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January 24, 2010

AEP-NRC-2010-12
10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Donald C. Cook Nuclear Plant Unit 2
Docket No. 50-316
Exigent License Amendment Request Regarding Containment Distributed Ignition System

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP) Unit 2, proposes to amend the Appendix A Technical Specifications (TS) to Facility Operating License DPR-74. I&M proposes to modify the TS for the Distributed Ignition System (DIS). The DIS is designed to initiate controlled ignition of hydrogen resulting from a postulated accident via a system of 70 ignitors (two trains of 35 ignitors) located inside containment. The existing TS require that at least 34 ignitors per train be operable to consider the train operable. Recent surveillance data indicates that two Train B ignitors are inoperable, thereby rendering Train B inoperable. Consequently, I&M is performing the TS Required Action to conduct weekly surveillance testing on DIS Train A. Replacement of one or both ignitors with the unit operating at power would involve exposing personnel to significant radiation and safety hazards.

The proposed TS modification would allow Train B of the DIS to be considered operable with 2 ignitors inoperable, because the train remains capable of performing its safety function. The proposed TS modification would be applicable until the fall 2010 refueling outage, or until the unit enters a mode which allows replacement of the affected ignitors without exposing personnel to significant radiation and safety hazards. I&M is requesting that the proposed change be approved on an exigent basis in accordance with 10 CFR 50.91. The unit is currently operating in TS Action Requirement 3.6.9.A.2. This Action Requirement requires increased frequency surveillance testing of the Train A ignitors, which may shorten their operating life. Additionally, the inoperability of Train B may result in entry into TS Limiting Condition for Operation (LCO) 3.0.3 if DIS Train A becomes inoperable or if the Train A emergency diesel generator is inoperable for more than 4 hours. Entry into LCO 3.0.3 would require the unit to be shut down within 7 hours.

Enclosure 1 to this letter provides an affirmation statement pertaining to the information contained herein. Enclosure 2 provides I&M's evaluation of the proposed TS change and the basis for requesting exigent approval. The attachment to this letter provides Unit 2 TS pages marked to show the proposed changes. New clean Unit 2 TS pages with proposed changes incorporated will be provided to the Nuclear Regulatory Commission (NRC) Licensing Project Manager when

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requested. Associated TS Bases changes will be made in accordance with the CNP Bases Control Program.

I&M requests approval of the proposed change by February 4, 2010, which would eliminate the requirement to perform surveillance testing of DIS Train A that week and weekly thereafter. If emergent plant conditions require entry into TS 3.0.3 due to the current inoperability of DIS Train B prior to February 4, 2010, I&M may request that this proposed amendment be approved on an emergency basis.

The proposed change will be implemented as soon as possible, but within 5 days of NRC approval. Copies of this letter and its enclosures and attachment are being transmitted to the Michigan Public Service Commission and Michigan Department of Environmental Quality, in accordance with the requirements of 10 CFR 50.91.

There are no new regulatory commitments made in this letter. Should you have any questions, please contact Mr. James M. Petro, Jr., Regulatory Affairs Manager, at (269) 466-2489.

Sincerely,

Lawrence J. Weber
Site Vice President

JRW/jen

Enclosures:

1. Affirmation
2. Proposed Exigent License Amendment Request Regarding Containment Distributed Ignition System.

Attachment:

Donald C. Cook Nuclear Plant Unit 2 Technical Specification Pages Marked To Show Proposed Changes

c: T. A. Beltz – NRC Washington DC,
J. T. King, MPSC
S. M. Krawec, AEP Ft. Wayne, w/o enclosures & attachment
MDEQ – WHMD/RPS
NRC Resident Inspector
M. A. Satorius, NRC Region III

Enclosure 1 to AEP-NRC-2010-12

AFFIRMATION

I, Lawrence J. Weber, being duly sworn, state that I am Site Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

Lawrence J. Weber

Lawrence J. Weber
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 24th DAY OF January, 2010

Bridget Taylor
Notary Public

My Commission Expires 6/10/2013

Enclosure 2 to AEP-NRC-2010-12

Proposed Exigent License Amendment Request Regarding Containment Distributed Ignition System

Documents referenced in this enclosure are identified in Section 8.0.

1.0 DESCRIPTION

Pursuant to 10 CFR 50.90, Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP) Unit 2, proposes to amend the Appendix A Technical Specifications (TS) to Facility Operating License DPR-74. I&M proposes to modify the TS for the Distributed Ignition System (DIS). The DIS is designed to initiate controlled ignition of hydrogen resulting from a postulated accident via a system of 70 ignitors (two trains of 35 ignitors) located inside containment. The existing TS require that at least 34 ignitors per train be operable to consider the train operable. Recent surveillance data indicates that two Train B ignitors are inoperable, thereby rendering Train B inoperable. Consequently, I&M is performing the TS Required Action to conduct weekly surveillance testing on DIS Train A. Replacement of one or both ignitors with the unit operating at power would involve exposing personnel to significant radiation and safety hazards.

The proposed TS modification would allow Train B of the DIS to be considered operable with 2 ignitors inoperable, because the train remains capable of performing its safety function. The proposed TS modification would be applicable until the fall 2010 refueling outage, or until the unit enters a mode which allows replacement of the affected ignitors without exposing personnel to significant radiation and safety hazards. I&M is requesting that the proposed change be approved on an exigent basis in accordance with 10 CFR 50.91. The unit is currently operating in TS Action Requirement 3.6.9.A.2. This Action Requirement requires increased frequency surveillance testing of the Train A ignitors, which may shorten their operating life. Additionally, the inoperability of Train B may result in entry into TS Limiting Condition for Operation (LCO) 3.0.3 if DIS Train A becomes inoperable or if the Train A emergency diesel generator (DG) is inoperable for more than 4 hours. Entry into LCO 3.0.3 would require the unit to be shut down within 7 hours.

2.0 PROPOSED CHANGE

I&M proposes to modify TS 3.6.9, "Distributed Ignition System" as follows:

The following footnote will be added to both pages of TS 3.6.9:

> Footnote: For the remainder of Fuel Cycle 18, or until the next entry into a MODE which allows replacement of the affected ignitors, DIS Train B may be considered OPERABLE with one lower containment phase 2 Power Supply ignitor inoperable and with one lower containment phase 3 Power Supply ignitor inoperable.

