

VOLUME 6 – 1

MANAGEMENT OF POWER FACILITIES



FACILITIES INSTRUCTIONS, STANDARDS, AND TECHNIQUES

March 2003

United States Department of the Interior
Bureau of Reclamation
Denver, Colorado



REPORT DOCUMENTATION PAGEForm Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suit 1204, Arlington VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Report (0704-0188), Washington DC 20503.

1. AGENCY USE ONLY (Leave Blank)		2. REPORT DATE February 2003	3. REPORT TYPE AND DATES COVERED Final	
4. TITLE AND SUBTITLE Management of Power Facilities Facilities Instructions, Standards, and Techniques, Volume 6-1			5. FUNDING NUMBERS	
6. AUTHOR(S) Mitchell Samuelian, Max Spiker, Larry Anderson, Don Bader, and Eric Corbin				
7. PERFORMING ORGANIZATIONS NAME(S) AND ADDRESS(ES) Bureau of Reclamation Denver Federal Center PO Box 25007 Denver CO 80225-0007			8. PERFORMING ORGANIZATION REPORT NUMBER Volume 6-1	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Power Resources Office Office of Program and Policy Services Bureau of Reclamation Mail Code D-5400 PO Box 25007 Denver CO 80225			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION AVAILABILITY STATEMENT Available from the National Technical Information Service, Operations Division, 5285 Port Royal Road, Springfield, Virginia 22161			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) FIST Volume 6-1 – Management of Power Facilities – lists the policies and best practices associated with the management of Bureau of Reclamation power facilities. This manual serves as a guideline for facility managers to prepare for a power operation and maintenance review.				
14. SUBJECT TERMS hydropower, facilities, management			15. NUMBER OF PAGES 38	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UL	18. SECURITY CLASSIFICATION OF THIS PAGE UL	19. SECURITY CLASSIFICATION OF ABSTRACT UL	20. LIMITATION OF ABSTRACT UL	

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Power Resources Office

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PREFACE

This document presents guidelines for the management of powerplants owned and operated by the Bureau of Reclamation (Reclamation). These guidelines are intended to act as a guide for Reclamation Power O&M and facility managers to implement requirements for the Management Review of Power Operations and Maintenance and best practices for the management of Reclamation power facilities.

Power maintenance, operations, and management personnel from Reclamation's Denver, Regional, and Area Offices developed these guidelines.

For more information on these guidelines and the Power Review of O&M Program, please contact Mitchell Samuelian at the Power Resources Office, D-5400, 303-445-3712.

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Appendix 4 – Short- and Long-Term Training Goals Template

Appendix 5– Annual Strategic Plan Template

Appendix 6 – Powerplant Facility Condition Assessment Template

MANAGEMENT OF POWER FACILITIES

1.0 RESPONSIBILITY

The Bureau of Reclamation (Reclamation) has responsibility for the generation of hydroelectric power and the release of water for flood control and authorized project purposes at its dams and powerplants. Power Operation and Maintenance (O&M) and Power Managers (Power Managers) ensure the safe and sound operation of all structures and equipment associated with the fulfillment of this responsibility.

2.0 SCOPE

Management of facility operations and maintenance achieves a high level of safety and performance through effective implementation and control of facility activities. Reclamation policies and procedures recognize that protecting the environment and ensuring safety and conducting proper maintenance and efficient operations are compatible goals. Such policies and procedures reflect the standards of excellence used in managing Reclamation facilities. These policies setup standards by which management ensures that Reclamation facilities are operated and maintained in the best interest of the public. Management, through policies, will establish a method to monitor and assess performance of the facility and staff. This manual discusses the policies, resources, and assessment needed in the management of Reclamation power facilities.

3.0 MANAGEMENT ROLE IN FACILITY OPERATIONS AND MAINTENANCE

Power Managers have a major responsibility, play a key role, and are an integral part in the success of Reclamation's Power O&M Program. The responsibilities and roles of Power Managers include:

- The O&M of power facilities in a manner that meets high standards and levels of performance.
- Communicating these performance standards to O&M staff.
- Providing staff with the necessary tools, training, and resources to achieve these high standards and levels of performance.
- Monitoring and evaluating facility and staff performance.
- Establishing and implementing an effective O&M program.
- Defining goals and establishing standards.
- Establishing and communicating priorities and work responsibilities.
- Measuring O&M performances by using a variety of tools (e.g., reports, records, goals, standards, etc.).

- Receiving input and feedback from staff on goals and training.
- Holding staff accountable for their performance through recognition, awards, supervisory counseling, performance appraisals, and, when necessary, administrative action.
- Implementing established policies, regulations, directives and standards, and other administrative requirements.

4.0 DEFINITIONS

4.1 Facility Condition Assessment

Each power facility (hydroelectric plant) is to be rated annually to meet the needs of the Reclamation Facility Condition Assessment Survey (FCAS). This annual survey is a departmentally mandated assessment to determine and document the condition of a facility. The survey identifies maintenance needs and provides a performance indicator in evaluating the reliability/condition of these facilities per the Reclamation goals established under the Government Performance and Results Act (GPRA). A facility condition indicator must be reported annually for each power facility. Area offices are responsible for completing an annual FCAS.

4.2 Individual Development Plan

The Individual Development Plan (IDP) is a tool for employees and their supervisors, in partnership, to develop a written, detailed, and progressive training and development strategy. Facility management uses IDPs as the basis for budget formulation for training dollars.

4.3 Benchmarking

Benchmarking is a tool for regional directors, area managers, and Power Managers to determine the performance of a facility as it is compared to other similar facilities and private industry. Performance data are collected and published in an annual report from the Power Resources Office.

4.4 Power Project

One of Reclamation's 58 facilities that generates electrical power for distribution within the Western United States.

4.5 Capacity Scheduling

A process by which maintenance work is scheduled based on available human resources. This ensures adequate usage of available resources without over-scheduling those resources.

5.0 FACILITY PERFORMANCE

5.1 Scope

The National Performance Review Power Management Laboratory identified key benchmarking areas for Reclamation power facilities.

5.2 Purpose

Benchmarking of Reclamation facilities against similar facilities, both public and private, allows Power Managers to gauge the performance of the facilities. Open and honest communication about performance with staff is essential to reinforce the importance of performance.

5.3 Guidelines

The following performance standards are included in the management component of Reclamation's Power Review of Operation and Maintenance (PRO&M) Program and are used to determine the overall performance of the facility. Appendix 1 contains an example template that summarizes a facility's production costs, forced outages, and unit availability performance.

A. Production Costs

Production costs of the facility (\$/megawatt [MW]) should be reviewed annually and compared to the appropriate capacity class facility of the hydropower industry. The annual production cost of the facility is determined by dividing the total cost that was accrued (expensed) against all Federal Energy Regulatory Commission power O&M cost authority structures (5100-535 through 5100-545) by the total powerplant MW nameplate generating capacity.

B. Forced Outages

A forced outage rate is an excellent indicator of the effectiveness of the facility maintenance program. Reclamation's goal is to maintain a forced outage rate not greater than 3 percent annually. The annual forced outage rate of a facility is determined by dividing the total number of forced outage hours for all units by the total number of hours available in a year for all units.

C. Power Delivery

Project power is one of the deliverable products of Reclamation power facilities. The project should provide 100 percent of the project power.

