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ACCESSION NBR:8110260174 DOC.DATE: 81/10/16 NOTARIZED: NO DOCKET #
FACIL:50-244 Robert Emmet Ginna Nuclear Plant, Unit 1, Rochester G. 05000244
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SUBJECT: Forwards review of plant shutdown capabilities following installation of proposed dedicated shutdown sys, & required instrumentation for sys.Plant can be maintained in safe condition following a/d fires.

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JOHN E. MAIER
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October 16, 1981

Director of Nuclear Reactor Regulation
Attention: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Fire Protection Dedicated Shutdown System
R. E. Ginna Nuclear Power Plant Unit #1
Docket No. 50-244

Dear Mr. Crutchfield:

In response to 10CFR 50.48 and Appendix R to 10CFR Part 50, we submitted reports on March 19 and May 19, 1981 which described potential modifications at the R. E. Ginna Nuclear Power Plant for a dedicated shutdown system. The potential modifications are the result of a fire protection safe shutdown study submitted December 28, 1979 and an ongoing design effort.

Our previous submittals did not explicitly address the requirement in Appendix R to 10CFR Part 50 that plants be capable of protecting, or repairing within 72 hours, those systems necessary to achieve and maintain cold shutdown following each fire postulated in the plant or that dedicated shutdown systems be able to achieve cold shutdown conditions within 72 hours. We believe that 72 hours is an arbitrary period with no defined safety basis. We believe that a commitment to a predetermined manipulation of the plant following an event is inappropriate. A discussion of our plant shutdown capabilities following installation of the proposed dedicated shutdown system is contained in Attachment A. Our conclusion is that the plant can be maintained in a safe condition following all fires. An exemption from the regulations is requested for four fire zones in the plant where we cannot assure, given the current assumptions which must be used in the evaluation, that cold shutdown can be achieved in 72 hours.

Attachment B discusses the instrumentation which is to be installed for the dedicated shutdown system. The attachment compares instrumentation that the NRC staff has requested in telephone conversations to the instrumentation which has been included in our conceptual design.

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The dedicated shutdown system design is based on the very conservative assumption that no detection, no automatic suppression, and no fire brigade suppression is effective in controlling or limiting fire damage. Even with the complete failure of all detection and suppression, the proposed system will provide adequate capability to maintain a safe shutdown condition and, therefore, no undue risk to the public health and safety will exist.

Very truly yours,

John E. Maier

Attachment A

Capability to Achieve Cold Shutdown

10CFR 50 Appendix R, paragraph III.G.1 requires that fire protection features shall be provided which are ". . . capable of limiting fire damage so that . . . one train of systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours." Paragraph III.L.5, Alternative and Dedicated Shutdown Capability, requires that "equipment and systems comprising the means to achieve and maintain cold shutdown conditions shall not be damaged by fire; or the fire damage to such equipment and systems shall be limited so that the systems can be made operable and cold shutdown can be achieved within 72 hours."

An evaluation of the R. E. Ginna plant capability to achieve cold shutdown following a fire anywhere in the plant was performed and was submitted December 28, 1979 (reference 1). The evaluation identified potential difficulties which required modifications to assure that the plant could be placed in cold shutdown following each postulated fire. The length of time required to achieve cold shutdown was not studied; the main purpose of the evaluation was to provide assurance that the plant could be maintained in a safe condition at all times by the removal of decay heat.

A conceptual design effort, now nearing completion, was undertaken to resolve the potential difficulties identified in our December 28, 1979 report. A dedicated shutdown system has been described in reports dated March 19 and May 19, 1981 (references 2 and 3). This system, when approved and installed, will give the plant the required capability to achieve and maintain cold shutdown following each postulated fire. We believe that maintaining the plant in a safe condition is necessary and we agree that it is important to be able to achieve cold shutdown following abnormal events. However, a requirement to achieve cold shutdown within 72 hours is an arbitrary requirement with no defined safety basis. Implicit in such a requirement is also a requirement to place the plant in cold shutdown within a 72 hour period following the event. We will be prepared to place the plant in cold shutdown if that is the safest mode of operation, however, circumstances at the time of the event may indicate that a mode of operation other than cold shutdown is a more stable and more prudent way to operate the plant. A commitment to a predetermined manipulation of the plant following a postulated event is inappropriate and may be unsafe.