Reference to this footnote will be added to:

- The TS 3.6.9 LCO statement that two DIS trains shall be operable.
- The description of TS 3.6.9 LCO Condition A as "One DIS train inoperable."
- The TS 3.6.9 Surveillance Requirement 3.6.9.3 requirement to energize each ignitor and verify the specified temperature is ≥ 1700°F.

A parenthetical statement, "(or ≥ 33 ignitors if allowed by footnote)," will be added to the TS 3.6.9 Surveillance Requirement 3.6.9.1 requirement to energize each DIS train and verify ≥ 34 ignitors are energized in each train.

The attachment to this letter provides Unit 2 TS pages marked to show proposed changes. New text on these pages is enclosed in a single-line border. New clean Unit 2 TS pages with proposed changes incorporated will be provided to the Nuclear Regulatory Commission (NRC) Licensing Project Manager when requested. Associated TS Bases changes will be made in accordance with the CNP Bases Control Program.

3.0 BACKGROUND

3.1 DIS Design and Operation

The DIS is designed to meet 10 CFR 50.44 requirements for a system to reduce the hydrogen concentration in the primary containment following a degraded core accident. The DIS must be capable of handling an amount of hydrogen equivalent to that generated from a metal water reaction involving 75% of the fuel cladding. The DIS is designed to minimize the potential for hydrogen accumulation and preclude detonations in the unlikely event of such an accident. The DIS is based on the concept of controlled ignition using thermal ignitors, designed to be capable of functioning in a post accident environment. Analyses have shown that the deliberate ignition of hydrogen would not pose a threat to containment integrity and would not result in environmental conditions more severe than the conditions for which the majority of the necessary safety equipment has been qualified. The DIS depends on the dispersed location of the ignitors so that local pockets of hydrogen at increased concentrations would burn before reaching a hydrogen concentration significantly higher than the lower flammability limit. The Containment Air Recirculation/Hydrogen Skimmer (CEQ) system, in conjunction with upper and lower volume containment sprays, provides sufficient mixing so as to prevent the stratification or pocketing of hydrogen in the various compartments of the containment.

The DIS is a two-train system employing a total of 70 ignitor assemblies located throughout the containment building. The two trains are designated Train A and Train B. The emergency power sources for the Train A and the Train B ignitors are the Train A and Train B DGs. Each train of 35 ignitor assemblies is further divided into two groups; one group of 17 assemblies is in the general lower volume area of containment and the second group of 18 assemblies is in the general upper volume area of containment (including the ice condenser upper plenum volume). Each ignitor assembly consists of a glow plug and a control power transformer mounted in a sealed box housing. The ignitors are supplied power in "strings." Each string consists of parallel arrangement of 4 to 7 ignitors and their associated control power transformers (see Figure 1 in this enclosure). Each string is powered by one phase of a three-phase power supply. Table 1 in this enclosure shows the ignitor strings grouped according to their power supply phase. The ignitors are located such that each containment region has at least two ignitors, one from each train, controlled and powered redundantly so that ignition would occur in each region even if one train failed to energize. The containment regions and their associated ignitors are listed in Table 2 in this enclosure. The containment locations of the ignitors involved in this amendment request are shown in Figures 2 and 3 in this enclosure.

The DIS is a manual system controllable from the main control room or either DG room. Manual actuation of the DIS is directed by the applicable Emergency Operating Procedure. When the DIS is actuated, the ignitor elements are energized and the glow plug heats up to a surface temperature ≥ 1700°F. At this temperature, they would ignite hydrogen gas in the airspace in the vicinity of the ignitor.

The hydrogen ignitors are not required for mitigation of a Design Basis Accident (DBA) because an amount of hydrogen equivalent to that generated from the reaction of 75% of the fuel cladding with water is far in excess of the hydrogen calculated for the limiting DBA. The hydrogen concentration resulting from a DBA can be maintained less than the flammability limit using the hydrogen recombiners.

3.2 Surveillance Testing

TS Surveillance Requirement 3.6.9.1 requires that each DIS train power supply breaker be energized and requires verification that ≥ 34 of the 35 ignitors in each train are energized. The specified Frequency of TS Surveillance Requirement 3.6.9.1 is 184 days. Therefore, the Surveillance Requirement is normally performed when the unit is operating in Mode 1. Many of the ignitors are not accessible with the unit operating in Mode 1 because of radiation and high temperature hazards in their containment locations, particularly in the lower containment. Therefore, current measurements, rather than direct observation, are used to verify the ignitors are energized when performing TS Surveillance Requirement 3.6.9.1 with the unit operating in Mode 1. Radiation and high temperature hazards also preclude access to areas that would enable measurement of current to individual ignitors. Consequently, the current to each phase of the power supply, i.e., each ignitor string, is measured to ensure it is within limits established for that string. A current below the established limits indicates that one or more ignitors in that string have failed (their typical failure mechanism is to "burn out," which produces an open circuit for that ignitor). The amount by which the measured current is below the established limit will indicate the number of ignitors which have failed on that string.

When TS Surveillance Requirement 3.6.9.1 was performed on January 14, 2010, acceptable current readings were obtained for all Train A upper and lower ignitors, all Train B upper ignitors, and the Train B lower ignitor string powered by phase 1. However, low current readings were obtained for the Train B lower ignitor strings powered by phase 2 and phase 3. The readings indicated that one ignitor in the string powered by phase 2 and one ignitor in the string powered by phase 3 had failed. Radiation and high temperature hazards precluded access that would allow visual observation or repair of all Train B lower ignitors in strings powered by phase 2 or phase 3, except for phase 2 ignitor B24. During troubleshooting, the glow plug for ignitor B24 (accumulator room 1) was observed to be glowing when energized, indicating that it was operable. Therefore, one ignitor (B18, B19, B20, B21, or B22) in the lower containment string powered by phase 2 is considered to have failed, and one ignitor (B8, B9, B10, B11, or B12) in the lower containment string powered by phase 3 is considered to have failed. This conclusion was supported by a subsequent re-performance of TS Surveillance Requirement 3.6.9.1 for these strings on January 19, 2010.