D. Unit Availability

Unit availability is a standard used throughout the power industry. The capability of providing unit availability is an excellent measure of facility performance and should be maintained to at least 90 percent.

6.0 FACILITY REVIEWS

6.1 Scope

Reclamation conducts a continuous review program of its hydroelectric facilities. Directive and Standard FAC 04- 01, Power Review of Operation and Maintenance Program, implements the PRO&M Review Program.

6.2 Purpose

The purpose of these reviews is to assess the effectiveness of Reclamation's power O&M activities to support its hydroelectric assets. These assessments are conducted under the Reclamation PRO&M Program.

6.3 Guidelines

Details about the review program can be found in the PRO&M Program Guidebook. In accordance with Directive and Standard FAC 04-01, Power O&M reviews are to be conducted annually. The Power Review of O&M Program consists of an annual review, a periodic review, and a comprehensive review. Listed below is a brief description of each review.

A. Annual Reviews

Each year that does not include a periodic or comprehensive power review, reviews are to be conducted and documented by local staff.

A cornerstone of the review program is the annual review during which staff from the local office performs a self-evaluation of the local power program by completing the Power O&M Review checksheets developed for the Power O&M Review Program.

Early identification and self-correction of individual and systemic problems is considered essential to a well-managed O&M program.

B. Periodic Reviews

Reviews are to be conducted and documented by the regional office once every 6 years (every 3 years following comprehensive power reviews).

C. Comprehensive Reviews

Reviews are to be conducted and documented by the Power Resources Office once every 6 years (every 3 years following periodic power reviews).

D. Power Resources Information System Database

Category 1 and category 2 recommendations from the periodic and comprehensive reviews are entered and tracked using the Power Resources Information System (PRIS), which is a separate database found in the Dam Safety Information System.

It is the responsibility of the area and regional offices to enter recommendations from the reviews into PRIS.

It is also highly recommended that all category 3 recommendations resulting from a Power O&M Review be entered into the PRIS database.

E. Review Checksheets

It is important that completed, site-specific checksheets and other requested data be furnished in a timely manner to the Periodic and Comprehensive Power O&M Review Teams so that adequate review can take place before the site visit. Failure to deliver the needed data in the time requested may result in the review being postponed, potentially causing scheduling and budgeting problems. Review checksheets are the most important review tool and form the foundation of the Power Review Program. The checksheets are key to maintaining thorough and accurate documentation of review findings and recommendations. Checksheets are used during the annual, periodic, and comprehensive reviews.

F. Variances

A variance from the standards is permitted provided that it can be justified, is officially documented, and properly approved by management. A variance form is required to be completed and kept on file at the facility. See appendix 2 for an example of a variance form template.

7.0 INCIDENT REVIEWS

7.1 Scope

The Reclamation Incident Review Program is covered in the Power Operation and Maintenance Incident Evaluation and Reporting Program, FAC 04-02.

7.2 Purpose

Each facility shall ensure that incidents (emergency, abnormal, and near-miss situations) are recognized, reported, investigated, and corrected.

Incidents are occurrences that could:

- Affect the health and safety of the public, employees, or guests
- Have an adverse effect on the environment

- Affect the operations and intended purpose of the facility
- Result in loss or damage to property

Incidents that are associated with personal injury or near-misses shall be reported in the Safety Management Information System within the required reporting period.

7.3 Guidelines

Power Managers are responsible for ensuring all Power O&M incidents are evaluated, documented, and corrected in accordance with Reclamation's Power O&M Incident Evaluation and Reporting Program. Power O&M incidents are defined as an unexpected or undesirable event resulting in a loss of functionality of equipment or systems that impact the capability to deliver or control water or power.

A. Level 1 Incidents (Major)

A level 1 incident has the highest level of significance, typically having Reclamation-wide implications. Level 1 incidents are major events involving serious damage to equipment, major power system breakups, prolonged outages, or the inability to deliver water.

B. Level 2 Incidents (Moderate)

Level 2 incidents have significant implications on a region-wide basis, not just affecting the facility or area office. These incidents involve unusual operation or misoperation of equipment causing short-term loss of load, generation, or transmission or that result in major equipment damage.

C. Level 3 Incidents (Minor)

Level 3 incidents are those events with local significance or events involving unusual operation or misoperation of equipment resulting in momentary loss of load, generation, or transmission or that cause moderate damage to equipment.

8.0 TRAINING AND CAREER DEVELOPMENT

8.1 Scope

This section covers the recommendations of the "Career Development and Training Implementation Plan," October 1999.

8.2 Purpose

Maintaining the proper number and classifications of facility staff members is a key component in managing the facility. As technology changes, the technical staffing requirements change. Power Managers maintain an awareness of the staffing requirements for their facility. An integral part of an effective O&M program requires a “well-trained staff.” For you, as a Power Manager, supporting training and career development of staff is not only essential to the facility, but it is also necessary for maintaining the vitality of the agency.

8.3 Guidelines

The following guidelines are discussed in the Commissioner's Power O&M Team Report and Reclamation's “Career Development and Training Implementation Plan,” October 1999.

A. Workforce Analysis

To ensure Reclamation is effective and economically efficient in addressing human resource issues discussed in the Commissioner’s Power O&M Team Report, “Achieving a More Effective Power O&M Program,” August 1997, staffing, recruitment, attrition, and the development of craft and critical power positions is essential.

Facility and regional power organizations should perform a 5-year workforce analysis by facility and series (management, administration, engineer, engineering technician, craft, and other) and update annually. See appendix 3 for an example of a 5-year workforce analysis. A workforce analysis will help the Power Manager identify staffing levels to:

- (1) Determine if these levels are appropriate to carryout an effective Power O&M Program
- (2) Ensure staff is properly positioned to maximize O&M productivity
- (3) Plan for retirements
- (4) Develop, justify, and defend fiscal and full-time equivalent (FTE) resources
- (5) Develop short- and long-term training goals to allow the more efficient use of training resources (see appendix 4 for an example)

B. Technical Training Goal

Two separate studies, the National Performance Review, Power Management Laboratory, in 1996, and an independent study conducted by Niagara Mohawk Power Corp and Hydro Review, in 1995, suggested that Reclamation training might fall short of common industry practices at some facilities.

It is therefore recommended that Power Managers establish a technical training goal of 40 to 80 hours per year (formal/informal) for permanent power O&M employees not currently covered by an apprenticeship program.

To conserve training resources, Power Managers should consider the following methods for controlling the cost of training:

- Training a large number of staff on-site for the same price as sending an individual to training at a remote location
- Using in-house expertise to conduct training to greatly reduce costs; often, training materials can be acquired from the Technical Service Center for staff to use for conducting training
- Periodically discussing the design and O&M of specific plant systems or facility Standard Operating Procedures (SOP), Emergency Operating Procedures (EOP), or policies is another valuable and inexpensive training source
- Using local universities or trade schools to conduct training
- Sending staff to other facilities to learn innovative work processes
- Having a vendor conduct training on site-specific equipment

C. Individual Development Plans

IDPs provide permanent Reclamation employees with a written, detailed, and progressive training and development strategy. The development, approval, and achievement of IDPs should be tied to the interim and annual performance appraisal process and serve as the basis for budget formulation for training dollars.

