

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

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SUBJECT: Application for amends to Licenses DPR-58 & DPR-74, modifying  
 Tech Specs 3/4.6.5.1 & 3/4.6.5.3.

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AEP:NRC:0900H

Donald C. Cook Nuclear Plant Units 1 and 2  
Docket Nos. 50-315 and 50-316  
License Nos. DPR-58 and DPR-74  
ICE CONDENSER TECHNICAL SPECIFICATIONS

U. S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D. C. 20555

Attn: T. E. Murley

December 29, 1989

Dear Dr. Murley:

This letter and its attachments constitute an application for amendment to the Technical Specifications (T/Ss) for the Donald C. Cook Nuclear Plant Units 1 and 2. Specifically, we propose to modify T/S 3/4.6.5.1 (Ice Condenser Ice Bed) and T/S 3/4.6.5.3 (Ice Condenser Doors). The justifications for the proposed changes and our analyses concerning significant hazards considerations are contained in Attachment 1 to this letter. The proposed revised T/S pages are contained in Attachment 2.

Both units at Cook Nuclear Plant operate on an 18-month fuel cycle. Existing T/Ss require certain ice condenser surveillances to be performed at nine months. Since some of these surveillances cannot be performed at power, a mid-cycle outage lasting at least three to five days is required. Attachment 1 to this letter provides justification for extending the surveillance interval for the subject T/Ss from nine to eighteen months. As indicated, the proposed amendment is not expected to have an adverse impact on the public health and safety. Implementation of the change will, on the other hand, eliminate the need for a plant shutdown during each fuel cycle, and thereby contribute to overall plant safety by reducing the number of shutdown/startup transients the plant will experience. For your information, the next scheduled mid-cycle outage for ice condenser inspection is January 5, 1990 for Unit 2.

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Dr. T. E. Murley

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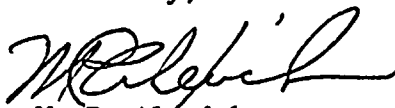
We believe that the proposed changes will not result in (1) a significant change in the types of effluents or a significant increase in the amounts of any effluent that may be released offsite, or (2) a significant increase in individual or cumulative occupational radiation exposure.

These changes have been reviewed by the Plant Nuclear Safety Review Committee and the Nuclear Safety and Design Review Committee.

In compliance with the requirements of 10 CFR 50.91(b)(1), copies of this letter and its attachments have been transmitted to Mr. R. C. Callen of the Michigan Public Service Commission and to the Michigan Department of Public Health.

This document has been prepared following Corporate procedures that incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Sincerely,



M. P. Alexich  
Vice President

MPA/eh

Attachments

cc: D. H. Williams, Jr.  
A. A. Blind - Bridgman  
R. C. Callen  
G. Charnoff  
A. B. Davis  
NRC Resident Inspector - Bridgman  
NFEM Section Chief

ATTACHMENT 1 TO AEP:NRC:0900H  
JUSTIFICATION AND 10 CFR 50.92 ANALYSES FOR CHANGES TO THE  
DONALD C. COOK NUCLEAR PLANT UNIT NOS. 1 AND 2  
TECHNICAL SPECIFICATIONS



## I. Introduction and Background

This license amendment request proposes to modify T/S 3/4.6.5.1 (Ice Condenser Ice Bed) and T/S 3/4.6.5.3 (Ice Condenser Doors). The proposed changes are intended to position Cook Nuclear Plant Units 1 and 2 so that mid-cycle (9-month) outages for ice condenser surveillances can be eliminated. Specifically, the requested changes will eliminate the need to shutdown to Mode 3 to perform the following surveillances: (1) visual inspection of the ice condenser turning vanes and lower support structure for frost and ice accumulation (T/S 4.6.5.1.b.3) and (2) opening/closing torque testing of the ice condenser inlet doors (T/S 4.6.5.3.1.b). Other surveillances required by T/S 4.6.5.1.b.3, i.e. ice weighing and flow passage inspections in the ice bed above the lower support structure and the turning vanes, are unaffected by this request and would still be performed every nine months while at power. Eliminating the need for a mid-cycle outage can be accomplished by an extension of the surveillance interval for the lower support structure and turning vane visual inspections and inlet door inspections to 18 months. Based on our experience to date, the requested extension of the surveillance interval to 18 months has insignificant impact on safety and, to a degree, contributes to overall safety by eliminating one shutdown/startup transient per cycle. The safety impact of the requested changes is discussed below.

