CECW-OM Regulation No. 1130-2-510	Department of the Army U.S. Army Corps of Engineers Washington, DC 20314-1000	ER 1130-2-510 12 Dec 96
	Project Operations HYDROELECTRIC POWER OPERATIONS AND MAINTENANCE POLICIES	
	Distribution Restriction Statement Approved for public release; distribution is unlimited.	

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, D.C. 20314-1000

CECW-O

ER 1130-2-510
Change 1

Regulation
No. 1130-2-510

16 December 2002

Project Operations
HYDROELECTRIC POWER OPERATIONS AND MAINTENANCE POLICIES

1. This change 1 to ER 1130-2-510, 13 Dec 96, authorizes local reproduction of ENG FORM 2198.

2. Substitute the attached page as shown below:

Chapter 2	Remove page 2-3	Insert page 2-3

3. File change sheet in front of this publication for reference purposes.

FOR THE COMMANDER:

JOSEPH SCHROEDEL
Colonel, Corps of Engineers
Chief of Staff

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, D.C. 20314-1000

CECW-OM

ER 1130-2-510

Regulation
No. 1130-2-510

13 December 1996

Project Operations
HYDROELECTRIC POWER OPERATIONS AND MAINTENANCE POLICIES

TABLE OF CONTENTS

This regulation supersedes Engineer Regulations (ER) 1130-2-437, dated 10 October 1987; 1130-2-338, dated 31 August 1989; 1130-2-320, dated 15 July 1989; 1130-2-322, dated 31 July 1989; 1130-2-323, dated 15 April 1988; 1130-2-324, dated 1 March 1978; 1130-2-321, dated 20 July 1988; 350-2-400, dated 5 January 1067; and 1130-2-436, dated 20 June 1988.

CHAPTER 1 - INTRODUCTION

1-1. Purpose. This regulation establishes the policy for the operation and maintenance (O&M) of USACE hydroelectric power generation facilities and related structures at civil works water resource projects.

1-2. Applicability. This regulation applies to all USACE commands having responsibility for civil works functions and hydroelectric power generation.

1-3. References.

a. PL 534, Section 5, 78th Congress, (58 Stat. 889), Flood Control Act of 1944, 22 December 1944.

b. PL 95-91, Section 302, 95th Congress, (91 Stat. 565), Department of Energy Organization Act, 4 August 1977.

c. PL 99-662, Section 937, Reports on Hydropower Statistics, Water Resources Development Act of 1986.

d. ER 500-1-1, Natural Disaster Procedures.

e. ER 1110-2-109, Engineering and Design - Hydroelectric Design Center.

f. ER 1110-2-1200, Engineering and Design - Plans and Specifications.

g. EP 1130-2-510, Hydroelectric Power Operations and Maintenance Procedures

h. Monthly Power Plant Report - Department of Energy Form EIA-759, (OMB) Form No. 1905-0129, and RCS Form FERC-1001).

i. In-Service Dates for Hydroelectric Generating Units (RCS Exempt: AR 335-15, Para 5-2c (3)).

1-4. Glossary.

a. Equipment Failures and Generation Interruptions. Occurrences which negatively affect the project's major power plant equipment which are necessary for generation of hydroelectric power. Such equipment may consist of turbines, generators, transformers, unit and switchyard switchgear, station service system, etc. Also included in this definition is loss of power generation due to project operating procedures and errors, and improper or faulty maintenance or work practices. Interruptions due to lightning strikes, outages of non-USACE facilities, and those where impact to service, equipment, cost, etc., is insignificant are excluded.

b. Forced Rewind. The replacement of a generator stator winding, outside the normal scheduling process, made necessary by an actual failure of the existing winding when repair is not practical.

c. Generator Rewind. A generator rewind is the replacement of a generator stator

winding. The winding capacity may be increased incidental to the rewind, but the nameplate capacity of the unit may or may not be changed. The present state-of-the-art in materials used for stator winding insulation may result in increased stator winding capacity but due to other considerations the hydropower manager may elect not to change the unit nameplate capacity.

d. Generator Uprating. The replacement of a generator stator winding in which the capabilities of the associated power train equipment are also considered in effecting an increase in the unit capacity and nameplate rating.

e. In-service Date of a Unit. The date when the generator is first synchronized to the transmission system. For new generators, the date when the generator is initially placed in service, as defined above. For existing generators, the date is when the generator is again placed in operation after a change in rated capacity. Units declared in service, which subsequently develop trouble requiring modifications that may delay normal generation, shall continue to be considered in service, unless otherwise specifically approved by the Commander, HQUSACE.

f. Marketable Electric Power. Hydroelectric energy and/or capacity that is in excess of project needs and is connected to any commercial or Federal power system for revenue producing purposes.

g. Net Generation. The gross generated power, including that power used for operation of locks, fishways, flood control, or functions other than power generation, minus the power used for the operation of the powerhouse and generating equipment.

h. Planned or Scheduled Rewind. The planned replacement of a generator stator winding while the generator is still serviceable and operable.

