test equipment is calibrated and controlled to provide accuracy and traceability. Out-of-tolerance test equipment is removed from service. Plant equipment maintained with out of tolerance test equipment is evaluated in a timely manner for operability, and deficiencies are corrected as necessary.
I. Equipment is accessible for operations activities.
J. Communications equipment is provided and is available to support operations activities.

GENERAL OPERATION STANDARDS

Standard 12: Operations Conduct

To ensure safety, and optimize plant availability, the GAO conducts operations systematically, professionally, and in accordance with approved policies and procedures. The GAO takes responsibility for personnel actions, assigns personnel to tasks for which they are trained, and requires personnel to follow plant and operation procedures and instructions while taking responsibility for safety.

Among other things:

A. All personnel follow approved policies and procedures. Procedures are current, and include a course of action to be employed when an adopted procedure is found to be deficient.

B. All operations are performed in a professional manner. Basic rules of conduct apply throughout the plant at all times.

C. All personnel on-duty are trained, qualified, and capable of performing their job functions. Personnel are assigned only to duties for which they are properly trained and qualified.

D. Personnel take immediate actions to prevent or correct unsafe situations.

Guidelines for Standard 12: Operations Conduct

A. Personnel shall not give directions or guidance which conflict with approved procedures.
B. All personnel are required to verify that the most recent revisions of procedures are used.
C. Personnel who cannot, or believe they should not, follow a procedure as written shall advise their supervisor immediately. If necessary, the supervisor will initiate a revision of the procedure, or will authorize an emergency deviation from the procedure.
D. A chain of command is established for approving procedure deviations.
E. Supervisors are responsible for ensuring that personnel under their direction understand the applicable procedures. All personnel are encouraged to provide constructive feedback regarding the adequacy of procedures.
F. Personnel are required to take immediate actions to prevent or correct unsafe situations of a minor nature. Concerning major safety related events such as, fires, injuries, major equipment malfunctions, etc. personnel shall immediately take whatever actions are necessary to place the

equipment/system into a safe and stable condition and contact management as practical and appropriate.

G. The GAO takes reasonable steps to assure that there is always someone in charge at each unit and plant who is responsible for operations, can supervise all personnel and is authorized to make necessary decisions.

H. Personnel on the current shift have primary responsibility, until relieved by personnel on the next shift, for the safe operation of the plant under all conditions occurring on, or during, shift transition.

I. Trainees are properly supervised. Trainees are permitted to operate equipment and take log readings only under a qualified operator's or supervisor's direction. Qualified personnel are responsible for all actions taken by trainees under their supervision.

J. Purposeful activity is the norm. Personnel treat all with respect, and do not engage in roughhousing or dangerous or distracting activity.

Standard 13: Routine Inspections

Routine inspections by plant personnel ensure that all areas and critical parameters of plant operations are continually monitored, equipment is operating normally, and that routine maintenance is being performed. Results of data collection and monitoring of parameters during routine inspections are utilized to identify and resolve problems, to improve plant operations, and to identify the need for maintenance. All personnel are trained in the routine inspections procedures relevant to their responsibilities.

Among other things, the GAO creates, maintains, and implements routine inspections by:

A. Identifying systems and components critical to system operation (such as those identified in the guidelines to Standard 28).

B. Establishing procedures for routine inspections that define critical parameters of these systems, describe how those parameters are monitored, and delineate what action is taken when parameters meet alert or action levels.

C. Training personnel to conduct routine inspections.

D. Monitoring routine inspections.

Guidelines for Standard 13: Routine Inspections

A. The GAO prepares and maintains a procedure for creating, updating, and controlling procedures for routine inspections.
B. Routine inspections or automated systems cover all critical system components, which the GAO specifically identifies.
C. The procedures for routine inspections and the inspections themselves ensure that site personnel monitor critical equipment (components) and system parameters so that equipment operates safely and reliably, consistent with the Unit Plan.
D. The procedures and routine inspections are developed and controlled in accordance with the Operations Procedures and Documentation Standard and are reviewed and updated periodically.
E. The procedures for routine inspections provide guides to personnel on how to monitor equipment and gather data.
F. The procedures for routine inspections describe how such duties are to be handed off between shifts.
G. The routine inspections include routine minor maintenance tasks such as tightening of packing, grease application, oil application, etc., as necessary.
H. Indicators of acceptable equipment performance are developed, as discussed below, and included in the procedures for routine inspections of critical systems and components.
I. Personnel monitor these indicators during periodic inspections of power plant equipment.
J. Data is assessed and action is taken as necessary to allow safe and reliable operation consistent with the unit plan.
K. For each critical operating parameter, the GAO develops an appropriate system of actions levels (e.g. Alert, Warning and Action Levels), taking into account design basis documents.
L. Appropriate action levels are reflected in routine inspections for data collected manually, and in plant control systems logic for data collected automatically.
M. Systems and components and auxiliary equipment critical to the reliability and availability of the unit are monitored and critical data gathered and recorded, either manually, or automatically via the plant control systems.
N. Data (and trends in data) are assessed immediately and compared to established action levels, and trends toward those levels are detected. This comparison may be performed manually, in accordance with routines, or automatically via the logic in the plant control systems.
O. Personnel performing routine inspections also informally monitor the condition of plant components and systems by noticing the sounds, appearance and feel of various components, to detect unusual noise, leakage, or vibration.
P. In the case of data monitored automatically, plant control systems act to warn personnel via the alarms or other appropriate notices evident to personnel. Personnel take appropriate action in response to alarms or notices. Data is filed in accordance with plant procedures.

Q. Routines are readily available to personnel, have a common look-and-feel, are easy to use, and provide checklists to ensure completion.

Standard 14: Clearances

Work is performed on equipment only when safe. When necessary**,** equipment is taken out of service, de-energized, controlled, and tagged in accordance with a clearance procedure. Personnel are trained in the clearance procedure and its use, and always verify that equipment is safe before any work proceeds.
Among other things:

A. The GAO prepares and maintains a clearance procedure. The clearance procedure contains requirements for removing a component from service and/or placing a component back into service.
B. The GAO ensures that personnel are trained in and follow the clearance procedure.

Guidelines for Standard 14: Clearances

A. Clearance tags state clearly what equipment and systems are out of service, who can authorize and remove a clearance, and who can provide more information regarding the reason for issuing the clearance tag.
B. Clearance tags state clearly who requested and approved the clearance, and what must be done to remove the clearance.
C. The clearance procedure clearly describes which personnel are responsible for issuing and removing clearances.
D. Plant logbooks show the operation of all valves, switches and devices required to isolate equipment.
E. Tags are non-reusable, attachable by hand, self-locking, and secure unless deliberate effort is applied.
F. Clearance approvals assure that equipment status will not be changed during the duration of the clearance.
G. Procedures assure that full information is provided when assignments are handed off between personnel or between shifts.
H. Clearances should specify whether and under what conditions equipment may be tested through energizing, pressurization, or heating.
I. Clearances are appropriately tracked, assuring that information is transferred between shifts.
J. The clearance log is available to all personnel at the various work sites.
K. Status of work and equipment is confirmed before clearances are lifted.
L. Training in the plant's clearance procedure is provided to personnel before they enter the work area.

Standard 15: Communications and Work Order Meetings

The availability of the generating asset and safety of personnel is ensured during the execution of work orders by adequate communications and meetings, which may be scheduled or as needed, to review work plans with all affected personnel before work begins. Clear lines of communication exist between personnel responsible for operations, maintenance and engineering groups.

Among other things:

A. The GAO prepares and maintains a procedure for review of work plans through communications and work order meetings at the facility.
B. Work is analyzed to determine what personnel, components, and systems are affected.
C. Affected personnel meet before work begins to define the work, identify safety issues, to minimize the impact on plant operation, and to determine the need for further meetings.
D. Personnel are trained in and follow the procedure.

Guidelines for Standard 15: Communications and Work Order Meetings

A. Personnel affected by the work meet to discuss an imminent task related to the system/component. Discussions are intended to help streamline the task.
B. Personnel attending work order meetings brief any other affected personnel that did not attend.
C. Work potentially affecting the availability of the unit does not proceed without the knowledge and approval of appropriate operations personnel.
D. Personnel supervising the work follow the progress of the work, provide guidance as necessary, and schedule additional meetings for longer tasks, if needed. When the task is completed, extended, or otherwise changed, a closeout meeting is held if issues remain unresolved or new issues have arisen.
E. Appropriate site personnel are trained in and follow the procedure for communications and work order meetings.

Standard 16: Participation by Operations Personnel in Work Orders

Operations personnel identify potential system and equipment problems and initiate work orders necessary to correct system or equipment problems that may inhibit or prevent plant operations. Operations personnel monitor the progress of work orders affecting operations to ensure timely completion and closeout of the work orders, so that the components and systems are returned to service.

Among other things:

A. Operations personnel identify problems requiring work orders, and initiate work orders to correct those problems

B. The operations manager or other appropriate operating personnel periodically review work orders that affect operations to ensure timely completion and closeout of the work orders, so that components and systems are returned to service.
C. Personnel responsible for prioritizing work orders consult operations personnel to assure that work orders affecting the operations of the plant are properly prioritized. .
D. Appropriate personnel are trained in and follow procedures applicable to work orders.

Guidelines for Standard 16: Participation by Operations Personnel in Work Orders

A. The operations manager or other appropriate personnel monitor work order progress regularly to ensure timely completion and closeout of the work order, allowing the component to be returned to service.
B. The work order procedure includes but is not limited to:
    1. A process to identify operating issues that are or have the potential to become problematic for maintaining unit performance, reliability, or safety.
    2. Determining and assessing the impact of continued operation without resolving the issue.
    3. Creating a “work order” to document the problem and to plan the corrective action.
    4. Monitoring the progress of work order tasks, formal closeout of the work order upon completion, and assessing success of the work order actions.
    5. A written or electronic, trackable system that can be checked by personnel.

Standard 17: Records of Operation

The GAO assures that data, reports and other records reasonably necessary for ensuring proper operation and monitoring of the generating asset are collected by trained personnel and retained for at least five years, and longer if appropriate

Guidelines for Standard 17: Records of Operation

A. The GAO prepares and maintains procedures for the collection and retention of plant data and records.
B. Appropriate personnel are trained in and follow the records procedures.
C. Records are kept at least for the period required by this standard, and longer if so required by other federal, state, or local law or regulation.
D. Retained records include documents such as:
    1. Daily Continuous Emissions Monitoring System (CEMS) Calibration Report as required by the local air district.
    2. Daily Logbook Data Input as required by the CPUC Electric Generating Facility Logbook Standards adopted April 1, 2003, by the California Electric Generation Facility Standards Committee.
    3. Records related to environmental monitoring, investigation, regulatory reports, transport and disposal of materials.
    4. Other records required by law or regulation.
    5. Control Board Strip Charts and Printouts, thermal, hydraulic, chemical, and electrical performance and monitoring data, and circular charts, catalogued promptly in a manner to allow easy future retrieval.
    6. Documents, reports, studies, data, and physical evidence related to system or component failures, unit trips, failed startups, and curtailments.
    7. NERC/GADS and other performance related data gathering and analysis particularly on components whose performance issues could result in a curtailment or outage.
    8. Failure event analysis results and data.
    9. Performance test results and analysis which are conducted in a formal manner for either certifying the performance of a component or to certify a repair or replacement.
    10. Performance test results required by Standard 18.
    11. Outage Reports including but not limited to, boiler overhauls, turbine overhauls, control valve overhauls, hot section inspections, hot section repairs, major motor rewinds.

12. Records of the first year of the unit's operation if available: kept for the life of the unit.
13. Records of changes to plant, systems, or equipment if available: kept for the life of the equipment or system.
14. Where a record falls into multiple categories with different retention periods, the longest retention guideline applies.
15. Original and updated design and schematic drawings: kept until plant demolition.

Standard 18: Unit Performance Testing

The GAO conducts periodic performance tests as appropriate to identify trends and possible improvements in unit operation. The GAO responds to test results with changes to equipment, policies, routines, or procedures necessary to maintaining unit availability and the unit's ability to support grid operations consistent with the Unit Plan.

Guidelines for Standard 18: Unit Performance Testing

A. The GAO designates appropriate person responsible for unit performance monitoring.
B. The GAO establishes and carries out an appropriate program for regular testing of critical unit functions, and critical unit and system components, taking into consideration factors such as plant age, size, technology, capacity factors, manufacturers' recommendations, etc., and consistent with the Unit Plan. Please note that examples in Tables I and II are illustrative of the test types and frequencies each specific site should consider for their units.
C. Based on testing, the GAO evaluates and carries out changes to equipment, policies, routines, or procedures necessary to maintaining unit availability and ability to support grid operations consistent with the Unit Plan.
D. Concurrent testing of auxiliary equipment during a boiler or steam turbine performance test is acceptable provided that performance testing parameters are monitored and recorded for the auxiliary equipment or systems being tested.