With two DIS Train B ignitors inoperable, the number of operable ignitors in Train B is less than the minimum of 34 ignitors required by TS Surveillance Requirement 3.6.9.1. Therefore, LCO 3.6.9 Condition A was entered. The Required Action for this Condition is to restore the inoperable DIS train to operable status within 7 days or perform TS Surveillance Requirement 3.6.9.1 on the operable DIS train at least once per 7 days. Since these ignitors cannot be repaired with the unit operating in Mode 1, I&M is performing TS Surveillance Requirement 3.6.9.1 on DIS Train A weekly.

3.3 Suspected Failure Mechanism

During the January 14, 2010, surveillance testing, it was determined that the initial ignitor voltage for all three power supply phases of the lower containment ignitors was higher than normal. The cause of the higher voltage was determined to be drift of the installed voltage regulator. The suspected failure mode for the ignitors is that the over-voltage contributed to the premature failure of the glow plugs. To assure an overvoltage condition does not recur, I&M plans to repair or replace the DIS Train B voltage regulator prior to declaring Train B operable.

3.4 Reason for Requesting Amendment

As described in this section, the inoperability of DIS Train B has several significant consequences. However, as described in Section 4.0 below, I&M has determined that DIS Train B can continue to perform its safety function even if one ignitor in the lower containment string powered by phase 2 is inoperable and one ignitor in the lower containment string powered by phase 3 is inoperable. Therefore, I&M is requesting NRC approval to change TS 3.6.9 to recognize that the inoperability of the two ignitors does not render DIS Train B inoperable.

3.4.1 Potential Effect on DIS Train A Ignitors and Unit Shutdown Due to Train A Inoperability

Continued weekly performance of TS Surveillance Requirement 3.6.9.1 on DIS Train A between the current date and the planned start of the Unit 2 refueling outage in the fall of 2010 will result in Train A ignitors being cycled at least thirty-six times. Continuing to perform the surveillance at this frequency could result in additional failures of ignitors in Train A as a result of thermal stress to the ignitors from the heatup and cooldown associated with the testing. The normal surveillance frequency requires this testing to be performed every 184 days (six months). At this frequency, the ignitors will be thermally cycled three times during an operating cycle. The TS Surveillance Requirement 3.6.9.3 to verify each ignitor is at a temperature greater than or equal to 1700°F is performed each refueling outage. This testing results in an additional thermal cycle, for a total of four thermal cycles per unit operating cycle. Testing at a weekly frequency between now and the fall 2010 Unit 2 refueling outage would be equivalent to normal frequency testing for nine operating cycles of eighteen months which is approximately thirteen and a half calendar years. I&M plans to replace all the Unit 2 glow plugs during the fall 2010 refueling outage in accordance with their normally scheduled replacement frequency of every four outages. This frequency is designed to assure that glow plugs are not excessively cycled and continue to remain reliable.

If more than one DIS Train A ignitor becomes inoperable, TS Surveillance Requirement 3.6.9.1 would require declaring Train A inoperable. If both DIS Train A and DIS Train B are declared inoperable, TS LCO 3.0.3 would apply because TS LCO 3.6.9 does not provide an Action for two inoperable DIS Trains. TS LCO 3.0.3 would require that the unit be in Mode 3 within 7 hours.

3.4.2 Potential for Unit Shutdown Initiation Due to Monthly DG Surveillance Testing

TS 3.8.1, "AC Sources – Operating," includes Surveillance Requirements that must be performed at the specified Frequency for the DG to be considered operable. Operability of the DGs is required for continued unit operation in Mode 1. Performance of some of these DG Surveillance Requirements necessitate declaring the DG inoperable due to the alignments necessary to perform the surveillance test. For the Train A DG, the next surveillance test that will render the DG inoperable is the test performed to satisfy TS Surveillance Requirement 3.8.1.3, which has a 31-day (monthly) frequency. This test requires that the DG be synchronized to a 4 kilovolt (kV) bus that is connected to offsite power, loaded, and operated for ≥ 60 minutes at the specified load. During performance of this test, the DG is considered inoperable because, during the time that the DG output breakers are closed on the 4 kV bus, the bus would not experience a low voltage condition should the offsite power source be lost. Because the low voltage condition will not occur, there will be no load-shed signal to remove non-essential loads from the bus. This in turn could result in an overload condition of the DG when it is forced to carry the normal loads on the bus with no other external power source.

With the DG inoperable during performance of this test, TS LCO 3.8.1 Condition B, "One required DG inoperable," will apply. One of the Required Actions for this condition, Required Action B.3, states that, with one DG inoperable, required features supported by the inoperable DG must be declared inoperable within 4 hours when the required redundant feature is inoperable. Therefore, the inoperability of the Train A DG would require that, within 4 hours, Train A of the DIS be declared inoperable because the redundant DIS train (DIS Train B) is inoperable. If both DIS Train A and DIS Train B are declared inoperable, TS LCO 3.0.3 would apply because TS LCO 3.6.9 does not provide an Action for two inoperable DIS Trains. TS LCO 3.0.3 would require that the unit be in Mode 3 within 7 hours.

Review of operating logs indicates that performance of the monthly surveillance testing typically renders the DG inoperable for periods that could challenge the 4 hours allowed by TS LCO 3.8.1 Required Action B.3. With DIS Train B inoperable, unexpected issues or delays in the monthly performance of the Train A DG surveillance testing required by TS could result in entry into TS LCO 3.0.3. If the unexpected issues or delays were not resolved and the DG restored to operability within the 4 hours specified in TS LCO 3.8.1 Required Action B.3, initiation of a unit shutdown may be required.

3.4.3 Potential for Unit Shutdown Due to a Failure of the Train A DG

If the Train A DG is rendered or found to be inoperable for more than 4 hours due to an equipment or component failure, entry into TS LCO 3.0.3 would be required similar to the manner described above regarding the planned monthly Train A DG inoperability. This sequence of events could result in requiring the unit to be in Mode 3 within 7 hours even though

TS LCO 3.8.1 Required Action B.5 would allow the DG to be inoperable for 14 days without requiring a unit shutdown.

