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SUBJECT: Requests temporary exemption from GDC 17 re electrical cable separation.Fee paid.

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Gentlemen:

In the Matter of	)	Docket No. 50-259
Tennessee Valley Authority	)	50-260
		50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - ELECTRICAL CABLE SEPARATION - REQUEST FOR TEMPORARY EXEMPTION FROM GENERAL DESIGN CRITERION (GDC) 17

Reference: 1. TVA letter from R. Gridley to NRC dated November 30, 1988.
2. TVA letter from R. Gridley to NRC dated December 2, 1988.

In accordance with the provisions of 10 CFR 50.12(a)(1), 10 CFR 50.12(a)(2)(ii), 10 CFR 50.12(a)(2)(iii), and 10 CFR 50.12(a)(2)(v), TVA hereby requests a temporary exemption for (BFN) from the requirements for electrical cable independence set forth in Title 10 CFR 50, Appendix A, GDC 17 (Electrical Power Systems) until just before unit 2 restart from the current outage. The enclosure provides a more detailed description of the temporary exemption request and supporting justification. This submittal is being made to supplement the referenced TVA letters.

In making this submittal, it should be noted the BFN's licensing commitment in this area references the Atomic Energy Commission (AEC) proposed GDC (predecessor to the current GDC). This commitment is described in Appendix A of the BFN Final Safety Analysis Report (FSAR). However, based on the reviews documented in the AEC/NRC Safety Evaluation REports (which reference the more current GDC as the acceptance bases for licensing BFN), it is appropriate for TVA to submit this exemption request within the context of the more current GDC (e.g. GDC 17) than the specific licensing commitment provided by TVA in the BFN FSAR.

Enclosed is a check for the $150 fee required by 10 CFR 170.12 for review of this exemption extension.

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U.S. Nuclear Regulatory Commission

Please refer any questions regarding this submittal to Patrick Carier, Manager, BFN Site Licensing, (205) 729-3570.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

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ENCLOSURE 1

ELECTRICAL CABLE SEPARATION
TEMPORARY EXEMPTION FROM GENERAL DESIGN CRITERION (GDC) 17

1.0 PURPOSE

In accordance with the provisions of 10 CFR 50.12(a)(1), 10 CFR 50.12(a)(2)(ii), 10 CFR 50.12(a)(2)(iii), and 10 CFR 50.12(a)(2)(v), TVA hereby requests a temporary exemption for the Browns Ferry Nuclear Plant (BFN) from the requirements for electrical cable independence set forth in Title 10 CFR 50, Appendix A, General Design Criteria (GDC) 17 (Electrical Power Systems) until just before unit 2 restart from the current outage.

2.0 BACKGROUND

On October 14,1988 during a teleconference with NRC's Office of Special Projects, TVA discussed the BFN electrical separation program. The program requirements were documented in a TVA letter from R. Gridley to NRC dated November 10,1988.

The purpose of the electrical separation program is to verify that the installed cable configuration meets the BFN Final Safety Analysis Report (FSAR) commitments. The first phase of this program was a discovery process which identified approximately 250 discrepancies with electrical cable separation criteria for BFN. These discrepancies were evaluated for impact on systems required to be operational during fuel reload operations. Phase 2 will correct any identified electrical separation discrepancies affecting BFN unit 2 (and common) restart systems before unit 2 restart.

By letter dated December 2,1988, TVA informed NRC that the discovery phase was completed and that identified cable separation discrepancies were evaluated for potential impact on those systems required for fuel reload and restart. This evaluation determined the potential for adverse consequences from postulated electrical failures resulting from improper cable separation during unit 2 fuel reload activities is extremely low and does not pose undue risk to the health and safety of the public. Even though the potential for adverse consequences from cable separation related failures is extremely low, TVA will ensure implementation of the compensatory measures identified in Section 5.0 during the time this temporary exemption is in effect. Based on this finding, TVA has determined that the required cable modifications can be deferred beyond unit 2 fuel reload without significantly impacting plant safety.