1 (FOR ILLUSTRATIVE PURPOSES ONLY)

TABLE I –SCHEDULE OF MAJOR EQUIPMENT TESTS

TYPE OF TEST	CLASS OF UNIT					
	Supercritical	330 MW	170 MW	50MW	HRSG	Geothermal
Input/Output Single Valve Point	6 Months	6 Months	6 Months	6 Months	12 Months	Monthly
Input/Output Multiple Valve Point	AOH or 18 Months	AOH or 24 Months	AOH or 24 Months	AOH or 24 Months	AOH or 24 Months	N/A
Boiler Efficiency	AOH or 18 Months	AOH or 24 Months	AOH or 24 Months	AOH or 24 Months	AOH or 24 Months	N/A
Enthalpy Drop	AOH or 18 Months	AOH or 24 Months	AOH or 24 Months	AOH or 24 Months	AOH or 24 Months	N/A
Peak Load Capability	Monthly	6 Months	6 Months	6 Months	6 Months	Monthly
Governor Characteristics	AOH or 12 Months	AOH or 12 Months	AOH or 12 Months	AOH or 12 Months	AOH or 12 Months	6 Months
Quick Load Pickup	N/A	N/A	N/A	N/A	N/A	N/A
Boiler, Superheat, Reheat Safety Valves	AOH or 12 Months	AOH or 12 Months	AOH or 12 Months	AOH or 12 Months	AOH or 12 Months	N/A
Full Load Dump	N/A	N/A	N/A	N/A	N/A	N/A
Cooling Tower	AOH or 12 Months	N/A	N/A	N/A	AOH or 12 Months	AOH or 12 Months
Automatic Dispatch	As Required	As Required	As Required	As Required	As Required	N/A

2

3 **Notes:** AOH = After Overhaul

4

(FOR ILLUSTRATIVE PURPOSES ONLY)

TABLE II –SCHEDULE OF AUXILIARY EQUIPMENT TESTS							
TYPE OF TEST		CLASS OF UNIT					
		Super-critical	330 MW	170 MW	50MW	HRSG	Geothermal
Feedwater Heater	HP Heaters 6 Months (1&2) LP Heaters 18 Months (1&3)	24 Months (1&3)		24 Months (1&3)	24 Months (1&3)	24 Months (1&3)	N/A
Circulating Water Pumps and Motors	18 Months (1)	24 Months (1)		24 Months (1)	24 Months (1)	24 Months (1)	12 Months (4)
Boiler Feed Pumps and Motors	3 months (1)	24 Months (1&3)		24 Months (1&3)	24 Months (1&3)	24 Months (1&3)	N/A
Condensate Pumps and Motors	18 Months (1&3)	24 Months (1&3)		24 Months (1&3)	24 Months (1&3)	24 Months (1&3)	12 Months (4)
Air Preheater	18 Months (1&3)	24 Months (1&3)		24 Months (1&3)	24 Months (1&3)	24 Months (1&3)	N/A
Fire Pumps and Diesel Engine	12 Months	12 Months		12 Months	12 Months	12 Months	12 Months

Notes:

1. Tests to be run at test point nearest guaranteed or rated output.
2. Test to be performed in conjunction with I/O single valve point test.
3. Test to be performed in conjunction with I/O multiple valve point and boiler efficiency tests.
4. Tests to be performed in conjunction with cooling tower test.
5. Gas Turbine performance tests should be per OEM recommendations but, in general, test frequencies should approximate the following:

(FOR ILLUSTRATIVE PURPOSES ONLY)

Test Type	Peaking GT (EOH)	Base Load GT (EOH)
Single Point Test	100 Hours	4,000 Hours
4-Point Test	500 Hours	8,000 Hours
8- Point Test	AOH	AOH

Standard 19: Emergency Grid Operations

The GAO prepares for conditions that may be reasonably anticipated to occur during periods of stress or shortage on the state's electric grid. During such periods of stress or shortage, the GAO makes operational decisions to maximize each unit's availability and ability to support grid operations.

Among other things the GAO:

A. Takes reasonable steps to maintain the ability to communicate with the Control Area Operator all times.
B. In preparing for periods of stress or shortage, takes steps to clarify the regulatory requirements, such as emissions, water discharge temperature, etc., which will apply during emergencies,
C. When emergencies appear imminent, seeks regulatory relief from those regulatory requirements that reduce output,
D. Assists the Control Area Operator in responding to the various kinds of possible problems on the electrical grid, including restoration of service after a disturbance.
E. When practical, during periods of stress or shortage, consults with the Control Area Operator before derating a unit or taking a unit off line and defers outages and derates at the Control Area Operator's request when continued operation is
    1. Possible and practical,
    2. Safe to plant personnel and to the public,
    3. In accordance with applicable law and regulations, and
    4. Will not cause major damage to the plant.

Guidelines for Standard 19: Emergency Grid Operations

A. The GAO prepares for conditions that may be reasonably anticipated to occur during periods of stress or shortage on the state's electric grid, as declared by the Control Area Operator, such as Restricted Maintenance Operation periods, Alerts, Warnings, and Emergencies.
B. The GAO maintains the ability of the plant to receive and respond to instructions from the Control Area Operator by maintaining primary and back up communication.

C. The GAO prepares and maintains emergency operating procedures, which describe the responsibilities and actions to be taken by plant personnel during system emergencies.

D. All affected personnel are trained in emergency procedures, expected equipment reaction, and their individual roles and responsibilities during these incidents to assure each generating unit's timely and satisfactory response to system emergencies.

E. The GAO confers regularly with regulatory agencies that impact operation of the unit, to determine what operational limits and /or relief from limitations, if any, will apply during periods of stress or shortage. The GAO takes reasonable steps to identify and resolve ambiguities in such limits.

F. Before reasonably anticipated periods of stress or shortage and, when practical, during periods of stress or shortage, the GAO takes action to resolve regulatory issues and receive regulatory relief from those regulatory requirements that reduce maximum output.

G. Emergency operating procedures at each facility address the following system disturbances and the facility’s response to those disturbances:

a. Low Frequency

b. System Instability

c. High Frequency

d. Low Voltage

e. Low System Reserve Margins

f. Low VARS

g. Loss of normal communications

H. The GAO identifies plant systems or equipment, if any, that require special attention to maintain reliable operations during emergencies.

I. The GAO considers the impact on emergency operations of coincident alerts from the security agencies such as the National Infrastructure Protection Center.

J. The GAO plans for assistance to the Control Area Operator for restoration of service following a major grid disturbance.

K. During periods of stress or shortage, if the unit encounters mechanical problems, to the extent practicable the GAO:

a. Contacts the Control Area Operator for recommendations and/or options.
b. Considers aligning the plant equipment/systems to mitigate equipment damage and/or adverse environmental impact.
c. Considers performing on-line repairs, scheduling those repairs during off-peak hours if possible.
d. Considers starting or increasing load on other plants in the owner's portfolio to supplement lost output through bids or other offers to the Control Area Operator.
e. Considers starting peaking facilities in the owner's portfolio to supplement lost output, through bids or other offers to the Control Area Operator
f. Increases attention (through shifted work and/or increased staffing) to critical systems.

Standard 20: Preparedness for On-Site and Off-Site Emergencies

The GAO plans for, prepares for, and responds to reasonably anticipated emergencies on and off the plant site, primarily to protect plant personnel and the public, and secondarily to minimize damage to maintain the reliability and availability of the plant.
Among other things, the GAO:

A. Plans for the continuity of management and communications during emergencies, both within and outside the plant,
B. Trains personnel in the emergency plan periodically, and
C. Ensures provision of emergency information and materials to personnel.

Guidelines for Standard 20: Preparedness for On- and Off-Site Emergencies

A. The GAO prepares and maintains an emergency action plan, which describes the responsibilities and actions to be taken by plant personnel during on-site and off-site emergencies.
B. The plan considers and addresses the following:
    1. A backup communication system for plant personnel (e.g., walkie-talkies, etc.) in case primary communications fail.
    2. Reasonably anticipated emergencies, for example, multiple injuries to personnel, earthquake, fire, flood, and hazardous substance spill.
    3. Maintaining personnel on-site for the duration of the emergency to direct and coordinate activities.
    4. Coordination and establishment of a plan of action with local emergency services. The generating facility has established lines of communications with the local community emergency service providers.
    5. Use of protective equipment (such as respirators) and clothing for personnel.

6. Coordination and establishment of an emergency management and communications center for extended emergencies.

C. The GAO considers the impacts of emergencies on plant security issues addressed by Standard 21 on Security.

D. There is a basic emergency plan that is concise, is easy to follow, includes emergency contact lists, is readily accessible to plant personnel, and remains available when power or computer systems fail.

E. All responsible personnel are trained on the plan so that it can be placed into effect using only a brief checklist.

1. All plant personnel attend a training meeting at least annually.
2. Training meetings include a discussion of possible situations and typical response.
3. Personnel have the opportunity to receive instruction in CPR, burn and shock first-aid procedures.
4. Emergency preparedness plans are part of each new employee's orientation package.

Standard 21: Plant Security

To ensure safe and continued operations, each GAO provides a prudent level of security for the plant, its personnel, operating information and communications, stepping up security measures when necessary.

Guidelines for Standard 21: Plant Security

A. Each generation facility is secure and considers the following concerns:

1. Protection of Personnel
2. Exterior Perimeter Security
3. Key Control
4. Intrusion Detection and Response
5. Protective Lighting
6. Material Handling
7. Computer Security
8. On-Site Building Access
9. Major Equipment and Switchyard Security
10. Parking Facility Access
11. Access to the site by non-employees
12. Security Personnel Screening and Training
13. Varying levels of security

B. The facility responds to security alerts such as those from the NERC Electricity Sector Information Sharing and Analysis Center (ES-ISAC) or National Infrastructure Protection Center (NIPC) national threat alert notification system.

C. The facility places itself in alert status if local conditions warrant, regardless of the current national, state, or local alert status.

Standard 22: Readiness

Until a change in a unit's long-term status, except during necessary maintenance or forced outages, the GAO is prepared to operate the unit at full available power if the Control Area Operator so requests, after reasonable notice, when such operation is permitted by law and regulation.

Among other things, the GAO:

A. Maintains contingency plans to secure necessary personnel, fuel, and supplies, and
B. Prepares facilities for reasonably anticipated severe weather conditions.

Guidelines for Standard 22: Readiness

A. Full available power is defined as net dependable capacity minus necessary forced or planned outages or derates, generally as calculated by the Control Area Operator. Outages requiring approval by the Control Area Operator are valid for the purposes of this standard only if those Outages receive that approval.
B. Generating facilities have contingency plans in place to take practical steps to provide fuel and necessary commodities, including, but not limited to, all gases, consumables and cooling water necessary to operate the generating facility at full available power.
C. Except during necessary forced or planned outages or when a change in long-term plant status has been granted under Standard 24, the GAO can produce full available power with no more delay than is necessary to conduct normal start-up procedures. A unit that is expected to operate only seasonally should specify in its Unit Plan how much notice will be required to reach full readiness under this standard; however, this notice period should not exceed two weeks.
D. Where the design and location of a plant make alternative delivery approaches practical, facilities have determined the necessary steps for the delivery of fuel and necessary commodities to the generating facility in the event of an interruption in electricity, natural gas, labor actions, etc. (e.g., fuel pipelines and pumps vulnerable to rolling brownouts or blackouts, storms, labor strikes, etc.). Unit Plans should state the lead time required to accomplish alternative deliveries.
E. Cooling water intake channels are adequately dredged to allow operations at full available power during low tide conditions.
F. Prudent steps are taken to maintain cooling water intake channels free of debris.
G. Generating facilities maintain the ability to obtain adequate personnel to operate the plant at full available power when necessary.

H. Generators plan for vacations, sick time, or plant personnel time away from the generating facility, and maintain adequate staffing for plant operations.
I. Vulnerable pumps, motors, electrical equipment, are adequately protected from the elements.
J. Housings designed to protect equipment from water intrusion are adequately maintained.
K. Vulnerable pumps, motors, electrical equipment are adequately dried before energizing to prevent electrical shorts and equipment failures.
L. Loose items or equipment that could become missiles in windy conditions are secured.
M. Access roads under GAO control to and on the generating facility site are prudently maintained in order to be passable during storm conditions.
N. Alternate methods of communication are available in the event that the primary lines of communication become inoperable.
O. Changes in long-term status include shutdown, cold layup, mothballing, retirement, decommissioning, and similar changes, other than planned and forced outages, that make a unit unavailable for dispatch. Outages requiring approval by the Control Area Operator are valid for the purposes of this standard only if they receive that approval.

Standard 23: Notification of Changes in Long-Term Status of a Unit

The GAO notifies the Commission and the Control Area Operator in writing at least 90 days prior to a change in the long-term status of a unit. The notification includes a description of the planned change.

Guidelines for Standard 23: Notification of Changes in Long-Term Status of a Unit

A. Changes in long-term status include shutdown, cold layup, mothballing, retirement, decommissioning, and similar changes, other than planned and forced outages, that make a unit unavailable for dispatch. Outages requiring approval by the Control Area Operator are valid for the purposes of this standard only if they receive that approval.
B. Submission of an Operation Plan and/or Unit Plan does not constitute notice of a change in unit status.
C. The GAO follows Maintenance, Logbook, and Operation standards until the plant status changes, with no decline in the unit's readiness for operation.

