FINAL REPORT ON THE AUDIT OF THE OAKLAND POWER PLANT

CONDUCTED UNDER GENERAL ORDER 167
TO DETERMINE COMPLIANCE WITH
OPERATION, MAINTENANCE, AND LOGBOOK STANDARDS

ELECTRIC GENERATION PERFORMANCE BRANCH
CONSUMER PROTECTION AND SAFETY DIVISION
CALIFORNIA PUBLIC UTILITIES COMMISSION
505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102

OCTOBER 31, 2007

Richard W. Clark, Director
Consumer Protection and Safety Division

Table of Contents

List of Figures

EXECUTIVE SUMMARY

The Consumer Protection and Safety Division (CPSD) presents this Final Report on the audit of Oakland Power Plant ("Oakland" or "the plant"). CPSD audited the plant for compliance with the California Public Utilities Commission's ("CPUC's" or "Commission's") General Order 167, which includes Operation, Maintenance, and Logbook Standards for power plants.

In September 2005, CPSD contacted Oakland to schedule the audit. Auditors subsequently spent three days at the plant site. While onsite, Auditors inspected equipment, examined documents, and interviewed plant personnel. CPSD issued its Preliminary Audit Report ("Preliminary Report") on October 24, 2006, and requested the plant to submit a response by November 24, 2006. Oakland requested and was granted an extension of this deadline. The plant submitted its response on December 8, 2006. CPSD and Oakland held a teleconference on February 16, 2007 to discuss the plant's response. On April 18, 2007, CPSD and Oakland met and conferred. The plant provided additional information and CPSD now issues this Final Audit Report.

In the Preliminary Report, CPSD identified potential violations of various standards. Although the plant disputes many of CPSD's findings and their characterization as violations, the plant agreed to take various corrective actions, which are summarized below and further discussed in the report in sections entitled "Final Outcome and Follow-up."

Finding 2.1 The plant had not held annual emergency drills as required by its own procedures. In response, the plant conducted a full evacuation drill on November 22, 2006. All facility members participated and the drill critique identified no deficiencies nor made any recommendations. The plant will continue to conduct a full evacuation drill annually.

Finding 2.2 The plant did not store training records onsite as required by its own procedures. In response, the plant now keeps copies of employee training logs onsite.

Finding 2.3 The plant lacked inspection records for hazardous material containers and did not keep Material Safety Data Sheets well-organized. In response, the plant inspected its above-ground fuel tank on November 17, 2006. The plant agreed to follow its Spill Prevention and Pollution Control Plan to inspect all above-ground vessels and to keep inspection records onsite. Finally, the plant updated and reorganized its Material Safety Data Sheets. The plant also agreed to use a system to more easily locate data sheets for hazardous chemicals that the plant uses frequently. CPSD requests that the plant report its corrective action by June 30, 2008.

Finding 2.4 The plant's procedures failed to define turbine inlet as a confined-space. In response, the plant revised its procedures to designate turbine inlet as a confined-space. The plant also posted a "confined-space entry" sign on the entrance door of the inlet.

Finding 2.5 The plant lacked comprehensive documentation of its operation and maintenance procedures. Instead plant staff relied heavily on vendor manuals and employees' memories. In response, the plant adopted new operating procedures, created daily round checklists and generated detailed job plans to document common knowledge important to safe and reliable operation.

Finding 2.6 The plant lacked a program to assure plant drawing accuracy. In response, the plant revised two outdated drawings and reviewed all Oakland Power Plant drawings.

Finding 2.7 The plant had limited spare inventory. The lack of critical spare parts onsite could prolong outages and affect availability. In response, the plant provided an end-of-life study which concluded that parts are commercially available for the Oakland units. The plant stated that it sends the gas turbines to JTS in Florida for all major repair and stocks spares for minor repair onsite. During the meet and confer meeting, the plant showed Auditors several additional cabinets that contain spare parts. These spares appeared to be adequate for onsite repairs.

CPSD is satisfied that the above corrective actions will adequately address the issues raised in the Preliminary Report. CPSD requests that the plant resolve and report on outstanding issues by June 30, 2008.