3.0 GDC 17 EXEMPTION

GDC 17 provides NRC accepted design criteria pertaining to electric power systems for nuclear power plants. In part, GDC 17 requires that,"... The onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure . . .". Upon completion of the discovery phase of the BFN Electric Cable Separation Program, it was determined that approximately 250 cables for BFN do not adequately meet the separation criteria. Based on these findings, TVA is requesting temporary relief from the requirements of GDC 17. This temporary exemption will be in effect during the time period from unit 2 fuel reload until the appropriate modifications are completed. All identified discrepancies noted above, will be corrected and will meet the requirements of GDC 17 before unit 2 restart.

Special circumstances are present which warrant issuance of this requested exemption. These special circumstances are discussed in accordance with 10 CFR 50.12(a)(1) and 10 CFR 50.12(a)(2) as follows:

10 CFR 50.12(a)(1)

In that it is authorized by law, granting of the requested exemptions will not present an undue risk to the public health and safety, and are consistent with the common defense and security.

Section 4.0-Nuclear Safety Considerations (below), discusses the current condition of the fuel to be reloaded and the effects of the electrical cable separation discrepancies on systems required to support unit 2 fuel reload. The potential for adverse consequences from postulated electrical failures resulting from not fully complying with the electric cable independence and redundancy criteria (GDC 17) during fuel load is extremely low.

For the limited time period between fuel load and restart, full compliance with the applicable section of the GDC will not be met. However, this does not present an undue risk to the health and safety of the public and is consistent with the common defense and security.

10 CFR 50.12(a)(2)(ii)

Application of the regulation in the particular circumstance would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.

GDC 17 states in part," the safety function for each system shall be to provide sufficient capacity and capability to assure 1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents."

The intent of GDC 17 requirements is to ensure necessary system functions to respond to postulated accidents for all modes of reactor operation. Application of GDC 17 system independence (cable separation for the purpose of this discussion) criteria in this case is not necessary to achieve the underlying purpose of the rule. As discussed below, the temporary exemptions to GDC 17 requirements will only be applicable during unit 2 fuel reload while cable modifications are being worked before restart. Necessary systems required for water makeup and cooling to the reactor will be maintained operable, with the exception of cable separation, in accordance with the applicable technical specification (TS) requirements during the period of time the temporary exemption is in effect. Additionally, it is TVA's operational philosophy to maintain alternate cooling and makeup systems available to the extent practical to supplement TS required systems to ensure that the intent of GDC 17 requirements are met.

Section 4.0 below, discusses potential accident scenarios during the fuel reload and hydrostatic testing evolutions that BFN will complete before restart. Due to the current condition of the fuel (essentially no decay heat and no iodine inventory) a fuel handling accident would not create an undue risk to the health and safety of the public.

During hydrostatic testing, the reactor vessel will be under test pressure conditions established by nonnuclear means. The most severe accident postulated during this short test period, of approximately two days, is a loss of coolant accident (LOCA). Adequate systems will be required to be inservice by operating procedures and TS to ensure that there is appropriate core reflood capability to mitigate such an event. BFN will ensure implementation of the compensatory measures in section 5.0 to provide even more assurance that an adequate water supply is available until the subject discrepancies are corrected.

Before restart, various modifications will be ongoing to correct electrical cable separation and other post-fuel load electrical work. If during this period a required system needs to be taken out-of-service, the redundant or an alternate system, if previously out-of-service, will have its capability of performing its intended safety function demonstrated before being placed into service to fulfill the functions of the system being removed from service.

Consequences of the potential accident scenarios evaluated for the time the temporary GDC 17 exemptions will be in effect are within the bounds of the BFN FSAR. Therefore, the exemption does not pose an undue risk to the health and safety to the public.

10 CFR 50.12(a)(2)(v)

The exemption would provide only temporary relief from the applicable regulation and the licensee or applicant has made good faith efforts to comply with the regulation.