A footnote to T/S 3/4.6.5.1 of the Unit 2 T/Ss is also being deleted as an editorial change because it is no longer applicable.

## II. Technical Specification Change - Ice Condenser Ice Bed Flow Passages

The technical basis for the surveillance requirements for ice condenser ice bed flow passages is to provide reasonable assurance that there is adequate flow area through the ice condenser following a loss-of-coolant accident (LOCA) or a high energy line break (HELB). The T/S calls for verifying at least once every nine months, by a visual inspection of at least two flow passages per ice condenser bay, that the accumulation of frost or ice on flow passages between ice baskets, past lattice frames, through the intermediate and top deck floor grating, or past the lower inlet plenum support structures and turning vanes is restricted to a nominal thickness of 3/8 inches. The proposed change would revise only the surveillance interval to perform the visual

inspection of the lower inlet plenum support structures and turning vanes from nine months to eighteen months (i.e., at refueling outages). The acceptance criteria for these inspections would remain unchanged. The existing surveillance intervals on inspection of flow passages between ice baskets, past lattice frames, through the intermediate deck and through the top deck grating every nine months would be retained. However, note that the order that these components appear in T/S 4.6.5.1.b.3 has been changed to be consistent with a "top-down" inspection of the ice condenser. Given that only the order of the components is changed, this change is considered editorial.

The lower support structure is designed to support and hold down the ice baskets in the required array. It is also designed such that there is an adequate area for the air/steam mixture to flow into the ice bed in the event of a LOCA or HELB. The lower support structure has turning vanes that are designed to turn the flow up through the ice bed in the event of an accident. For such an event, the vanes would serve to reduce the drag forces on the lower support structural members, reduce the impingement forces on the containment wall across from the lower inlet doors and distribute the flow more uniformly over the ice bed.

To determine if operational history supported extending the surveillance interval to 18 months for these T/Ss, a review was conducted of the Cook Nuclear Plant Licensee Event Reports (LERs) and plant condition reports since 1981 (this date was selected arbitrarily). Any evidence of excessive frost or ice buildup in the lower support structure would be reported in these documents. Based on these documents, no conditions could be identified where the T/S surveillance criteria on accumulation of frost or ice in the lower inlet plenum support structure flow path or on turning vanes were not met.

The conclusions from this review and from discussions with Cook Nuclear Plant personnel involved with ice condenser surveillance were that operating experience supports the extension of the surveillance interval to 18 months for the lower support structure and turning vanes.

The physical design of the ice condenser was also considered in the evaluation. The ice bed itself is the portion of the ice condenser with the least amount of flow area. Experience also indicates that it is the location where most of the



frost and ice accumulation occurs due to sublimation. Thus, any evidence of abnormal degradation of the ice condenser will be found during the nine-month surveillance of the ice bed.

Per 10 CFR 50.92, a proposed amendment will not involve a significant hazards consideration if the proposed amendment does not:

- (1) involve a significant increase in the probability or consequences of an accident previously evaluated.
- (2) create the possibility of a new or different kind of accident from any accident previously analyzed or evaluated, or
- (3) involve a significant reduction in a margin of safety.

#### Criterion 1

The ice condenser is a passive system that performs a mitigative function to reduce containment pressurization following a LOCA or HELB. Therefore, the proposed change in the surveillance frequency for inspection of frost and ice accumulation on the lower inlet plenum support structure and turning vanes would not increase the probability of an accident previously evaluated.