Standard 24: Approval of Changes in Long-Term Status of a Unit

The GAO maintains a unit in readiness for service in conformance with Standard 22 unless the Commission, after consultation with the Control Area Operator, affirmatively declares that a generation facility is unneeded during a specified period of time. This standard is applicable only to the extent that the regulatory body with relevant ratemaking authority has instituted a mechanism to compensate the GAO for readiness services provided.

Guidelines for Standard 24: Approval of Changes in Long-Term Plant Status

A. Changes in long-term status include shutdown, cold layup, mothballing, retirement, decommissioning, and similar changes, other than planned and forced outages, that make a unit unavailable for dispatch. Outages requiring approval by the Control Area Operator are valid for the purposes of this standard only if they receive that approval.

B. The GAO follows Maintenance, Logbook, and Operation standards and there is no decrease in the unit's readiness for operation until the plant status changes.

Standard 25: Transfer of Ownership

The GAO notifies the Commission and the Control Area Operator in writing at least 90 days prior to any change in ownership.

Standard 26: Planning for Long-Term Unit Storage

At least 90 days before a change in the long-term status of an electric generation unit, other than permanent shutdown and/or decommissioning, the GAO shall submit to the Commission plans and procedures for storage, reliable restart, and operation of the unit.

Guidelines for Standard 26: Planning for Long-Term Unit Storage

A. Changes in long-term status include shutdown, cold layup, mothballing, retirement, decommissioning, and similar changes, other than planned and forced outages, that make a unit unavailable for dispatch. Outages requiring approval by the Control Area Operator are valid for the purposes of this standard only if they receive that approval.

B. Procedures are prepared and submitted for storing and restarting a unit both for 1) removal from service for 12 months or more and 2) removal from service for less than 12 months.
C. Procedures are developed in compliance with Standard 7 on Operation Procedures.
D. Either a dry or wet storage approach is acceptable.
E. Procedures are carefully planned and documented in a step-by-step process for each system. The lay-up/mothballing procedures and checklists address the following systems, components, and issues.

a. Boiler Water Sides

1. Procedure for preparing the steam drum
2. Check list for steam drum status
3. Check list for steam drum instrumentation status
4. Check list for steam drum nitrogen/valves status
5. Procedure for preparing the Mud Drum
6. Checklist for the Mud Drum status
7. Checklist for the Mud Drum Drain status
8. Procedure for preparing the Economizer(s)
9. Checklist for the Economizer Status
10. Checklist for the Economizer Drain Status
11. Procedure for preparing Superheater and Reheater Headers
12. Checklist for the Superheat and Reheat sections status
13. Checklist for the Superheat and Reheat Header Drain Status
14. Checklist for the Boiler Root Drain Valve Status
15. Checklist for the Boiler Drain Stop and Vent Valves Status
16. Checklist for the Boiler Main Drain Stop Valve status
17. Procedures for desiccant or dehumidifying Scope (if dry lay-up) and Water Quality scope if wet lay-up.
18. Procedures for outdoor humidity or water quality checks, as appropriate.
19. Procedures for documenting and maintaining a data log during the out-of-service period.

20. Procedures for periodic data review to ensure lay-up condition remains effective.

b. Boiler Firesides

Procedures to confirm that the fireside is reasonably clean and in good condition.

c. Turbine

1. Document detailing strategy for Turning Gear operation
2. Document detailing strategy for Seal Oil and Lube Oil systems
3. Document detailing strategy for oil systems return to service
4. Document for detailing strategy for maintaining dry atmosphere in turbine to prevent corrosion

d. Generator

1. Procedures to determine Generator Purge Status
2. Document detailing Hydrogen Cooler strategy
3. Document detailing Hydrogen Supply system strategy
4. Document detailing Hydrogen System Monitoring strategy
5. Document detailing Bearing Cooling Water system monitoring strategy
6. Checklist to confirm, at least once per day, the generator air is to be checked to confirm warm and dry.
7. Document describing the use of a dehumidifier if the unit is to be considered for utilization on a lay-up greater than six months.
8. Procedure for a generator/turbine shaft rotation strategy.

e. Turbine Lube Oil System

1. Procedure for a Lube Oil Pumps strategy
2. Procedure for a Main Oil Reservoir strategy
3. Procedure for a Oil Filter Pump strategy
4. Procedure for a Vapor Extractor strategy

f. Seal Oil System

1. Procedure for a Seal Oil Pumps strategy
2. Procedure for a Seal Oil System Reservoir strategy
3. Procedure for an inspection strategy

g. Condensate and Feedwater System

1. Procedure for Condensate Makeup strategy
2. Procedure for Feed Pump Recirculation system strategy
3. Procedure for Boiler Attemperation system strategy
4. Procedure for Main Condenser strategy
5. Procedure for vent System strategy
6. Feedwater System Drain and Hotwell Strategy
7. Checklist for monitoring strategy and actions strategy for problem discovery
8. Procedure for Deaerator Storage Tank strategy
9. Procedure for Return to Service strategy

h. Bearing Cooling Water System

1. Procedures for Bearing Cooling Water system strategy including pumps and heat exchangers
2. Procedures for Bearing Cooling Water chemistry monitoring strategy

i. Electrical Equipment

1. Procedures for 4160-Volt Motors and Large 480-Volt motors strategy
2. Description of Monitoring strategy
3. The following equipment at a minimum will have documents that will address heating requirements (to prelude moisture and condensation) in the strategy documents:
    a. Boiler Feed Pump Motors
    b. Circulating Water Pump Motors
    c. FD & ID Fan Motors
    d. Condensate Pump Motors
    e. Heater Drip Pump Motor
    f. Gas Recirculation Fan Motor

j. Transformers

1. Procedure for monitoring strategy

k. Alarms and Annunciators

1. Checklist for routine checking of the control room for abnormal conditions/alarms during every shift.

2. Checklist for documentation of rounds is required.

l. Busses and Load Centers

1. Checklist to confirm that normal monitoring with respect to daily routines is still being performed.

m. Service Air

1. Checklist to confirm that this system remains in service.

n. Instrument Air

1. Checklist to confirm that this system remains in service.
2. Checklist to confirm that normal monitoring with respect to daily routines is being performed.

o. Cooling Tower

1. Procedure for draining Cooling Tower basin.
2. Documentation to confirm the normal monitoring with respect to daily routines.

p. Fire Protection

1. Documentation confirming that this system is to remain in service.
2. Documentation confirming normal monitoring with respect to daily routines.

q. SCR System

1. Procedure for securing ammonia storage tank.
2. Documentation to confirm normal monitoring with respect to daily routines.

r. Switchyard

1. Documentation that the required interconnections between a mothballed unit and the switchyard and grid are maintained.

s. Staffing

1. Plan for re-staffing for return to service.
2. Level of staffing while in mothballed status

Standard 27: Flow Assisted Corrosion

Where circumstances require it, the GAO has a flow-assisted corrosion program, which identifies vulnerable equipment, provides for regular testing of that equipment, and responds appropriately to prevent high energy pipe failures.

Guidelines for Standard 27: Flow Assisted Corrosion

The flow-assisted corrosion program takes into consideration factors such as:

A. Identification of the most susceptible piping components/areas and establishment of a sampling protocol consistent with engineering principles and practices.
B. Appropriate nondestructive testing (usually ultrasound) to determine the extent of pipe thinning (if any).
C. Where thinning is identified, establishment of a preventative maintenance. program and replacement of piping in accordance with ASME recommendations.
D. Refer to the U.S. Dept. of Labor, Occupational Safety and Health Administration, Hazard Information Bulletin dated 10/31/96 for more information.

Standard 28: Equipment and Systems

GAO complies with these Operation Standards (1-27) considering the design bases (as defined in the Appendix) of plant equipment and critical systems. The GAO considers the design basis of power plant equipment when as required by other standards it, among other things:

A. Establishes procedures for the operation of critical systems at each unit (Ref. Standard No. 7).
B. For each system, identifies critical parameters that require monitoring (Ref. Standard No. 8 and 13).
C. For each critical parameter, establishes values at which to increase observation of the system or take actions to protect it (Ref. Standard No. 8 and 13).
D. Assures that systems are monitored and actions are taken. (Ref. Standard 8 and 13)
E. Establishes parameters for operation during periods of stress or shortage on the state's electric grid (Ref. Standard No. 9 and 19).
F. Assures that personnel operating critical systems are trained and qualified (Ref. Standard No. 6).

Guidelines for Standard 28: Equipment and Systems

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues for each of the relevant systems and components identified below. This list of issues is neither exhaustive nor a minimum set of guidelines.

A. Incorporates specific system or component requirements into the procedures and documents used to operate those systems and components. GAOs consult available design-basis documents (see Appendix for definition) to determine

requirements for safe, reliable operation of systems and components, and incorporate those requirements into the operating documents for those systems and components.

B. Maintains updated design basis documents on-site for the site-specific equipment.

C. Ensures that personnel responsible for operating power plant systems are trained, tested, and qualified on system operation in accordance with Standards 5 and 6 respectively on Personnel Knowledge and Training. Ensures that system operating configurations are identified in the control room and/or in the specific site operating procedure.

D. Ensures that operating procedures and documents address startup, shutdown, normal operation and reasonably anticipated abnormal and emergency conditions and are readily available to operation personnel.

E. Ensures that operating procedures and documents for each system and component reflect the operating requirements, parameters and limits found in the design basis documents.

F. Ensures that sufficient controls to maintain critical operating parameters within their limits are in place and in operating condition.

G. Incorporates monitoring of critical operating parameters into procedures to ensure that equipment operates reliably consistent with the unit plan.

H. Has processes that:

1. Consider design basis documents in establishing appropriate action levels for critical operating parameters. Action levels are reflected in routines and procedures for data collected manually, and in plant control systems logic for data collected automatically.
2. Monitor systems and components critical to the reliability and availability of the unit either manually or automatically via the plant control systems. Manual monitoring complies with Standard 13 on Routine Inspections.
3. Appropriately assess data and compare that data to established action levels. This may be performed manually, in accordance with Standard 13 on Routine Inspections, or automatically via the logic in the plant control systems. Data trending toward action levels is noted.
4. Take appropriate action by notifying operation personnel and others as appropriate. In the case of data monitored automatically, plant control systems act to warn personnel via the control room alarms. If appropriate, personnel take corrective action.

A. Circulating Water System

1. General Guidelines

The Circulating Water System (CWS) is operated in a manner to supply adequate cooling water to maintain condenser backpressure over the load range. In addition, sufficient flow is available for ancillary cooling equipment without negatively impacting main condenser performance.

The CWS equipment is operated and monitored in such a manner that safe reliable control of components allows unit operation across the entire load range. The state of the system operating condition including the main pumps, lube pumps, intake structure, intake and outfall piping/conduit, and biofouling control systems does not prohibit unit operation to support Control Area Operator or grid requirements for load.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Loss of a CWP (circulating water pump) as it relates to unit load reduction, condenser operation impact, fuel flow reduction, etc.

b. Lube system equipment are available and in service at all times the circulating water pumps are in service.

c. Traveling screens are routinely rotated to maintain sufficient flow supply to the circulating pumps.

d. Screen wash operations are routinely performed to avert any blockage of flow to circulating pumps.

e. Bar racks are periodically inspected and cleared to prevent any flow obstructions to the circulating pumps.

f. Intake and outfall (conduit and headworks) are periodically inspected and monitored (through pump performance) to minimize and subsequently clean any micro and macro biological fouling.

g. Pump removal from service, pump out of service, and pump return to service procedures are clearly established.

h. Vacuum pump system for priming the condenser is available and in good working condition.

i. High circulating water temperatures are investigated and understood. Corrective actions take place, as necessary.

j. Condenser pressure drop is monitored and corrective actions take place if cleanliness impacts circulating water system performance.

k. Condenser tube leak program is in place and operational. Operator action guidelines are clearly defined in procedures.

l. Variable speed drive (VSD) faults (as necessary) are monitored closely and special care and procedures are prepared and available for placing VSD equipment into service.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Circulating water pump discharge pressure/temperature

b. Circulating water pumps operating status (manual/auto/off)

c. Cooling tower fans operating status (on/off)

d. Closed circulating water system pH

e. Cooling tower basin water level (if applicable)

f. Cooling tower blowdown operating status (on/off)

B. Condensate System

1. General Guidelines

The condensate system is operated in a manner consistent with the heat balance cycle design requirements and to allow stable and reliable operation over the entire load range.

The system is operated in a manner to allow sufficient oxygen scavenging and intrusion protection. Condensate pumps are monitored to adequately plan and schedule repairs due to cavitation or other severe duty type of performance problems. Ejector systems are in service to optimize achieving condenser vacuum.

