THREE MILE ISLAND UNIT 2

CRITERIA FOR LOSS OF OFF-SITE

BOP ELECTRICAL POWER

(REV. 1)

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APPROVED

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Inter-Office Memorandum

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Subject TMI-2 Modification Criteria for Loss of Off-Site BOP Electrical Power - Rev. 1
TSG-127

To W. R. Cobean

Location TMI

Attached are revised criteria for use in designing the plant modifications associated with providing electrical power to vital BOP loads in the event of a loss of a loss of normal off-sit power.

The following significant changes have been made from Revision 0.

1. In the long term, there shall be installed a feed from the second 10 MVA transformer to bus 2-6. This will eliminate requirement for transfering and reterminating cables in the event of transformer loss.

2. The new 13.2 KV feed shall have capability to be connected to buses 2-5 and 2-6 on a "hot transfer". Periodic testing of the line is being required by the NRC using this make before break transfer.

3. Diesel generator testing criteria has been expanded.

4. Remote indication and control has been reduced to only the absolutely essential items.

The above revisions are consistant with current design.

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for D. K. Croneberger

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CRITERIA FOR LOSS OF OFF-SITE
BOP ELECTRICAL POWER

(REV. 1)

1.0 SCOPE

This document provides criteria for the installation of additional equipment to provide electrical power to BOP buses in the event of failure of the normal off-site sources to the BOP buses. Work on these modifications is already in progress and this document attemps to reflect existing plans as well as future efforts.

2.0 CIRCULATING WATER PUMP HOUSE BUSES 2-5 AND 2-6

2.1 The present cooling scheme of steaming and one of the proposed cooling schemes for solid water cooling require the operation of at least one Circulating Water Pump.

2.2 Based on the "Criteria for General Modifications to the BOP Electrical System, only Circulating Water Pumps CW-P-1A and/or 1C (as supplied by bus 2-5) should be used for cooling systems associated with Steam Generator "A". Similarly, CW-P-1B and/or 1D should be used with Steam Generator "B". However, to expedite completion of back-up power supply only bus 2-5 (and pumps 1A and 1C) will initially be connected to the back-up supply.

2.3 The normal power for the circulating water pumps on bus 2-5 is supplied via auxiliary transformer 2B. The high side of this transformer is connected to 230 kv substation bus No. 8 (on site). This bus can be supplied via two 230 kv lines from the north and via one 230 kv line and one 500 kv line from the south. Power can also be supplied via a normally open bus tie from the even numbered plant buses.

2.4 In order to operate the circulating water pumps and associated auxiliaries in the event of loss of normal off-site power, a new 13.2 kv line supplied from the 115 kv network is being installed. The 115 kv network is backed by combustion turbines and can be energized independently of the 230 kv network, in the event of a system collapse.

2.5 The new 13.2 kv feed will be connected to bus 2-5 via a 10 MVA 13.2 kv to 4.16 kv transformer. Circulating water pump 1E will be disconnected and its breaker will be used to connect the new supply. The existing pump breaker protective relaying will be adjusted or disabled as necessary to allow operation of this new feed.

2.5A After the initial plant modifications are complete, the new 13.2 kv feed shall also be connected to bus 2-6 via a second 10 MVA transformer (which is presently installed). Circulating water pump 1F shall be disconnected and its breaker will be used to connect the new supply The protective relaying shall be revised as necessary.

3.6 Relaying exists to disconnect large motor loads from the 4.16 kv buses. New controls shall be added to open the off-site supply breakers and to automatically start the diesels upon loss of the normal power supplies and connect them to the BOP buses (the existing bus transfer scheme shall be left in tact). Futhermore, new controls shall be added to disconnect large 480 volt loads (Ref. Criteria for Vital and Non Required BOP Electrical Loads). The loading of individual loads shall be manually controlled from the Unit 2 control room. (Certain new loads may temporarily be controlled from outside of the control room.) Return to normal off-site power shall be done manually by first opening the diesel breaker and then closing the off-site supply breaker.

3.7 Controls and indication for the diesel generators initially will be located locally at the diesel generators. In the long term, basic controls, indicators and alarms shall be duplicated in the Unit 2 control room (As described in 3.11 below)

3.7A The diesel generators will be periodically tested. This testing will be done by paralleling one diesel generator at a time onto the plant auxiliary system and manually loading the unit. Manual synchronizing and governor isochronous/droop change over controls are located locally at the diesel generator.

3.8 The diesel generators are located out of doors in self-contained enclosures. The foundations and arrangement of the diesels shall ensure satisfactory operation of the diesels under all typical adverse weather conditions for this area.

3.9 One 5000 gallon fuel oil tank is being installed to supply each diesel generator. These tanks will provide sufficient oil for approximately one day of full load operation of each diesel. Arrangements shall be made for a minimum fuel oil supply on-site to operate both diesel generators for the time required to obtain fuel resupply (under normal conditions) plus four days (to allow for weathe bad enough to delay normal delivery). Equipment shall be provided to transfer fuel from the on-site storage and delivery vehicles to the 5000 gallon tanks under all weather conditions.

3.10 Suitable fire protection shall be provided for the diesel generators. This shall include fire detection devices in the area of the diesels and oil storage tanks, fire walls separating each of the 5000 gallon oil storage tanks, and a fire suppression system for each diesel generator unit or fire walls between the units.