First line supervisors, in consultation with the employee, will assess and identify individual training needs and time estimates and integrate the information into the IDPs.

D. Training Budgets

Training budgets formulated separately from other O&M activities ensure that adequate funding is directed towards these goals. Power Managers will periodically review and monitor the status of the training conducted against that budgeted.

A training needs assessment should be developed annually, with staff input, to determine training priorities for the upcoming fiscal year.

F. Schematics and Single-Line Diagrams

The maintenance of current, up-to-date facility drawings and the knowledge thereof is critical to efficient O&M. Drawings are used for

developing clearances, troubleshooting, replacements, modifications, additions, and normal day-to-day O&M troubleshooting activities. Power Managers will provide ensure training is provided on schematics and single-line diagrams.

F. Hazardous Waste Training

ENV 02-06, Required Training and Medical Surveillance for Hazardous Waste Operations and Emergency Response, requires the following training:

- (1) All managers having line responsibility for hazardous waste management will attend hazardous waste awareness training within 12 months of assuming such position.
- (2) All employees and their respective supervisors working on a hazardous waste sites exposed to hazardous substances, health hazards, or safety hazards shall receive training before being permitted to engage in hazardous waste operations.

G. MAXIMO Training

The maintenance management system, MAXIMO, is an integral part of facility management. It is the platform used in planning, scheduling, tracking, and recording historical data as it relates to the maintenance of Reclamation facilities. The effective use of the system depends on the knowledge level of the facility staff in the use of MAXIMO. Power Managers will provide training in the use of the MAXIMO database and O&M business practices.

H. Training Documentation

It is essential that all training be documented. Power Managers will consolidate training requests and ensure training is documented as it is completed.

There is a significant amount of training that occurs in Reclamation facilities. Power Managers should ensure that this training is captured in employee training records. Power Managers will consolidate training requests and ensure all training is documented and entered into Reclamation's Records Training System (ARTS) as it is completed.

I. Reclamation Safety and Health Standards

Reclamation employees are required to have knowledge of Reclamation Safety and Health Standards (RSHS). Power Managers will provide 24 hours of initial training and a minimum of 8 hours annually thereafter.

The site <<http://intra.do.usbr.gov/safety/Tools/train.htm>> lists the safety training requirements for Reclamation facilities.

- (1) Reclamation Safety and Health Standards – Knowledge of RSHS is required. Power Managers will ensure 24 hours of initial training and a minimum of 8 hours annually thereafter is provided to all power O&M employees.
- (2) Emergency Plans – All employees are required to receive training on the facility's emergency plans in accordance with 29 Code of Federal Regulation (CFR) 1910.38(a).
- (3) Emergency Exercises and Drills – Power Managers shall ensure all employees participate in training exercises and drills on emergency and evacuation procedures on at least an annual basis. Staff shall be familiar with assembly areas and employee accountability processes. Written, site-specific procedures dealing with fires and other facility emergencies shall be made available to all employees, and staff shall receive training annually.
- (4) Hazardous Work Activities – Training is required based on employee exposure in accordance with 29 CFR 1910, 29 CFR 1926, 485 Departmental Manual (DM) 12.2, and RSHS.
- (5) Respiratory Protection Program – Annual training is required based on employee exposure in accordance with 29 CFR 1910.134, 485 DM 17.3, and RSHS.
- (6) Hearing Conservation Program – Training is required based on employee exposure in accordance with 29 CFR 1910.95, 29 CFR 1910.132, and RSHS.
- (7) Managers/Supervisors Safety and Health Orientation – Managers and supervisors are required to receive 3 hours of safety and health orientation training once every 3 years in accordance with 29 CFR 1960.54, 29 CFR 1960.55, and RSHS.
- (8) Confined Space – Training is required based on employee exposure in accordance with 29 CFR 1910.146 and RSHS.
- (9) CPR – Annual training is required based on employee duties and exposure in accordance with 29 CFR 1910.146, 29 CFR 1910.151, and 29 CFR 1910.269.
- (10) First Aid – Training is required once every 3 years based on employee duties and exposure in accordance with 29 CFR 1910.146, 29 CFR 1910.151, and 29 CFR 1910.269.
- (11) Bloodborne Pathogen – Training is required based on employee exposure in accordance with 29 CFR 1910.1030, 485 DM 30.3, and RSHS.

- (12) Personal Fall Protection and Fall Arrest Systems – Training is required based on employee exposure in accordance with 29 CFR 1910.66, 29 CFR 1926.1060, 20 CFR 1926.503, and RSHS.
- (13) Rope-Supported Work – 32 hours of annual training is required based on employee duties and exposure in accordance with RSHS.
- (14) Fire Brigade – Training is required based on employee duties and exposure in accordance with 485 DM 19.3 and RSHS.
- (15) Mobile Cranes – 40 hours of on-the-job training is required based on employee duties in accordance with RSHS.
- (16) Personal Protective Equipment – Training is required based on employee duties and exposure in accordance with 29 CFR 1910.132 and RSHS.
- (17) Spill Prevention and Countermeasure – Training and a mock exercise is required annually based on employee duties and exposure in accordance with 29 CFR 1910.112.
- (18) Hazard Communication – Training is required based on employee duties and exposure in accordance with 29 CFR 1910.1200, 29 CFR 1910.1450, and RSHS.
- (19) Supervisor Hazardous Waste Operations – Training is required based on employee duties and exposure in accordance with 29 CFR 1910.120.
- (20) Defensive Driving – Training is required once every 3 years in accordance with 485 DM 16.3 and SAF 01-04.
- (21) Powered Industrial Truck Operators – Training is required for employees who operate forklifts, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks. Supervisors are responsible for reviewing and certifying employee's performance once every 3 years in accordance with 29 CFR 1910.178.
- (22) Construction Safety Standards – Training is required for construction inspectors and O&M supervisors/employees in accordance with 485 DM 13.3. RSHS recommends a total of 32 hours of training.
- (23) Watercraft Safety – Employees who operate a watercraft are initially required to have 24 hours of the Department of Interior Motorboat Operator Certification course and 8 hours every 5 years thereafter in accordance with 485 DM 22 and RSHS.

J. FIST 1-1, Hazardous Energy Control Program

All employees involved with hazardous energy control procedures shall receive training on Reclamation's Hazardous Energy Control Program (HECP) to ensure that the purpose and procedures of the HECP are understood by all affected employees and that authorized employees possess the knowledge and skills required for the safe application, usage, and removal of energy controls. Power Managers are responsible for ensuring the following:

- (1) All employees involved with hazardous energy control procedures receive 4 hours of initial HECP training and demonstrate adequate working knowledge of hazardous energy control policy, local programs, and procedures prior to the individual performing work on or near any equipment or system that produces, uses, or stores hazardous energy (electrical, mechanical, pneumatic, hydraulic, chemical).
- (2) Initial HECP training is received prior to an employee being placed on the list of authorized employees in accordance with Reclamation's Facilities Instructions, Standards, and Techniques (FIST) volume 1-1.
- (3) All employees receive a minimum of 3 hours of refresher training annually thereafter.
- (4) All visiting personnel receive hazardous energy control and equipment orientation specific to the facility prior to allowing them to participate in any working function or duty.
- (5) HECP training consists of classroom and hands-on instruction. Each authorized employee shall receive training in the recognition of hazardous energy sources, the type and magnitude of energy available in the workplace, and the methods, equipment, and means for energy isolation and control.
- (6) Each authorized and affected employee is instructed in the purpose and use of the energy control procedures.
- (7) All incidental personnel are instructed about the procedures and about prohibitions relating to re-energizing systems that are locked or tagged out.
- (8) Authorized and affected employees shall be subject to examination at any time on FIST volume 1-1.
- (9) Retraining is provided for all authorized and affected employees whenever there is a change in their job assignments, a change in systems or processes that present a new energy control hazard, a change in energy control procedures, or whenever a periodic

inspection reveals, or there is reason to suspect the presence of, deviations from, or inadequacies in the person's knowledge or use of energy control procedures.