The main impact of flow passage blockages is on the short-term containment subcompartment pressures following a LOCA. Blockages result in reduced flow areas in the ice condenser and hence higher upstream pressure during the blowdown phase of the accident. As stated earlier in this attachment, during surveillance inspections of the ice condenser turning vanes and lower inlet plenum support structure flow paths, no evidence has been found that frost/ice accumulation has exceeded the T/S requirement. In addition, the consequences of flow passage blockage in the ice condenser have already been evaluated. For example, our letter AEP:NRG:1067 dated October 14, 1988, and supplemented by our letter AEP:NRG:1067C dated March 14, 1989, transmitted the results of subcompartment analyses to support operation of Unit 1 for the reduced temperature and pressure program. In these analyses a 15% flow blockage in the ice condenser was assumed. These analyses were approved in a safety evaluation report attached to your letter dated June 9, 1989 (TAC No. 71062). Similar evaluations have been performed by

Westinghouse for a 20% flow blockage for Unit 2 operating conditions. In summary, the proposed T/S change will not increase the consequences of a previously analyzed accident because flow blockage has been accounted for in the accident analyses and operating experience indicates that this particular area of the ice condenser is not very susceptible to frost/ice accumulation.

#### Criterion 2

The surveillance interval increase to 18 months will not result in a change in plant configuration or operation. Further, as indicated above, the ice condenser is a passive system that only performs a mitigative function following certain accidents. Therefore, this change will not create the possibility of a new or different kind of accident from any accident previously analyzed or evaluated.

#### Criterion 3

The ice condenser performs the mitigative function of limiting containment pressure buildup following a LOCA or HELB. To ensure that the ice condenser will fulfill its function, buildup of frost and ice in the flow passage area must be limited. However, there are allowances for frost/ice buildup assumed in the safety analysis as indicated above. The requested change increases the surveillance interval for an area within the ice condenser that, based on operating experience, is not very susceptible to frost/ice buildup. Further, surveillance inspections of the flow passages in the ice bed will continue to be performed every nine months for the area of the ice condenser that is most susceptible to frost/ice buildup. Therefore, it is apparent that the proposed T/S change will not involve a significant reduction in the margin of safety.

Lastly, we note that the Commission has provided guidance concerning the determination of significant hazards by providing certain examples (48 FR 14870) of amendments considered not likely to involve significant hazards consideration. The sixth of these examples refers to changes that may result in some increase to the probability of occurrence or consequences of a previously analyzed accident, but the results of which are within limits established as acceptable. We believe this change falls within the scope of this example. This request to increase the surveillance interval may result in some increase in the probability of frost and ice accumulation on the ice condenser lower support

structure and turning vanes. However, based on plant operational experience, the degree of flow blockage will be within the limits of the safety analysis and therefore the consequences are not increased. We believe this change does not involve a significant hazards consideration as defined in 10 CFR 50.92.

### III. Technical Specification Change - Ice Condenser Inlet Doors

The T/S basis (3/4.6.5.3) for ice condenser doors states that the operability of the ice condenser doors and the requirement that they be maintained closed ensures 1) that the reactor coolant system fluid released during a LOCA will be diverted through the ice condenser bays for heat removal and 2) that excessive sublimation of the ice bed will not occur because of warm air intrusion. Excessive sublimation is controlled during normal operation through continuously monitoring and determining the inlet doors closed using the inlet door position monitoring system (T/S 4.6.5.3.1.a). To verify that the doors will open during an accident, T/S 4.6.5.3.1.b requires that one half of the ice condenser inlet doors be demonstrated operable during shutdown at least once every nine months.

The proposed T/S changes would require that the surveillance testing on all lower inlet doors be performed at least once every 18 months. The proposed change for inlet door surveillances is identical to that previously approved for the McGuire and Catawba Nuclear Stations. (For the safety evaluation report on this change, see Hood, NRC, to Tucker, Duke Power, "Issuance of Amendment No. 83 to Facility Operating License NPF-9 and Amendment 64 to Facility Operating License NPF-17 - McGuire Nuclear Station, Units 1 and 2," dated May 11, 1988.)

The primary purpose of the lower inlet door surveillance is to determine that the doors are capable of opening properly when required during a LOCA or other high energy line break. This ensures that the steam released in the lower containment compartment can enter the ice condenser compartment and be condensed by the ice inside. The lower inlet doors are equipped with springs that produce a small force to resist door opening during normal operation. The doors are normally held shut, against a seal mounted on the frame, by the static differential pressure due to the higher density air in the ice condenser compartment. With zero differential pressure across the doors (no cold air head), the neutral position of the spring is set so that the doors are slightly open



( $3/8" \pm 1/8"$ ). The spring torque is then set so that the doors will open rapidly in response to a lower containment pressure increase during a line break. The spring torque aids in preventing maldistribution of flow through the 24 pairs of lower inlet doors during a small line break accident when the doors would only open partially.