3.5 Reason for Requesting Approval on an Exigent Basis

I&M is requesting approval of the proposed TS change on an exigent basis as allowed by 10 CFR 50.91(a)(6). The regulation at 10 CFR 50.91(a)(6)(vi) requires that a licensee seeking approval of an amendment on an exigent basis explain the exigency and why the licensee cannot avoid it.

The unit is currently operating in TS Action Requirement 3.6.9.A.2. This Action Requirement requires increased frequency surveillance testing of the Train A ignitors which may shorten their operating life. As described in Section 3.4 above, there are several occurrences which could require initiation and possible completion of a unit shutdown if DIS Train B must continue to be considered inoperable. The likelihood of these occurrences increases the longer that DIS Train B must be considered inoperable. Additionally, the Train A DG and DIS Train A are being classified as "guarded" equipment while DIS Train B remains inoperable. Equipment that is classified as guarded is protected from activities that may have an adverse affect on the system or component. The current guarded classification limits the performance of preventive or elective maintenance on the Train A DG and DIS Train A to only non-intrusive activities. Therefore, I&M is requesting exigent approval rather than incur the delay that would result from the 30-day public comment period specified by 10 CFR 50.91(a)(2).

I&M could not avoid the exigent circumstance because the discovery of two inoperable ignitors in DIS Train B on January 14, 2010, could not have been foreseen. The electrical circuit design and location of the affected ignitor strings in areas of significant radiation and high temperature preclude repairing the inoperable ignitors or even identifying which two individual ignitors are inoperable. The weekly performance of surveillance testing on DIS Train A and the monthly performance of Train A DG surveillance testing is required by TS for verification of continued operability of these components.

As described in paragraph 3.4.1 above, continued weekly performance of TS Surveillance Requirement 3.6.9.1 on DIS Train A can be detrimental to the ignitors and may lead to a unit shutdown. I&M is requesting approval of the proposed change by February 4, 2010, which would eliminate the requirement to perform surveillance testing of DIS Train A that week and weekly thereafter.

4.0 TECHNICAL ANALYSIS

4.1 Capability of DIS Train B to Perform Its Safety Function

The function of the DIS is to assure adequate hydrogen control capacity during a degraded core cooling event. The distribution of ignitor assemblies throughout the containment promotes combustion of lean hydrogen/air/steam mixtures. Ignitors are located in areas well mixed by the CEQ System.

As a result of the operation of the CEQ System, the individual compartments are well-mixed and the overall ice condenser containment is well-mixed with flow assured through virtually every compartment in the containment. Among the dead-ended compartments, only the regenerative heat exchanger room does not have a CEQ System connection. This room is normally closed from the rest of containment and water supplied to its heat exchangers is isolated automatically following receipt of a Phase A safety injection signal and low pressurizer water level signal, both of which would be expected to occur prior to significant core damage occurring that would lead to significant hydrogen generation. Mixing of gas constituents within the lower compartment of an ice condenser containment with hydrogen injection was experimentally verified by studies conducted at Hanford Engineering Development Laboratory that were documented in 1983 (Reference 1). Design flows of the CEQ fans also assure that gas constituents are recirculated and thereby mixed between containment compartments.

Direct ignition of the hydrogen within an area is not required to burn the hydrogen at low concentrations, which is the fundamental DIS objective. Burns ignited in one compartment can readily propagate into adjacent compartments when the hydrogen concentration in the adjacent compartment exceeds the propagation limit. Propagation limits are lower than the ignition limits. Typical empirical flame propagation limits are shown in NUREG/CR-4993, "A Standard Problem for HECTR-MAAP Comparison: Incomplete Burning." In addition, a description of flame propagation phenomena is included in NUREG/CR-4993.

Hydrogen combustion analyses were performed for CNP using the MAAP3.0B computer code to demonstrate the ability of the hydrogen control system to mitigate the consequences of the release of hydrogen into containment during postulated degraded core accidents. These analyses were submitted to the NRC by Reference 2. Given the focus of this analysis, the effects of flame propagation were not discussed. However, the effectiveness of burn propagation within containment was discussed in a report submitted by Duke Energy Company to the NRC in August 1993, "An Analysis of Hydrogen Control Measures at McGuire Nuclear Station." This report was referenced in a Duke Energy Company submittal (Reference 3) in support of a Catawba Nuclear Station Proposed Technical Specification Amendment which was approved as documented in Reference 4. The Duke Energy Company submittal states that the analysis clearly shows that propagation of burns between compartments is effective for initiating burns within compartments that have not yet reached the hydrogen concentration ignition limit. The submittal includes details that document the propagation effectiveness of several sequences that were analyzed. Review of this report confirms that at the level of detail used in containment modeling, the CNP and Catawba containment arrangements are similar and the conclusions regarding flame propagation are applicable to CNP. This implies that hydrogen burns typically occur first in the lower compartment, followed by burns in the ice condenser upper plenum, and then (possibly) in the upper compartment.

The significance of hydrogen burn propagation to surrounding areas is that complete containment coverage with ignition sources is not a requirement for effective hydrogen control. The CEQ System suction and discharge locations provide for a well-mixed environment inside the containment. Ignition in any compartment is likely to result in combustion in every compartment that has accumulated hydrogen at the propagation limit. With lower containment as the region most likely to see the hydrogen source term, ignition occurs frequently in this compartment and would spread readily to the dead-ended compartments (such as steam generator or pressurizer enclosures) as well as up into and through the ice condenser into upper containment. Propagation of hydrogen deflagration flame fronts both within a compartment and between compartments assures that control of the hydrogen concentration in the containment would be effective with multiple ignitors unavailable.

Although the possibility of a degraded core event that would generate a significant concentration of hydrogen is remote, the DIS is still capable of adequately performing its intended design function with the two subject ignitors out of service using the remaining 33 of 35 ignitors. CNP has safety related, redundant CEQ System fans that actuate within approximately two minutes of a high containment pressure signal (approximately 1 psig) that provide added assurance that lower and upper compartment air is thoroughly mixed. The CEQ System fans and their associated hydrogen collection ducting will provide sufficient air mixing for the areas where the two non-functional ignitors are located to prevent hydrogen buildup. The hydrogen will be burned by other ignitors in the lower compartment or in the ice condenser upper plenum. The air mixing ensures that the potential does not exist for a hydrogen buildup to excessive concentrations beyond those considered for CNP. Thus, the failure of the two Unit 2 Train B lower containment ignitors should not result in any change to the hydrogen burn profiles. Since the hydrogen concentration remains low and pocketing which could lead to rapid burns and challenge containment is unlikely, the original design continues to be met. Thus, the probability of a containment failure and associated radiological release is insignificantly altered with respect to maintaining hydrogen concentrations low following a degraded core accident.