- (10) The responsible official certifies and documents all training and retraining by maintaining a local training file or log. Certification contains the name of the person; the time, date, and location of training; the name of the trainer; etc.
- (11) The individual receiving the training signs the training document acknowledging their receipt of training.

K. Managers/Supervisors Safety and Health Training

Power Managers will provide managers and supervisors with a total of 3 hours safety and health orientation training every 3 years.

L. Power Leadership Certificate Program

Reclamation needs to ensure a pool of qualified Power Managers and supervisors. All current Power O&M managers and supervisors should attend Reclamation's Power Leadership Program training course. All potential Power Managers and supervisors should also attend the training course.

M. Standard Operating Procedure, Abnormal Operating Procedure, and Emergency Operating Procedure Training

Plant staff with operations responsibility shall review the SOP, abnormal operating procedure, and EOP annually and document the review in the station log in accordance with FIST volume 1-11, *Conduct of Power Operations*, and FIST volume 1-12, *Abnormal Operating Procedures Generic Technical Guidelines for Hydroelectric Facilities*.

9.0 FACILITY MANAGEMENT

9.1 Scope

This section covers the key facility management components of the Power O&M Review Program.

9.2 Purpose

Key facility management items include strategic planning, replacements, additions, and extraordinary (RAX) items, deferred maintenance, and condition assessment for the facility.

9.3 Guidelines

A. Strategic Plan

An annual facility strategic plan identifies goals for the upcoming year and is a valuable tool for identifying and establishing goals, priorities, workloads, and resources; tracking projects; and documenting accomplishments.

This plan should be developed with the assistance of the facility staff. It is an excellent tool to evaluate the performance of staff. Power Managers will develop an annual strategic plan for the facility. See appendix 5 for an example of an annual strategic plan.

B. Replacements, Additions, and Extraordinary Maintenance

Power Managers will ensure all major foreseeable expenses for RAX maintenance items are identified and included in out-year budget formulations. RAX items need to have a written justification, and these should be accompanied with an economic analysis.

RAX items, when pushed out year after year, are a good indication that future problems are on the horizon. These problems can result in:

- An untimely failure of equipment
- The inability of deliver power and/or water
- A loss of, or damage to equipment and/or infrastructure
- Poor facility performance
- Safety and health issues
- A loss of institutional knowledge

C. Deferred Maintenance

Ensure that deferred maintenance is kept to a minimum and all deferred maintenance is documented in the annual report. Examples of deferred maintenance are as follows:

- Any outstanding category 1 and category 2 water and power O&M recommendations from facility reviews and O&M reviews that were not completed as scheduled during the previous fiscal year (FY)
- Any Universal Accessibility and Life Safety Code retrofits identified in action plans that were not completed as scheduled during the previous FY
- Any (annual) preventive maintenance (PM) jobs on mission-critical equipment (typically a MAXIMO calculated priority of

6 or greater) that was not completed by the end of the previous FY and the nonperformance of that maintenance that directly affects to ability of the mission-critical equipment to operate.

D. Facility Condition Assessments

Each power facility (hydroelectric plant) is to be rated annually to meet the needs of the Reclamation FCAS.

This annual survey is a Departmentally-mandated assessment to determine and document the condition of a facility...and identify maintenance needs as well as provide a performance indicator in evaluating the reliability/condition of these facilities per the Reclamation goals established under GPRA (Government Performance and Results Act)

A facility condition indicator must be reported annually for each power facility. Area offices are responsible for completing an annual FCAS.

10.0 OPERATIONS

10.1 Scope

Reclamation power facilities maintain system voltage and reactive control and respond to system emergencies by controlling powerplant loading and system frequency and voltage as required by the system dispatcher.

10.2 Purpose

Facility operations are one of the critical functions of a power facility. Facility management ensures that facility operations are performed in accordance with established standards.

10.3 Guidelines

A. Facility Operations

Facility operations will be conducted in accordance with FIST volume 1-11, *Conduct of Power Operations*.

B. Facility Management

Facility management will ensure operations staff members are adequately trained.

C. SOPs

The SOP shall be reviewed by the plant staff on an annual basis, and the review shall be documented in the station log. Changes to operating

procedures or the addition of new equipment will require the revision of the SOP, as needed.

11.0 BUDGET

11.1 Scope

Power Managers will strive to ensure program budgets are appropriate for the anticipated workload, employee training, facility reviews, RAX items, and deferred maintenance items.

11.2 Purpose

Long-term facility performance is related to budget. A facility operating continuously with appropriate funding and budget execution will have good performance and be less likely to have a major failure of mission-critical equipment and have an adverse affect to maintaining a well-trained staff.

11.3 Guidelines

A. Status

The budget status should be discussed with leadership staff on regular intervals. Leadership staff should bring budget items forward in meetings for all members to discuss.

B. Prioritization

Budget items should be prioritized. By prioritizing maintenance items, management can ensure that limited resources are focused in the correct or appropriate areas.

C. Justification

Cost/benefit justifications, in accordance with Reclamation Instructions, should be done for large purchases. Justifications for budget items can greatly improve the probability of their execution. FIST volume 4-3, *Economic Analysis of Maintenance Problems*, is a resource to be used in the development of budget items.

Equipment replacement costs should be compared to maintenance costs when deciding whether to replace or keep an item.

D. List of Ready-to-Purchase Item

Often at the end of the FY, funds become available without much notice. Facility management should maintain a list of ready-to-purchase items with a list of vendors, cost estimates, and justifications in the event such funding becomes available for immediate use.

12.0 MAINTENANCE MANAGEMENT

12.1 Scope

Maintenance management is the coordination, control, planning, execution, and monitoring of equipment maintenance activities.

12.2 Purpose

Maintenance remains one of the business areas in Reclamation in which significant savings can be achieved. According to *Maintenance Technology Magazine*, "Best Maintenance Practices," November 2002, significant improvements in maintenance effectiveness result from the use of "best practices."

12.3 Guidelines

FIST volume 6-2, *Conduct of Power Maintenance*, will give additional details for maintenance "best practices" at Reclamation power facilities.

A. Equipment Testing and Monitoring

Management will validate the proper frequency of equipment testing and monitoring. The completion of preventive maintenance is essential to ensure equipment performs reliably.

FIST volume 4-1A, *Maintenance Scheduling for Mechanical Equipment*, and volume 4-1B, *Maintenance Scheduling for Electrical Equipment*, lists the required maintenance and the periodicity of that maintenance for powerplant equipment.