An evaluation has been made of plant cold shutdown capability following a fire. Our December 28, 1979 submittal divided the plant into 62 fire zones. Assuming that the Dedicated Shutdown System (DSS) described in our May 19, 1981 submittal is installed, the plant will be capable of achieving cold shutdown within 72 hours following fires in at least 57 of the 62 fire zones. Fires in the remaining five zones may extend the time to achieve cold shutdown.

In all cases, cold shutdown could be achieved and the plant could be maintained in a stable condition following the fire.

The five fire zones where fires may cause the time to achieve cold shutdown to be extended beyond the 72 hours are the Auxiliary Building Basement West (ABBW), Containment Vessel Basement East (CVBE), Containment Vessel Basement West (CVBW), Auxiliary Building Residual Heat Pit (ABRH) and Auxiliary Building Operating South (ABOS). These zones are shown on drawings included in reference 1. Each of these areas contains one or more components of the residual heat removal system, the system used to achieve the most rapid cooldown after the primary system temperature has been reduced to 350°F or less. Components of the RHR system are assumed to be inoperable because they are located in the fire zone. As explained below, however, in four of the five zones damage to the equipment is unlikely. In the remaining zone, provisions will be made to repair equipment for use in taking the plant to cold shutdown.

Cooldown of the plant from normal operating temperatures to at least 350°F is accomplished by steam relief from the steam generators to the condenser or to the atmosphere. Steam relief will remove much of the latent metal heat and will provide heat removal during the periods of highest decay heat after plant shutdown. Steam relief and heat removal through the steam generators can continue until plant temperatures are near the normal boiling temperature for water. Only the heat to reduce plant temperatures from the boiling point of water to 200°F must be removed by the water solid steam generator method or by use of the RHR system. The RHR system is normally put in use at approximately 350°F for commercial reasons to speed the cooldown process but the plant is stable and safe remaining with steam generator heat removal.

The CVBE and CVBW zones contain the four motor operated valves (MOVs 700, 701, 720, 721) which isolate the primary system from the RHR system. The major threat to these valves, which existed prior to making fire protection modifications, was oil from the reactor coolant pump motors. Installation of the RCP oil collection system has removed this threat. During plant operation, transient combustibles are removed from the containment and do not represent a hazard. Electrical cables, the only remaining significant fire loading in these containment zones, are located in trays many feet above the valves. A cable fire may disable the motors for the valves but it would not prevent opening the valves manually. Manual operation after the fire is out is acceptable since the valves would not be used for a day or two after plant shutdown. Modifications for the DSS will prevent premature opening of the valves by the fire. Temperature detectors are installed on the cable trays and around the RCP motors to detect fires and initiate suppression activities.

The ABRH zone contains the RHR pumps and is a single room or pit below the auxiliary building basement level. The zone has a

very low combustible loading. Although the loading has not been evaluated precisely, it is certainly less than 500 BTU/ft^2. The only components that could burn are cables to the pumps and valves in the pit (cables are in conduits), the motors, and less than a quart of oil for each pump. There are no ignition sources in the pit. Transient combustibles are kept out of the zone during plant operation; there is no need for transient combustibles. The zone is physically removed from other zones. Personnel and transient combustibles associated with normal maintenance and operation activities do not pass through this zone. The zone is kept locked except for work performed in the zone under a special radiation work permit. The zone is covered with an early warning smoke detection sytem. Either one of the two RHR pumps will provide cold shutdown capability.

The ABBW zone is immediately above the RHR pit and contains the RHR pump cooling units. This zone is also protected by an early warning detection system, has a low combustible loading (<7600 BTU/ft^2) and is kept free of transient combustibles. The cooling units are not needed until the RHR system is put into service. Cooling is provided to remove pump motor heat and heat introduced to the RHR pump room by the circulated fluid in the RHR system. Only one of the two units is required for cooling. Each cooling unit fan is powered by a small, two horsepower electric motor. A spare motor will be kept on site as a replacement. Temporary, portable fans could be used to remove heat from the pump room following a fire at the cooling system if necessary.