INTRODUCTION

On September 27, 2005, CPSD notified Oakland of the audit, and requested pertinent documents and data. CPSD's audit team included Jim Cheng, Ron Lok, Chris Lee, Chuck Magee, and Rick Tse. The Auditors reviewed the materials and subsequently visited the plant from December 12, 2005 through December 14, 2005. While onsite, Auditors inspected equipment, examined documents, observed plant operations, and interviewed plant staff and managers.

On October 24, 2006, CPSD issued its Preliminary Audit Report ("Preliminary Report") and asked the plant to respond by November 24, 2006 with a Corrective Action Plan. The plant requested and was granted an extension of this deadline. The plant submitted its response on December 8, 2006. CPSD and Oakland held a teleconference on February 16, 2007 to discuss the plant's response. A 'meet and confer' meeting was held on April 18, 2007 to further discuss the plant's response and corrective actions. In attendance were the CPSD audit team members mentioned above, the Oakland Plant Manager, and the Oakland Production Superintendent.

During the audit, CPSD's team focused on:

A. Safety training
B. Balance of maintenance, work management, maintenance procedures and documentation
C. Spare parts and procurement management
D. Equipment performance and engineering support
E. Chemistry control and other regulatory requirements
F. Equipment history
G. Maintenance facilities and equipment
H. Routine inspection and records of operation
I. Performance testing and emergency grid operations
J. Plant security and readiness
K. Logbook standards

CPSD found potential violations of various standards and of GO 167. As stated in Section 1 of this report, CPSD found no safety hazards requiring immediate corrective action. Section 2 of the report describes the potential violations as well as the plant's response to them. Section 3 describes other audit activities where Auditors found no violation of standards.

Although the plant disputes many of CPSD's findings and their characterization as violations, the plant agreed to take various corrective actions, which are summarized below and further discussed in the report in sections entitled "Final Outcome and Follow-up."

Finding 2.1 The plant had not held annual emergency drills as required by its own procedures. In response, the plant conducted a full evacuation drill on November 22, 2006. All facility members participated and the drill critique identified no deficiencies nor made any recommendations. The plant will continue to conduct a full evacuation drill annually.

Finding 2.2 The plant did not store training records onsite as required by its own procedures. In response, the plant now keeps copies of employee training logs onsite.

Finding 2.3 The plant lacked inspection records for hazardous material containers and did not keep Material Safety Data Sheets well-organized. In response, the plant inspected its above-ground fuel tank on November 17, 2006. The plant agreed to follow its Spill Prevention and Pollution Control Plan to inspect all above-ground vessels and to keep inspection records onsite. Finally, the plant updated and reorganized its Material Safety Data Sheets. The plant also agreed to use a system to more easily locate data sheets for hazardous chemicals that the plant uses frequently. CPSD requests that the plant report its corrective action by June 30, 2008.

Finding 2.4 The plant's procedures failed to define turbine inlet as a confined-space. In response, the plant revised its procedures to designate turbine inlet as a confined-space. The plant also posted a "confined-space entry" sign on the entrance door of the inlet.

Finding 2.5 The plant lacked comprehensive documentation of its operation and maintenance procedures. Instead plant staff relied heavily on vendor manuals and employees' memories. In response, the plant adopted new operating procedures, created daily round checklists and generated detailed job plans to document common knowledge important to safe and reliable operation.

Finding 2.6 The plant lacked a program to assure plant drawing accuracy. In response, the plant revised two outdated drawings and reviewed all Oakland Power Plant drawings.

Finding 2.7 The plant had limited spare inventory. The lack of critical spare parts onsite could prolong outages and affect availability. In response, the plant provided an end-of-life study which concluded that parts are commercially available for the Oakland units. The plant stated that it sends the gas turbines to JTS in Florida for all major repair and stocks spares for minor repair onsite. During the meet and confer meeting, the plant showed Auditors several additional cabinets that contain spare parts. These spares appeared to be adequate for onsite repairs.

CPSD is satisfied that the above corrective actions will adequately address the issues raised in the Preliminary Report. CPSD requests that the plant resolve and report on outstanding issues by June 30, 2008.