The condensate system components including condenser, air ejectors, and condensate pumps are operated such that unit load requirements can be met as necessary. Condenser tube leaks are monitored and controlled as well as dissolved oxygen and other potentially harmful intrusions. Operating procedures, rounds, and data monitoring tracks the site-specific intrusion concerns and takes action as necessary to minimize intrusion related damage.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Condenser high and low-level indication and alarms are in service at all times.

b. High hydrogen cold gas temperature indications are monitored and unit load limits established to operate below limits. Assessment and remedies are performed to alleviate gas temperature issues.

c. Condenser high conductivity is addressed immediately by operation personnel. All proper precautions are taken to limit the potential for tube leaks.

d. “Loss of Lube Oil” procedures are established for operator actions on condensate pumps and other components requiring lube oil.

e. Procedures for loss of condensate pump or booster pumps are clearly established and all follow-up steps and operating configuration changes including unit load impacts, fuel and air impacts etc. are clearly outlined.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Condenser Hotwell level

b. Condensate Hotwell temperature

c. Condenser Hotwell condensate conductivity

d. Condenser Hotwell makeup water flowrate

e. Condensate pump discharge pressure

f. Condensate pump discharge flowrate

C. Feedwater System

1. General Guidelines

The feedwater system is operated in a manner which maximizes protection of system components including providing sufficient deaeration or oxygen scavenging and sufficient “suction head” and recirculation control on boiler feedpumps.

The feedwater system is available and ready for service at all times. Emergency operation procedures are in place and clearly communicate maintaining the unit on line during reasonably anticipated feedwater system abnormal events, such as a feedwater heater out-of-service. The operation approach is to always allow a safe configuration of equipment to protect the boiler, feedpump, and other major components so that a controlled shutdown can be initiated if necessary.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. A checklist for placing a feedwater heater into service when on-line or during startup should be available. The procedures address equalizing pressure at the heater, boiler feedpump impact (both operation and warmup), turbine extraction differential pressure, drum level controls, and heater level controls.

b. Placing a feedwater heater out of service (and/or bypassing a feedwater heater) when online will impact not only boiler firing rate but also impact steam velocities in the desuperheater and/or condensing zones of the feedwater heaters. It will also impact drain cooler velocities.

c. Deaerators are maintained ready for service and performance periodically evaluated. Pegging steam supply components are monitored such that availability will not preclude the deaerator from going into service.

d. Specific procedures on operation response to loss of a boiler feedpump are prepared with the ultimate objective of not erroneously tripping the unit and minimizing unit swings, including consideration of feedwater system response as well as fuel and combustion air system response as a minimum.

e. Chronic low feedwater temperature is investigated and remedied.

f. Drum level controls have redundancy and drum level indication is available to operations at all times when the unit is online. Since the feedwater system is directly tied to drum level, chronic high or low level is not permitted.

g. Excessive cycling of the boiler feedpump recirculation valves is not permissible.

h. High-boiler feedpump vibration is investigated immediately and remedied to the extent possible. A specific procedure is in place on site to attempt to minimize impact to the unit including investigating such methods of shifting the operating point by slight curtailments or by recirculation valve adjustments.

i. Feedwater system chemistry requirements are adhered to under all operating configurations. Operations personnel are aware of operational problems, which could indicate chemistry issues. Operations personnel are required to monitor at pertinent locations (including but not limited to the economizer inlet, condensate, make-up, and saturated steam) and initiate adjustments, as necessary.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Boiler Feed Pump Vibration

b. Boiler Feed Pump lube oil pressure/temperature

c. Boiler Feed Pump discharge pressure/temperature

d. Boiler feedwater pressure/temperature to the Economizer inlet

e. Boiler Feed Pump flowrate

f. Boiler Feed Pump operating status (manual/auto/off)

g. Boiler Feed Pump Motor bearing temperature

h. Boiler Feed Pump Motor temperature

i. Boiler Feed Pump Motor current

j. Boiler Feed Pump Recirculation Valve position

k. Deaerator storage tank level

l. Dearator storage tank pressure

m. Feedwater Heaters condensate level

n. Feedwater Heaters inlet steam temperature

o. Feedwater Heaters outlet condensate temperature

D. Drum Boiler

1. General Guidelines

The specific operating procedures for each boiler are based on its operating characteristics, limitations and the range of stable burner operation. Established procedures minimize the number of manual operations and standardize methods for startup, shutdown, and on-line operations. Check-off sheets are available for use during all modes of operation. Preventing the boiler from running dry (low drum water level) and furnace explosion prevention (or flame safety) are two primary areas of operation that are emphasized by all operation documentation, training, and rounds.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Boiler protective equipment and state testing frequencies, record-keeping procedures, and other pertinent data.

b. Air Flow.

c. Boiler Pre-firing Equipment check-off procedure

d. Boiler Pre-firing operations and tests

e. Unit Startup (includes windbox-furnace differential versus gas header pressure curves)

f. Combustion controls

g. Procedures for introducing or removing fuel from the boiler and for changing "swing" fuel (if applicable)

h. Emergency shutdown

i. Normal shutdown

j. Reasonably anticipated abnormal operation: Hours of operation under reasonably anticipated “abnormal” conditions such as emergency ramping, unit trips, cold starts, hot starts, failed starts, and out of range operations are tracked and a method to assess (at least qualitatively) operating damage along with planning procedures to manage them.

k. Boiler limitations with relief valves out of service

l. Boiler protective equipment and test frequencies

m. Operation during Out –of-Chemical Conditions

n. Chemical feedpump operation

o. Boiler blowdown operation

p. Operation with high solids

q. Drum level control

r. Feedwater flow control valve

s. Feedwater inlet temperature

t. Drum level temperature differential

u. Superheater/Reheater steam outlet temperatures

v. Tube metal temperature and attemperation sprays

w. High energy piping identification

x. Normal and Emergency Ramping

y. Cycling limitations and damage management

z. Normal Minimum Load limitations and absolute-minimum load limitations

aa. Furnace Explosion Prevention per NFPA

bb. Overfiring and Staged Combustion

cc. Air Preheater Operation

dd. Boiler Tube Leaks

ee. Flue Gas Outlet Temperature

ff. Standardized operation procedures consider:

1) Pre-firing Inspections

i. Boiler walkdown procedure

ii. Instrument and power supply checks

iii. Exercising dampers

iv. Tailboarding

2) Pre-firing Tests
   i. Fan damper fail-safe circuit and control
   ii. Testing of fuel safety shutoff valves
   iii. Ignitor tests
   iv. Furnace purging (Interlocks)
3) Light-Off
   i. Cold Furnace hazards ("do's and don'ts")
   ii. Flame observation
   iii. Ignitor operation/register operation
   iv. Flame scanners, TV, monitoring firing
   v. Open register firing
   vi. Operation of gas header controls
4) Normal Operation
   i. Routine inspection
   ii. Monitoring boiler operation; sensitivity to change of audible and visual signs
   iii. Cleaning lance operations
   iv. Smoke indicators
5) Ignition systems
6) Fuel system operation, monitoring, and testing
7) Flue gas analysis
8) Firing for low NOx
9) APH operation
10) FD, ID, and FGR Fan Operation

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Main boiler drum level (remote and local indications)
b. Main boiler drum pressure
c. Feedwater flowrate
d. Feedwater Inlet pressure
e. Main steam/superheated steam flow rate

f. Superheater inlet/out steam temperature
g. Reheater inlet/outlet steam temperature
h. Furnace fuel flow rate
i. Combustion air flow rate
j. Furnace Pressure
k. Furnace outlet flue gas temperature
l. Stack opacity
m. Continuous blowdown flowrate
n. Air Preheater rotation
o. FD Fan bearing vibration
p. FD Fan lube oil pressure/temperature
q. FD Fan discharge pressure
r. FD Fan Flowrate
s. ID Fan bearing vibration
t. ID Fan lube oil pressure/temperature
u. FD/ID Fan operating status (manual/auto/off)
v. Furnace burner scanner status
w. Burner air flowrate

E. Once-Through Boiler

1. General Guidelines

Once-through boilers generally have controlled circulation pumps (in contrast to a natural circulation boiler's drum). Consider developing checklist type procedures for filling, purging, and lightoff (including but not limited to filling the pump cold, warming up, draining, cavitation protection, and special considerations such as chemical cleaning).

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. All issues identified in the Detailed Guidelines sections for Drum Boilers with the exception of any language specifically dealing with the natural circulation aspects of operation.

b. Water Circulation Pump, Flow/Combustion Interlock. Controlled circulation pumps are interlocked to prevent operation of the combustion equipment unless water flow is established and maintained.

c. The water used to fill the circulation pump is condensate quality. It may come from the low-pressure condensate line or from the boiler feed pump discharge line.

d. If necessary, a fill/purge process is used to fill the pump. Fill and purge line strainers are inspected for plugging periodically.

e. Reasonable precautions and care are exercised to prevent any air pocketing in the pumps. Due to the close clearances in the bearings and motor components, even a very small amount of entrapped air could result in considerable damage.

f. When filling the boiler, prior to normal operation, air is likely to become trapped in the furnace wall system. During cold startups and initial operation, this air may become lodged in the pumps.

Procedures for minimizing air pockets in the pumps. This also applies even if the circulating pump is the feedwater pump.

g. If the unit is equipped with a flash tank, flash tank operation with particular attention paid to bypass systems, as necessary.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. All critical operating parameters for the Drum Boiler Operating Standard apply to this standard as well with the exception of any language specifically dealing with the natural circulation aspects of operation.

F. Fuel Delivery System

1. General Guidelines
The fuel delivery system and boiler management systems are operated to ensure safe and reliable operations under normal and reasonably anticipated emergency conditions.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Flame safety is in compliance with applicable laws and regulations:
   1. Loss of Ignitor Flame During Lightoff (first and second burners)
   2. Loss of Main Flame During Lightoff (first and second burners)
   3. Low Main Header Pressure
   4. Low Ignitor Header Pressure
   5. Master Fuel Trip
   6. Main Fuel Valve Cycling
   7. Loss of Main Flame During Operation
   8. Low Flame Signal Intensity

9. Loss of a Seal Air
10. Loss of All Flame (Black Furnace)
11. Visual Flame Monitoring System

b. The Fuel Delivery System design considers the following issues:
   1. The fuel system logic is designed so that a single component failure in that system shall not prevent a safe shutdown. A double block and bleed system is utilized on individual burner gas supply.
   2. System status information is displayed in a convenient area for the control room personnel to view throughout the shift.
   3. The flame safety system detects and guards against hardware failures including but not limited to:
      a. Failure of any BMS CPU to execute a program.
      b. Failure to scan the inputs and outputs.
      c. Failure of input/output devices.
      d. Internal addressing failures.
      e. Memory failure.
   4. Flame Safety Monitors observe and discriminate both igniter and main flames
   5. Scanner heads are self-checking and are able to withstand burner front temperatures and moisture.
   6. A self-checking sequence occurs to detect any component failure throughout the system. Indication that the self-checking sequence is taking place and system is normal should be available.
   7. The system accommodates power supply voltage swings.
   8. Flame safety components have appropriate approvals. For examples: FM (Factory Mutual) Approval, CSA (Canadian Standards Association) Certification, NRLT (National Recognized Testing Laboratories) Listing or UL (Underwriters Laboratory).
   9. Valves and vents are sized in accordance with NFPA 8502 and are FM approved.
   10. Header Purge Procedures
   11. Header Leak Tests
   12. Gas supply double block and venting

c. The following lists of permissives and alarms are in good working order and are supplemented as required to satisfy applicable laws and regulations:

   1. Boiler Start Permissives
      a. Master Fuel Trip (MFT) Reset

b. Drum Level Satisfactory
c. All Boiler Fans Running
d. Prove Fuel Supply Trip Valves Close-Vent Valve Open
e. Prove Burner and Ignitor Valves Closed-Vent Valves Open
f. Low Gas Pressure Interlocks satisfied
g. High Gas Pressure Interlocks satisfied
h. Furnace/Flue Gas Dampers open, as appropriate

2. Purge Permissives
   a. Air Registers to Purge Position
   b. Prove Air Purge Flow Rate
   c. Successful Purge
3. Burner Start Permissives
   a. Purge complete
   b. Gas Header Fuel Pressure permissives satisfied
   c. Gas Header Trip Valve Open and Vent Valve Closed
   d. Burner Gas Valves closed
   e. Flame monitor proves flame not detected.
   f. Air Register to Light Off Position
4. Alarms include but are not limited to:
   a. Gas Supply Pressure High/Low
   b. Burner Header High/Low Fuel Pressure
   c. Ignition Header High/Low Fuel Pressure
   d. Loss of ID Fan (if applicable)
   e. Loss of FD Fan
   f. Loss of Flue Gas Recirculation Gas (if applicable)
   g. Furnace Air Flow Low
   h. Furnace Draft High
   i. Loss of Interlock Power
   j. Loss of Control Power
   k. Loss of Flame
   l. Burner Valves Not Closed
   m. Flame Monitor Self-check Alarm
   n. Air Preheater Zero Rotation

o. Furnace/Flue Gas Dampers Closed

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Main gas supply header pressure/flowrate
b. Burner header high/low fuel pressure
c. Furnace/flue gas dampers status (open/close)
d. Burner Gas Valves status (open/close)
e. Flame status
f. FD/ID fan operating status (manual/auto/off)
g. Furnace Pressure
h. Seal air pressure
i. Air preheater rotation status

G. Boiler Chemistry

1. General Guidelines

Personnel are trained in the operation of the chemical injection systems, their controls and indicators, permissives, alarms and trips. The importance of maintaining sufficient sample flowrates and the conditions for notifying a chemist are clearly described in operating procedures.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Appropriate training in boiler blowdown system and its impact to overall boiler water chemistry, flow limits, drum water levels, and boiler makeup water system.

b. The chemical injection method, injection locations, and reasoning behind using chemical processes such as oxygen scavenger, phosphate, sodium hydroxide, trisodium phosphate, and ammonia.

c. Identification of parameter ranges for all monitored and controlled boiler water parameters and action steps for out of range values. The table below can be used as an illustrative guide for parameters to be measured.

