

ENCLOSURE 1

PROPOSED TECHNICAL SPECIFICATION REVISIONS  
BROWNS FERRY NUCLEAR PLANT  
UNITS 1, 2, AND 3  
TVA BFPN TS 176 SUPPLEMENT 6

8306150248 830603  
PDR ADOCK 05000259  
PDR

UNITS 1 AND 2

2. During a complete core removal, the SRM's shall have an initial minimum count rate of 3 cps prior to fuel removal, with all rods fully inserted and rendered electrically inoperable. The count rate will diminish during fuel removal. Individual control rods outside the periphery of the then existing fuel matrix may be electrically armed and moved for maintenance after all fuel in the cell containing (controlled by) that control rod have been removed from the reactor core.

#### 3.10.C Spent Fuel Pool Water

1. Whenever irradiated fuel is stored in the spent fuel pool, the pool water level shall be maintained at a depth of 8 1/2 feet or greater above the top of the spent fuel. A minimum of 5 -1/2 feet of water shall be maintained over single irradiated fuel assemblies during transfer and handling operations.
2. Whenever irradiated fuel is in the fuel pool, the pool water temperature shall be  $\leq 150^{\circ}\text{F}$ .
3. Fuel pool water shall be maintained within the following limits:
  - conductivity  $\leq 10$  umhos/cm @25°C
  - chlorides  $\leq 0.5$  ppm

#### 4.10.C Spent Fuel Pool Water

1. Whenever irradiated fuel is stored in the spent fuel pool, the water level and temperature shall be recorded daily
2. A sample of fuel pool water shall be analyzed in accordance with the following specifications:
  - a. At least daily for conductivity and chloride ion content.
  - b. At least once per 8 hours for conductivity and chloride content when the fuel pool cleanup system is inoperable.

UNIT 3

2. During a complete core removal, the SPM's shall have an initial minimum count rate of 3 cps prior to fuel removal, with all rods fully inserted and rendered electrically inoperable. The count rate will diminish during fuel removal. Individual control rods outside the periphery of the then existing fuel matrix may be electrically armed and moved for maintenance after all fuel in the cell containing (controlled by) that control rod have been removed from the reactor core.

#### 3.10.C Spent Fuel Pool Water

1. Whenever irradiated fuel is stored in the spent fuel pool, the pool water level shall be maintained at a depth of 8 1/2 feet or greater above the top of the spent fuel. A minimum of 5-1/2 feet of water shall be maintained over single irradiated fuel assemblies during transfer and handling operations.
2. Whenever irradiated fuel is in the fuel pool, the pool water temperature shall be  $\leq 150^{\circ}\text{F}$ .
3. Fuel pool water shall be maintained within the following limits:

conductivity  $\leq 10$  umhos/cm  
@25°C

chlorides  $\leq 0.5$  ppm

#### 4.10.C Spent Fuel Pool Water

1. Whenever irradiated fuel is stored in the spent fuel pool, the water level and temperature shall be recorded daily
2. A sample of fuel pool water shall be analyzed in accordance with the following specifications:
  - a. At least daily for conductivity and chloride ion content.
  - b. At least once per 8 hours for conductivity and chloride content when the fuel pool cleanup system is inoperable

ENCLOSURE 2

DESCRIPTION AND JUSTIFICATION OF CHANGES  
TVA BFNP TS 176 SUPPLEMENT 6  
BROWNS FERRY NUCLEAR PLANT

The current technical specification 3.10.C.1 requires a minimum of 6-1/2 feet of water be maintained over single irradiated fuel assemblies during transfer and handling operations. It is proposed to change the limit to 5-1/2 feet of water as a minimum.

Reason for Proposed Change

During fuel inspections at Browns Ferry unit 2 for reload 4, the inspectors had to work from the fuel prep machine in a crouching position. By allowing the fuel assembly to be raised higher to maintain 5-1/2 feet of water instead of 6-1/2, feet the inspectors will be able to work in a more comfortable position. It is expected that this will reduce the inspection time for a fuel assembly. As discussed in the following Safety Analysis, it is expected that the exposure rate to personnel would not be increased significantly during the inspection.