POWER PLANT DESCRIPTION

The Oakland Power Plant is located in the City of Oakland, near the Oakland Seaport, on Martin Luther King Junior Way (Figure 1). Its three Pratt and Whitney gas turbines generate a total of 160 Megawatts (MW). Because the Bay Area uses more power than it can import on transmission lines, and must rely in part on local generation, the California Independent System Operator (CAISO) has signed a Reliability Must-Run (RMR) contract with the plant. This contract authorizes the CAISO to order the plant to operate during peak demand periods.

Figure 1 -- Oakland Power Plant as seen from atop an oil storage tank.
Photo: LS Power Group (**http://www.lspower.com/projects/**)

Pacific Gas and Electric (PG&E) built, owned, and operated this plant. In July 1998, when California restructured the electric market, PG&E sold the units to Duke Energy North America. In May of 2006, LS Power Equity Partners acquired Oakland from Duke, along with Moss Landing, Morro Bay and South Bay Power Plants. In April 2007, LS Power merged with Dynegy and Dynegy took ownership of the plant.

POWER PLANT PERFORMACE

CPSD conducted a performance study on Oakland.[1] CPSD compared Units 1, 2, and 3 against other diesel gas turbine units for the period 2004 to 2006. A summary of the results is shown in Table 1.

[1] The study looked at six performance indices established by the North American Electric Reliability Council (NERC), which included (1) Equivalent forced outage rate during demand (EFORd), (2) Equivalent Availability Factor (EAF), (3) Net Capacity Factor (NCF), (4) Start Reliability (SR), (5) Scheduled Outage Factor (SOF), and (6) Forced Outage Factor (FOF).

Table 1. Performance indices for Oakland Units 1, 2, and 3 compared to other North American gas turbine units. Indices shown are calculated from 2004 to 2006 data.

	EFORd[1]	EAF[2]	NCF[3]	SR[4]	SOF[5]	FOF[6]
Oakland Unit 1	7.4	96.3	1.8	100.0	0.8	0.3
Oakland Unit 2	15.3	91.1	3.0	98.1	0.6	1.3
Oakland Unit 3	4.8	98.4	2.1	99.2	1.0	0.4
Others*	8.7	89.3	2.8	98.0	4.0	2.2

[1] EFORd measures how often a unit is in forced outages when the plant needs it to produce power. This index measures a unit's generating reliability.
[2] EAF measures a unit's availability to produce power. For example, if a unit often faces outages and suffers derates, which makes it unavailable to produce power, then it will have a low EAF.
[3] NCF measures how close a unit operates to its full capacity. For example, a 50% NCF means a unit generates just half of what it can produce. This index is a function of market demand. For example, a unit will have a higher NCF if market condition exists which provides it with more opportunity to produce more power.
[4] SR calculates the ratio of actual starts to attempted starts. It measures how often a unit actually started when it was attempted to start. This index indicates whether a plant keeps a unit well-maintained, i.e. a well-maintained unit starts reliability.
[5] SOF measures how often a unit is in scheduled outages.
[6] FOF measures how often it is in forced outages.
**Others include all other distillate oil gas turbine units in North America. The index for this group is capacity-weighted.

The study reveals that the Oakland units performed comparable to other North American gas turbine units. In fact, all three units demonstrated below average scheduled and forced outage factors compared to other similar units.

SECTION 1 – SAFETY HAZARDS REQUIRING IMMEDIATE CORRECTIVE ACTION

CPSD found no safety hazards requiring immediate corrective action.

SECTION 2 – POTENTIAL VIOLATIONS REQUIRING CORRECTIVE ACTION

Maintenance Standard 1 – Safety
The protection of life and limb for the work force is paramount. The company behavior ensures that individuals 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 individuals are consistent with the policies and procedures.

Operation Standard 1 – Safety
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.

Maintenance Standard 5 – Maintenance Personnel Knowledge and Skills
Maintenance personnel are trained and qualified to possess and apply the knowledge and skills needed to perform maintenance activities that support safe and reliable plant operation.

Operation Standard 5 – Operations Personnel Knowledge and Skills
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.