B. Power O&M Practices, Procedures, and Maintenance Philosophy

Power O&M practices and procedures, along with the facilities maintenance philosophy, is current, documented, available in writing, and shared with O&M staff.

Reliability centered maintenance, condition-based, preventive, and breakdown maintenance are all different ways of approaching maintenance and are discussed in detail in FIST volume 6-2, *Conduct of Power Maintenance*. These philosophies, in most cases, will be used as a mixed approach to deal with the specific equipment of facilities and to accomplish efficient maintenance.

C. Safety

The number one priority of Reclamation's Power O&M Program is the safety and health of its employees and the general public. Power Managers are responsible for ensuring:

- Use of Job Hazard Analysis in maintenance work is 100 percent.
- Toolbox safety meetings are conducted on a weekly basis.
- Required written Safety and Health Programs are developed, are current, and are available to all employees.

D. Planning

- (1) Maintenance work processes should use capacity scheduling techniques to minimize lost generation.
- (2) All scheduled work should have estimated hours, number of personnel required to complete the work, and priority to better manage maintenance resources.
- (3) Work should be scheduled a minimum of 1 week in advance.
- (4) In general, planned and scheduled tasks can be as much as 50 percent more efficient in terms of duration and costs than unplanned and unscheduled tasks.

E. Distractions to an Effective Maintenance Program

- (1) Typically, a facility is staffed to deal with everyday maintenance issues. Management should consider contracting out large projects that are not core work for facility staff. Using local staff for special projects takes the staff away from the normal preventive maintenance program and can result in long-term weaknesses in the performance of the facility. Management should use every effort possible to retain expertise of unit teardowns and repairs without compromising the preventive maintenance program.
- (2) Poor control of materials and spare parts can lead to delays in maintenance. It can also cause equipment to remain out of service longer than anticipated and result in losses in revenue.
- (3) Lack of coordination between maintenance, engineering, and operations groups can delay or prolong work and cause friction between groups.
- (4) Maintaining equipment that should be run to failure can take the facilities maintenance staff away from more important maintenance. Some equipment, based on its low replacement cost, should be run to failure. Management should determine what equipment falls into that category and disseminate that information to maintenance staff.
- (5) Failing to replace older technology equipment that requires significant, higher cost maintenance can also cause the maintenance program to be less effective.

- F. Reclamation Enterprise Maintenance Management System (REMMS)/MAXIMO O&M Business Practices
- (1) MAXIMO is Reclamation's computerized maintenance management system. It is the standard system that is used to track computerized maintenance, costs, equipment history, and inventory. Details about the usage of MAXIMO as a maintenance management tool are contained in FIST volume 6-1, *Conduct of Power Maintenance*.
 - (2) TAAS is the Reclamation standard computerized system that is used to input and track labor.
 - (3) FED Strip is the Federal computerized system to acquire materials.

13.0 MAINTENANCE PERFORMANCE

13.1 Scope

Monitoring the facilities' maintenance performance indicators will provide facility management with insightful information, including labor and cost of maintenance.

13.2 Purpose

Maintenance is a large portion of a facility's budget. A top-performing maintenance program can provide significant budgetary savings. Consultants frequently use 15 percent as the maintenance cost gap between field leaders and the average performance. By improving maintenance processes, a poor performing maintenance program can see budget savings as large as 40 percent. There is no doubt that maintenance remains one of the areas in which significant savings can be achieved.

13.3 Guidelines

A. Objectives of Maintenance Management

Objectives of maintenance management are to preserve asset functions and avoid the consequences of failure of the asset:

- Safety failures endanger personnel and equipment.
- Environmental failures result in adverse or illegal impacts.
- Operational failures result in safety product loss and cost of repair.
- Nonoperational failures result in cost of repair.

B. Management Discussions

Management should discuss facility performance with the staff on a regular basis to:

- Show management's commitment to the facilities performance
- Encourage employee's competitive side to make the facility the best
- Show staff appropriate recognition when performance goals are met

C. Developing and Posting Performance Indicators

Management should consider developing and posting performance indicators for their facility. These reports are available through the Denver Maximo Support Group. Some examples of performance indicators are:

- Number of generated work orders
- Number of completed work orders
- Number of outstanding work orders
- Number of outstanding work orders more than 30 days past due
- Percent of rework
- Number of PM work orders
- Number of PM work orders completed
- Number of corrective maintenance (CM) work orders
- Number of CM work orders completed
- Number of emergency maintenance work orders
- Number of scheduled versus nonscheduled work orders
- Total forced outage rate and per unit
- Total unit availability rate and per unit
- Production costs (\$/MW and \$/megawatthour [MWh])
- Mean time between failures
- "Cost per" reports
- Scheduled compliance report

D. Completion of Maintenance Work

At least 90 percent of maintenance work, excluding special work, should be completed on an annual basis. This percentage can be found by comparing the total number of work orders completed in the current FY to the total work orders generated in the current FY plus any outstanding work from the previous year. The completion of maintenance work is an indicator of whether the facility is staffed and funded properly. Additionally, it can show the effectiveness of the facility maintenance program.

E. Planning Work

As a standard, all nonemergency work should be planned, and at least 80 percent of work should be completed on time. Planning work is essential to the efficient operation of a facility. When maintenance priorities change on a daily basis, maintenance staff can become disillusioned.

F. Charging Work

All completed work orders should have time charged against them. Not charging hours to a work order causes invalid cost accounting of maintenance on specific equipment.

G. Open Work Orders

The total number of open work orders (not closed, completed, or canceled) should be no more than 10 percent of the total work orders completed in the last 365 days. Each facility should identify the total number of PMs completed each year.

H. Outstanding PMS

The total number of outstanding PMs (greater than 30 days past the due date) should not be greater than 5 percent of the total PMs.

I. Documenting Outstanding PMs

PMs that are not completed are documented in accordance with FIST volume 6-1, *Conduct of Power Maintenance*.

J. Power Statistics

The Power Resource Office maintains power statistics for Reclamation's 58 powerplants. These include:

- Wholesale firm rates
- Reclamation costs as compared to the wholesale firm rates
- Production costs

- Work force deployment – FTE/unit and FTE/MW
- Availability factors
- Forced outage factors
- Scheduled outage factors

14.0 HAZARDOUS WASTE PROGRAM

14.1 Scope

This section covers a set of recommendations or best practices in the area of hazardous waste.

14.2 Purpose

Hazardous waste can cause a multitude of issues at each facility. Employee exposure, environmental releases, compliance violations, and the cost of disposal can all become serious issues if the hazardous waste program is improperly managed. This section identifies some best practices in the area of hazardous waste management.

14.3 Guidelines

A. Training and Medical Surveillance

Training and medical surveillance are required in accordance with ENV 02-06, *Required Training and Medical Surveillance for Hazardous Waste Operations and Emergency Response*

- (1) Personnel at any facility that generates hazardous waste shall be informed of the hazardous waste present at the facility and of the emergency response plan for the facility.
- (2) All employees who are or may be exposed to hazardous materials during the course of their assigned duties shall be placed under medical surveillance. This shall consist of an annual physical, the cost of which shall be borne by the employee's duty station.

B. Hazardous Materials Inventory

The facility shall maintain an inventory of all hazardous materials.

- (1) Locate all hazardous material records and store them in a central file.
- (2) Determine what products in stock are hazardous, ozone depleters, or no longer used and dispose of them or find alternatives. This will lower the risk of accidents or employee exposure.

