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Little Rock District, Corps of Engineers
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Office Memorandum
No. 1130-2-1

27 February 1978

Project Operation
POWER PROJECT EMPLOYEE REFRESHER OPERATIONAL
EXERCISES FOR ABNORMAL CONDITIONS

1. Purpose. The purpose of this memorandum is to establish the requirement for periodic refresher training of powerplant personnel. A program for each powerplant will be designed to assure that powerplant operators and maintenance personnel maintain familiarization with procedures to be followed in the event of certain abnormal conditions that may occur in the operation and maintenance of powerplant equipment.

2. Applicability. The provisions of this memorandum apply to all multiple-purpose projects with power in the Little Rock District.

3. Reference. ER 1130-2-321.

4. Procedures. A tabulation of possible abnormal conditions, the expected result of each condition, the possible causes of each condition, and the action that should be indicated to or required of plant personnel shall be written for each powerplant and utilized, along with other appropriate training resources, to assure that plant personnel maintain a high degree of familiarization with procedures to follow when an abnormal condition occurs. Appendix A to this memorandum shows a suggested format for the tabulation and offers a listing of several suggested abnormal conditions. In addition, each powerplant superintendent will include other abnormal conditions which to his knowledge could occur at a particular powerplant.

5. Responsibility. The powerplant superintendent will be responsible for the development of a refresher training program, its implementation, and its continued updating. The program for each powerplant shall be developed originally and submitted to the District Office Hydropower Branch for comments not later than sixty (60) days following the date of this memorandum. Subsequent changes and additions that are indicated or required to the program for each powerplant shall also be submitted at the time they are made.

6. Implementation.

a. Powerplant superintendents will conduct group training sessions of at least 2 hours duration each 6 months involving as many of the powerplant's operation and maintenance personnel as possible, even to the extent of paying overtime for off-duty operators to attend. The training should be tailored to the needs of personnel in a particular plant and should include discussion of abnormal conditions that have occurred in the District or Division since the last session, as well as items from the tabulation prepared for that particular powerplant.

b. Shift work makes it impractical to assemble all operators at one time for training; therefore, the operators who cannot attend the group session will be given individual study by assigning selected items from the tabulation of abnormal conditions to study and discuss with the powerplant superintendent at a convenient time.

c. Care should be taken in scheduling of group sessions to insure that operators do not miss consecutive group sessions.

d. A special effort should be made to include powerplant trainees in the group sessions. In addition, trainees should be assigned two items per month from the tabulation of abnormal conditions for individual study and discussion with either the powerplant superintendent or a senior operator.

7. Reporting. Reports of training exercises shall be submitted to the District Office Hydropower Branch within 10 days after the training is complete, both for group sessions and individual study assignments. A copy of the report will also be kept on file at the powerplant. Training exercise reports can be submitted in the form of a DF and shall include a list of those in attendance, date of the session, name of the individual conducting the training, and a summary statement of the subjects covered. Comments and opinions of the personnel receiving the training should also be considered as appropriate for inclusion in the reports.

FOR THE DISTRICT ENGINEER:

Robert W Glenn

1 Appendix
APP A, Tabulation Format

ROBERT W. GLENN
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APPENDIX A

Project Operation
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1. Format. The format shown by the attached sheets is suggested for tabulating Abnormal Conditions, Result of Abnormal Conditions, Possible Causes, and Operator Action.

2. Items for Inclusion in Tabulation. The following is a list of some of the more common abnormal conditions that should be considered in preparation of the tabulation for each powerplant. This list is not intended to be all inclusive and each plant superintendent should include conditions known by him to be important and/or peculiar to his plant in addition.

1. Generator bearing(s) failure
2. Loss or partial loss of excitation
3. Fire in generator (or other equipment)
4. Low governor pressure (or loss of pressure)
5. Governor response (or lack of response)
6. Loss of PMG or ballhead motor
7. Loss of turbine bearing oil pressure (or level)
8. Loss of generator bearing oil (or excess oil)
9. Generator brake failure
10. Loss of station air
11. Loss of cooling water (windings, bearings, packing gland)
12. Sheared pins
13. ACB malfunction
14. OCB or MOD malfunction
15. Grounds (D.C. bus, 480 volt bus, etc.)
16. Failure of automatic setup (remote plants)
17. Failure of SCADA (remote plants)
18. Loss of potential to regulator, meters, etc.
19. Stator winding high temperature (also field)
20. Transformer winding high temperature
21. Generator differential relay operation
22. Transformer differential relay operation
23. Bus differential relay operation
24. Synchroscope or automatic synch. failure
25. Loss of station service generator or transformer

26. Loss of essential circuits bus
27. Separation of transmission lines
28. System frequency problems
29. Overvoltage or undervoltage problems
30. Generator overcurrent
31. Generator overspeed

Etc., Etc.

Abnormal Condition	Result of Abnormal Condition	Possible Cause(s) for Abnormal Condition	Operator Action Required or Indicated
1. Loss of D.C. power to relay, actuator and control bus with unit in operation.	1. Loss of SD solenoid protection (or SD as the case may be). 2. Loss of lockout relay protection (5, 5C, 5M, 5S, etc.). 3. Loss of protection from other relays dependent on D.C. 4. Loss of SNL solenoid. 5. Loss of electrical operation of speed adjust and gate limit. 6. Etc., etc. (Ann. expected).	1. Defective ckt. breaker. 2. Broken wire. 3. Fault in wiring or device. 4. Temporary ckt. overload trips breaker or burns wire. 5. Etc., etc.	1. See if breaker is tripped and reset (manned plants). 2. If unable to restore power to bus go to actuator and unload machine with manual gate limit, adjusting voltage if necessary, open ACB when load and reactive are zero then shut the unit down (manual application of brakes if necessary). The above is to avoid the remote possibility of the need for removal of equipment from service by protective relay and the relays not be operable. 3. Step 2 is not necessarily a critical emergency situation but needs to be done within a reasonable time. If the operator considers it advisable, he may want to start and load another machine, if available. 4. Call plant superintendent. 5. Etc., etc.

EXHIBIT 1

Abnormal Condition	Result of Abnormal Condition	Possible Cause(s) for Abnormal Condition	Operator Action Required or Indicated
1. Turbine guide bearing failure.	1. Alarm at ___°C. 2. Shutdown automatically at ___°C giving brg. temp. (etc.) annunciation. When gates reach ___% ACB opens, voltage reg. trips, etc.	1. Loss of oil from reservoir. 2. Foreign substance in oil. 3. Pump failure with no D.C. pump start. 4. 38 Relay malfunction. 5. Etc., etc.	1. Do not attempt to restart unit until cause of shutdown can be determined. 2. Rapid or continued rise in temp. may warrant operator shutdown (Supt's preference when preparing this instruction). 3. Notify plant superintendent.

EXHIBIT 2