FINDING 2.1 – THE PLANT HAS NOT HELD ANNUAL EMERGENCY DRILLS AS REQUIRED BY ITS OWN PROCEDURES

The plant has failed to hold regular emergency drills required by its own procedures, potentially violating Operation and Maintenance Standards. The plant's Emergency Response Plan (Section 5.0) requires annual emergency response drills. However, the plant last held a full emergency drill in October 2002, and has held only "table top" drills since that time.

FINAL OUTCOME AND FOLLOW-UP

In response to this finding, the plant conducted a full emergency evacuation drill on November 22, 2006. On April 18, 2007, the plant showed to the Auditor an evacuation drill critique. All

facility members participated and the critique identified no deficiencies nor made any recommendations. Oakland will continue to conduct a full evacuation drill annually.

Maintenance Standard 6 – Training Support
A systematic approach to training is used to achieve, improve, and maintain a high level of personnel knowledge, skill, and performance.

Operation Standard 6 – Training Support
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.

FINDING 2.2 – THE PLANT DOES NOT STORE TRAINING RECORDS ONSITE AS REQUIRED BY ITS OWN PROCEDURES

The plant does not store training records onsite as required by its own procedures and potentially violating Operation and Maintenance Standards. The plant's Facility Response Plan **(**Section 1.8.3.1) requires the plant to keep onsite logs of safety training courses taken by employees, but the Auditor found no such logs. The Plant Manager explained that he keeps all training logs at the Moss Landing Power Plant.

FINAL OUTCOME AND FOLLOW-UP

In response to this finding, the plant now keeps copies of employee training logs onsite. On April 18, 2007, the plant showed to the Auditor copies of training records. The plant has agreed to store these records in a binder onsite.

Maintenance Standard 1 – Safety
The protection of life and limb for the work force is paramount. The company behavior ensures that individuals 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 individuals are consistent with the policies and procedures.

Operation Standard 1 – Safety
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.

FINDING 2.3 – THE PLANT LACKS INSPECTION RECORDS FOR HAZARDOUS MATERIAL CONTAINERS AND DOES NOT KEEP MATERIAL SAFETY DATA SHEETS WELL-ORGANIZED

The plant lacks inspection records for tanks containing hazardous materials, and keeps poorly organized data sheets on those materials, potentially violating safety and other standards.

The team found no records at the plant for inspections of tanks containing hazardous materials. Without regular inspections, leaks could go undetected causing risks to personnel and possibly the public. Further, the plant lacks records for the certification of contractors who handle spills of hazardous materials.

The plant's Material Safety Data Sheets (MSDS) are out-of-date and poorly-organized. The plant stores MSDS in a binder chronologically, rather than alphabetically. The bulky binder contains data sheets dating back 25 years, including one chemical the plant used in a long-abandoned makeup-water demineralizer. The mobile demineralizer tanks have since replaced the original system (Figure 2). Further, the binder interweaves data sheets for hazardous and non-hazardous chemicals, making it difficult to find data sheets for hazardous chemicals. This information should be readily accessible at all times. The plant should reorganize the MSDS to make it easy to find hazardous materials information.

Figure 2 -- Existing mobile demineralizer tanks.

FINAL OUTCOME AND FOLLOW-UP

In response, the plant inspected its above-ground fuel tank. The plant also updated and reorganized its Material Safety Data Sheets.

The plant inspected its above-ground fuel tank for structural damage on November 17, 2006. The plant stated that it will visually inspect all above-ground vessels as required by its Spill Prevention and Pollution Control Plan (SPPC) and will maintain these inspection records onsite.

The plant updated and reorganized its Material Safety Data Sheets. The Plant Manager showed the Auditor the reorganized MSDS binder which included a table of contents based on the manufacturers name and chemical name. The Plant Manager also stated that Moss Landing and Oakland Power Plants have a 1-800 phone number that plant staff can call for information on chemicals. The Auditor pointed out that many sheets in the binder cover minor chemicals such as white-out and other household cleaning and office products. CPSD expressed continued concern that the inclusion of such minor chemicals would impede finding the proper data sheets during a chemical accident. After discussion, the plant's Production Superintendent agreed to use a system to more easily locate data sheets for hazardous chemicals that the plant uses frequently. CPSD requests that the plant report its corrective action by June 30, 2008.