CHAPTER 2 - REPORTS ON HYDROELECTRIC POWER GENERATION STATISTICS

2-1. Purpose. This chapter establishes the policy for reporting USACE hydroelectric power statistics, including the availability, failure, and usage rates of generating equipment; power generating equipment failures and generation interruptions; monthly power plant generation; and in-service data; and for the maintenance of operations logs at multiple-purpose projects having hydroelectric power.

2-2. Policy. It is the policy of the Corps of Engineers that the following reports be prepared and submitted as specified:

a. Annual Reports to Congress. In accordance with PL 99-662 (Water Resources Development Act (WRDA) 1986, §937), MSCs having hydroelectric generating facilities shall submit an annual report, using the format and formulas presented in Chapter 2 of EP 1130-2-510, to CECW-OM by December 15th covering the following data for the previous Fiscal Year:

(1) Amount of electricity generated.

(2) Revenues received by the United States from the sale of electricity.

(3) Allocated investment costs operation, expenses allocated to power.

(4) Balance of investment cost.

(5) Total operations expenses allocated to power.

(6) Total maintenance expenses allocated to power.

b. Annual Service Rates Report.

(1) Each district shall maintain sufficient data and shall perform the calculations to develop annually, on a fiscal year basis, the rates listed below for each hydroelectric project rated at one megawatt or larger. Definitions and formulas for each rate are provided in Chapter 2 of EP 1130-2-510. These rates shall be composite for each project, based on the total main unit hours in each category for all units at the project.

(a) Operating Rate

(b) Standby Rate

(c) Availability Rate

(d) Generator Forced Outage Rate

(E) Non-generator Forced Outage Rate

(f) Generator Delayed Forced Outage Rate

(g) Non-generator Delayed Forced Outage Rate

(h) Generator Scheduled Outage Rate

(I) Non-generator Scheduled Outage Rate

(J) Planned Modification Outage Rate

(2) Each MSC shall furnish these annual district reports, for each district having hydroelectric power facilities, to HQUSACE (CECW-OM) in accordance with the schedule and format required by Chapter 2 of EP 1130-2-510.

(3) Each MSC having districts with hydropower generating facilities shall, at the same time, also furnish a MSC summary report containing the data presented in Chapter 2 of EP 1130-2-510. A sample "MSC Summary Report Format for Service Rates for Generating Equipment at Multiple-Purpose Projects Having Hydroelectric Power," can be found in the same engineer pamphlet.

c. Equipment Failure and Generation Interruption Reports.

(1) The MSCs shall report all power generating equipment failures and generation interruptions anticipated to cost in excess of $50,000, or require more than five working days to return equipment to service, to CECW-OM immediately by telephone, facsimile (FAX) machine, or electronic mail (E-mail). The specific information required for each report and sample format are presented in Chapter 2 of EP 1130-2-510. Reports shall be made as soon as possible; however, reports must be furnished before the end of the next regular business day. All interruptions shall be included in the quarterly performance indicators narratives. The MSC Commander may delegate this reporting responsibility to the District Commander and the Operations Division.

(2) When requested a detailed narrative report shall be prepared and forwarded to CECW-OM as soon as all pertinent information and data on the failure or interruption are available. Specific guidance on the format and content of the written report can be found in Chapter 2 of EP 1130-2-510. The report shall present the information and data in such a manner as to facilitate review and evaluation by CECW-OM and other elements of the HQUSACE.

d. Monthly Power Plant Generation Reports Using the Department of Energy's (DOE) Energy Information Administration FORM EIA-759. District commanders shall ensure that applicable FOAs complete copies of DOE Form EIA-759 for the monthly generation report. This form shall be completed and submitted directly to the Energy Information Administration (EIA) of the DOE, which furnishes the form, by the tenth of the following month. Specific guidance for the preparation of this form is provided in Chapter 2 of EP 1130-2-510.