With the two ignitors out of service, the remaining ignitors provide sufficient capability to burn hydrogen such that the concentration of hydrogen in containment would remain low and the DIS function would be maintained. The remaining 33 ignitors are fully operable and capable of providing the required coverage to effect hydrogen ignition in the event of a severe accident causing fuel damage. Specifically, even with one lower Train B Phase 2 ignitor failed, operation of the remaining operable ignitors in the general area would compensate and burn off any accumulated hydrogen safely because of the well-mixed atmosphere maintained by the CEQ System fans. Similarly, for one failed lower Train B Phase 3 ignitor in a steam generator or pressurizer enclosure, any hydrogen accumulated in the general area would be burned off by operation of the remaining operable ignitors in the area below the enclosure. For a steam generator enclosure, the ignitor in its connected steam generator enclosure would also be available to assure ignition in the shared space; for the pressurizer enclosure, the CEQ System fans assure a rapid volumetric turn-over (approximately once per 5 minutes) of the contained atmosphere so pressurizer enclosure hydrogen concentration would be expected to be similar to that in the area below the enclosure which is protected by fully operational ignitors.

4.2 Risk Assessment

The highly redundant nature of the DIS extends to its power supplies. The DIS has multiple power sources to provide assurance of its availability following as many different hypothetical scenarios as possible. Under normal conditions, the DIS is powered by the unit preferred offsite power source. If this supply is lost, DIS is energized by the DGs. If the DGs are unavailable, then DIS power is provided by either the 69 kV alternate offsite power source or the Supplemental Diesel Generators.

Continued operation at full power until the next scheduled refueling outage would involve no increase in plant risk since the DIS safety function would be maintained. However, even assuming a worst case, i.e., that the current failures constitute complete loss of Train B DIS function, the following quantitative risk estimates support the conclusion that there is only minimal safety consequence associated with the current DIS condition. Treating the ignitor failures as constituting a train failure would only cause a very small increase in plant risk due to large early release of radioactivity to the public. First, there is no associated increase in Core Damage Frequency (CDF) due to DIS unavailability because DIS operation is solely to mitigate post-core-damage conditions. Regarding post-core-damage risk, assuming that the entire B train of DIS is out of service causes an increase in Large Early Release Frequency (LERF) of 2E-8/year. Given that the next refueling outage is scheduled for October 2010, or about 9 months from now, the Incremental Large Early Release Probability (ILERP) for this hypothetical case is about 1.5E-8. Note that this small postulated increase in plant risk is offset by avoidance of plant risks associated with a plant shutdown. For CNP, each shutdown entails an Incremental Conditional Core Damage Probability (ICCDP) of 7.6E-7 and an Incremental Conditional Large Early Release Probability (ICLERP) of 5.9E-8.

4.3 Hydrogen Recombiners

The hydrogen recombiners are designed to preclude the hydrogen concentration in containment, following a DBA, from reaching a level that would require mitigation by the hydrogen ignitors. TS 3.6.8 requires that two hydrogen recombiners be operable with the unit in Mode 1 or Mode 2. The hydrogen recombiners, therefore, provide defense-in-depth for protection of the containment against the potential effects of a post accident hydrogen build-up.

4.4 Conclusion

The proposed TS change, which would allow Unit 2 to remain in Mode 1 until the affected ignitors can be replaced during an outage that occurs for other reasons, is preferable to the transient that would be incurred if the unit were forced to shut down. I&M has evaluated the consequences of this request from a safety standpoint and the results were found to be acceptable for the following reasons: the safety-related, redundant CEQ System fans are capable of providing a thoroughly mixed containment atmosphere; the remaining operable ignitors have been demonstrated to provide acceptable coverage for all containment regions that may be impacted as a result of hydrogen generation during a severe accident; any hydrogen not consumed in the lower compartment would be burned in the ice condenser upper plenum or upper compartment; and there is a low probability of a LERF sequence being negatively impacted during the period the TS change is applicable.

4.4 Basis for Specific TS Changes

The reasons for the specific changes to TS 3.6.9. are as follows:

4.4.1 Addition of Footnote to TS Pages 3.6.9-1 and 3.6.9-2

The footnote added to both pages of TS 3.6.9 will clearly establish the limitations of the allowance provided by this proposed amendment, i.e., the specific ignitor strings that may contain an inoperable ignitor and the period during which the allowance is in effect. The requirement that, during the remainder of Fuel Cycle 18, the ignitors be replaced if the unit enters a MODE which allows replacement, provides assurance that the condition necessitating this proposed amendment will be addressed at the earliest opportunity while allowing for assessment of specific radiation and temperature hazards to personnel.

4.4.2 Addition to TS LCO 3.6.9 of a Reference to the Footnote

The addition to TS LCO 3.6.9 of a reference to the footnote will clearly indicate that Train B, one of the two trains that are required to be operable by the LCO, is considered operable even though ignitors in the two specified strings are inoperable.

4.4.3 Addition to TS LCO 3.6.9 Condition A of a Reference to the Footnote

The addition to TS LCO 3.6.9 Condition A of a reference to the footnote will clearly indicate that the stated condition, "One DIS train inoperable," does not apply to Train B even though ignitors in the two specified strings are inoperable.

4.4.4 Addition to Surveillance Requirement 3.6.9.1 of "≥ 33 Ignitors if allowed by footnote"

The addition to Surveillance Requirement 3.6.9.1 of "≥ 33 Ignitors if allowed by footnote" will clearly establish that ≥ 33 rather than ≥ 34 ignitors are required to be operable to consider Train B operable, will establish the specific ignitor strings that may contain an inoperable ignitor, and will establish the period during which those ignitors may be inoperable.