The surveillance in question requires that various measurements be made of door spring torque, in order to ensure that the required safety functions can be met. These measurements include initial opening torque, opening torque, closing torque and door frictional torque. The initial opening torque is the torque required to open the door when the door is closed and is against the door seal. The opening torque and closing torque are measured when the door is open 40 degrees. The door frictional torque is calculated based on the opening and closing torques.

The proposed T/S changes would not change the acceptance criteria for the above torque measurements but would revise the surveillance interval on the ice condenser inlet doors from nine months to 18 months (i.e., at refueling outages). Further, while the current T/S requires testing of 50% of the doors every nine months, the proposed T/S would require testing all of the doors every 18 months. In this way, the interval for complete testing of any one door will remain unchanged from the current surveillance interval.

To determine if operational history supported extension of the surveillance interval to 18 months, a review of plant LERs and condition reports since 1981 was conducted. The year 1981 was selected arbitrarily. Since 1981, the Cook Nuclear Plant Units 1 and 2 ice condenser inlet doors have failed T/S surveillance criteria on seven occasions. The reasons for the failure of inlet doors to meet T/S requirements and the corrective/preventive actions taken are highlighted below.

In a June 1983 surveillance it was found that one Unit 2 inlet door exceeded the acceptance criteria for the initial opening torque. An inspection of the door found that the problem was the result of the frame seals initially sticking to the door because of glycol on the seal. The seal was cleaned and the door tested satisfactorily. No further action was performed because the incident was considered isolated.

In a surveillance performed in August 1983, it was found that five Unit 2 inlet doors exceeded the acceptance criteria for



initial opening torque. The investigation revealed that three of the doors required adjustments to the door frame and one door was closed on a loose RTD cable. The cable was removed and secured. The remaining door was inspected and the seals were cleaned. To prevent recurrence, the appropriate procedures were modified to ensure that all doors are free of obstructions and that the seals and sealing surfaces are free of debris that could cause binding following completion of ice basket weighing.

In June 1984, two Unit 2 inlet doors failed the acceptance criteria in the T/Ss. One door exceeded the opening torque by a small amount (198 inch-lb while the T/S criteria is 195 inch-lb). The investigation found that the door bumper (shock absorber) cover had an accumulation of ice behind it and was restricting the door movement. The ice was removed and the door retested satisfactorily. The appropriate procedure was revised to include an inspection for ice accumulation in the door bumper. The other door failed the acceptance criteria for closing torque by a small amount (76.4 inch-lb versus the T/S criteria of 78 inch-lb). The door was retested and found to be acceptable. No further actions were taken.

In August 1984, one Unit 1 inlet door failed the hinge frictional torque test (although passing the initial opening torque, opening torque and closing torque tests). During inspection of the door, an ice accumulation was found between the door bumper and the bumper cover. The ice was removed and the door retested satisfactorily. The ice accumulation occurred as a result of fresh ice being blown into some baskets in the particular bay where the failure occurred. Due to the shortness of the outage, inlet door testing was scheduled to be completed prior to the final inspection for ice accumulation in the lower part of the ice condenser. The ice would have been removed prior to power operation during the ice condenser final inspection as required by the procedure changes implemented as a result of the June 1984 event discussed above.

In a December 1984 surveillance, one Unit 2 inlet door exceeded the acceptance criteria for initial opening torque. The door was inspected and a dry residue was found on the door top seal. The seal was cleaned and the hinges lubricated. The door would have opened at a differential pressure of only about 1.3 pounds per square foot (psf) rather than 1 psf, which is the basis for the acceptance criteria.

In January 1985, 14 of 48 Unit 1 inlet doors failed to meet the acceptance criteria for initial opening torque (although all doors did open). In only three cases did both doors in a particular bay fail to meet the acceptance criteria. A differential pressure of only about 1.1 psf would have opened at least one door in each of these three bays. Therefore, at a differential pressure of 1.1 psf, all bays would have had at least one door open. Doors which failed were retested to determine if the problem was with the door seals or the door hinges. The retest indicated that the problem was with the seals. No previous failures of this type had been found. Although the door seals were inspected and found to be very clean, test personnel believe that light frost had caused the doors to stick due to vapor transfer between the seals. To prevent this moisture infiltration between the seals, a silicone lubricant is now applied to the seals and then wiped down prior to return to power.