(FOR ILLUSTRATIVE PURPOSES ONLY)

Parameter	Control Limits
Cation Conditions	
Specific Conditions	
pH	
Ammonia	
Dissolve 02	
Oxygen Scavenger	

d. Establishment of control limits and intentions for normal operation. The following illustrative table is for guidance only.

(FOR ILLUSTRATIVE PURPOSES ONLY)

Parameter	Control Limits
Phosphate, PO_4	1 – 3 ppm
pH	9.3 – 9.9
Silica, SiO_2	0.20 ppm
Chloride	0

e. Operating limits and remediation procedures are available for "out of compliance" boiler water chemistry.

3. Monitoring Critical Operating Parameters:

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Feedwater pH level

b. Feedwater conductivity level

c. Feedwater silica level

d. Feedwater ammonia level

e. Feedwater oxygen level

f. Feedwater carbon dioxide level

g. Phosphate level

h. Phosphate feedpumps operating status (manual/auto/off)

i. Ammonia feedpumps operating status (manual/auto/off)

j. Oxygen scavenger feedpumps operating status (manual/auto/off)

k. Continuous blowdown flowrate

H. Steam Turbine

1. General Guidelines

Operations are conducted with strict adherence to required warm-up and thermal expansion rates, overspeed requirements, vibration requirements, vacuum requirements and all other vendor recommended protective restrictions.

Operation of the turbine requires close coordination between the OEM, maintenance, performance test/monitoring personnel, engineering and operations. Vendor bulletins that may affect current operations are up to date.

Startup procedures and checklists are adhered to.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

1. Shaft eccentricity is monitored while operating on turning gear. Clear eccentricity limits are identified and adhered to.
2. Turbine bearing lube oil return sight glasses indicate normal flow during all operating modes.
3. Lube oil reservoir level is normal, auxiliary lube oil pump is running. Cooling and sealing water is available.
4. All steam driven Boiler Feed Pumps are available for service.
5. Stop valve equalizing valves are properly positioned as appropriate.
6. Turbine vacuum breaker valve properly positioned as appropriate.
7. Generator hydrogen gas pressure is normal and turbine and collector end seal oil pressures normal.
8. Hydraulic couplings are available as appropriate.
9. Low bearing oil pressure indication and/or alarm is in service.
10. Low-vacuum pressure alarm and trip devices in service.
11. Thrust bearing alarm and trip devices in service.
12. All other protective trip devices in service.
13. Turbine throttle valves, emergency stops, interceptor and Reheat Stops (as appropriate) are properly positioned.

14. Turbine control system checklists are completed (DEH or otherwise).
15. Turbine supervisory instruments available.
16. Lube oil pump available for service. Emergency lube oil pump available for service.
17. Verify DC pump start and operating pressure.
18. Auxiliary Oil Pump is in service.
19. All drain valves are properly positioned.
20. All telltale valves are properly positioned.
21. All temporary piping spool pieces (e.g. reheat hydro fill) are removed and piping has been secured.
22. Open extraction line trap valves for all appropriate stage extractions. Valve traps are in service.
23. After turbine roll when turbine loading begins, passing through critical speeds should be watched extremely carefully. Vibration monitoring equipment is in-service and in good working condition. Operating procedures clearly state the vibration levels, which would trigger an operator-initiated trip such as to minimize debate during a startup.
24. Operations personnel always attempt a controlled shutdown when the unit is to be taken out of service for any reason.
25. Normal hours of turbine operation are tracked closely as well as emergency ramp up hours, emergency ramp down hours, number of unit trips, and number of failed starts. For any continuous alarm condition, hours of operation in the alarm range are to be tracked.
26. Turbine admission temperatures are clearly stated in operating procedures, monitored, and should not exceed requirements of the turbine.
27. Water induction potential is minimized. If no formal water induction equipment is in-place or is unavailable, there is a total plant procedure indicating operating practices of other components to affect a water induction minimization program. There are several ways that water induction can occur. Operations personnel are aware of these causes in order to be able to react to and minimize water induction. Appropriate action is taken upon the detection of water induction to prevent damage. Some causes of water induction are:
    i. Misuse of Attemperator Sprays
    ii. Extraction Line Backup

iii. Clogged or Inadequate Drains

iv. Carryover from the Boiler

28. The initial pressure regulator is designed to protect the turbine from a drop in boiler pressure. Boiler pressure drop often precedes water carryover from the boiler into the turbine. When the initial pressure regulator detects a drop in boiler pressure, it causes the turbine valve to close.

29. Conventional monitoring systems use thermocouples to detect water induction. The system consists of several pairs of thermocouples in the turbine shells and casings. A sudden drop in temperature of several of these thermocouples could signal a potential water induction incident when immediate operator action is required.

30. Critical speed is a characteristic of all rotating shafts and contributes to increased vibration when starting up or shutting down the steam turbine. When starting or stopping the turbine, it is important to pass through the critical speeds without necessary delay. If the unit is held at a critical speed for too long, excessive vibration and rubbing can occur.

31. Turbine supervisory boards, displays, and instrumentation are in service and any annunciator panels are routinely tested for proper indication status. All turbine driven system protection devices are in good working order, tested routinely, and in service during all turbine operation periods. The protective devices in service include but are not limited to:

i. Low Vacuum Trip

ii. Overspeed Trip

iii. Emergency Trip

iv. Thrust Bearing Temperature Trip

v. Exhaust Hood Temperature Trip

vi. Critical Oil Level Trip

vii. Loss of Fuel

viii. Loss of Feedwater

ix. Drop in Boiler Pressure

x. Fuel Shutoff Trip

xi. Any Buss Relay Trip

xii. Generator Trip

xiii. Vibration Trip and/or alarms

xiv. Thrust Bearing Fail

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Turbine speed
b. Main steam inlet pressure/temperature/flowrate
c. Cold reheat steam inlet pressure/temperature/flowrate
d. HP turbine throttle and governor valve position
e. IP turbine interceptor and reheat stop valve position
f. Turbine steam bypass valve position
g. Extraction steam pressure/temperature
h. Water induction detectors operating status
i. Casing expansion detector operating status
j. Turbine thrust bearing position (wear) status
k. Hydraulic fluid pressure
l. Condenser vacuum pressure
m. Bearing vibration
n. Bearing Oil Pressure

I. Gland Seal System

1. General Guidelines

Gland steam pressure and temperature requirements are met throughout the load range.

The Gland Steam System components including attemperation devices and gland steam condenser are monitored and in good operational condition.

Operations procedures address steam system requirements during startup and normal operation.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Hierarchy of operation if multiple valves are utilized. If a backup steam supply is utilized due to a low-pressure condition, it is available at all times the primary supply is in service. High-pressure relief system is in service as well to prevent overpressurization. The system maintains proper pressures where required (e.g., a slight positive pressure on the inboard labyrinth shaft seal cell with the gland seal condenser and exhaust maintaining a slight vacuum on the outboard labyrinth shaft seal cells).

b. Description of multiple valve operation logic for either manual or automatic systems. For instance, if Steam Supply 1 and 2 are used for different load ranges and a dump valve used only at full load, operators clearly understand logic and options. Startup steam supply sources are identified in the procedure. Local pressure and temperature data is collected on rounds to allow control room operations to confirm control system parameters.

c. Temperature control by attemperation and spray water control valves are in good working condition. Any orifices for either continuous drain lines or spray nozzles are monitored for operation impacts due to excessive wear.

d. The gland steam condenser is in service at all times and is not bypassed. The minimum flow of condensate through the gland steam condenser is clearly established and monitored.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Gland Steam Condenser operating pressure

b. Gland Steam Condenser condensate level

c. Gland Steam Condenser Exhauster operating status (manual/auto/off)

d. Gland Steam Condenser condensate temperature

J. Turbine Lube Oil System

1. General Guidelines

Lube oil is available at all times when equipment is in operation or on turning gear. Purity levels are appropriately monitored and maintained.

The Lube Oil System including any coolers, main pump, backup and DC pumps, vapor extractors, and main storage system are in good operating condition and the backup/safety components are periodically tested to ensure the safety of the larger equipment this system supports.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Lube oil tank area is included on normal rounds and is periodically tested and inspected for contamination.

b. Lube oil coolers are available in service and in good working condition. They are monitored and inspected routinely.

c. Vapor extractors are in service at all times.

d. Main oil pump is periodically tested for identification of performance issues.

e. Auxiliary oil pump is started and tested prior to every unit start up.

f. DC backup pump is required to be in service and of proven performance prior to every unit start. The start test for this pump is incorporated into normal unit startup procedures.

g. Centrifuge/Purification System is available at all times the unit is on line or on turning gear.

h. Equipment bearings are monitored for sufficient oil flow and temperature of exit oil.

i. Vibration monitoring is part of bearing and shaft lubrication operational observations.

j. Temperature controls on the lube oil are in service at all times. Operations personnel make rounds to ensure control parameters are consistent with local readings.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Bearing lube oil pressure/temperature

b. Bearing lube oil flowrate

c. Bearing lube oil reservoir level

d. Lube oil pump operating status (manual/auto/off)

e. Cooling water pressure/temperature

K. Seal Oil System

1. General Guidelines

Seal oil pressure is maintained at hydrogen seals whenever hydrogen is in the generator or when the shaft is turning. All vapor extractors are operated continuously when the generator is filled with hydrogen Hydrogen system monitoring is performed during all stages of startup and shutdown. Sufficient quantities of hydrogen are on site to allow for successful unit startup when required by the Control Area Operator or grid conditions.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Seal oil coolers are in service whenever the seal oil system is in service.

b. Backup DC pump is tested and placed into automatic start mode prior to placing seal oil system into service. Backup seal oil supply is in service and in confirmed good working condition. Backup supply from either the DC backup pump or turbine hydraulic fluid is available.

c. Seal oil system is not removed from service until the generator has been purged and the unit is off turning gear.

d. Both the hydrogen side and airside seal oil pumps have established operating differential pressures which are monitored by operations.

e. Moisture detectors are in service and monitored on routines.

f. Alarms which are periodically tested and confirmed in service include but are not limited to the following:

1. Hydrogen Purity High Low
2. Hydrogen Pressure - High or Low
3. Hydrogen Supply Pressure Low
4. Water Detector High
5. Air Side Seal Oil Pump Off
6. Seal Oil Pressure Low
7. Hydrogen Side Oil Level Low
8. Seal Oil Turbine Backup
9. Hydrogen Side Seal Oil Pump Off

10. Air Side Seal Oil Backup Pump Running

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Hydrogen Purity High or Low

b. Hydrogen Pressure - High or Low

c. Water Detector High

d. Seal Oil Pressure Low

e. Hydrogen Side Oil Level Low

f. Seal oil reservoir level

g. Main seal oil pumps operating status (manual/auto/off)

h. Seal oil and hydrogen gas differential pressure

L. Generator

1. General Guidelines

Generators are operated within their capability curves. The capability curves are clearly established and understood by appropriate operations personnel as are automatic and manual procedures for synchronizing and maintaining the generator to the grid.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Generator temperatures, vibration, and the various generator support systems are closely monitored.

b. At no time are excitation interlocks or relay protection disabled or made non-automatic for the purpose of establishing a generator field.

c. A generator field is not re-established after operation of a generator protective relay until a thorough investigation has been completed.

d. On generators requiring field pre-warming, the manufacturer's instructions and established local procedures are followed relative to maximum allowable field current.

e. A generator field is applied and maintained at appropriate turbine speeds. On cross-compound units if a field is applied while on

turning gear, extreme caution is exercised. Should either or both shafts come to a stop, the field is immediately removed to prevent overheating damage to the collector rings.

f. Operations management has established a standard for synchroscope operation. It provides clear guidance and uniformity to synchronizing operations including incoming and running voltage matching tolerances.

g. Anti-motoring in the event of a unit trip or normal shutdown. System separation during upset conditions.

h. During normal operation voltage regulation and, where applicable, power system stabilization are continuously in service.

i. Generator moisture detection.

j. GAOs consider preparing checklists for the following types of activities:

1. Check hydrogen purity levels normal and adjust, as needed.

2. Check seal oil system operating properly/maintaining proper differential pressure.

3. Check hydrogen dryers in service/desiccant checked and regenerated as needed.

4. Check liquid level detectors for accumulations of water or oil. Report and monitor any abnormalities.

5. Check stator, field, and gas path temperatures. Report and monitor any abnormalities.

6. Check generator residual ground voltage. Report and monitor any abnormalities.

7. Check collector ring areas for broken or arcing brushes.

8. Check pressure, temperature and flowrate of water-cooled heat exchangers.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Generator speed

b. Generator Frequency

c. Generator Voltage

d. Liquid level detectors

e. VARs

f. Hydrogen Gas Purity

g. Field winding temperature

h. Stator winding temperature

i. Stator Winding Water Conductivity

j. Stator core end iron temperature

k. Hydrogen Cooler water inlet temperature

l. Generator internal hydrogen gas pressure

m. Generator hydrogen consumption rate

M. Control System

1. General Guidelines

Control Systems including DCS control screens, hardwired control boards, manual control operations, and all associated discrete and protection logic are to be fully operational at all times. There are sufficient control devices and systems (manual and automatic) to safely and reliably operate the generating unit during all modes of operation.