4.4.5 Addition to Surveillance Requirement 3.6.9.3 of a Reference to the Footnote

The addition to Surveillance Requirement 3.6.9.3 of a reference to the footnote will clearly indicate that, although there is an ignitor in each of the two specified strings that may not satisfy the requirement to achieve a temperature ≥ 1700°F, DIS Train B is still considered operable for the specified period.

5.0 REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

Pursuant to 10 CFR 50.90, Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP) Unit 2, proposes to amend the Appendix A Technical Specifications (TS) to Facility Operating License DPR-74. I&M proposes to modify the TS for the Distributed Ignition System (DIS). The DIS is designed to initiate controlled ignition of hydrogen resulting from a postulated accident via a system of 70 ignitors (two trains of 35 ignitors) located inside containment. The existing TS require that at least 34 of 35 ignitors in a train be operable to consider the train operable. Recent surveillance data indicates that two Train B ignitors are inoperable. Replacement of one or both ignitors with the unit operating at power would involve significant personnel radiation exposure and safety hazards. The proposed TS modification would allow Train B of the DIS to be considered operable with 33 operable ingitors, because it will remain capable of performing its safety function. The proposed TS modification would be applicable until the fall 2010 refueling outage, or until the unit is shut down and cooled down for other reasons prior to the fall 2010 refueling outage. I&M has evaluated whether a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

   Response: No

   The postulated event involving operability of the DIS is a beyond-design basis accident that generates a quantity of hydrogen from the reaction of the fuel cladding with water that is far in excess of the hydrogen release calculated for the limiting design basis accident. The proposed change will not increase the probability of such an accident because the DIS performs an entirely mitigative function. Except for brief periods of surveillance testing, the DIS is not in use during normal unit operation. The proposed change will not result in any physical changes to the plant which would affect accident initiators. Those structures, systems, and components (SSCs) involved in the initiation of postulated accidents will not be operated in any different manner. Therefore, the probability of occurrence of a previously evaluated accident will not be significantly increased.

   I&M's evaluation has determined that Train B of the DIS will remain capable of performing its intended safety function of initiating controlled ignition of hydrogen resulting from a postulated beyond-design basis accident. I&M's evaluation has demonstrated that propagation of hydrogen burning initiated by ignitors that remain operable will ensure adequate combustion in the regions potentially affected by the two inoperable ignitors. Therefore, continued assurance of containment integrity would be provided following a postulated beyond-design basis accident even if significant quantities of hydrogen were generated. With containment integrity maintained, there would be no increase in radiation releases from such an accident. Additionally, the hydrogen concentration resulting from a DBA can be maintained less than the flammability limit using the hydrogen recombiners. Therefore, the consequences of a previously evaluated accident will not be significantly increased.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   Response: No

   The proposed change does not alter the design function or operation of any SSC that may be involved in the initiation of an accident. The DIS will not become the source of a new type of accident. No new accident causal mechanisms will be created. The proposed change does not create new failure mechanisms, malfunctions, or accident initiators. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

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

   Response: No

   The margin of safety involved with the DIS is that associated with protecting containment integrity from the potentially deleterious effects of a significant hydrogen accumulation following a beyond-design basis accident. I&M's evaluation has determined that Train B of the DIS will remain capable of performing its intended safety function of initiating controlled ignition of hydrogen resulting from such an accident, thereby assuring that the associated margin of safety for the containment will be maintained. Therefore, there is no significant reduction in a margin of safety as a result of the proposed amendment.

   Therefore, the proposed change does not involve a significant reduction in the margin of safety.

Based on the above, I&M concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

10 CFR 50.44(b)(2)(ii) requires that all pressurized water reactors with ice condenser containments must have the capability for controlling combustible gas generated from a metal-water reaction involving 75 percent of the fuel cladding surrounding the active fuel region (excluding the cladding surrounding the plenum volume) so that there is no loss of containment structural integrity. I&M's evaluation has determined that DIS Train B will continue to perform this function at CNP with one inoperable ignitor in each of the two identified ignitor strings. Regulatory guidance documents, such as the Standard Review Plan and associated Regulatory Guides do not provide specific criteria regarding the locations of hydrogen ignitors in those containments using ignitor systems to comply with 10 CFR 50.44 requirements. Therefore, compliance with 10 CFR 50.44(b)(2)(ii) will be maintained.

6.0 ENVIRONMENTAL CONSIDERATIONS

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 PRECEDENTS

The proposed change is specific to the ignitor strings in which the failed ignitors are located at CNP. However, two other nuclear power plants, Catawba Nuclear Station Unit 2 and Watts Bar Nuclear Plant Unit 1, received approval of TS changes that allowed operation for a limited period with two inoperable ignitors. The Catawba amendment and the Watts Bar amendment are documented in Reference 4 and Reference 5, respectively. Both the Watts Bar amendment and the Catawba amendment were approved based, in part, on the operability of the remaining ignitors, and adequate hydrogen mixing in conjunction with ignition of lean mixtures which effectively precludes the formation of detonable concentrations. The Watts Bar amendment was approved on an expedited basis to address the potential entry into LCO 3.0.3 if a DG providing power to the unaffected ignitor train became inoperable. The Catawba amendment was approved on an emergency basis to address a potential unit shutdown because the two inoperable ignitors were the only ignitors in a region.

8.0 REFERENCES

1. Report prepared for the Electric Power Research Institute by Westinghouse Hanford Company, "Hydrogen Mixing and Distribution in Containment Atmospheres," NP-2669, dated March 1983.

2. Letter from E. E. Fitzpatrick, I&M, to T. E. Murley, NRC, "Hydrogen Control Program (10CFR50.44(c)), Submittal of Analyses," AEP:NRC:0500Y, dated February 26, 1993,

3. Letter from G. R. Peterson, Duke Energy Company, to NRC Document Control Desk, "Catawba Nuclear Station, Unit 2 Docket Number 50-414 Proposed Technical Specifications Amendment Technical Specification 3.6.9 Hydrogen Ignition System (HIS)," dated May 3, 2000 (ADAMS Accession No. ML003712857).

4. Letter from C. P. Patel, NRC, to G. R. Peterson, Duke Energy Corporation, "Catawba Nuclear Station, Unit 2 Re: Issuance of Amendment (TAC No. MA8805)," dated May 5, 2000 (ADAMS Accession No. ML003713019).

