

REVIEW OF THE
POINT BEACH NUCLEAR PLANT, UNIT 1 and 2
ALTERNATE SHUTDOWN CAPABILITY

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1.0 Introduction

The primary objective of the 10 CFR 50 Appendix R requirements is safe plant shutdown following any fire. Upon review of the Point Beach Nuclear Unit 1 and 2 against the 10 CFR 50 Appendix R requirements on fire protection, it was determined that 4160 volt switchgear room does not meet the Appendix R requirements regarding separation of redundant 4160 volt buses. The Wisconsin Electric Power Company requested an exemption from this requirement. This request was denied by the NRC.

In response, Wisconsin Electric Power Company proposed a design for addition of a dedicated 13,800 volt bus that would provide the capability for safety plant shutdown independent of the 4160 volt switchgear room (1,2). This report provides a summary discussion and evaluation of the proposed design.

2.0 Discussion

Following a fire in the 4160 V switchgear room without a fire barrier, it is assumed that all electric power to the plant equipment would be lost. The licensee-proposed alternate shutdown capability following a fire in the 4160 volt switchgear room is based on addition of an independent 13,800 volt bus powered by the on-site gas turbine. The gas turbine and the associated output breakers are located in the gas turbine building away from the 4160 volt switchgear room. The turbine and breakers are contained in a room constructed of walls and floor/ceiling assembly that are three-hour fire rated. An independent source of 125 V DC power is also provided for operation of the breakers to load the gas turbine. Control and monitoring instrumentation for the gas turbine is provided in the control room independent of the 4160 volt switchgear room cables.

The source of power for the safe shutdown systems is two 480 V buses supplied by the 13,800 V bus through a step-down transformer. These buses also provide power to a distribution panel for battery chargers, lighting, and communication.

The safe shutdown functions that must be performed following a fire are:

1. Reactor Reactivity Control Function
2. Reactor Coolant Make-up Control Function
3. Reactor Coolant Pressure Control Function
4. Reactor Heat Removal Function
5. Process Monitoring Function
6. Miscellaneous Supporting Functions

The reactor reactivity control function is provided by the reactor protection system that would function independent of a fire in the 4160 V switchgear room. This system will keep the reactor subcritical for the first 24 hours after reactor trip. Due to xenon decay and negative moderator coefficient during cooldown from hot shutdown to cold shutdown, after the first 26 hours, addition of borated water to the primary system would be needed. This requirement will be provided by the Chemical Volume and Control System (CVCS) which also provides the requirement of the reactor coolant make-up control function. The CVCS charging pumps would take suction from Refueling Water Storage Tank (RWST) and inject the coolant through reactor coolant pump seal injection path or auxiliary charging path.

The initial reactor coolant pressure (overpressure) control function is provided by pressurizer safety valves. Once the reactor is depressurized to approximately 425 psig and Residual Heat Removal System (RHRS) is in operation, RHR safety valves provide this function. The reactor heat removal function is provided by establishment of natural circulation in the primary system, and operation of Auxiliary Feedwater System (AFWS) to remove heat through at least one steam generator. Both atmospheric steam dump valves and main steam system code safety valves can be used to dump the decay heat.

The process monitoring function is provided by the instrumentation necessary to monitor (a) pressurizer pressure, (b) pressurizer level, (c) primary coolant hot and cold leg temperatures, (d) steam generator level, (e) steam generator pressure, and (f) neutron flux.

The miscellaneous supporting functions are provided by systems required in support of functions discussed so far. The systems required to provide the support function include: Component Cooling Water System (CCWS), Service Water System (SWS), and emergency power system. The proposed independent switchgear room will provide power to all these support systems. A fire in the 4160 V switchgear room will not damage any of the front line or support systems necessary for safe shutdown of the plant by the proposed alternate shutdown system.

3.0 Evaluation

In a letter dated July 30, 1986, the NRC had accepted the conceptual design of the switchgear room dedicated shutdown system (3). However, the final approval of the system was postponed until the detailed design of the system is reviewed against the criteria of 10 CFR 50 Appendix R, Section III.L on "Alternative and dedicated shutdown capability." Because the 4160 V switchgear room is protected by automatic fire detection and suppression systems, the fire protection requirements of Section III.G.3 have been met. The purpose of this review is to confirm that the proposed alternative shutdown design meets the requirement of 10 CFR 50 Appendix R, Section III.L, and the guidelines issued in Generic Letter 81-12 (4).

To satisfy the criteria for electrical isolation discussed in Generic Letter 81-12, the Licensee's proposed independent AC power source consists of a gas turbine, a 13.8 KV bus, 13.8 KV to 480 V transformer, 480 V bus and the associated power supply breakers. This new system connects to the existing power supply system below the new 480 V bus through a class 1E breaker panel. As will be mentioned later, one of the earliest actions by the control room operators in response to a fire in the switchgear room is to connect the 480 V buses to the alternate power source and isolate them from the 4160 switchgear room. This design and procedure satisfies the electrical isolation criteria of the Generic Letter 81-12.

The licensee has identified the functions and systems required for safe shutdown of the plant and has developed a set of procedures for the operators to deal with a fire in the switchgear room. These procedures consist of a series of actions by three control room operators outside the control room during the first hour after the initiation of the fire. The

major elements of these actions include proper line-up of the 480 V breakers to connect the 480 V buses to the alternate power source and isolate these buses from the 4160 V switchgear room in conformance with the criteria for electrical isolation of Generic Letter 81-12, manual initiation and control of AFWS, CVCS charging pumps, and startup of the gas turbine. During the first 30 minutes all control actions will be taken on local stations. After about 30 minutes one of the operators would go back to the control room and the other two would stay at the AFWS and charging pump local stations for local control and monitoring of these systems.

Following a fire in the 4160 V switchgear room, the following indications would be available in the control room without interruption: pressurizer pressure and level, primary hot and cold leg temperatures, steam generator pressure and level. In addition, the neutron flux would be available at a local position. No direct indication of the status of the AFWS, CVCS, RHRS, CCWS, and SWS pumps or valves would be available in the control room. The licensee indicates that the operators at local stations will monitor the status of these systems. The adequacy of licensee's procedures, communication and lighting associated with the proposed design will be verified during future regional inspection.

Overall, it appears that the proposed design will provide power to the equipment necessary for safe shutdown of the plant. As described earlier, information about the primary plant parameters is provided in the control room without interruption. Even though direct indication on status of systems discussed earlier are not provided in the control room, local monitoring of these systems by operators is available.

4.0 Conclusion

Based on the above evaluation, the staff concludes that, subject to verification of the adequacy of the safe shutdown procedures, communications, and lighting associated with a fire in the 4160 V switchgear room, the licensee's proposed design conforms with Section III.6.3 and III.L of Appendix R to 10 CFR 50 and the guidelines issued in Generic Letter 81-12.

REFERENCES

1. Letter from C.W. Fay, Vice President Nuclear Power, Wisconsin Electric Power Company to H.R. Denton, Director, Nuclear Regulatory Commission, Dated February 7, 1986.
2. Letter from C.W. Fay, Vice President Nuclear Power, Wisconsin Electric Power Company to Mr. David H. Wagner, Project Manager, Project Directorate III-3 USNRC, Dated February 29, 1988.
3. Letter from Timothy G. Colburn, Project Manager, Project Directorate #1, Division of PWR Licensing-A, USNRC, to C.W. Fay, Vice President, Wisconsin Electric Company, Dated July 30, 1986.
4. "Fire Protection Rule (45 FR 76602, November 19, 1980) - Generic Letter 81-12," USNRC, February 20, 1981.