Maintenance Standard 1 – Safety
The protection of life and limb for the work force is paramount. The company behavior ensures that individuals 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 individuals are consistent with the policies and procedures.

Operation Standard 1 – Safety
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.

Operation 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.

FINDING 2.4 – THE PLANT'S PROCEDURES FAIL TO DEFINE TURBINE INLET AS CONFINED SPACES

The plant's procedures fail to define turbine inlets as confined spaces, a potential violation of safety and other standards. When staff work in confined spaces, they must ventilate the space and wear respirators as appropriate. Turbine inlets not fully ventilated could trap harmful gas. Oakland's procedure defines sumps, turbine exhaust ducts and large tanks, but not turbine inlets, as confined spaces. Therefore, the plant's workers may fail to take proper precautions in turbine inlets and expose themselves to hazardous materials and other dangers.

FINAL OUTCOME AND FOLLOW-UP

The Production Superintendent agreed with our concern regarding the additional safety precautions required to be implemented before entering the inlet of the gas turbine when turbine blade cleaning is being performed. The plant revised its "confined-space procedure" to include the turbine inlet on its equipment list and posted a "confined-space entry" sign on the entrance to the gas turbine inlet. The Auditor confirmed these changes.

Maintenance Standard 8 – Maintenance Procedures and Documentation
Maintenance procedures and documents are clear and technically accurate, provide appropriate direction, and are used to support safe and reliable plant operation. Procedures must be current to the actual methods being employed to accomplish the task and are comprehensive to ensure reliable energy delivery to the transmission grid.

Operation Standard 7 – Operation Procedures and Documentation
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.

FINDING 2.5 – THE PLANT LACKS COMPREHENSIVE DOCUMENTATION OF ITS OPERATION AND MAINTENANCE PROCEDURE

The Auditor found limited operation and maintenance procedures. Rather, plant staff relied heavily on equipment-specific vendor manuals and employee memories. The lack of such procedures constitutes a potential violation of Operation and Maintenance Standards.

The Auditor observed that plant staff relied heavily on vendor manuals alone rather than using them as reference in conjunction with a more comprehensive procedure. However, plant staff appeared to be familiar with their overall responsibilities. This indicated that much of the non-written practices do exist, but reside only in peoples' heads rather than on paper. This is a programmatic issue if a team member resigns, taking away non-written knowledge important to safe and reliable plant operation. However, the Auditor learned that Oakland had hired a contractor to start systematizing its procedures. See Observation 3.2.

FINAL OUTCOME AND FOLLOW-UP

In response to this finding, the plant adopted new procedures and job plans to document common knowledge important to safe and reliable operation.

In October 2006, Oakland submitted a list of their newly-revised operating procedures. They also included samples of those procedures. The list includes 31 procedures that cover different operational aspects of the gas turbines. For example, the plant submitted Procedure No. 1 titled, "Gas Turbine Pre-start Checklist". Operators now follow that procedure to prepare the engine for start-up.

In December 2006, Oakland submitted written response to our preliminary audit report. The response included samples of job plans. Each job plan includes information on a specific

maintenance task and references OEM manuals. For example, the plant submitted a job plan titled, "Hot Section Inspection".

In February 2007, Auditor told the plant while job plans were satisfactory, the plans only apply to major work. The Auditor was still concerned about the potential loss over time of common knowledge on minor routine maintenance and daily-rounds. The plant replied that it revised round sheets to include more details, including lower and upper limits for instrument readings. New or untrained employees can now use those limits to decide if readings are within specs.

In April 2007, the plant presented a copy of revised round sheets and detailed job plans. The plant will maintain round sheets and job plans in a binder onsite.

Operation Standard 8 – Plant Status and Configuration
Station activities are effectively managed so plant status and configuration are maintained to support safe, reliable and efficient operation.

Assessment Guidelines

B.6 Each modification is planned, scheduled, and tracked throughout design, installation, testing, turnover to operations, training of affected personnel, and completion of document revisions.

B.11 The as-built configuration of modified systems is verified.

B.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.

