ILLINOIS POWER COMPANY

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500 SOUTH 27TH STREET, DECATUR, ILLINOIS 62525

December 2, 1981

Mr. James R. Miller, Chief
Standardization & Special Projects Branch
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Miller:

Clinton Power Station Unit 1
Docket No. 50-461

The attached material represents a response which was discussed with Messrs. Ernie Rossi and Rick Kendall during a meeting on November 30, 1981. The response represents Illinois Power Company's position relative to the remote shutdown capability as set forth in the CPS FSAR.

Sincerely,

J.D. Geier
Manager, Nuclear Station Engineering

Attachments

cc: J.H. Williams, NRC Clinton Project Manager
H.H. Livermore, NRC Resident Inspector
R. Kendall, NRC ICSB
J.P. O'Brien
H.M. Sroka S & L
G.E. Wuller

B001 Add: Ernie Rossi
S1/1 Rick Kendall

Issue Title: Remote Shutdown Panel

Issue:

The remote shutdown capability should meet the following criteria:

To Meet GDC-19 (As interpreted in SRP Section 7.4)

1. The design should provide redundant safety grade capability to achieve and maintain hot shutdown from a location or locations remote from the control room, assuming no fire damage to any required systems and equipment and assuming no accident has occurred. Credit may be taken for manual actuation (exclusive of continuous control) of systems from locations that are reasonably accessible from the Remote Shutdown Panel. Credit may not be taken from manual actions involving jumpering, rewiring or disconnecting circuits.

2. The design should provide redundant safety grade capability for attaining subsequent cold shutdown through the use of suitable procedures.

To Meet Appendix K (ECCS Requirements)

3. The design should be such that the manual transfer of control to the remote location(s) should not disable any automatic actuation of ESF functions while the plant is attaining or maintained in hot shutdown, other than where ESF features are manually placed in service to achieve or maintain hot shutdown. It is permissible to disable automatic LPCI actuation in this manner only when necessary in order to enable control of the RHR system to effect cold shutdown from hot shutdown.

To Meet Appendix R (Fire Protection Requirements)

4. The design should provide, as a minimum, non-redundant safety grade systems necessary to achieve and maintain hot shutdown from either the control room or from a remote location(s) assuming a postulated fire in any fire area, including the control room or the Remote Shutdown Panel. Credit may be taken for manual actuation (exclusive of continuous control) of systems from locations that are reasonably accessible from the control room or the Remote Shutdown Panel, as applicable. Credit may not be taken for manual actions involving jumpering, rewiring or disconnecting circuits.

5. The design should provide, as a minimum, non-redundant safety grade systems necessary to achieve and maintain cold shutdown from either the control room or from a remote location(s). The design should be such that in the event of fire damage in any fire area, systems could be repaired or made operable within 72 hours if required for cold shutdown.

Response:

General Design Criteria 19 in Appendix A of 10 CFR 50 reads as follows:

"Criterion 19 - Control Room. A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident.

Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures."

The control room and remote shutdown panel design for Clinton Power Station fully meet the requirements of GDC 19. The design bases used in the design of the remote shutdown capability to meet the requirements of GDC 19 are as follows:

1. The plant is operating initially at, or less than, design power.

2. The plant is not experiencing any transient situations. Even though the loss of off-site ac power is considered unlikely, the remote shutdown panel is powered from a Class 1E power system bus so backup ac power would be automatically supplied by the plant diesel generator. Manual controls of the diesel generator are also available outside the main control room.

3. The plant is not experiencing any accident situations. No design basis accident (including a LOCA) shall be assumed, so that complete control of engineered safeguard feature systems from outside the main control room is not required.

4. All plant personnel have evacuated the main control room.

5. The main control room continues to be inaccessible for several hours.

6. The initial event that causes the main control room to become inaccessible is assumed to be such that the reactor operator can manually scram the reactor before leaving the main control room. If this was not possible, the capability of opening the output breakers of the RPS logic from outside the main control room can be used as a backup means to achieve initial reactor reactivity shutdown.

7. The main turbine pressure regulators may be controlling reactor pressure via the bypass valves. However, in the interest of demonstrating that the plant can accommodate even loss of the turbine controls, it is assumed that this turbine generator control panel function is also lost. Therefore, main steam line isolation is assumed to occur at a specified low turbine inlet pressure and reactor pressure is relieved through the relief valves to the suppression pool.