3.11 In the long term, the following alarms, indications and controls shall be provided in the Unit 2 control room, as a minimum:

a) Alarm on lube oil temp low (diesel auto starts on low lube temp.)
b) General alarm on each diesel gen. set
c) Diesel generator volts
d) Generator line current
e) Generator watts
f) Diesel Gen. not ready to start

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2.6 Connection of these new feeders onto the bus in the event of a loss of off-site power will be done manually using the existing breaker control switches in the control room. (No interlocks shall be installed between the new feeder breaks and existing breakers.) Operating procedures shall direct that the breakers connecting bus 2-51 with 2-61, bus 2-7 with 2-8, bus 2-71 with 2-81, bus 2-72 with 2-82 be removed.

2.6A Starting of the required loads shall be manually controlled from the Unit 2 control room (using existing breaker control switches).

2.7 Return to normal power shall be controlled manually. The preferred method shall be a "hot transfer" made by closing the normal supply breaker before opening the new supply breaker.

2.7A The new 13.8 kv feed to bus 2-5 (and 2-6) will be tested periodically. The test will be accomplished by making a "hot transfer" from the normal supply to the new line; return to normal power after the test shall also be made with a "hot transfer".

2.8 Procedures shall direct that the appropriate Me-Ed dispatchers are informed any time that the new supply is put into (and taken out of) service.

3.0 TURBINE BUILDING BUSES 2-3 AND 2-4

3.1 The present cooling scheme of steaming with Steam Generator "A", and all proposed cooling systems using both steam generators, use existing and new equipment powered from turbine building buses. At present, the principal loads include one 900 HP condensate pump, two new 700 HP pumps for water solid steam generator cooling, the 200 HP secondary closed cycle cooling water pumps, and the new temporary fuel handling/auxiliary building charcoal filter fans and heaters (new buses 2-38 and 2-48). (These loads are listed in detail in the "Criteria for Vital and Non-Required BOP Loads".)

3.2 Based on the "Criteria for General Modifications to the BOP Electrical System", loads associated with cooling Steam Generator "A" should be connected to odd numbered BOP buses and loads associated with cooling Steam Generator "B" shoudl be connected to even number buses.

3.3 The normal power for the turbine building buses is supplied via the two auxiliary transformers. The high side of these transformers is connected to the 320 kv substitution buses. These buses are supplied by three 320 kv lines and one 500 kv line.

3.4 In order to operate the critical turbine plant loads in the event of loss of off-site power, two new 2500 kw diesel generators are being installed. These diesels are being designed as the "gray" and "white" diesel will be connected to bus 2-4. The connection will be made using existing condensate booster pump motor breakers. It is intended that these diesels shall energize all 480 volt unit substations and motor control centers supplied from buses 2-3 adn 2-4.

3.5 These diesels are intended to back up the off-site power sources for a minimum of 2 years in support of the various new systems. the diesels should be operational prior to completion of any of the new vital BOP systems.

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3.12 Communication facilities between the diesel generator sets and the Unit 2 control room shall be provided before diesels are considered operational.

4.0 START-UP TESTING OF DIESEL GENERATOR

4.1 The start-up testing should determine the following:

a) The nominal starting time for each diesel generator

b) The correct functioning of the automatic bus clearing and automatic starting scheme

c) The adequacy of the 480 volt bus unloading and reloading scheme

d) The ability of each diesel generator to power a (900 HP) condensate pump.

e) The adequacy of the manual loading sequence to control diesel generator voltage and frequency transients and to complete loading of all vital loads within the required time limits.

f) That the total of all vital loads and other expected BOP loads are within the capability of each diesel generator.

5.0 PERIODIC TESTING AND SURVEILLANCE OF DIESEL GENERATOR

5.1 Periodic testing will be performed at intervals as specified in the Technical Specifications (only one unit shall be tested at a time).

5.2 The test will consist of manually starting the diesel generator, and manually synchronizing it onto the bus. The diesel should be loaded to at least 75% of rating and operated until temperature equilibrium is reached (or as specified in the Technical Specifications).

5.3 During testing in paralled with the system, the governor must be in the "droop" mode. However, during operation in the event of a loss of off-site power the governor should be in the isochronous mode. Therefore, the test procedures must direct that the governor mode, which is controlled manually, be changed before and after each periodic test.

5.4 The fuel oil in the on-site storage tanks shall be tested initially and periodically in accordance with ANS draft standard N195. The fuel oil must meet the manufacturer's recommended minimum requirements and particular attention should be paid to Centane Valve to ensure reliable starting.

5.5 The fuel oil must also be checked to ensure that the cloud point (Viscosity Criteria) is below the worst case winter temperature for this area. If the cloud point is too high the oil must be treated with suitable additives or other remedial action must be taken.

5.6 In addition to the above, the recommendation of the manufacturer for maintenance and testing should be followed.

6.0 FURTHER INVESTIGATION

6.1 In addition to the new diesel generators, it may be feasible to energize at least the odd numbered BOP buses from the new 13.2 off-site line. This would be accomplished by Opening the 230 kv disconnect switch supplying the auxiliary transformer and then feeding the turbine building BOP buses via the 4.16 kv cable and bus connected to the auxiliary transformer secondary. The feasibility of this connection shall be reviewed and documented for future consideration.