FINDING 2.6 – THE PLANT LACKS A PROGRAM TO ASSURE PLANT DRAWING ACCURACY

The plant lacks a program to assure the accuracy of plant drawings, a potential violation of Operation Standards. In particular, the Auditor found three out-of-date drawings. Plant staff or emergency personnel could take inappropriate actions based on these diagrams, in turn causing reliability, safety, or environmental problems.

First, a site drawing entitled "Facility Layout/Drainage Map" (Dwg. No. C-98716-WP01, Rev. B) omits the plant's liquid waste storage tank, called the "Baker" tank. This tank stores overflow from the collection pond. Improper operation could send that overflow into the bay. Therefore, incorrect drawings could cause plant staff to violate the provisions of the plant's Storm Water Pollution Prevention Program (SWPPP), dated November 2004. The Plant Manager agreed that the Baker tank should have been on the drawing (Figure 3).

Figure 3 -- This “Baker” tank is not reflected on the Facility Layout/Drainage Map.

Second, at least two Piping and Instrumentation Diagrams (P&ID) are obsolete:

1. The P&ID for the gas turbine shows that generators are cooled with hydrogen; in fact, the generators are now air-cooled.
2. The P&ID (Dwg. No. 100502, Rev. 7) shows an injection water demineralization system that is no longer in use. The plant abandoned this system and now leases portable deionizer storage tanks. Further, the diagram shows storage tanks for the acid waste from regeneration of the demineralizer. These tanks now hold only oily wastes.

The chief operator acknowledged these discrepancies.

FINAL OUTCOME AND FOLLOW-UP

In response, the plant revised and submitted two drawings that replaced the outdated drawings of the water treatment and waste treatment systems.

The plant revised drawing number 100502 sheets 12 and 15 to match the as-built layout of the “injection water softener system” and the “treated water storage tanks”. The plant updated drawing number 100502 to show the as-built layout of its outdoor liquid waste containment storage tank or “Baker Tank”. The Plant Manager stated that he reviewed all Oakland Power Plant drawings.

Maintenance Standard 12 – Spare Parts, Material and Services
Correct parts and materials in good condition, are available for maintenance activities to support both forced and planned outages. Procurement of services and materials for outages are performed in time to ensure materials will be available without impact to the schedule. Storage of parts and materials support maintaining quality and shelf life of parts and materials.

FINDING 2.7 – THE PLANT LACKS ADEQUATE SPARE PARTS

The plant lacks critical spare parts onsite, possibly prolonging outages and affecting availability, a potential violation of Operation and Maintenance Standards. In particular, the plant warehouse consists of just one set of open shelves stocked with minimal spares (Figure 4).