8. The reactor feedwater system which is normally available is also assumed to be inoperable. Reactor vessel water inventory is made up by the RCIC system.

9. Dc power services are expected to be supplied from at least one plant dc power system for each essential system or equipment item in the remote shutdown system.

For remote shutdown operation, no off-normal operation is assumed. The remote shutdown capability, by itself, does not perform any safety related or protective function. This system interfaces with safety related systems, such as RHR and RCIC and meets the design criteria for those systems. No additional design criteria for the remote shutdown capability are necessary since they are already addressed in the respective design requirements.

The capability to achieve and maintain hot shutdown and subsequent attainment of cold shutdown is enumerated as follows:

1. The capability provides remote control for reactor systems needed to carry out the shutdown function from outside the main control room and bring the reactor to cold condition in an orderly fashion.

2. It provides a variation to the normal system used in the main control room permitting the shutdown of the reactor when the normal heat sinks (turbine and condenser) are assumed to be unavailable.

3. Automatic activation of relief valves and the Reactor Core Isolation Cooling (RCIC) system will bring the reactor to a hot shutdown condition after scram and isolation are achieved by removing Reactor Protection System power. During this phase of shutdown, the suppression pool will be cooled by operating the Residual Heat Removal (RHR) system in the suppression pool cooling mode. Reactor pressure will be controlled and core decay and sensible heat rejected to the suppression pool by relieving steam pressure through the relief valves. Reactor water inventory will be maintained by the RCIC system.

4. Manual operation of the certain safety relief valves will cool the reactor and reduce its pressure at a controlled rate until reactor pressure becomes so low that the RCIC system will discontinue operation. This condition will be reached at 50 to 100 psig reactor pressure.

5. The RHR system will then be operated in the shutdown cooling mode using the RHR system heat exchanger in the reactor water circuit to bring the reactor to the cold low pressure condition.

6. Essential equipment cubicles cooling systems will maintain the design basis environmental conditions for equipment operated from the remote shutdown panel.

The remote shutdown capability is designed to control the required shutdown systems from outside the main control room irrespective of shorts, opens, or grounds in the control circuit in the main control room that may have resulted from an event causing an evacuation. The functions needed for remote shutdown control are provided with manual transfer devices which override controls in the main control room and transfer the controls to the remote shutdown panel. All necessary power supplies are also transferred. Remote shutdown control is not possible without actuation of the transfer devices. Operation of the transfer devices causes an alarm in the main control room.

Access to areas in which the remote shutdown panel is located is under the control of the security system. Communications with other areas of the plant are being provided.

The following indicators are provided to enable the operator to monitor the status of the shutdown.

1. Reactor water level indactor.

2. Reactor pressure indicator.

3. Drywell temperature indications (two).

4. Suppression pool temperature (three - one near each of the three safety relief valves controlled from the remote shutdown panel).

5. RCIC Flow Controller and indicator.

6. RCIC Turbine Speed.

7. Indicating lights are provided for:

   a. Turbine tripped

   b. Turbine Bearing oil low pressure

   c. Turbine governor end bearing oil temperature high

   d. Turbine coupling end bearing oil temperature high

8. RCIC storage tank level.

9. Suppression pool level.

10. SSWS Strainer discharge pressure.

11. Indicating light for SSWS strainer high differential pressure.

In addition, status lights are provided for equipment operated from the panel and for other equipment important to the shutdown.

The following description of the shutdown operation identifies contingencies which provided for in the operation of the remote shutdown panel:

1. If evacuation becomes necessary, the operator will scram the reactor by depressing the scram switches at the Principal Plant Console as he leaves the main control room.

2. Under normal conditions, the main turbine pressure regulator will control the reactor pressure while rejecting heat (steam) through the turbine bypass valves, and the feedwater control system will control water level.

3. Opening the output breakers on feeders from the NSPS buses and the auxiliary 120 Vac bus to the Reactor Protection System trip logic channels can be used as a backup means of scramming the reactor and closing the containment and reactor vessel isolation valves. The controls for this function are located on the Reactor Protection System power distribution panel.

4. The remainder of the procedure assumes that the automatic pressure regulator is not available and the main steam line isolation valves are closed.

5. Operate transfer switches to transfer control to the remote shutdown panel.

6. Relief valves not used in the Remote Shutdown System may open automatically and cycle to control reactor pressure. Reactor level starts to drop rapidly or slowly depending on prior power level and elapsed time from scram.