If it is necessary to operate without a specific control loop, a safe control alternative is implemented with associated documentation; and personnel are trained to operate under that configuration.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. The pre-start checks/operations required prior to placing the unit in service from the control room including a cold air tests, boiler purge, lightoff, steam quality and pressure, turbine roll, trip tests, paralleling to the grid, ramping load, automatic control, and unit shutdown.

b. All the pre-start checks and operations performed locally, including necessary communications between the field and the Control Room, required prior to placing the unit in service.

c. The applicable procedures that can be used to guide the startup of the unit through control board operations.

d. The correct positioning of isolating and control dampers, the availability and quality of auxiliary systems such as bearing cooling water and seal air.

e. The line-up of all purge permissives including control interlocks and alarms, levels, etc.

f. The operation and reasoning behind the feedwater flow control, the burner firing concepts, and air/fuel lead/lag controls as well as which critical unit parameters have redundancy. Operator understanding includes full details of operation, operating pressures and temperatures, method of flow and control, operating limits, supervisory limits, alarm values, monitoring screens and/or boards, and locations of local instrumentation which displays in the control room.

g. The physical configuration of the specific unit's control room including the purpose and location of the cable spreading rooms, battery room, and UPS system. The hardwired controls versus digital controls are understood as well as impact of various digital control scan rates on appropriate unit parameters. The difference between hardwired protective circuits versus software protective routines and the limitations of each.

h. The hardware required for performing control room operations including operator interfaces, manual/auto stations, CRTs, soft and hard push-buttons, keyboards, data highway interface electronics, operator interface electronics, power supplies, cabinets, operators console and furniture, and printer/loggers. Control board layout including identification and understanding of the turbine board, boiler board, generator and synchronization board, circulating water board, overall unit board, burner flame scanner cabinet and displays, CEMS station, annunciator, etc. as well as various PLC screens and various single/multi loop controllers for systems not fully integrated into main controls.

N. High-Voltage System

1. General Guidelines

The most critical component in the high-voltage system is the high voltage transformer. In particular, load current, temperature measurements and associated actions for out of range values are clearly defined in procedures.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Transformers are inspected at regular intervals. The interval is determined by taking into account operational history with the specific transformer, severity of service, and harshness of environment.

b. Dry-type transformers require little inspection but ventilated dry-types, the grounding terminal, and tap connections are inspected on rounds for air flow path restrictions. Noise level is also observed.

c. All gages provided on liquid-immersed transformers are monitored and data recorded. Observations include but are not limited to:

i. Oil Leaks (Tanks, Coolers, Piping, Bushings)
ii. Loose Terminal Connections
iii. Loose Grounding Connections
iv. Water Leaks (Water-cooled Transformers)
v. Fans in Inoperative Condition
vi. Accumulation of Dirt on Fan Blades and Motors
vii. Fan Bearings and Lubrication
viii. Paint Deterioration
ix. Pressure relief is indicated.
x. Bushing Oil Level Low Insight Glasses
xi. Chipped or Soiled Bushings or Lightning Arresters
xii. Abnormal Conditions in Cooler Control Cabinet
xiii. Audible Corona Discharge
xiv. High Sound Level

d. monitoring and recording at regular intervals items such as:

i. Tank Pressure
ii. Tank Liquid Level
iii. Ambient Temperature
iv. Top Liquid Temperature
v. Winding Temperature
vi. Load Current
vii. Voltage
viii. Liquid Flow at Each Pump
ix. Lightning Arrester Discharge Counters
x. Gas Seal Equipment
xi. Transformer Pressure Gage
xii. Low-pressure Alarm Circuit
xiii. External Gas Equipment and Hardware
xiv. Nitrogen Bottle Pressures (Inert Gas System)
xv. Fault Gas Monitors
xvi. Water Cooling Equipment
xvii. Water Flow Rate
xviii. Water Pumps
xix. Oil Circulating Pumps

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Load current

b. Oil temperature

c. Oil level

d. Transformer gas pressure

e. Cooling water temperatures

O. Medium-Voltage System

1. General Guidelines

The Medium-Voltage System includes all motors, circuits, breakers, and components off of the house auxiliary transformer and is generally in the 480- to 4160-volt range. These components and surveillance systems are appropriately monitored and operated within their design ranges at all times. Work activities are in place to verify that the Medium-Voltage System is operating within reasonable limits with investigating and corrective actions taken when out–of-range parameters are monitored.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Medium Volt Bus Undervoltage Relays

b. Generator Differential Relay

c. Generator Overcurrent Relay

d. Generator Neutral Ground Overcurrent Relay

e. Generator Loss of Field Relay

f. Generator Anti-motoring Relay

g. Main Transformer Sudden Pressure Relay

h. House Auxiliary Transformer Differential Relay

i. Turbine Emergency Tripping Relay

j. Unit Overall Differential

k. House Transformer Overcurrent

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicator:

a. Tripped relays and circuit breakers

P. Low-Voltage System

1. General Guidelines

The Low-Voltage System is generally 220 volts and below. The operational surveillance on this system ensures that critical low-voltage components are operated within their design range and that sufficient lead-time is allowed to repair defects without unreasonably impacting normal operations. Motor control centers and transformer oil system should be considered.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Low-Voltage Bus Undervoltage Relays

b. Auxiliary Transformer System

c. Motor Control Centers

d. Switchgear and Clearance Procedures

e. Breakers and Disconnects

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Tripped relays and circuit breakers

Q. DC System

1. General Guidelines

Sufficient unit protection is provided by the Direct Current (DC) system to allow safe shutdown, startup, or surveillance of critical components during normal and reasonably anticipated abnormal operating modes. Battery and Uninterruptible Power Supply (UPS) systems are in service and monitored to ensure availability as necessary. Motor control centers and transformer oil systems should be considered.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. A Battery Backup System is in place to allow safe and reliable operation of critical equipment and therefore allow a controlled shutdown during a loss of all power event. The battery equipment is monitored routinely and periodically assessed for loading limitations based on any existing, modified, or new equipment.

b. An UPS system and conditioning system is in service for those digital components, which require power supplies absent of electrical noise. UPS system is also to be provided for components, which are determined to be critical to unit operation or unit shutdown. The facility has determined and documented the backup power supply issues and how the system in place reflects those findings.

c. The Instrument and Control Voltage Distribution System is adequate to provide sufficient quality and quantity power supply to all plant locations requiring DC voltage. The system has a means to satisfy anyone making rounds that the DC voltage system is in service and operating at sufficient levels.

d. Lightening protection exists and is in working order.

e. Protective devices or relays are in service and operating normally

f. Sufficient breakers and disconnects are available to operations to allow uninterrupted operations during routine operation and maintenance functions.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Battery status

b. DC voltage level

c. DC Grounds

R. Instrument Air System

1. General Guidelines

Service and Instrumentation air has sufficient pressure and is available at all times. Instrumentation air is dry and moisture free per component requirements throughout the site.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. *Rotary/Centrifugal Compressors*. Both are in use at various sites and many sites have both. Inspect lube oils, cooling water, cycling frequencies, operating current and temperatures, etc. as appropriate.

b. Moisture detectors are in good working order and monitored. Moisture in the system can cause problems with most controls. Blowdown frequencies and/or heater cycling should be observed for any anomalies.

c. Receiver systems (tanks) are drained periodically (if not automatic) and tank/component integrity observed on rounds along with excessive compressor cycling frequencies.

d. Headered systems specifically where backup air supplies are tied together are checked to ensure they are valved-in as necessary.

e. Purity requirements for components on-site are adhered to by periodic monitoring.

f. Loss of an air compressor is alarmed and does not interrupt operations through a backup system or through planning via rental units.

g. Air system operation is not impacted by a unit trip.

h. Air filter high pressure differential

i. Loss of air drying system

j. Loss of Air to scanners and cameras

k. Annunciation system failure

l. Decreasing system air pressure

m. High compressor air or oil temperature

n. Excessive compressor cycling

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Main system operating pressure
b. Instrumentation air dryness (moisture dewpoint temperature)
c. Air compressors operating status (manual/auto/off)
d. Compressor lube oil pressure/temperature

S. Auxiliary Steam System

1. General Guidelines

Auxiliary steam is available at all required times and load points. Sufficient supply of temperature, pressure, and flow is available from either existing permanent systems, cross- tied systems, or stand-alone/rental systems.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Pressure Reducing Stations or auxiliary boilers providing steam for deaerator pegging, gland steam condenser startup, condenser vacuum ejectors, water treatment evaporators, building heating, fuel oil heating, sootblowing, or providing any other auxiliary service is provided at a quality suitable for the intended service.

b. Any relief devices on the auxiliary steam are in good working condition.

c. Temperature and pressure indication as well as pressure control valve stations are monitored on rounds for any cycling or out-of-range parameters.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Deaerator pegging steam pressure

b. Gland Seal Steam Pressure during startups

c. Condenser Hogging ejector steam pressure during startups

T. Selective Catalytic Reduction (SCR) System

1. General Guidelines
The SCR is in good working order and does not prohibit the unit's ability to meet load commitments or startup commitments. The SCR operational temperature range and ammonia flowrate are efficiently operated to meet emissions targets.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Whether there exists an ammonia slip monitoring system or not, ammonia slip is periodically reviewed by operations to ensure mechanical integrity and/or catalyst activity is being maintained.
b. Sample lines are operated at a temperature sufficient to prevent condensation from obstructing required sample rates of the pertinent analyzers. If sufficient temperature or physical routing does not allow for this, sample lines are blown down with a frequency to prevent obstruction.
c. Sample conditioners are operated in a manner consistent with the sample quality requirements of whichever analyzer equipment exists on-site.
d. A policy on moisture protection for the catalyst is prepared and on site.
e. The vaporizer system operation does not allow ammonia admission prior to reaching a safe vaporization temperature for the specific system installed. The operations organization monitors the vaporizer temperature to assess the performance to minimize possibility of flooding the vaporizer.
f. The Dilution Air System provides appropriate diluent to preclude operation of the ammonia system from operations in the explosive mixture range of ammonia and air.
g. The operations organization periodically evaluates catalyst exposure to water and high flue gas temperatures. A system is established to allow a clear run/not run criteria (when a tube leak is present) to protect the catalyst.
h. Injection System tuning checks are performed prior to placing the SCR system in service. If the system is going into service for the first time, tuning is performed. If the system is simply coming back into service after its initial startup, tuning valve positions are spot-checked to ensure no tampering occurred while the system was out of service.
i. Ammonia storage and handling equipment performance is incorporated in the daily rounds routines. Specific operation procedures are established to clearly identify when ammonia tank levels are such that ordering ammonia and re-filling the tank will not hinder operations with respect to lead-time and tank fill operations. Aqueous ammonia is utilized by any facility over ten megawatts. Contingency plans are established to allow purchase from a “backup” supplier if necessary. Other storage area equipment such as tank appurtenances, forwarding pumps, continuous recirculation, leak detection, etc. are operated in a manner to maintain system availability and local compliance.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Ammonia storage tank level

b. Dilution Air Fans discharge pressure

c. Dilution Air Fans operating status (manual/auto/off)

d. Dilution air discharge temperature

e. Flue gas temperature at SCR

U. Continuous Emissions Monitoring System (CEMS)

1. General Guidelines

The system provides accurate and up to date data for maintaining the unit within compliance parameters and accomplishes all reporting functions required by federal, state, and local agencies.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues:

a. A written Quality Assurance/Quality Control Program (QAP) adhering to applicable laws and regulations (e.g. Code of Federal Regulations, 40 CFR 75) including the following activities:

i. Calibration error tests and linearity checks
ii. Calibration and linearity adjustments
iii. Preventive maintenance
iv. Audit procedures
v. Recordkeeping and reporting

b. The QAP for the CEMS is on-site and available to personnel as needed. It is designed to satisfy federal, state and local requirements.

c. This QAP is a working document of procedures and specifications that can be used daily to ensure compliance with environmental regulations. Pertinent information and procedures are organized in step-by-step lists, flowcharts, fill-in forms, and other easy-to-use formats.
Operations monitor for CEMS alarm conditions on a 24-hour basis. If alarms are active, operations perform the necessary corrective actions. If unable to correct the alarm condition, they immediately notify proper site

personnel so that corrective actions can be taken such that support of grid operations is not interrupted.

d. All required CEMS daily check forms are completed and initialed as part of the daily routine, with appropriate corrective action taken as necessary.

i. Alarm Checks

Alarm and/or fault checks include but are not limited to such things as: Power Interruption, UPS Alarm, Shelter Temp High or Low, any HVAC Alarm, Calibration Gas Pressure Low, Sample Conditioner Faults, Sample Probe Heater Alarm, Sample Line Temperature Alarm, Exceedances, Data Acquisition System (DAS) Faults, Analyzer Faults, and CEMS General Faults. The DAS fault may include a variety of fault conditions including warning and out-of-control zero/span calibration check results.

ii. Calibration Tests

Results of the daily calibration test for each measured parameter are appropriately reviewed. Out-of-control conditions receive appropriate corrective action. A warning system is utilized to caution personnel that an out-of-control condition is imminent such that corrective action may preclude the condition.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Oxygen, O2
b. Carbon Monoxide, CO
c. Carbon Dioxide, CO2
d. Sulfur Dioxide, SO2
e. Nitrogen Oxides, NOX
f. Opacity, Ringleman

V. Water Treatment System

1. General Guidelines

Water Treatment Systems are monitored and maintained to allow sufficient quantities of treated water to always be available as needed to support operation over the load range throughout long run periods such as summer peak. Personnel have instructions on how to respond to out of range parameters to maintain safe and reliable operation.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Personnel take appropriate action in response to abnormal operating conditions. Personnel have the ability to operate the water sampling and treatment systems under normal and reasonably anticipated abnormal conditions using the appropriate control screens, hardwired control stations, and local field support as required to maintain parameters within acceptable operating limits in both automatic and manual. Specific procedures are available and operators are able to demonstrate appropriate response to conditions such as those shown in the table below (the ranges listed below are illustrative only). Site-specific ranges are established for each facility by operations personnel.