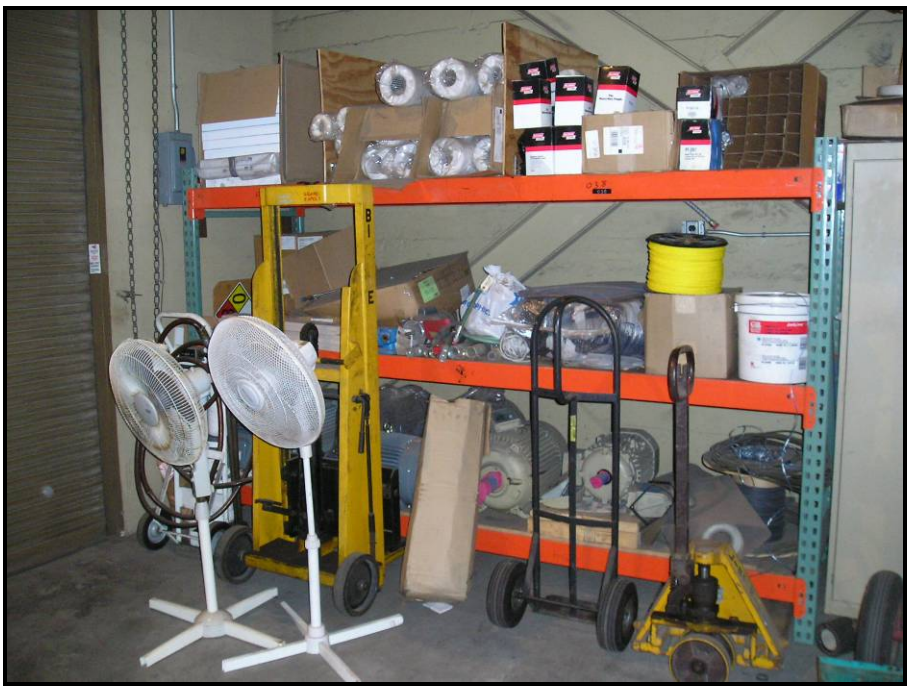

Figure 4 -- Open shelves stocked with minimal spares.

Although the units are common aero-derivative jet engines and spares are easily obtainable, the lack of available spare parts onsite could delay repair work during outages and prolong the amount of time the plant is down. This concern is especially important because the units are peakers, which are critical to the electric grid when demand is high.

In at least one instance, the plant disregarded a recommendation in a report prepared by Jet Turbine Services[2], which recommended that the plant stock additional spare parts, including a

[2] Jet Turbine Services Report # 062205JVFS dated June 22, 2005

new set of combustion chambers and nozzle guide vanes, in order to minimize downtime during repairs. [3] At the time of the audit, these additional parts were not in stock.
Even though the units are operated only a few hundred hours in a year[4], being peakers they are also the most crucial during those times. Therefore, the plant should revisit their spare inventory to ensure that it is adequate to support reliable operation, minimize downtime, and maximize availability.[5]

FINAL OUTCOME AND FOLLOW-UP

In response, the plant provided an end-of-life study which concluded that parts are commercially available for the Oakland units. The plant stated that it sends the gas turbines to JTS in Florida for all major repair work and stocks spares for minor repair onsite, such as speed probes, temperature sensors, lube oil gaskets, and modulating valves. During the meet and confer meeting, the plant showed Auditors several additional cabinets that contain spare parts. These spares appeared to be adequate for onsite repairs.

[3] NERC GADS data show that combustors problems are the number two cause code (#5079) for California gas turbine units in 2005. GADS publish top 25 cause codes based on megawatts-hour lost per year due to a particular cause code.
[4] NERC GADS data show that Units 1, 2, and 3 operated for 383 hours, 474 hours, and 255 hours respectively during 2005.
[5] In stocking spares, the plant should compare the carrying costs of inventory to the potential economic loses customers incur when they lose power.

SECTION 3 – OBSERVATIONS

Maintenance Standard 7 – Balance of Maintenance Approach
The maintenance program includes the proper balance of the various approaches to maintenance, e.g., preventive, predictive, or corrective. The approach is adequately documented with consideration of economics and reliability of equipment or components, and their affect on reliable operation of the unit. Operating experience is factored into the program. Maintenance procedures and documents should include the generation equipment and all those components owned by the generation owner 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.

Maintenance Standard 10 – Work Management
Work is identified and selected based on value to maintaining reliable plant operation. Work is planned, scheduled, coordinated, controlled, and supported with resources for safe, timely, and effective completion.

OBSERVATION 3.1 – BALANCE OF MAINTENANCE

The plant uses a combination of condition- and schedule-based maintenance approaches. In other words, plant staff inspects equipment after it has run a specified numbers of hours, and schedules maintenance when the equipment shows evidence of wear. CPSD believes such an approach is reasonable because the plant's units run only a few hundred hours a year.[6]

For example, the plant schedules a Hot-Section Inspection (HSI) of the gas turbines every 500 to 800 run-hours. During this procedure, Jet Turbine Services Inc. (JTS) disassembles, inspects, and calibrates engine components. The Auditor found HSI reports dating back 10 years.

The Auditor reviewed the most recent HSI report for units 1A and 1B, dated June 22, 2005.[7] The report indicated that both engines were in good condition and at the time did not need repairs.

The Auditor also reviewed reports for Units 2A and 2B, and 3A and 3B dated March 14, 2005 and March 18, 2005, respectively. The reports said all four engines were in good working order and needed no repairs.