C. Pollution Prevention

The facility shall minimize hazardous and solid waste in accordance with ENV03-03, *Pollution Prevention – Hazardous and Solid Waste Minimization*

- (1) Each Reclamation facility (regional office, area office, etc.) shall implement a documented pollution prevention plan for waste minimization to cover facilities under their jurisdiction.
- (2) Each facility shall conduct a waste minimization assessment or audit for determining potential opportunities to reduce or recycle waste.
- (3) It will be the responsibility of each facility to review, revise, and update their program, as necessary, every 2 years. Guidance in conducting an effective pollution prevention program is contained in Reclamation's 1996 *Pollution Prevention Guidance Manual*.

15.0 SECURITY

15.1 Scope

This section covers the general security requirements of the facility.

15.2 Purpose

Maintaining the security of Reclamation power facilities is a critical role of Power Managers.

15.3 Guidelines

The facility will have a current security plan. Plant staff will receive training on the use of facility procedures.

16.0 DOCUMENTATION

16.1 Scope

This section covers the documentation of O&M activities as well as drawings of the facility.

16.2 Purpose

Documentation is essential to compiling a history of facility O&M. Accurate drawings are critical to the staff in the performance of their duties to ensure work is carried out safely and accurately.

16.3 Guidelines

A. Equipment Trouble Reports

Operating offices shall prepare a PRO&M-124 report for every item of major power equipment or associated auxiliaries that fail in service or is found damaged or defective.

B. Variances

Variance from the standards is permitted and approved if it can be justified and is officially documented. A variance form is required to be completed and kept on file at the local office. A sample variance form is found in appendix 2.

C. Drawings

Drawings shall be accurate, up to date, and available and shall meet Reclamation's drawing requirements.

D. Maintenance Records

Maintenance is documented; records are accurate, up to date, and available for the facility staff.

E. Records Central Repository

Power Managers are responsible for ensuring all maintenance records, test records, trouble reports, incident reports, compliance records, etc., are centrally located at the facility and that all records are available to O&M staff.

F. O&M Improvement Report

Power Managers are responsible for ensuring all incidents and near-misses are properly reviewed and documented by completing a PO&M-171 report in accordance with FIST volume 1-2, *Operations & Maintenance Improvement Program*. The reports shall contain sufficient detail to provide an understanding of the problem encountered and any recommended solutions for rectifying the problem. Facility inspections, routine O&M activities, and operating incidents ranging from incidents to near-misses may all disclose a need for improvement in O&M practices, employee training, equipment installation, or design practices. Every incident, miscue, or near-miss indicates a need for improvement in some respect.

G. Hazardous Energy Control Program

Reclamation's HECP, contained in FIST volume 1-1, defines the hazardous energy control requirements of Reclamation facilities.

- (1) Power Managers are responsible for ensuring a local, site-specific written HECP is developed, is made available to all employees, is reviewed annually, and is up to date. The facility's local HECP program (comprised of FIST volume 1-1 and a facility supplement) shall comply with FIST volume 1-1, Occupational Safety and Health Administration's (OSHA) Electric Power Generation Transmission and Distribution (29 CFR 1910.269), OSHA's Control of Hazardous Energy Lockout/Tagout (29 CFR 1910.147), Reclamation's Safety and Health Standards; and list the responsible official, authorized employees, and define hazardous energy control training requirements.
- (2) A hazardous energy control procedure shall be written, and the energy sources controlled, in accordance with the requirements of FIST volume 1-1 before any person services and/or performs maintenance on equipment in which the unexpected energizing, startup, or release of stored energy could occur and cause personal injury, property damage, loss of content, protection, or capacity. In such circumstances, personnel and resources shall not be considered protected until hazardous energy control procedures have been implemented.
- (3) Periodic (at least annual) inspections shall be conducted to ensure compliance with the HECP (FIST volume 1-1 and a facility supplement). This inspection shall include a sampling of hazardous energy control procedure documentation completed at the facility. The inspection shall specify the system on which the hazardous energy control procedures were used, the date of inspection, and the names of personnel performing and participating in the hazardous energy control procedure. The periodic inspection shall be performed by an authorized employee other than those utilizing the energy control procedure being inspected.
- (4) Periodic inspections of the HECP and procedures shall include a review between the inspector and personnel involved in the use of the procedures to assess individual personal knowledge of and responsibilities under the program.
- (5) Any deficiencies shall be documented with an appropriate implementation plan to correct the deficiencies and to ensure future compliance.

17.0 CONFIGURATION MANAGEMENT

17.1 Scope

Configuration management covers the change of facility equipment from the original design.

17.2 Purpose

Changes to power facilities shall be based on sound engineering and O&M practices. Peer reviews by qualified personnel are essential to ensure that changes do not negatively impact Reclamation facilities.

17.3 Guidelines

A. Plant Modifications

- (1) Each facility should develop a process to ensure facility modifications are systematic. Peer reviews should be conducted on modifications.
- (2) A modification package should be used to ensure proper reviews and should include the following:
 - A detailed description of the proposed facility changes
 - A marked up drawing or sketch showing the proposed change
 - A list of materials required for the modification, including specifications and suppliers
 - Any associated technical manuals of any new equipment
- (3) Other Potential Changes

Power Managers are responsible for ensuring the modification is reviewed to determine if any other changes are needed and implemented. Potential changes that may need to be implemented as a result of the modification include:

 - Operational procedures
 - SOP changes
 - Maintenance procedures
 - Job plans
 - Drawings
 - Safety plans and/or procedures
 - Inventory of spare parts
 - Removal of obsolete spare parts
 - New spare parts entered into the MAXIMO inventory module
 - Modification package placed in plant history files

18.0 COMPLIANCE WITH ASSOCIATED PROGRAMS

18.1 Scope

Power Managers are responsible for ensuring the facility in compliance with a number of different associated programs.

18.2 Purpose

This section lists the different programs that are associated with Reclamation power facilities. In general, the area office is required to conduct these compliance assessments on a periodic basis.

18.3 Guidelines

A. Safety Review

Regional safety and health managers perform an annual safety review. This is to verify that facility management is providing employees a safe and healthful work environment.

B. Life Safety Code

Assess power O&M facilities and develop a Life Safety Code Action Plan.

C. Universal Accessibility

Assess power O&M facilities and develop a Universal Accessibility Action Plan.

D. Facility Condition Assessment Survey

Assess power O&M facilities annually and develop a facility condition assessment.

E. Environmental Compliance

A Spill Prevention Control and Countermeasure (SPCC) Plan and an Oil Contingency Plan has been developed and certified by a registered professional engineer in accordance with 40 CFR Part 112 and Part 119, respectively.

The statements and procedures contained in the SPCC Plan are intended to help prevent and/or control oil spills from the facility into or upon the waters below or above the dam. Power Managers are responsible for ensuring the SPCC Plan is reviewed every 5 years in accordance with 40 CFR Part 112.4(d).

An additional environmental review will be conducted periodically by the regional office in accordance with Reclamation requirements.