The ABOS zone contains the Component Cooling Water (CCW) pumps and heat exchangers which must be operable if the RHR system is to be used for cold shutdown. The CCW system need not be operable for the first day or two after a fire even if cold shutdown is to be achieved in 72 hours. The fire loading in this area is low but the CCW system may be exposed to transient combustibles on the operating floor. The CCW system is near the truck bay and may be exposed to fire hazards of a truck or crating and cribbing materials. An exposure fire may disable the pump motors or the power cables.

The most practical method of assuring operability of at least one of the CCW pumps is to keep a spare pump on site along with materials for installation of the pump and a power feed. The spare pump will have adequate capacity to perform the cooldown function of the CCW system. It will be commercial quality and will not be qualified to the standards normally applied to a seismic class I auxiliary system. Procedures will be prepared for installation of the pump should it ever be required following a fire so that the capability to achieve cold shutdown within 72 hours is assured.

Conclusion

Installation of the DSS and procurement of a spare CCW pump will give Ginna the capability of achieving cold shutdown in 72

hours following fires in 58 of the 62 plant fire zones. The likelihood of losing rapid cold shutdown capability in the remaining 4 zones is small. Most repairs to manipulate valves, make ductwork intact, replace motors or otherwise make the equipment operable within a couple of days do not represent insurmountable problems. Even if redundant equipment is destroyed beyond repair in these 4 zones cold shutdown can still be achieved but the time required may be extended beyond 72 hours. There is no practical way of modifying the plant to provide absolute assurance that cold shutdown can be achieved within 72 hours in these 4 fire zones. Therefore, an exemption from the regulations should be granted for R. E. Ginna because the time period in the regulations is arbitrary and does nothing to increase plant safety, because the likelihood of a fire which might extend the time to cold shutdown is minimal, and because no alternative for modifying the plant to comply with the regulations is feasible.

References

1. Fire Protection - Shutdown Analysis, RGE letter from L. D. White, Jr. to Mr. Dennis L. Ziemann, USNRC, dated December 28, 1979.

2. Fire Protection Safe Shutdown Systems, RGE letter from John E. Maier to Mr. Dennis M. Crutchfield, USNRC, dated March 19, 1981.

3. Fire Protection Dedicated Shutdown Sytem, RGE letter from John E. Maier to Mr. Dennis M. Crutchfield, USNRC, dated May 19, 1981.

Attachment B

Dedicated Shutdown System Instrumentation

The NRC staff has developed a list of instrumentation which it believes should be provided with a dedicated shutdown system. The list, provided to RGE in a telephone conversation with the staff and their consultants, is given below:

1. pressurizer pressure
2. pressurizer level
3. hot leg temperature T_H
4. cold leg temperature T_C or average temperature T_{avg}
5. steam generator pressure
6. steam generator level
7. auxiliary feedwater flow
8. condensate storage tank level
9. source range flux
10. refueling water storage tank level
11. component cooling water flow
12. residual heat removal flow
13. service water flow

Our previous submittals have committed to provide the instrumentation of items 1-3, 5, 6, 8, 10, and 12. We have reevaluated the need for primary system temperature indication, auxiliary feedwater flow, and reactivity monitoring. Although the indication we had proposed in previous submittals is adequate for safe plant shutdown, additional indications will be useful to the operator. Further, a source range neutron monitor will eliminate the need for rapid sampling shortly after shutdown. Therefore, the indications of items 4, 7 and 9 will be provided.

Component cooling water flow and service water flow are indications not normally used by RGE operators to monitor these systems. The operators normally use pressure indications and pump information to determine proper operation of these systems. Our dedicated shutdown system will incorporate the same features on the DSS panel. Since the indications which the operator normally uses will be provided, flow indication for these systems is unnecessary. Substituting indications that are unfamiliar to the operator and for which he has no "feel" may only add confusion during an already stressful situation. Therefore, we do not intend to provide the instrumentation of items 11 and 13 but will provide alternative header pressure and pump operation information.