(FOR ILLUSTRATIVE PURPOSES ONLY)

SAMPLE POINTS	PARAMETERS	NORMAL RANGE	ACTION LEVEL 1	ACTION LEVEL 2	ACTION LEVEL 3	CONTROLED SHUTDOWN
Condensate Pump Discharge	Cation Conductivity (Micromhos/cm^2)	less than 0.2	0.2 – 0.35	0.35 – 0.65	greater than0.65	
	Dissolved Oxygen, ppb	less than 20	20 - 40	greater than 40		
Feedwater	PH	8.8 – 9.3	less than8.8, greater than 9.3			
	Cation Conductivity	less than 0.2	0.2 – 0.35	0.35 – 0.65	greater than 0.65	
	Oxygen Scavenger, ppb	1 - 3	less than 1 or greater than 3			
	Dissolved Oxygen, ppb	less than 5	5 - 10	10 - 20	greater than 20	
Boiler Blowdown	pH	9.3 – 9.9	less than 9.3 or greater than 9.9	less than 9.0	less than 8.5	less than 8.0
	Phosphate, ppm	1 - 3	less than 1 or greater than 3	less than0.5	0	
	Silica, ppm - Silica Action Level Guidelines					
	Chloride, ppm	0	0 - 1	1 - 2	2 - 3	greater than 3
	NaCl , ppm	0	greater than 0 or less than 2	greater than 2 or less than 3	greater than 3 not less than 5	greater 5

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

The following parameters are for treated demineralized boiler makeup water.

a. Sodium
b. Potassium
c. Chloride
d. Sulfate
e. Silica
f. Specific Conductivity
g. Cation Conductivity
h. TOC
i. Oxygen
j. Iron
k. Copper

W. Bearing Cooling Water System

1. General Guidelines

The Bearing Cooling Water (BCW) System including heat exchangers, pumps, and components with bearing cooling water requirements are in sufficient operating condition to provide adequate supplies of flow, pressure, temperature, and water quality at all times throughout the load range.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. BCW Heat Exchangers
b. BCW Heat Exchanger Strainers
c. BCW Pumps/Motors
d. BCW Storage Tank Level (as appropriate)
e. BCW Makeup Water System

f. BCW Chemical Treatment and Monitoring
g. Forced Draft Fan Bearings
h. Gas Recirculation Fan Bearings
i. ID Fan Bearings
j. Lube Oil System
k. Seal Oil System
l. Sample Coolers
m. Circulating Water and/or Backup Water System
n. BCW System Pressures and Temperatures

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. BCW system water pressure
b. BCW cooling water temperature
c. BCW system pump operating status (manual/auto/off)
d. BCW system water quality

X. Cooling Tower

1. General Guidelines

The Cooling Tower System equipment including suction pit, pumps, tray system, deluge system, etc. are operated within their safe operation ranges at all times. Support systems for components such as lube water or lube fluids are available for service and are sufficient to allow continued safe and reliable operation of the equipment they support. Plume abatement, if required for regulatory compliance, is in service when necessary to not preclude achieving a required load due to a compliance issue

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Tower circulating water pumps (CWP's) are adequately lubricated.. Any external lube system with appropriate filters and screens are available and in service whenever a CWP is in service. Pumps are

routinely evaluated for vibration and performance degradation and adjustments initiated as necessary. In addition, any cathodic protection systems are monitored routinely.

b. Circulating water pumps are never operated without proper water levels in the cooling tower basin.

c. Deluge systems are observed with periodic testing to ensure they are in good working order.

d. The tray systems are observed to identify potential flow problems and/or structural damage, which could impact operation such that repairs can be initiated.

e. Suction pit operations follow prepared site-specific procedures including but not limited to any freeze protection, high water temperature control, dealing with high turbidity, bacterial slime, and vortexing into the CWP.

f. Circulating water temperatures are closely monitored and recorded for indicating general health of the Circulating Water System (CWS) and performance improvement efforts are initiated when circulating water temperature is chronically out of range.

g. Operations personnel response to loss of a cooling tower cell exists. Unit impact is understood and remedies are initiated to prevent the unit experiencing any undue mechanical stress or performance degradation from loss of the cell.

h. Drift eliminator operation is observed and remedied if drift becomes excessive. The intent is to ensure excessive drift does not pose a compliance problem, freezing problem, or structural problem both in the tower and the nearby locality.

i. Sampling is performed on a regular basis such that chemical treatment can be performed as necessary.

j. Cooling canals or intake and outfall are periodically assessed for micro and macro biofouling. Periodic assessment to determine benefits of cleaning to bring back system performance is performed.

k. Fans and drives are monitored closely for excessive vibration and sufficient lube oil. Variable pitch fan blade linkages are kept free of debris and sufficient lubrication supplied to minimize downtime. If belt driven, the belts and pulley system are monitored periodically for excessive wear and vibration such that maintenance can be anticipated and planned.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Circulating Water pumps discharge pressure/temperature

b. Circulating Water pumps operating status (manual/auto/off)

c. Cooling Tower fans operating status (manual/auto/off)

d. Circulating water pH

e. Circulating water acid feed system operating status (manual/auto/off)

f. CWS water makeup operating status (manual/auto/off)

g. CWS blowdown operating status (manual/auto/off)

Y. Raw Water Pre-Treatment System

1. General Guidelines

All water treatment components are operated in a manner to ensure sufficient quantities of makeup water are available for all modes of site operation. System and component parameters are monitored in sufficient detail to allow anticipation of component problems, which may adversely impact water production. A backup plan for water treatment is in place should system component failure necessitate an alternative approach.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Screening

b. Chlorination

c. Softening, Coagulation, Flocculation, Sedimentation

d. Filtration, Sand, Osmotic, Diatomaceous Earth, Paper Filter Systems

e. Demineralization; Cation or Anion Systems

f. Water Sampling and Testing

g. Contract Trailer Systems

h. Storage Tank

i. Feedpump

j. Reverse Osmosis System

k. Evaporator System

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Condensate Storage tank level

b. Filtered Water storage tank level

c. Raw Water storage tank level

d. Raw water supply pumps operating status (manual/auto/off)

Z. Fire Protection System

1. General Guidelines

The fire protection system is maintained and operated to protect plant systems in conformance with applicable laws and regulations.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. All fire protection equipment is in service and good operating order prior to starting up any unit in the plant. This includes units that have been shut down for fuel conservation. Procedures clearly define personnel responsibilities for fire fighting, training, inspection and maintenance of the fire fighting equipment and the site's coordination requirements with local fire agencies.

b. GAO considers preparing checklists delineating the equipment which is to be checked and confirmed available for service prior to rolling a unit which may include the following:

1. Status of all fire hose stations in the immediate area of the unit.
2. Status of all fire hydrants.
3. Status of all fire extinguishers in the immediate area.
4. Deluge systems with all spray nozzles verified in good condition.

5. The CO_2 system and hoses valved-in and verified in good operating condition.
6. Generator CO_2 System status verified
7. Exciter CO_2 System status verified
8. CO_2 to the lube oil system status verified
9. Status of wet pipe sprinkler system for any cooling tower and primary fuel gas compressors.
10. Status of steam and/or water to nozzles at the air preheaters.
11. Status of any dry-powder systems including verification of full pressurized gas bottles.
12. Status of wet pipe sprinkler systems (particularly at the main turbine stop valves, lube reservoir, seal oil room, boiler front and fuel gas compressor area as necessary).
13. Verification that deluge system cut in and spray nozzles in good condition over the main and auxiliary transformers and generator bearings, turbine governor and stop valves as necessary.
14. Status of Gas Turbine Fire Protection Systems
15. Status of periodic verification of pressure and flow availability is performed and verification that that sprinklers not discharge onto operating equipment during a test.
16. Confirmation that the diesel fire pump testing is performed on a regular basis and fuel tank is full and available at all times.

c. Local Fire Department

1. List of current emergency telephone numbers to be called in case of fire is readily available to operations personnel in the Control Room and to other pertinent site personnel. The agencies are listed in order of priority to be called if more than one agency is required.
2. Documentation verifying that the local fire agencies that will normally answer emergency calls in case of fire are asked to review facility fire equipment and ascertain that proper connections can be made between station equipment and the local fire agency equipment.

d. Personnel Training

1. Documentation verifying that personnel designated to use firefighting equipment are trained and

knowledgeable in the use of this equipment. This includes portable fire extinguishers and fire hose.

2. Documentation verifying that training is accomplished upon initial assignment and at least annually thereafter.

3. Documentation of this training is maintained at each location.

e. Prudent Inspection Schedule For Fire Extinguishers and Standpipe Hose Stations

1. Records should be kept for all inspections.

f. Fire Protection Equipment Markings

1. Locations employing low-pressure and high-pressure water systems clearly differentiate each system.

2. Fire protection equipment, including but not limited to fire blanket boxes, pumps, hose locations, hydrants, sirens, and extinguishers, are painted red.

g. Fixed Fire Protection Systems Operations & Maintenance Guidelines

The systems discussed below reference the following three concepts:

1. Maintenance begins with a visual inspection and includes any corrective action taken to repair deficiencies discovered during the inspection.

2. Service is a complete check of a system including the maintenance procedures and testing.

3. Records of all maintenance and service are retained at the facility for five years.

a. Pre-Engineered Fixed Fire Extinguishing Systems are appropriately maintained and serviced.

These systems include but are not limited to:

1. Dry Chemical Systems
2. Carbon Dioxide Systems
3. Halogenated Agent Systems
4. Liquid Agent Systems
5. Automatic Fire Sprinkler Systems

b. An extinguishing system which uses water as its primary extinguishing agent is appropriately maintained and serviced.

These systems include but are not limited to:

1. Wet Pipe Sprinkler Systems
2. Dry Pipe Sprinkler Systems
3. Deluge Sprinkler Systems
4. Pre-Action Sprinkler Systems
5. Dry Pipe Pre-Action Sprinkler Systems
6. Fixed Water Spray Systems
7. Deluge Foam Water Spray Sprinkler Systems
8. Foam Water Spray Systems

c. Engineered Fixed Extinguishing Systems

These are systems which are custom designed for a particular hazard are appropriately maintained and serviced.

These systems shall include but not be limited to:

1. Dry Chemical Systems
2. Carbon Dioxide Systems
3. Halogenated Agent Systems
4. Steam Systems
5. High Expansion Foam Systems
6. Foam Extinguishing Systems
7. Liquid Agent Systems.

d. Standpipe Systems

These systems consist of piping, valves, and hose outlets are appropriately maintained and serviced.