e. Annual Power Plant Reports Using DOE FORM EIA-412. MSC commanders shall ensure that each district with hydropower generating facilities shall submit copies of DOE Form EIA-412 in accordance with ER 37-2-10, Accounting and Reporting Civil Works Activities, Chapter 32 (Change 86); and the Federal Energy Administration Act of 1974 (PL 93-275).

f. In-Service Data Reports for Hydroelectric Generating Units

(1) The Commander, HQUSACE shall keep the Chairman, Federal Energy Regulatory Commission (FERC), informed of the current installed hydroelectric generating capacity at

USACE projects. This includes installation of new generators and changes in the existing generating capacity due to rewinding of the generator stator, or any other reason. Within five business days after occurrence of the in-service date, the Commander, HQUSACE, shall be notified, Attention: CECW-OM, Washington, D.C. 20314-1000, of the name of the project and the nameplate rating (including kilowatts, kilovars, and power factor) of each unit as it is placed in service.

(2) The information may be transmitted by telephone, facsimile (FAX) machine, or electronic mail (E-mail) or any other suitable method. The in-service date information shall agree with the date reported to the power marketing agency and FERC. In-service dates for rewound units with no change in nameplate rating will report to HQUSACE only.

g. Reports for Power Marketing Administrations (PMA).

(1) All MSC commanders shall develop, in coordination with their respective PMA, a system for exchanging operating information. Responsibility for coordinating the exchange of information may be delegated to the District Commander at the discretion of the MSC Commander.

(2) The system shall include general operating information and information on conditions that could substantially affect costs or power availability. The MSC directly responsible for communicating with the marketing agency shall develop clear and timely reporting procedures in coordination with that agency.

h. Power Station Operation Log for Multiple-Purpose Projects with Power

(1) A permanent Operator's Log shall be maintained for each Corps hydroelectric power generating station.

(a) It shall be maintained by the operator in charge of each shift, utilizing ENG FORM 2198, Power Station Operating Log. Local reproduction authorized for ENG FORM 2198. The specifications for the form are available from the local forms manager.

(b) For remotely controlled plants, procedures shall be developed to insure that the log is properly maintained, in case of loss of supervisory control, communications, etc.

(2) The log shall contain a chronological history of all relevant communications sent or received, switching done, relay operations, equipment troubles or failures, and clearances, showing the date and time of each occurrence. The items listed should be concise, but sufficiently complete to provide a clear description of the project operation, insofar as the control room operator has jurisdiction. It should include information such as names of the persons communicated with, relay and switch numbers, clearance numbers, and other pertinent data as applicable to the particular project.

CHAPTER 3 - COORDINATION OF HYDROELECTRIC POWER OPERATIONS WITH POWER MARKETING AGENCIES

3-1. Purpose. This chapter establishes the policy for coordinating operation of the USACE hydroelectric generating facilities with the Power Marketing Administrations (PMA). In the absence of a PMA, a direct contractual arrangement may be entered into with other appropriate entities, with the approval of the Assistant Secretary of the Army (Civil Works).

3-2. Policy. It is the policy of the Corps of Engineers that:

a. The Corps shall be responsible for:

(1) operating Corps hydroelectric projects in the most cost effective manner practical, within the bounds of good management practice.

(2) providing information affecting cost and availability of power to the PMA.

b. The PMA shall be responsible for marketing of power declared excess to the needs of the Corps projects and recovering the Federal investments.

c. The Corps and the PMA shall develop mutually agreed upon reporting, information exchange, and operation procedures. The MSC Commander may delegate any or all of these responsibilities to the District Commander.

CHAPTER 4 - PROJECT EMPLOYEE REFRESHER OPERATIONAL EXERCISES FOR EMERGENCY STATIONS, MULTIPLE-PURPOSE PROJECTS WITH POWER

4-1. Purpose. This chapter establishes the requirement for the conduct of periodic operational exercises on abnormal or unusual emergency situations that may occur at Corps hydroelectric power projects.