This exemption request would provide BFN with only a temporary relief from compliance with specific separation requirements of GDC 17 for those electrical cable separation discrepancies identified by the BFN Electrical Separation Program. BFN has made good faith efforts to comply with the regulations by implementing a two phase program to 1) ensure that the electrical cable configuration meets the BFN separation criteria commitments in the BFN FSAR and evaluate any identified discrepancies for their impact on systems required to be operable for unit 2 fuel reload, and 2) complete by unit 2 restart, modifications to correct identified discrepancies for those systems required to be operable for unit 2 restart. Completing the subject modifications before restart will bring BFN unit 2 (and common) systems in compliance with GDC 17.

After identification of the electrical cable separation discrepancies, TVA began to develop an action plan to reduce the total impact to BFN in the areas of budget and schedule. The Electrical Cable Separation Program has identified approximately 60 fuel reload and approximately 190 post-fuel load cables that do not meet the separation criteria. Part of the action plan involves TVA Engineering which has begun to develop an integrated plan to correct the descrepancies along with other electrical work. TVA Engineering has placed the resolution of this problem on the highest priority and has dedicated appropriate resources to expeditiously and safely complete this task.

TVA's current schedule is to issue the final design change package for work in the field by the end of February 1989. To optimize resources, and scheduling, engineering design package development and field implementation of the packages will be worked in parallel to the extent possible. As a design package is completed, it will be sent to the field to be worked. Best current estimates indicate that construction work should be completed by mid March 1989 and Post Modification Testing completed within the following two weeks.

When a design change package is released to the field for work, evaluations will be performed to ensure that system(s) required by the TS will not be taken out-of-service. If a required system needs to be taken out-of-service, the redundant or an alternate system, if previously out-of-service will have its capability of performing its intended safety function demonstrated before being placed into service to fulfil the functions of the system being removed from service.

4.0 NUCLEAR SAFETY CONSIDERATIONS

BFN unit 2 has been shutdown for over four years. Consequently, the decay heat power output from the fuel is extremely low (i.e., less than 0.4 MW for the entire unit 2 fuel pool) and the only fission product remaining in any significant quantity is Krypton 85 (KR 85). During fuel reload and other activities leading to restart, (e.g., fuel reload and vessel hydrostatic testing) of the unit 2 reactor, the following measures must be assured: (1) the fuel must be maintained cool, (2) the fuel must remain covered with sufficient water to ensure shielding for personnel on the refuel floor, and (3) in the event of fuel damage, the offsite and control room dose must be maintained within the guidelines established by 10 CFR 100.11, 10 CFR 20.101, and 10 CFR 50 Appendix A.

The potential adverse effects due to the electrical cable separation discrepancies have been evaluated for credible events which could exist before restart. It should be noted that there are no common mode failures that could affect all of the cables with separation problems. Since the plant is shutdown with extremely low decay heat and with adequate cooling water in the fuel pool and reactor vessel, there is no possibility of environmental extremes (i.e., harsh environments) from a LOCA and/or high energy line breaks. Extensive fire related failures are not anticipated based on existing fire prevention/detection features and interim compensatory measures, referenced in a letter from TVA to NRC dated December 2,1988. These fire prevention/detection measures are either in place or to be implemented by TVA before fuel reload. Raceways in the safety-related buildings are designed to survive seismic events without damage to required equipment; therefore, there are no seismic common mode failures. In addition, Section 5.0 discusses compensatory measures that will be implemented and maintained during the time this temporary exemption is in effect. Since there are no credible common mode failures affecting cables, the only credible failure mode is an individual cable failure which would have limited impact within the affected systems.