- F. FAC 01-07, *Review/Examination Program for High- and Significant-Hazard Dams*
- Perform these reviews every 6 years, alternating every 3 years with the comprehensive facility reviews).
- G. Associated Facility Review
- A review that has been performed in the last 12 months, including a review of powerplant structure, penstocks, and grounds. These require a periodic review by the regional office and a comprehensive review by an outside team every 6 years (so they are 3 years apart). Additionally, the area office will conduct an annual review for all other years.
- H. Western Energy Coordinating Council Compliance Monitoring Review
- A review will be conducted at all control centers in accordance with the requirements found in the *Western Energy Coordinating Council (WECC) Operating Committee Handbook* that can be found on the WECC web site <<http://www.wecc.biz>>
- I. Security Review
- A review of the facility security is required every 3 years.
- J. FAC 05-01, *Continuity of Operations*
- (1) Orientation Exercise (Seminar)
- As a minimum, each office/facility is required to perform one communications drill and orientation exercise annually.
- (2) Tabletop Exercise
- As a minimum, each office/facility is required to perform one tabletop exercise every 3 years. These tabletop exercises will be performed to evaluate the effectiveness of the continuity of operations (COO) plan.
- (3) Functional Exercise
- As a minimum, each mission essential facility is required to conduct one functional exercise every 6 years.
- K. FAC 01-01, *Emergency Action Plan*
- Reclamation's Emergency Action Plans (EAP) are procedures for management and dam operating personnel to follow during an emergency incident or unusual occurrence at a given dam to reduce potential for loss of life and property damage and to provide proper notification to downstream authorities. It also assists operational personnel in

deciding on and implementing actions to prepare for a variety of emergency incidents.

- (1) The EAP is to be reviewed by all employees and documented on an annual basis.
- (2) An EAP orientation that does not include a tabletop or functional exercise is to be conducted once every 2 years.
- (3) An EAP tabletop exercise is to be conducted once every 6 years; alternating every 3 years with the EAP functional exercise.
- (4) An EAP functional exercise is to be conducted once every 6 years; alternating every 3 years with the EAP tabletop exercise.
- (5) An annual review of the facility COO Plan and exercise is to be conducted by staff.

L. Property Review

Property reviews shall be conducted every 2 years.

M. Acquisition Review

Acquisition reviews shall be conducted every 2 years.

N. Bridge Review

Bridge reviews shall be conducted every 2 years.

APPENDIX 1 FACILITY PERFORMANCE TEMPLATE

<i>Facility Name Performance By Unit For FY02</i>											
Unit		Generation	Forced Outages			Scheduled Outages			Availability		
Unit No.	Total Starts	Gross (MWh)	Total No.	Time (Hours)	Rate (%)	Total No.	Time (Hours)	Rate (%)	Year Hours	Hours Available	Rate (%)
1	186	145,571	3	5.03	0.06	3	260.12	2.97	8760	8494.85	96.97
2	66	116,206	0	0.00	0.00	1	180.60	2.06	8760	8579.40	97.94
3	159	135,146	6	12.80	0.15	1	484.18	5.53	8760	8263.02	94.33
Total	411	396,923	9	17.83	0.07	5	924.90	3.52	26,280	25,337.27	96.41

FY02 Power O&M Cost Information (Cost Accounts 535-545)			
Total O&M Costs Without EOM RAX		Total O&M Costs With EOM RAX	
O&M Costs Without EOM	\$ 821,994	O&M Costs With EOM	\$ 1,296,626
O&M Costs Per Net MWh	\$ 2.07/MWh	O&M Costs Per Net MWh	\$ 3.27/MWh
O&M Costs Per MW Installed	\$ 16,440/MW	O&M Costs Per MW Installed	\$ 25,933/MW

**APPENDIX 2
VARIANCE FORM TEMPLATE**

**VARIANCE FORM
POWER O&M REVIEW PROGRAM**

Date: _____

Region: _____

Area/Project Office: _____

Local Operating Office: _____

Area: Electrical Maintenance ____ Mechanical Maintenance ____

Power Operations ____ Power Management ____

Equipment or Item: _____
(Include equipment designation [e.g., K1A], etc)

Reclamation Requirement: _____

Local Practice: _____

Justification for Variance: _____

* Attach Supplemental Documentation as Needed.

I agree that the described variance from Reclamation standard practice is justified and is based on sound engineering or management principles using a generally recognized methodology (e.g., RCM study).

Maintenance/Facility Manager

Date

Area/Power Manager

Date

**APPENDIX 3
5-YEAR WORKFORCE ANALYSIS TEMPLATE**

5-Year Workforce Analysis (FY03 – FY07)						
<i>Area Office or Facility Name</i> Power O&M Division						
Power O&M Positions (Includes Vacancies)	No. of Current Positions	Eligible to Retire and/or Expected Turnover in FY03	Eligible to Retire and/or Expected Turnover in FY04	Eligible to Retire and/or Expected Turnover in FY05	Eligible to Retire and/or Expected Turnover in FY06	Eligible to Retire and/or Expected Turnover in FY07
Management 1. Manager, Power O&M Division 2. Facility Manager 3. Supervisor III 4. Supervisor II 5. Supervisor, Support Services	1 1 1 4 1				1-R	
Administration 6. Office Automation Clerk 7. Facility Maintenance Clerk 8. Procurement/Warehouse Officer 9. Warehouse Technician 10. Warehouse Technician - Temp	2 1 1 1 1	1-T				
Engineer 11. Electrical Engineer	2	1-NP				
Engineer Technician 12. Engineering Technician	2					
Electrical Craft 13. Electrician, Journeyman 14. Electrician, Journeyman - Term 15. Electrician, Apprentice	6 1 1				1-T 1-NA	

5-Year Workforce Analysis (FY03 – FY07)

Area Office or Facility Name Power O&M Division

Power O&M Positions (Includes Vacancies)	No. of Current Positions	Eligible to Retire and/or Expected Turnover in FY03	Eligible to Retire and/or Expected Turnover in FY04	Eligible to Retire and/or Expected Turnover in FY05	Eligible to Retire and/or Expected Turnover in FY06	Eligible to Retire and/or Expected Turnover in FY07
Mechanical Craft 16. Mechanic, Journeyman 17. Mechanic, Apprentice	7 0		1-NA	1-R	1-NA	
Operator Craft 18. Operator, Journeyman 19. Operator, Apprentice	4 0			1-NA	1-R	
C&I Mechanic Craft 20. C&I Mechanic, Journeyman 21. C&I Mechanic, Apprentice	3 0	1-R	1-NA			
Support Craft 22. Utilityman 23. Building Repairman 24. Laborer 25. Laborer - Seasonal Temp	3 1 1 2		1-R			
TOTALS	47	1-R 1-T 0-NA 1-NP	1-R 0-T 2-NA 0-NP	1-R 0-T 1-NA 0-NP	2-R 1-T 2-NA 0-NP	0-R 0-T 0-NA 0-NP