4-2. Policy. It is the policy of the Corps of Engineers that:

a. Corps hydropower facilities shall maintain standards of reliability of service commensurate with those of the commercial power industry, such as the North American Electric Reliability Council (NERC).

b. District commanders shall ensure that subordinate project organizations are capable of functioning under all conceivable abnormal or unusual conditions with a minimum of delay. Such emergencies may include transmission system disturbances, power plant equipment failures, black start support for fossil and nuclear power plants, power plant fires, structural problems with the dam including dam safety, and other conditions which may affect the operation of the power plant.

c. The District Operations Division and the operations project managers shall develop standard procedures on how to cope with the various emergencies that may occur at each power plant and make them a part of appropriate project operations and maintenance (O&M) manuals. Coordinating these efforts with the regional power operating entities (e.g., Power Marketing Administration (PMA), commercial power companies, clients, etc.). In addition, operations project managers shall be responsible for:

(1) A continuing program of operational exercises to familiarize all power plant personnel with such abnormal and unusual conditions that may occur, through which all power plant employees know that such emergencies may occur and what steps to take, or procedures to follow, under each condition. Exercises shall be designed in coordination with ER 500-1-1.

(2) Ensuring that all employees participate in the exercises to the extent necessary to adequately perform their assigned responsibilities in a safe and efficient manner. The program shall, as a minimum, provide for annual training for each power plant employee. Training session attendance, dates held, and descriptions shall be recorded in project files.

CHAPTER 5 - HYDROELECTRIC POWER PLANT TRAINEES

5-1. Purpose. This chapter establishes the apprenticeship training program for hydropower trainees for advancement to journeyman status as power plant operators, mechanics, electricians, or electronic mechanics.

5-2. Policy. It is the policy of the Corps of Engineers that:

a. Corps districts shall utilize a uniform apprenticeship-type training program in order to fill existing and predicted power plant personnel vacancies. The four-year training program shall consist of a combination of academic, plant equipment, and on-the-job training. The training for academic subjects shall be provided by a correspondence school and plant equipment training through class room (or equal) instruction. On-the-job training shall be achieved by orderly progression through practical assignments closely related to correspondence school subjects and plant equipment class room instructions. Specific guidance on training procedures, tests, schedules, and curriculum are provided in Chapter 5 of EP 1130-2-510.

(1) The training program is intended to provide trainees a planned and coordinated educational program and hands-on training to enable the successful trainees to perform to a high degree of proficiency in their primary trade and basic capabilities in other trades.

(2) Recruitment, placement, assignment, training, and subsequent reassignment in the journeyman level shall be entirely on the basis of individual merit and without regard to race, color, sex, age, religion, or other factors which of themselves have no bearing on job performance.

b. HQUSACE (CECW-OM) shall be responsible for overview of the training program and keeping the training current to meet the changing Corps-wide program requirements. Any deviations from the program will require approval from CECW-OM. Additional responsibilities for program management are as follows:

(1) The MSC Commander is responsible for the overall implementation and management of the program. Each MSC Commander shall determine the number of trainees needed in the command. Consideration shall be given to anticipated retirements, changes in mission, and new projects in various stages of planning and construction when determining the number of new entrants. A training board shall be established to advise the Commander. The chairman and each board member shall be directly involved in, and knowledgeable of, operation and maintenance of Corps hydroelectric power plants. The MSC Commander may delegate all or part of his/her duties to the respective district commanders as appropriate.

(2) The District Commander, when so delegated, is responsible for the implementation of the training program. The Chief, Operations Division, or any other official in the district designated by the District Commander, shall see that the training is imparted as stipulated in this engineer regulation, and shall also be an advisor to the District Commander on matters pertaining to the training program. The Chief, Operations Division, in each district with a hydropower training program shall appoint a training coordinator at each training site. A training coordinator may be responsible for more than one training site.

(3) The trainees shall be responsible for meeting and maintaining standards of Federal

employment in their academic and on-the-job performance and personal work conduct. They shall be responsible for learning the study material and being able to do the work required in the trade without hazard to themselves or other workers. The applicant must have good distant vision in each eye and be able to read fine calibrations, glasses permitted. The ability to distinguish basic colors is required. The ability to hear the conversational voice, with or without a hearing aid, is required. An amputation of arm, hand, leg or foot will normally disqualify an applicant for appointment. Any physical condition which would cause the applicant to be a hazard to himself or to others is disqualifying.

c. Each local appointing authority shall enter into a signed agreement with the trainee which specifies, but is not limited to:

(1) Mobility during and after training for MSC-wide placement.

(2) Trainee's employment and training in an occupation, under standards adequate to produce a qualified skilled worker.

(3) Conditions for advancement and retention, removal from the program, and performance in a full performance position.