Spurious operation of valves might occur due to electrical faults resulting from improper electrical separation. The type of electrical faults (i.e., hot shorts) required to cause spurious operation of a valve is a highly improbable event (i.e., requires multiple failures). However, should a sufficient number of spurious operations occur, a drain path from the reactor vessel or spent fuel pool could be created. A review of the piping systems connected to the reactor vessel and spent fuel pool which have the potential for creating a drain path showed that the systems contain at least two valves in series while most systems contain three or more valves in series. Consequently, being able to create a sufficient number of hot shorts such that a potential drain path is created is not considered to be a credible event. Even though the potential of spurious valve operation is highly improbable, BFN will ensure through valve lineup verification that the valves required to support those systems providing makeup water in the event of an accident are in their proper position. Any subsequent changes to the verified valve lineup will be controlled and documented in accordance with established plant procedures.

The BFN TSs require systems to be operable for specific modes of plant operation. During reactor power operation, the TSs require that safety-related systems have redundant trains available for operation in order to provide single failure protection. During nonpower operations such as cold shutdown and refueling, the TSs recognize that there are less stringent requirements needed for safety concerns and; therefore, equipment requirements are relaxed and time periods allowed to return equipment to service are extended.

Due to the extremely low decay heat of the unit 2 fuel, the time available for the plant staff to respond to transients is very long. Therefore, considering the low likelihood of an isolated electrical failure occurring because of improper cable separation, the diverse means which the plant has to respond to the events and the slow development of transients in the plant's current configuration, it is concluded that there is sufficient means to maintain the reactor core covered during fuel reload and during the time after reload until restart of unit 2.

Although the loss of safety systems because of improper electrical cable separation is highly improbable, TVA has evaluated the consequences which could result from a postulated accident during fuel reload operations. Many of the calculations used as the bases for these evaluations were performed in the past for other purposes. However, the calculations utilize decay period assumptions appropriate at that time (i.e.,1 1/2, 2, or 3-year decay), and therefore, conservatively bound the current 4-year decay period conditions.

In the event that during the time the vessel head is removed and the cavity is flooded, active cooling for the water in the reactor vessel pool and/or spent fuel pool were lost (i.e., residual heat removal and fuel pool cooling systems), it would require more than seven days for the pool to boil and more than an additional 33 days for the water to boil down to the TS limit for minimum shielding height (8 1/2 feet) above the top of the fuel. Based on the guidance in Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants," a period of 30 days is considered an adequate period of time to evaluate a situation of this nature (e.g., loss of cooling source) and take corrective actions. Thus, it is concluded that loss of active fuel pool cooling because of improper electrical cable separation does not represent a threat to nuclear safety because the fuel will remain covered, thus maintaining the fuel cool and will provide shielding to refueling floor personnel.

In the event of a postulated accident, offsite doses must be maintained within the guidelines specified by 10 CFR 100.11 while control room doses must meet 10 CFR 20.101. The NRC Standard Review Plan (NUREG 0800) recommends and BFN committed to maintain offsite doses below 10 percent of the requirements of 10 CFR 100.11. To conservatively assess the potential impact on offsite doses, TVA has evaluated the consequences of a potential fuel handling accident concurrent with a failure to isolate secondary containment. Such an event would prevent the standby gas treatment system (SGTS) from performing its safety function of filtering releases to the environment. The evaluation took no credit for secondary

containment or SGTS and is therefore equivalent to a ground level release of radioactive materials. The evaluation was conservatively based on a fuel decay of 1 1/2 years. The only significant radioisotope remaining is KR 85 with essentially no Iodine present. The evaluation concluded that the site boundary and low population zone two hour doses are on the order of one hundred times lower than the limits specified in the BFN FSAR and NUREG 0800 and are thus on the order of one thousand times less than the 10 CFR 100 limits. Should a fuel handling accident occur with the fuel in its present irradiated state, SGTS filtering of Iodine would not be required since essentially no Iodine is present. Filtering has no effect on KR 85 since it is an inert gas; however, as shown above, the low level of KR 85 poses no radiological hazard.