In a surveillance performed in December 1985, seven doors failed the initial opening torque acceptance criteria due to ice accumulation. After the ice was removed, all of the doors passed the retest and showed no signs of mechanical failure. Another surveillance was performed in June 1986, with all doors successfully passing. The failures found during the December 1985 surveillance are believed to have occurred as a result of outage work performed during the Unit 1 1985 refueling outage. Some of this work involved deliberate defrosting of the ice condenser, and was done after the September 1985 inlet door surveillances were performed. It is believed that water and ice from the defrost operation accumulated on the doors, causing the opening torques to exceed T/S limits. To prevent recurrence, the ice condenser defrost procedure now requires that the door opening torques be tested following a defrost operation.

Other additional preventive measures have also been implemented as follows. Operations personnel are required by procedure to make a containment closeout inspection tour prior to startup after an extended outage. This inspection includes looking for frost buildup on doors. A step has also been added to the operation departments plant heatup procedure that requires an evaluation and signoff by the performance department of the need to perform a lower inlet door surveillance test based on conditions in the ice condenser since the previous surveillance test. For example, unusually high ice bed temperature during an outage is a condition that would require a retest of the doors.



The purpose of detailing the T/S surveillance history of the inlet doors is to demonstrate that either failures have been single, isolated occurrences or effective corrective actions have been implemented through door seal maintenance or additional door inspections mandated by procedures. As a result of these efforts, no inlet doors at Cook Nuclear Plant have failed any of the T/S acceptance criteria related to initial opening torque, opening torque, closing torque or hinge friction torque since December 1985 in Unit 1 and December 1984 in Unit 2. Further, the failures identified prior to December 1985 were largely confined to the door seals and ice accumulation and not to the hinges or springs on the doors, thus confirming the design adequacy of the doors themselves.

The mechanical design of the inlet doors is extremely simple in order to reduce the chances of any malfunction. The door hinges are designed to prevent galling or self welding. The long-term performance and corrosion of the door hinges and related hardware, when exposed to the ice condenser atmosphere, has been considered in the ice condenser design. The low temperature ( $10^{\circ}\text{F}$ - $20^{\circ}\text{F}$ ) and low absolute humidity of the ice condenser atmosphere results in negligible corrosion of uncoated carbon steel. To ensure that corrosion is minimized while the components are in operation in the containment, components were either galvanized or painted. Galvanizing was in accordance with ASTM, A123 and painting in accordance with American National Standards Institute ANSI N101.2-72, "Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities." Materials, such as stainless steels, with low corrosion rates were used without protective coatings. Any ice condenser equipment whose performance might be affected by corrosion employs corrosion resistant material for critical components. Thus, corrosion has been considered in the detailed design of the ice condenser components, and it has been determined that the performance characteristics of the ice condenser materials of construction are not impaired by long-term exposure to the ice condenser environment. This has been confirmed with regard to the inlet doors by the operating experience of Cook Nuclear Plant.

Justification for the proposed increase in the T/S surveillance interval is based, in part, on the reliable design of the inlet doors, the programmatic improvements made at Cook Nuclear Plant with regard to door seal maintenance and inlet door inspections and the recent history of highly

reliable performance of the doors with regard to T/S surveillance tests.

Per 10 CFR 50.92, a proposed amendment will involve no significant hazards consideration if the proposed amendment does not:

- (1) involve a significant increase in the probability or consequences of an accident previously evaluated,
- (2) create the possibility of a new or different kind of accident from any accident previously analyzed or evaluated, or
- (3) involve a significant reduction in a margin of safety.

#### Criterion 1

The proposed T/S amendment would not involve any increase in the probability of previously evaluated accidents. The ice condenser is a passive mitigative system designed to limit the containment pressure after a LOCA or HELB; no accidents evaluated in the FSAR are initiated by ice condenser components.