Procedures consider the following for CARDOX systems:

1. Automatic Operation
2. Manual Operation

3. Pre-Discharge Period
4. Discharge Period
5. Post-Discharge Period
6. Pre-Reset Period
7. Working in areas with CARDOX protection
8. Flooded Area Hazards

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. CARDOX (carbon dioxide) storage tank pressure/level
b. Main firewater system pressure
c. Common fire systems trouble alarm status
d. Diesel fire pumps operating status (manual/auto/off)
e. Firewater storage tank level (if applicable)

AA. Gas Turbine

1. General Guidelines

Personnel record all dual fuel operating hours, unit trips, rapid starts, and emergency ramps to track equivalent operating hours to properly plan for inspections and repair/rebuild outages per OEM algorithms. Number of starts are monitored and controlled.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Inlet Filter Compartment
b. Fire Protection System
c. Starting Systems
d. Fuel Treatment Systems
e. Fuel Gas System
f. Lubricating Oil System
g. Water Wash System

h. Generator Cooling and Seal Oil Systems

i. Personnel operating units equipped with Dry Low NOX / Low Emission Combustors (DLN's/LEC) pay particular attention to combustor rumble and blowback and have procedures addressing operations personnel actions for both.

j. Units with water injection keep the injection system tuned to avoid potential operating problems with NOx and CO emissions.

k. Units with NOx catalyst, CO catalyst, and/or VOC catalyst observe firing temperature restrictions at all times.

l. Fogger and chiller operation for both power augmentation and emission control are operated per performance curves and are monitored for any flow restrictions, which could impact unit load.

m. Silencers and filters are monitored for debris and any friable material, which could impact pressure drop and unit load capability.

n. Personnel consider vendor recommended intervals when scheduling inspections and repairs for critical systems such as:

i. Combustion Section Inspection

ii. Major Unit Inspection

iii. Hot Gas Path Inspection

iv. Combustion Liner Repairs

v. Transition Piece Repairs

vi. Buckets/Nozzles Inspections/Repairs

vii. Fuel Nozzles Repairs

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Turbine speed

b. Exhaust gas temperatures

c. Burner flame

d. Inlet fuel pressure

e. Inlet fuel flow

f. Turbine Bearing temperature and vibration

g. Lube oil pressure and temperature

h. Lube oil filter cartridge differential pressure

i. Lube oil heat exchanger cooling water pressure and temperature
j. Lube oil skid Reservoir oil level
k. Lube oil skid Reservoir oil temperature
l. Turbine cooling water flow, pressure, and temperature
m. Load gear bearing temperature
n. Turbine air filter pressure drop
o. Turbine air filter compressed air pressure
p. Lube oil pumps operating status
q. Emergency lube oil pumps operating status
r. Lube oil mist eliminator blowers operating status
s. Steam or water header injection pressures and temperatures
t. Turbine performance trend monitoring

BB. Heat Recovery Steam Generator (HRSG)

1. General Guidelines

The HRSG design operating configuration is shown schematically in Heat Balance Diagram format and posted in the control room. Particular detail exists for “off-design” operation since the design restrictions on HRSG’s are extremely rigid.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Controls corresponding to drum volume are sufficient to accommodate drum level fluctuations during start-up without "tripping" the boiler due to high- or low-water level conditions.

b. The HRSG equipment and monitoring is appropriate at loads varying from full-load to low-load. Any make-up water sections are drainable and assessments are performed for the possibility of operating with this section dry.

c. Operating practices allow HRSG capability to ramp up to rated steam production in reasonable periods of time.

d. All instrumentation required for automatic operation are available and in good working condition.

e. The HRSG is designed for continuous operation throughout the operating range encompassed by the gas turbine range. The HRSG performance points are available at all times to operating personnel

and also indicate turndown and emission limitations associated with any duct burners.

f. The gas side static pressure drop from the HRSG terminal point at the inlet of the gas turbine transition piece to the HRSG exhaust stack discharge including exit loss is monitored and performance evaluated to assess potential for load impacts.

g. HRSG has in operation all required devices, local indicators and controls indicated in unit's process flow diagram.

h. The unfired/fired HRSG performance is clearly established such that operating personnel understand the limitations and performance issues associated with each mode of operation.

i. The feedwater deaeration limits are strictly adhered to and dissolved oxygen is monitored with assessment for all modes of operation including off-design feedwater temperature.

j. The make-up water heater section is operated to allow proper make-up water flow supplied to this section for all operating conditions and modes.

k. Assessment and operating practices are established for a variety of water conditions as they relate to materials including suitability for demineralized water which has not been deaerated and various supply pressures.

l. The flue gas exiting the HRSG is above the acid dew point for all conditions.

m. A satisfactory freeze protection assessment and system for the HRSG and auxiliary equipment as necessary is available.

n. Drum Level Control

o. High-Pressure Superheater and Attemperator

p. Drains and Vents

q. Water Chemistry

r. Deaerator Operation

s. Steam Drum Operation

t. Drum Blowdown

u. Ramping Limitations

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Main boiler drum level (remote and local indications)

b. Main boiler drum pressure
c. Feedwater flowrate
d. Feedwater Inlet pressure
e. Main steam/superheated steam flow rate
f. Superheater inlet/out steam temperature
g. Reheater inlet/outlet steam temperature
h. HRSG inlet/outlet turbine gas temperature
i. Stack opacity
j. Continuous blowdown flowrate

CC. Hydro Turbine and Penstocks

1. General Guidelines

A turbine and penstock inspection program is in place to ensure that each penstock is safely and efficiently operated and maintained. The target objectives of the facility penstock program include but are not limited to improvement of facility and safety of personnel and public, prevention of damage to the environment, Improvement of reliability, reduction of operation and maintenance costs, and minimization of unscheduled outages.

Since the hydro facilities are governed very strictly by a number of organizations, hydro facility generators ensure that requirements of several critical publications written by the American Society of Civil Engineers (ASCE) Hydropower Committee are considered and adhered to by hydro organizations. These documents include: Steel Penstocks (ASCE, 1993), Guidelines for Evaluating Aging Penstocks (ASCE, 1995), Guidelines for Inspection and Monitoring of In-Service Penstocks (ASCE, in preparation), and Bureau of Reclamation, "Mechanical Governors for Hydroelectric Units," Facilities Instructions, Standards, and Techniques.

2. Detailed Guidelines

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider the following issues.

a. Inspection Procedures

The procedures for inspection of a penstock or pressure conduit are listed below in sequential order:

1. Perform an initial assessment, which includes a thorough visual examination of the following items: penstock shell condition (interior and exterior), welds, bolts and rivets, expansion joints

and sleeve-type couplings, air valves and vents, control valves, manholes and other penetrations, anchor blocks and supports, appurtenances, linings and coatings, and instrumentation.

2. Record penstock shell thickness measurements using non-destructive examination (NDE) methods (usually ultrasonic) at selected locations along the penstock. This task could be combined with the initial assessment described above.

3. Perform a detailed assessment using NDE techniques for specific items of concern that were observed during the visual examination.

4. Simulate the emergency control system operation to ensure the emergency gates or valves will close and that documentation (physical test or calculations) exists to indicate they will completely close.

5. Perform load rejection tests for comparison against hydraulic transient analysis results and design criteria to ensure safe operating conditions.

6. Readjust the governor to establish a safe wicket gate timing to prevent over-pressurization of the penstock and to ensure maximum response capability.

7. Have design personnel evaluate the data obtained during the penstock inspection. This evaluation typically includes tasks associated with data and stress analysis and a determination if the penstock is in accordance with defined acceptance criteria.

b. Frequency of Inspections

Periods between inspections will not exceed five years. Factors to be considered in establishing an inspection schedule may include:

i. Accessibility for Inspection

ii. Overall Condition of the Penstock or Pressure Conduit

iii. Type of Design and the Age of the Penstock or Conduit

iv. Existence of Significant Public Safety Concerns

v. Existence of Significant Environmental Concerns

vi. The need to document the condition of the penstock or pressure conduit

vii. Criticality of the facility to power production and water operations

c. Guidelines for inspection frequency are:

i. *Monthly Inspection:* A visual observation of exposed penstocks is performed through a monthly walkdown by

operations personnel. If this observation is not practical because of excessive length, rough terrain, etc., then the walkdown is performed at least once a year.

ii. The interior and exterior surfaces of penstocks and pressure conduits are visually examined every two to three years to note the condition of the linings and coatings.

iii. A thorough penstock inspection is performed every five years.

d. Inspection Records

To establish an accurate representation of the penstock condition at a given hydroelectric facility, the in-service inspection program is well documented and implemented by facility personnel.

A log is established at the plant to record the date, type of inspection performed, and results of all inspections performed on penstocks. Inspection results are forwarded to the engineering personnel or other appropriate personnel for review and evaluation. These records are maintained for future reference. A documented chronology of inspections, results, evaluations, and repairs will help identify the development of any adverse trends and is essential for the proper maintenance of safe penstocks.

An inspection report is prepared by one or more members of the inspection team. The report documents the following items:

i. Dates of Inspection

ii. Inspection Participants

iii. Names of Facilities Inspected

iv. Description of Inspection Activities

v. All Technical Investigations, Data Analyses, and Design Studies

vi. All recommendations made during or as a result of the inspection.

Inspection reports are distributed to all inspection participants and groups associated with the facility.

3. Monitoring Critical Operating Parameters

In developing its plans, procedures, and training programs to comply with the Operating Standards, the GAOs should consider monitoring the following indicators:

a. Turbine speed

b. Turbine vibration

c. Generator frequency

d. Generator voltage

Appendix

A. Definitions

Design Basis Documents – Vendor and engineering documents used in the design, or used to instruct in the correct operation and maintenance, of the systems and equipment used in the power plant. Design basis documents consist of OEM Manuals, vendor documents, industry standards, codes and documented engineering assessments.

Documented deviations from the above documents are also considered part of the design basis documents provided there is documented reasoning for those deviations. Documented reasoning includes the benefit of the deviation and why the deviation is consistent with the Unit Plan.

B. Industry Codes Standards and Organizations

ASME Boiler and pressure vessel code, Section 1, (including all amendments)

ASME Boiler and pressure vessel code, Section V111

ANSI/ASME B 31.1 Power Piping

Note on Codes: Any boiler designed and approved to an earlier issue and amendment of these standards is maintained and repaired to the design as originally issued. However, advances in engineering knowledge and experience reflected in the subsequent issues of the codes are taken into consideration in operation and maintenance of the boiler.

Weld repairs and alterations of boilers designed to ASME Boiler and Pressure Vessel Code, Section 1, is carried out in accordance with the rules of the National Board Inspection Code, published by the National Board of Boiler and Pressure Vessel Inspectors.

These standards are intended to augment and not conflict with other standards, which are pertinent to specific components and systems at each facility such as standards issued by organizations including but not limited to:

A& WMA	Air & Waste Management Association
AAQS	Ambient Air Quality Standard
ABMA	American Boiler Manufacturer's Association
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APCD	Air Pollution Control District
API	American Petroleum Institute
ARB	Air Resources Board (see CARB)
ASME	American Society of Mechanical Engineers

ASNT	American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CAISO	California Independent System Operator
CAL OSHA	California Occupational Safety and Health Administration
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CPUC	California Public Utilities Commission
CEC	California Energy Commission
CCR	California Code of Regulations
CSA	Canadian Standards Association
EPA	Environmental Protection Administration
GAO	Generating Asset Owner
HEI	Heat Exchange Institute
HI	Hydraulic Institute
IEEE	Institute of Electrical and Electronics Engineers
ISA	The Instrumentation, Systems, and Automation Society
NEC	National Electrical Code
NERC ES-IC	North American Reliability Council Information Sharing and Analysis Center
NEMA	National Electrical Manufacturer's Association
NIPC	National Infrastructure Protection Center
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratories
OSHA	Occupational Safety and Health Administration
PFI	Pipe Fabrication Institute
SSPC	Steel Structures Painting Council
TEMA	Tubular Exchanger Manufacturer's Association
UBC	Uniform Building Code
UL	Underwriters' Laboratories
UPC	Uniform Plumbing Code

C. Summary Of Abbreviations and Acronyms

ACC	Air-Cooled Condenser
AODTM	A trademark of Environmental Elements Corporation for a urea to ammonia system
AVG, avg	Average
BACT	Best Available Control Technology
BMS	Burner Management System
BTA	Best Technology Available
BTU, Btu	British Thermal Unit
BCW	Bearing Cooling Water
CA	California
CAM	Compliance Assurance Monitoring
CEM, CEMS	Continuous Emissions Monitoring System (also referred to as CEMs)
CFR	Code of Federal Regulations
CO2	Carbon Dioxide
CO	Carbon Monoxide
CT	Combustion turbine
CTM	Conditional Test Method
CWP, CWS	Circulating Water Pump, Circulating Water System
DC	Direct Current
DLN	Dry Low-Nox
EOH	Equivalent Operating Hour
^{o}F	Degree Fahrenheit
ft3	Cubic Feet
GAO	Generation Asset Owner
gpm	Gallons per minute
H2SO4	Sulfuric Acid
HAP	Hazardous Air Pollutant

HHV	High Heating Value
hp	Horsepower
HR, hr	Hour
inj	Injection
kWe	Kilowatt electrical
LAER	Lowest Achievable Emission Rate
LEC	Low Emission Combustor
LB, LBs, lbs	Pound, Pounds
MACT	Maximum Achievable Control Technology
MMBtu	Million British Thermal Units
MW	Megawatt
MWe	Megawatt electrical
MWh	Megawatt-hour
NH3	Ammonia
nm	Nanometer
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen or Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
O&M	Operation & Maintenance
O_2	Oxygen
OEM	Original Equipment Manufacturer
PM10, PM10	Particulate Matter (10 microns or less)
PM2.5 or PM2.5	Particulate Matter (2.5 microns or less)
PM	Particulate Matter
ppm	Parts per Million
ppmvd	Parts per Million by Volume, Dry
PSD	Prevention of Significant Deterioration

QA/QC	Quality Assurance/Quality Control
RATA	Relative Accuracy Test Audit
RMP	Risk Management Plan
S/S	Startup and Shutdown
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur Dioxide
SOTA	State-of-the-Art
SOx	Sulfur Oxides
TDS	Total Dissolved Solids
UPS	Uninterruptible Power Supply
UV	Ultraviolet
VOC	Volatile Organic Compound
yr	Year
ZAT	Zero Ammonia Technology

(END OF ATTACHMENT 3)

1