7. The operator starts the RCIC system manually before the RCIC system comes on automatically on reactor vessel low water level initiation and monitors water level thereafter.

8. One relief valve is manually operated maintaining reactor pressure.

9. Reactor level reached RCIC initiation set point level if the RCIC system was initiated at low level. This is well above LPCS or RHR system initiation level. Level starts to rise as a result of RCIC system flow. Pressure relief is through one relief valve in manual intermittent operation.

10. Water level is returned to normal by operation of the RCIC system.

11. Start reduction of reactor pressure by manually actuating two relief valves.

12. While activating these relief valves, observe reactor level, reactor pressure, and suppression pool level and temperature. The relief valves are closed when level drops below the low level alarm point. The reactor cooldown rate shall not exceed 100°F per hour, as determined by observing reactor pressure.

13. Use the RHR system with one pump and one heat exchanger and associated water systems to cool the suppression pool. Operate the shutdown service water system to supply essential cooling water.

14. The operator activates two relief valves to maintain reduction of pressure while observing pool temperature.

15. Reduce reactor pressure to 100 psig.

16. Place the RHR system in the shutdown cooling mode. Flush the system for several minutes by pumping reactor water into the suppression pool. Then route reactor water back to the vessel, and continue cooldown until the reactor is in the cold low-pressure condition.

17. Hold reactor water level normal.

In addition to the RHR and RCIC controls required to perform the above functions, controls of shutdown service water and essential equipment cubicle HVAC systems are provided.

The following Shutdown Service Water System (SSWS) equipment/functions have transfer and control switches located at the remote shutdown panel for proper operation of the remote shutdown system:

One control switch is provided for each of the following:

SX01PA - SSWS Pump

SX014A - Motor Operated Valve (Plant Service Water/SSW Systems interconnection)

SX063A - Motor Operated Valve (diesel generator cooling water)

One control (selector) switch is provided which is common to the following:

SX003A - Motor Operated Valve (SSWS Strainer Inlet)

SX004A - Motor Operated Valve (SSWS Strainer Outlet)

SX008A - Motor Operated Valve (SSWS Strainer Bypass)

Controls for the strainer motor are available on a motor control center remote from the main control room.

The following essential equipment cubicle HVAC systems have transfer switches located on the remote shutdown panel. Controls are provided by local instrumentation remote from the main control room.

VH01CA - Fan (SSWS Pump Cubicle)

VY02C - Fan (RHR Pump Cubicle)

VY03C - Fan (RHR Heat Exchange Cubicle)

VY04C - Fan (RCIC Pump Cubicle)

VY01CA - Fan (Diesel Generator Cubicle)

VD02CA - Fan (Diesel Generator Cubicle)

VX03CA - Fan (Essential Switchgear Cubicle)

VX05CA - Fan (Battery Room)

Status (indicating) lights are provided on the remote shutdown panel for each of the fans listed.

One control switch is provided which is common to all of the following. This switch allows closing of all valves listed.

SX011A - Motor Operated Valve (SSWS Div. 1/2 Crosstie Isolation)

SX082A - Motor Operated Valve (RHR-A heat exchanger demineralized water inlet)

SX012A - Motor Operated Valve (Fuel Pool Heat Exchanger Inlet)

SX062A - MOV (Fuel Pool Heat Exchanger Outlet)

SX016A - MOV (Fuel Pool Make-Up Motor)

SX073A - MOV (SGTS Train A Charcoal Bed Water Supply)

SX076A - MOV (Control Room HVAC Unit A Deluge)

SX107A - MOV (Control Room HVAC Unit A Deluge)

Response to Issue Points

Issue 1: General Design Criteria No. 19 does not require that redundant safety grade shutdown capability remote from the control room be provided.

Issue 2: GDC No. 19 does not require redundant safety grade capability for attaining cold shutdown from outside the control room.

Issue 3: Operation of the transfer switches at the remote shut down panel transfers control of the system involved to the shutdown panel including power supply for these controls. This is done so failures in the control room such as shorts and/or opens will not affect manual operation of the shutdown equipment from shutdown panel.

Issue 4: The design of the control room and the shutdown panel is such that they provide independent means of shutdown assuming a postulated fire at either location.

Issue 5: The design of the control room and the remote shut-down panel is such that they provide independent means of shutdown to the cold shutdown condition assuming a postulated fire at either location.