Similar to the evaluation of offsite dose consequences, an evaluation was conducted of the resulting control room operator dose consequences following a fuel handling accident. The evaluation was based on fuel which had decayed for two years and no credit was taken for secondary containment integrity, SGTS or the control room emergency ventilation system (CREVS) operation. This analysis showed that the control room dose was on the order of 300 times lower than the 10 CFR 20.101 limits. It should be noted that the results of this evaluation were previously approved by NRC while evaluating, unit 2 TS Amendment 152 as a basis for allowing CREVS to be inoperable, due to potential inleakage problems, until restart.

When the reactor vessel head is installed to perform reactor vessel hydrostatic testing, the reactor vessel and pressure boundary will be pressurized. During this test the control rods will remain inserted and therefore, the reactor will not produce any power or increase fission product inventory. Following placement of the head on the vessel, the fuel in the vessel is isolated from the heat sink provided by the fuel pool. While in this configuration, the fuel in the vessel is cooled by the shutdown cooling mode of the Residual Heat Removal System. During hydrostatic testing, three potential accident scenarios were evaluated: (1) loss of active cooling to the water in the vessel, (2) inadvertent draining of the vessel, or (3) a LOCA during vessel hydrostatic testing.

As previously discussed, the creation of a drain path from the vessel because of simultaneous spurious operation of two or more valves in the reactor pressure boundary system piping not considered to be a credible event likely to occur. The two day time period associated with vessel hydrostatic testing is short thus, further minimizing the potential of an event occurring which has the potential to drain the vessel. In addition, TVA has performed an engineering evaluation which bounds the results of a postulated LOCA occurring during the vessel hydrostatic evolution. This evaluation determined that in the event of total core becomes uncovered concurrent with loss of core cooling capability, it would take several hours before the fuel temperature would reach the point (2200° F) at which time fuel damage is assumed to occur. However, TVA's operational philosophy is to maintain as much equipment available as possible to provide fuel cooling and/or water injection to the vessel. Providing multiple, diverse means for cooling/injection provides added assurance the reactor core will remain covered in the unlikely event of multiple failures.

In summary, TVA has determined that from a nuclear safety perspective, it is acceptable to proceed with fuel reload operations for BFN unit 2 and complete the modifications required to correct the electrical separation discrepancies before restart.

5.0 COMPENSATORY MEASURES

The current BFN electrical cable configuration will not present an undue risk to the health and safety of the public. The current electrical cable separation discrepancies will be corrected before unit 2 restart which is scheduled approximately 4 to 6 months after fuel reload is completed. However, in order to provide additional assurance that adequate reactor cooling and appropriate reactor vessel level is maintained, the following compensatory measures will be implemented:

1) BFN TS require certain systems to be operable if any work is in progress with the potential to drain the vessel. This will ensure that core cooling and appropriate water makeup capability is maintained.

2) BFN TS require specific systems to be operable during fuel reload. These systems will be verified operable in accordance with the appropriate surveillance test. Successful performance of the surveillance tests along with the requested GDC 17 exemption will allow affected systems to be considered operable to perform their intended function until the cable modifications are completed.

3) BFN has implemented and will maintain an active Preventative Maintenance (PM) program for those safety-related systems required for fuel reload. Performing these PM's at the required frequencies, will minimize degradation from normal equipment operation of the system. The PM program will minimize the potential of equipment failure during the time the temporary exemption is in effect.

4) When fuel reload starts, systems required to be operable by the TS will not be intentionally removed from service until the redundant or an alternate system, if previously out-of-service, has its capability to perform its intended safety function demonstrated. This commitment applies to water makeup and cooling capability when fuel is in the reactor vessel.

5) As previously committed in TVA letter dated December 2, 1988, BFN will submit an electrical cable separation program report. This report will identify which cables will be modified and how they will be modified (rerouted or provided with double isolation devices). In addition, BFN will prioritize and schedule the affected cable work in order to minimize equipment outage time and will perform an operational evaluation before starting work on a system to ensure that it does not inadvertently render other systems inoperable that are required by TS to be operable.

6) At fuel load, valve lineups will have been conducted and verified, as part of the return to service process, to ensure that necessary systems are properly aligned for service. Any subsequent change in valve status will be controlled by appropriate plant procedures.