(4) Mandatory service for four years after graduating from the program. (If less than four years service is performed, the trainee must reimburse the Government for the training-related expenses on a pro-rata basis.)

(5) Local arrangements about tools and supplies.

(6) Probationary Period. The probationary period for a trainee is one year. However, unacceptable performance during the program period shall be a cause to remove a trainee from the training program under 5 USC 4303.

(7) Pay During Training. Pay rates for trainee levels are established by the Department of Defense Wage Fixing Authority and are shown on current authorized wage schedules. Current Federal employees who enter the training program shall have their pay set in accordance with the Office of Personnel Management (OPM) regulations.

d. Training at the Journeyman Level and above. Each MSC shall establish a program that prepares the journeyman for advancement to the senior level in the craft. This program shall also provide for updating skills to meet new technologies for all employees. The MSC Commander may delegate all or part of his/her duties to the district commanders as appropriate. Guidance on training procedures and curriculum is provided in Chapter 5 of EP 1130-2-510.

CHAPTER 6 - REWIND OF HYDROELECTRIC GENERATORS AND GENERATOR MOTORS

6-1. Purpose. This chapter establishes the policy for replacing a generator stator winding. The goal is to provide Operations Project Managers with clear, uniform, and consistent rationale for use in repair/replace decisions. While it is intended that this engineer regulation should apply primarily to generator and generator/motor winding replacement, it also provides the framework for justifying the replacement of a generator stator winding as part of a major rehabilitation program. The same methodology can be used for other major investments, such as large transformers.

6-2. Policy. Generator and generator-motor stator rewinds shall be based on an approved report containing the factors found in Chapter 6 of EP 1130-2-510 and as follow in this chapter. Each unit shall be considered on its individual merits. Brief reports that contain this evaluation shall be prepared for consideration of approval. Consideration shall be given to uprating the unit whenever rewinding is contemplated.

a. Reports. The factors identified in Chapter 6 of EP 1130-2-510 shall be addressed in the report as a basis to support the need for a generator rewind. The additional factors in the EP shall also be addressed to support generator uprating, if recommended. If generator uprating is not recommended, the report shall identify the factor or factors which makes an uprating impractical. In accordance with ER 1110-2-109, the Hydroelectric Design Center will prepare the engineering and design features of the reports and other engineering documentation.

(1) Background Information. Provide a tabulation of pertinent data for the existing generator, turbine, transformer and other associated equipment. See Appendix 6-A of Chapter 6 of EP 1130-2-510.

(2) Rewind Evaluation. Provide an engineering and economic analysis of the need for any proposed rewind that considers the condition of the existing winding and the impact of forced rewind if a scheduled rewind is not accomplished. The analysis should be developed around the factors listed in Appendixes 6-B and 6-C of Chapter 6 of EP 1130-2-510.

(3) Potential for Uprating. If uprating is recommended, a "water to wire" analysis shall be prepared to demonstrate that an uprating is justified based on the factors identified in Chapter 6 of EP 1130-2-510.

(4) Marketability. A letter from the appropriate Power Marketing Administration (PMA) must accompany all reports. The PMA should indicate that they are capable of marketing the power as well as willing to repay the cost of the rewind through their rate making process.

b. Approval.

(1) All reports recommending generator rewinds (defined in paragraph 6-2a, above) which are justified on reliability shall be submitted through appropriate channels to the MSC Commander for approval. Those reports that recommend generators rewinds for other than reliability issues (economic opportunity) or deviations from 6-2a above, shall be submitted to CECW-O for approval.

(2) Failure of stator winding that requires a forced rewind (defined in Glossary, item 1-4.b. in Chapter 1) need not go through the report process but may, with the approval of the MSC Commander, proceed directly to the plans and specifications phase. A copy of the Commander's decision or other written notice shall be furnished to CECW-O. A PMA marketability letter (para. 6-2a.(4), above) should be included with this documentation.

c. Funding requests shall follow the budget process as defined in the most current annual budget guidance document. Special attention is directed to the major maintenance and major rehabilitation dollar thresholds.

(1) O&M, General Funding. No work allowance maybe issued for a scheduled rewind prior to report approval under this regulation. Forced rewinds maybe funded by reprogramming activities.

(2) Construction, General Funding. All requests for Construction, General (CG) funding shall follow current CG guidance.

FOR THE COMMANDER:

OTIS WILLIAMS
Colonel, Corps of Engineers
Chief of Staff