Finally, plant staff schedule and track such preventive maintenance tasks (called PMs) using a work management database called Maximo. The Auditor asked staff to print out a list of current PMs for the plant. Staff supplied a six-page printout that included PMs for each major piece of equipment at the plant. Staff perform various PMs annually, quarterly, monthly, or weekly, as appropriate.

[6] NERC GADS data show that Units 1, 2, and 3 operated for 383 hours, 474 hours, and 255 hours respectively during 2005.
[7] Jet Turbine Services Report # 062205JVFS

Maintenance Standard 8 – Maintenance Procedures and Documentation
Maintenance procedures and documents are clear and technically accurate, provide appropriate direction, and are used to support safe and reliable plant operation. Procedures must be current to the actual methods being employed to accomplish the task and are comprehensive to ensure reliable energy delivery to the transmission grid.

Operation Standard 7 – Operation Procedures and Documentation
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.

OBSERVATION 3.2 – OPERATION AND MAINTENANCE PROCEDURES

The Auditor reviewed the operation and maintenance manuals from the following vendors and found the manuals understandable and technically accurate:

1. Innovation Control Systems Manuals
2. Turbo Power and Marine Manuals

When the Commission adopted Maintenance Standards, Duke hired a contractor to review Oakland's procedures and to coordinate them with those of Duke's Moss Landing Power Plant. The Auditor reviewed a revised procedure[8] and found it thorough and clear. The Plant Manager expected the vendor to complete the remaining procedure revisions by the end of 2005. In 2006, the plant submitted to CPSD several samples of revised procedures.

[8] Procedure No. 21, entitled "Emergency Black Start for Unit 1"

Maintenance Standard 13 – Equipment Performance and Material Condition
Equipment performance and material condition support reliable plant operation. This is achieved using a strategy that includes methods to anticipate, prevent, identify, and promptly resolve equipment performance problems and degradation.

OBSERVATION 3.3 – EQUIPMENT PERFORMANCE

Plant staff monitor equipment performance both manually and electronically.

During their daily rounds, plant staff read meters on the generators, water injection system, and diesel fuel tank, and inspect critical equipment such as the engine and coupling compartment, water deluge system, water injection system, and transformer banks. Each day, staff send completed inspection reports (including meter data) to Duke's Moss Landing Power Plant, which stores them.

When the units are running, the unit's control system monitors the turbines and records critical parameters in real time. Staff can determine the cause of turbine failures by reviewing the data, accessible through "Human Machine Interface" workstations. Workstations are located in the Plant Manager's office as well as the control rooms for Units 1 and 2. However, such failures are rare; in the last 172 attempts, the plant started successfully all but 2 times.

Maintenance Standard 18 – Maintenance Facilities and Equipment
Facilities and equipment are adequate to effectively support maintenance activities.

OBSERVATION 3.4 – TOOLS AND REPAIR EQUIPMENT

The Auditor visited the tool room and found common mechanical and electrical repair tools (Figure 5). The shift supervisor explained that the plant requires only common repair tools, because the plant hires contractors for overhauls and other major turbine work. JTS has been their contractor for HSI inspections. See Observation 3.1. The shift supervisor also said that if a turbine goes out of service, JTS can install a replacement engine within two days. CPSD believes that the plant has the necessary tools to install any spare parts in its inventory.

Figure 5 -- Common mechanical and electrical repair tools.

Operation Standard 7 – Operation Procedures and Documentation
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.

Assessment Guideline
G. Procedures, documents, drawings, and other work-related references are readily accessible, authorized, clearly identified, controlled, technically accurate, and up to date.

OBSERVATION 3.5 – PLANT LIBRARY AND FILING SYSTEM

The plant stores documents systematically and clearly. The plant's library contains design and vendor prints, equipment test documents, and operation and maintenance manuals. The plant had organized those documents for easy retrieval. The plant stores documents in well-organized file cabinets. Using the plant's filing system, the Auditor easily found a folder containing a fuel oil filter vendor print, as well as current and historical HSI reports on the gas turbines. However, the Auditor found that three of the plant's drawings were out-of-date. See Finding 2.6.

Operation 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.

OBSERVATION 3.6 – PLANT SECURITY

Plant security included good barriers and frequent inspections. [redacted]

[redacted]