T = Turnover R = Retirement NA = New Apprentice Position NP = New Position

APPENDIX 4
SHORT- AND LONG-TERM TRAINING GOALS TEMPLATE

Course	Course Description	Target Groups	Training Source	Point of Contact	Target Date	~ Cost
Corrosion Control	Cover coatings, corrosion theory, and dissimilar metals	Maintenance Mechanical Engineering	TBD - TSC		TBD	4,000
Welding	Welding theory, Glen Canyon equipment and inspections	Mechanical Maintenance Engineering	Az Welding Institute		TBD	5,000
Hydraulics Training	Training on ydraulic systems for hollow jets and fixed wheel gates and print reading	Mechanical Engineering Operations	In House		TBD	200
Governor Training	Training on Glen Canyon governors (some in class and some hands on)	Mechanical Electrical Engineering Operations	Roger Cline -TSC		5/2001	4,000
Crane Operations	Crane operations training	Mechanical Maintenance Warehouse Electrical	WRRC 800-727-6355		7/2001	5,000
Elevator Training	Training on Glen Canyon elevators	Electrical Mechanical Engineering	Roger Chartrand		10/2000	TBD
Electrical Print Reading	Review of print reading using Glen Canyon prints	Electrical Operations	Gary Osborn - TSC		4/2001	4,000

Course	Course Description	Target Groups	Training Source	Point of Contact	Target Date	~ Cost
Protective Relaying	Training on Glen Canyon protective relays	Electrical Operations	TBD - TSC		TBD	5,000
Voltage Regulators	Training in conjunction with the voltage regulator tuning and assessment	Electrical Operations	George Gurgis - TSC		TBD	3,000
Crane and Rigging Inspection Training	Crane and rigging inspection training	Mechanical Maintenance Warehouse Electrical	WRRC 800-727-6355		TBD	5,000

APPENDIX 5

ANNUAL STRATEGIC PLAN TEMPLATE

Maintenance Management

- Add nameplate data for equipment into MAXIMO. (Coordinator)
- Complete automation of O&M review checksheets
- Complete failure code implementation. (Analyst)
- Complete installation of MSDS database. (Analyst)
- Continue to improve PM Program (Deputy, Analyst)
- Develop Reclamation failure analysis (Deputy, Analyst)
- Inventory all spare parts (Admin)
- Plan all jobs that are not emergency work materials (All plant personnel)
- Review equipment and eliminate unnecessary corrective or PM maintenance (Deputy, Analyst)
- Rewrite governor electrical alignment PM to merge operations PM
- Trend equipment failures and look for improvements to maintenance program (Deputy, Analyst)
- Trend vibration analysis reports (Deputy, Analyst)

Outage Management

- Availability greater than 90 percent (All staff)
- Forced outage factor less than 3 percent (All staff)
- Reduce start failures after outage to no more than 2 for the entire year
- Correct systemic maintenance problems
- Correct air admission valve problems (Mechanics)
- Correct brake system failures (Mechanics)
- Correct generator oil seal failures (Mechanics)
- Generator air coolers (Engineering, Mechanics) – Sleeve all coolers in units 4-6
- Penstock coatings (Engineering) (In progress)
- Repair hollow jet coatings (Maintenance)
- Replace HVAC system on 8th floor (Mechanics, Maintenance)
- Replace potable water piping from A to second floor (Mechanics)
- Replace service water piping (Mechanics)

- **Operations**
- Review SOP and incorporate changes
- Rewrite operator log sheets
- Develop weekly PM checksheets

- **CFR Findings**
- Z4399 1998-3-D Bulkhead Slots - Clean and paint (Maintenance)
- Z4401 1998-2-T Ring Follower Gates - Coatings (Maintenance)
- Z4402 1998-2-F Clean Foundation Drains (Maintenance) (Materials ordered)

Plant Appearance, Painting and Cleanup (Maintenance)

- V.C. restroom remodel (Maintenance)
- Continue painting program for plant and piping systems
- Employee break room (Electrical, Maintenance, Mechanical, Engineering)

Generating Equipment

- Improve reliability of data from vibration analysis system (Engineering)
- Install speed probes on all units (Electrical) 5 and 6 remain
- Ö Magna-flux remaining unit servo arms
- Replace D2A, D1A

Miscellaneous Projects

- Automatic gate at warehouse (Mechanical, Electrical, Maintenance)
- Continue upgrading systems to Fiberoptic Communications (Electronics Mechanics)
- Eroding riverbank along boat ramp (Maintenance)
- Install bell mouth drain valve reach rods (Mechanics)
- Install fiber system for LAN (Electronics, Mechanics)
- Install new auto synchronizer (Electronics, Mechanics, Engineering)
- Install new phone switch in dam (Electronics, Mechanics)
- Install new phone switch in warehouse (Electronics, Mechanics)
- Install rain tunnel lights in lower tunnel and order remaining light strings (Electrical)
- Install video camera and security at warehouse (Electronics, Mechanics)
- Move AHUs in DC equipment room (Mechanics)
- Remove vegetation between machine shop and dam and along dam buttress (Maintenance)
- Repair air handler louver and control systems (Electrical)
- Replace 480-volt breaker trip devices (Electrical)
- Replace all brake isolation valves with ball valves (Mechanics)
- Rock bolt testing? (Maintenance) (Ongoing)

APPENDIX 6 POWERPLANT FACILITY CONDITION ASSESSMENT TEMPLATE

FACILITY _____

AREA OFFICE _____

REGION _____

<i>Facility Powerplant Condition Assessment Survey – 2002</i>					
Equipment	Year of Installation or last Rehab	Age Factor	Equipment Condition Factor	Maintenance History Factor	Summary Rating
Turbine Runner	1953	Poor	Good	Good	Good
Governor	1953	Poor	Good	Good	Good
Penstock	1953	Fair	Fair	Good	Fair
Fixed-Wheel Gates	2000	Good	Good	Good	Good
Hollow Jet/Bypass Valves	n/a	n/a	n/a	n/a	n/a
Generator	1953	Poor	Good	Good	Good
Excitation/Volt Regulator	1953	Poor	Fair	Fair	Fair
Step-Up Transformer	1953	Poor	Good	Good	Fair
Unit Breaker	1953	Poor	Fair	Fair	Fair
Switchyard Breaker	1953	Poor	Fair	Poor	Poor
Plant Structure	1953	Good	Good	Good	Good
Plant Cost Indicator	---	---	---	---	Good
Forced Outage Factor	---	---	---	---	Good
RAX Completion Factor	---	---	---	---	Good
Summary Condition Indicator *					Fair

Note: Good, fair, poor (self-assigned at the area office).

ACRONYMS AND ABBREVIATIONS

ARTS	Reclamation's Records Training System
CFR	Code of Federal Regulation
CM	corrective maintenance
COO	Continuity of Operations
DM	Departmental Manual
EAP	Emergency Action Plan
EOP	Emergency Operating Procedure
FCAS	Facility Condition Assessment Survey
Fed Strip	Federal computerized system to acquire materials
FIST	Facilities Instructions, Standards, and Techniques
FTE	full-time equivalent
FY	fiscal year
GPRA	Government Performance and Results Act
HECP	Hazardous Energy Control Program
IDP	Individual Development Plan
MW	megawatt
MWh	megawatthour
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
PM	preventive maintenance
PRO&M	Power Review of Operation and Maintenance
PRIS	Power Resources Information System
RAX	replacements, additions, and extraordinary
Reclamation	Bureau of Reclamation
REMMS	Reclamation Enterprise Maintenance Management System
RSHS	Reclamation Safety and Health Standards
SOP	Standard Operating Procedure
SPCC	Spill Prevention Control and Countermeasure
TAAS	Reclamation's standardized computer system that is used to input and track labor
WECC	Western Energy Coordinating Council