## SAFETY ANALYSIS

The requirement to maintain 6-1/2 feet of water over single irradiated fuel bundles during transfer and handling operations is overly restrictive in light of the recent unit 2 fuel inspection (ST 8215) and potential future inspections and rod consolidation. The basis for this requirement is not addressed in the FSAR, the basis of the current technical specifications, nor the standardized technical specifications (NUREG-0123, Rev. 3). Thus, it cannot be construed to be a safety limit, but rather a health physics requirement to limit exposure of plant personnel.

If it is assumed the exposure due to the bundle can be represented by a point source, the following equation from Reactor Shielding for Nuclear Engineers, by N. M. Schaeffer, can be used to estimate the increase in exposure from the raising of the limit to 5-1/2 feet -  $\phi = \frac{Soe^{-\mu t}}{4\pi R^2}$

$$\phi_1 = \frac{Soe^{-\mu t_1}}{4\pi R_1^2}, \quad \phi_2 = \frac{Soe^{-\mu t_2}}{4\pi R_2^2}$$

$$\phi_2/\phi_1 = \left(\frac{R_1}{R_2}\right)^2 e^{-\mu(t_2-t_1)}$$

$$R_1 = t_1 = 6.5 \text{ feet} = 198.12 \text{ cm}$$

$$R_2 = t_2 = 5.5 \text{ feet} = 167.64 \text{ cm}$$

$\mu$  is the linear attenuation coefficient.

From H. Cember's Introduction to Health Physics values of  $\mu$  for water can be found.

SAFETY ANALYSIS (Continued)

For water and x-rays of .1mev,  $\mu = .167 \text{ cm}^{-1}$ .

For water and x-rays of 1mev,  $\mu = .071 \text{ cm}^{-1}$ .

By raising the limit to 5-1/2 feet the dose rates may be increased by factors of between the following:

$$\phi_2/\phi_1 = \left( \frac{198.12}{167.64} \right)^2 e^{.167(30.48)} = 226.85$$

$$\phi_2/\phi_1 = \left( \frac{198.12}{167.64} \right)^2 e^{.071(30.48)} = 12.16$$

From the previous unit 2 fuel inspection the dose rate experienced was approximately 10 mr/hr which is roughly the dose rate experienced when working around the spent fuel pool. The portion attributable to the bundle inspection can be estimated at .1 to 1 mr/hr. From this the increase in exposure due to the higher limit can be estimated between 1 and 226 mr/hr.

The calculation of 226 mr/hr is extremely conservative, Calculations by a different, but equally acceptable, method indicated an expected increase in exposure of .6 to 6 mr/hr. In either case, Health Physics requirements will continue to be met by adhering to the requirements of Technical Specification 6.3.D.



## CONCLUSION

The overall safety of fuel inspections and rod consolidation can be improved by raising the limit to 5-1/2 feet. This will reduce the possibility of an inspector making an accident and allow the work to proceed more quickly.

The existing inplant Browns Ferry health physics controls and procedures will limit the personnel exposures received by inspection personnel.

The reduction in fuel inspection time because of the revised assembly level in the pool is expected to result in personnel exposure lower than projected.

ENCLOSURE 3

SIGNIFICANT HAZARDS CONSIDERATION  
FOR  
PROPOSED TECHNICAL SPECIFICATION CHANGE  
TVA BFNP TS 176 SUPPLEMENT 6  
BROWNS FERRY NUCLEAR PLANT

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

No. The water level above a single irradiated fuel assembly during transfer and handling will not affect the probability of any accident associated with refueling operations. The basis for this minimum water level is not addressed in the technical specification bases, BWR standard technical specifications, or the FSAR. It is a limit established to limit the exposure to personnel during fuel inspections. The safety analysis indicates that the personnel exposure rate may increase slightly from one less foot of water shielding. However, because of a more comfortable working position, it is expected that the inspection will take less time and the resultant total exposure will be reduced.

2. Does the proposed amendment create the probability of a new or different kind of accident from any accident previously evaluated?

No. The fuel inspection procedure will not change. Only the level of water over the fuel bundle will change. Therefore, the revision will not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

No. As stated in (1), the margin of safety will not be reduced but may potentially be increased due to the possibility of reducing the time needed to perform the fuel inspection operation.