5. Letter from R. E. Martin, NRC, to O. J. Zeringe, Tennessee Valley Authority, "Issuance of Amendment on Hydrogen Mitigation System, Watts Bar Nuclear Plant, Unit 1 (TAC No. MA1491)," dated June 9, 1998 (ADAMS Accession No. ML020800059).

TABLE 1 – Ignitor Strings Grouped by Power Supply Phase (φ)

Unit 2 - Train A Upper Ignitor Location			
φ	No.	General Location	Elev
1	A29	Upper spray hdr pltfrm	760'
	A39	Upper spray hdr pltfrm	760'
	A31	Upper spray hdr pltfrm	760'
	A32	Low spray hdr pltfrm	748'
	A33	Low spray hdr pltfrm	748'
	A34	Low spray hdr pltfrm	748'
2	A1	In upper ice cond	709'
	A2	In upper ice cond	709'
	A3	In upper ice cond	709'
	A4	In upper ice cond	709'
	A5	In upper ice cond	709'
	A6	In upper ice cond	709'
	A7	In upper ice cond	709'
3	A13	Out S/G 1 enclosure	659'
	A14	Out S/G 2 enclosure	652'
	A15	Out S/G 3 enclosure	659'
	A16	Out S/G 4 enclosure	659'
	A17	Out Prz enclosure	659'

Unit 2 - Train A Lower Ignitor Location			
φ	No.	General Location	Elev
1	A24	Above CLV fan 1	631'
	A25	In acc rm 4	629'
	A26	Above CLV fan 3	629'
	A27	Near CLV fan 2	633'
	A28	On bio shield wall	618'
	A35	Ins rm by air lock	633'
2	A18	On Bio shield wall	647'
	A19	On Bio shield wall	648'
	A20	On Bio shield wall	648'
	A21	On Bio shield wall	646'
	A22	On Bio shield wall	641'
	A23	On Bio shield wall	648'
3	A8	In S/G 1 enclosure	686'
	A9	In S/G 2 enclosure	686'
	A10	In S/G 3 enclosure	686'
	A11	In S/G 4 enclosure	686'
	A12	In Prz enclosure	686'

Bold font indicates ignitors involved in the proposed amendment.

Unit 2 - Train B Upper Ignitor Location			
φ	No.	General Location	Elev
1	B29	Upper spray hdr pltfrm	760'
	B30	Upper spray hdr pltfrm	760'
	B31	Upper spray hdr pltfrm	760'
	B32	Low spray hdr pltfrm	748'
	B33	Low spray hdr pltfrm	748'
	B34	Low spray hdr pltfrm	748'
2	B1	In upper ice cond	709'
	B2	In upper ice cond	709'
	B3	In upper ice cond	709'
	B4	In upper ice cond	709'
	B5	In upper ice cond	709'
	B6	In upper ice cond	709'
	B7	In upper ice cond	709'
3	B13	Out S/G 1 enclosure	659'
	B14	Out S/G 2 enclosure	662'
	B15	Out S/G 3 enclosure	659'
	B16	Out S/G 4 enclosure	662'
	B17	Out Prz enclosure	662'

Unit 2 - Train B Lower Ignitor Location			
φ	No	General Location	Elev
1	B23	On bio shield wall	645'
	B25	Above CLV fan 4	629'
	B26	Near acc rms 2&3	623'
	B27	In acc rm 2	634'
	B28	Near Bio shield wall	618'
	B35	Ins rm by hatch	632'
2	**B18**	On bio shield wall	642'
	B19	On bio shield wall	637'
	B20	On bio shield wall	636'
	B21	On bio shield wall	634'
	B22	On bio shield wall	637'
	B24	In acc rm 1	630'
3	**B8**	In S/G 1 enclosure	686'
	B9	In S/G 2 enclosure	686'
	B10	In S/G 3 enclosure	682'
	B11	In S/G 4 enclosure	686'
	B12	In Prz enclosure	682'

TABLE 2

Bold font indicates ignitors involved in the proposed amendment.

Containment Region	Ignitor Nos.
1	A-29, B-29; A-30, B-30; A-31, B-31
2	A-32, B-32; A-33, B-33; A-34, B-34
3	A-1, B-1; A-2, B-2
4	A-3, B-3; A-4, B-4; A-5, B-5
5	A-6, B-6; A-7, B-7
6	A-14, B-14; A-15, B-15
7	A-13, B-13; A-16, B-16; A-17, B-17
8	A-24, B-24; A-25, B-25
9	A-26, B-26; A-27, B-27
10	A-35, B-35
11	A-18, **B-18**; A-19, **B-19**; A-20, **B-20**; A-21, **B-21**; A-22, **B-22**; A-23, B-23
12	A-8, **B-8**
13	A-9, **B-9**
14	A-10, **B-10**
15	A-11, **B-11**
16	A-12, **B-12**
17	A-28, B-28