6.0 SCHEDULE FOR RESOLUTION

Based on the above justification, TVA is requesting NRC grant a temporary exemption to GDC17 until the appropriate modifications can be completed to resolve the identified electrical cable separation discrepancies. This temporary exemption would allow TVA BFN to load fuel for unit 2 with the current plant electrical cable configuration. TVA will complete the modifications to bring the unit 2 (and common) electrical cables in compliance with GDC 17 before unit 2 restart.

7.0 ENVIRONMENTAL IMPACT STATEMENT

Identification of Proposed Action: The exemption to GDC 17 will allow fuel reload and reactor vessel hydrostatic testing for BFN unit 2 while relying on systems that do not meet the electrical independence requirement of GDC 17. The requested exemption will be in effect until electrical cable modifications are completed before restart of unit 2.

The Need for the Proposed Action: The proposed temporary exemption is needed to permit fuel reload and subsequent reactor vessel hydrostatic testing without undue schedule delays and substantial financial impact to TVA rate payers

Environmental Impact of the Proposed Action: The proposed temporary exemption is from the electrical independence requirement of GDC 17 for safety systems that are used for core cooling and water makeup to the reactor vessel. The intent of these provisions of GDC 17 is to ensure that the operation of one system cannot be affected by electrical problems in another redundant safety system. Therefore, electrical cables are required to be run in physically separate areas or cable trays in order to maintain the necessary independence between systems. At BFN, approximately 250 cables have been discovered that do not meet the cable separation criteria. The impact on the affected systems has been evaluated for unit 2 reload and hydrostatic testing. The probability of a failure of a required safety system from failure to meet the GDC 17 criteria is very low for the period of time the temporary exemption will be in effect. BFN has been shutdown for more than four years, resulting in extremely low decay heat from the fuel and with KR 85 being the only significant fission product remaining. Systems required by the TS for water makeup and cooling of the reactor vessel will be maintained operable, with the exception of cable separation, during the period the temporary exemption is in effect. Consequently, the radiological releases will not be greater than previously determined nor does the proposed temporary exemption otherwise affect radiological plant effluents. Therefore, it is concluded that there are no significant radiological environmental impacts associated with this proposed

exemption. With regard to potential nonradiological impacts, the proposed exemption does not affect nonradiological plant effluents and has no other environmental impact. Therefore, it is concluded that there are no significant nonradiological environmental impacts associated with the proposed exemption.

Alternatives to the Proposed Action: The alternative to the proposed action would be to delay fuel reload until after all cable modifications are completed in compliance with GDC 17. This would result in adding critical path time to the unit 2 restart. When considering the extremely low probability of an electrical failure resulting from the cable separation discrepancies, the low probability of an event occurring simultaneous with a failure that would require the function of the system, and the small consequences of the postulated events if they occur while the reactor is shutdown, it can be seen that postponing the modification to the subject electric cables until unit 2 restart is acceptable.

Alternative Use of Resources: This action does not involve use of resources not previously considered in connection with the Environmental Statement - BFN units 1, 2 and 3, dated September 1, 1972.

8.0 CONCLUSION

Based on the information provided above, TVA is justified in requesting NRC to grant a temporary exemption for BFN from the requirements for electrical cable independence set forth in 10 CFR 50, Appendix A, GDC 17 "Electrical Power Systems". This temporary exemption is being requested for a limited time period between fuel reload and restart.

The BFN electric cable separation program identified approximately 250 discrepancies for BFN. These discrepancies will be resolved as required in order to comply with GDC 17 before restart. Until these modifications are completed, the necessary systems required for reactor water makeup and cooling to the reactor vessel will be maintained operable, with the exception of cable separation, in accordance with the applicable TS requirements.

Based on the analysis provided in Section 4.0, the compensatory measures in Section 5.0, and the current condition of the fuel (essentially no iodine), not being in full compliance with GDC 17 during this time, will not pose an undue risk to the health and safety of the public.