The proposed amendment would also not involve any increase in the consequences of a previously analyzed accident. The ice condenser doors serve two distinct functions; 1) to stay closed during normal operation and 2) to open during a LOCA or HELB. The door position is continuously monitored during normal operation to ensure that the ice condenser inlet doors are closed to protect the ice bed from heat sources. The doors are hung in a neutral position and are slightly ajar when the differential pressure across the door is zero. The doors are held against the gasket seals by the small cold air head of one pound per square foot in the ice condenser during normal operation. The T/S acceptance criteria on initial opening torque is based on this differential pressure. For a large break loss-of-coolant accident (LBLOCA), the peak differential pressure between the lower and upper compartments of the containment is at least 7.5 psi which is on the order of 1000 pounds per square foot. Therefore, there is little likelihood that any inlet door will remain closed during a LBLOCA or large HELB.

For a small break loss-of-coolant accident (SBLOCA), the inlet doors are equipped with springs which aid in preventing maldistribution of flow through the doors when the doors would only partially open in order to assure equal flow through all door pairs.

In addition, during the design of the inlet doors, an analysis was performed to determine how many could remain shut and still permit the satisfactory operation of the ice condenser system. This analysis is discussed in Section 6.9.3.1 of Appendix M of the updated FSAR. The limiting case for maximum maldistribution for the worst-case break location and break size found that 21 inlet doors could remain closed without exceeding the ice bed capacity of the section of the ice bed receiving the maximum steam/air flow.

Given the reliability of the doors, the improvements in door seal maintenance and implementation of stricter inspection procedures, it is not expected that extending the surveillance interval for the inlet doors to 18 months will have any appreciable effect on the likelihood of a door failing to meet the T/S requirement. The consequences of an accident previously evaluated are not increased because the possibility of a large number of inlet doors remaining shut has already been considered for a SBLOCA and found to have acceptable consequences as discussed above.

#### Criterion 2

The surveillance interval increase to 18 months will not result in a change in plant configuration or operation. Therefore, this change will not create the possibility of a new or different kind of accident from any accident previously analyzed or evaluated. Further, as indicated above, the ice condenser is a passive system that only performs a mitigative function following certain accidents.

#### Criterion 3

The ice condenser performs the mitigative function of limiting containment pressure buildup following a LOCA (HELB is bounded by the LOCA analysis in terms of pressurization). To ensure that the ice condenser will fulfill its function, the ice condenser inlet doors must both initially open following certain accidents and perform a flow proportioning, if required. The T/S surveillance acceptance criteria are based on these requirements. For a large break LOCA, the resultant differential pressure across the doors is so large



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as compared to the acceptance criteria that there is little likelihood that the doors will fail to open. Because all doors will open fully, the flow proportioning function is not required. For a small break LOCA, as indicated earlier in this attachment, the possibility of a large number of inlet doors remaining shut has already been considered and found to be acceptable. Given that the interval for complete testing of any one door will remain unchanged as a result of this proposed T/S change, and that the reliability of the inlet doors has been improved through seal maintenance and stricter inspection procedures, there is little likelihood that the number of doors failing the T/S acceptance criteria will increase. Therefore, the proposed T/S change does not involve a significant reduction in the margin of safety.

Lastly, we note that the Commission has provided guidance concerning the determination of significant hazards by providing certain examples (48 FR 14870) of amendments considered not likely to involve significant hazards consideration. The sixth of these examples refers to changes which may result in some increase to the probability of occurrence or consequences of a previously analyzed accident, but the results of which are within limits established as acceptable. Based on the above discussion, it is not expected that the probability of doors failing to open following an accident would increase as a result of this T/S change, and thus no significant increase in the consequences of an accident will occur. We believe this change falls within the scope of this example. Therefore we believe that this change does not involve a significant hazards consideration as defined in 10 CFR 50.92.

#### IV. Editorial Change

In addition to the changes described previously, one editorial change is suggested. This change deletes the footnote on Page 3/4 6-36 of Unit 2 T/S 3/4.6.5. This footnote now reads "on a one time basis during March/April 1987 outage, the weights of three Row 8 baskets may be substituted for three adjacent Row 9 baskets." The footnote can be deleted because it is no longer applicable. Because this change is purely editorial, it does not reduce a margin of safety, does not increase the probability or consequences of a previously analyzed accident, and does not introduce the possibility of a new accident. Therefore, we believe these changes do not involve a significant hazards consideration as defined by 10 CFR 50.92.