Figure 1
Unit 2 - Train B Lower Wiring Digram

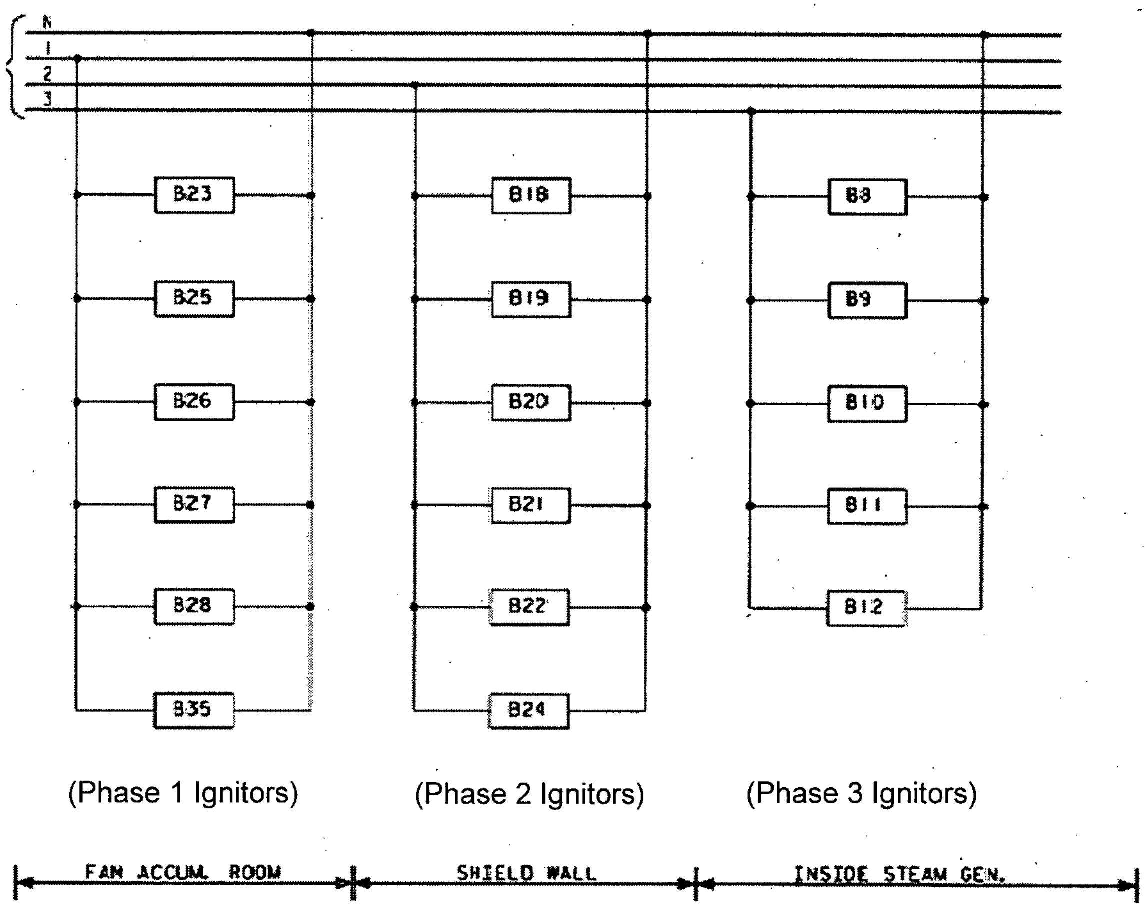


Figure 2

Unit 2 - Containment Elevation 648 feet and Below

The approximate locations of the Train B ignitor strings powered by lower containment phase 2 are indicated by arrows.

Ignitor B24 is not shown.

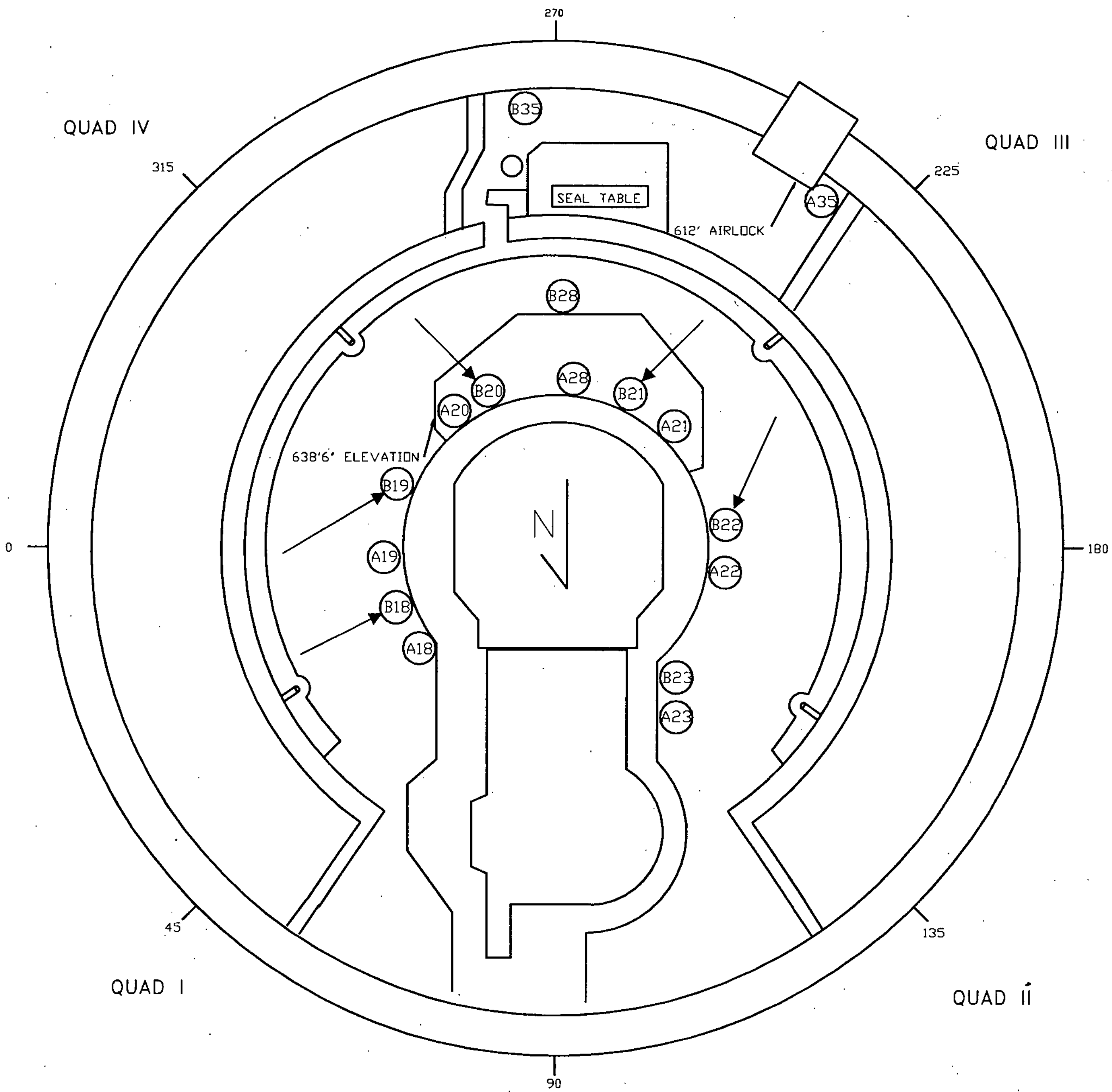
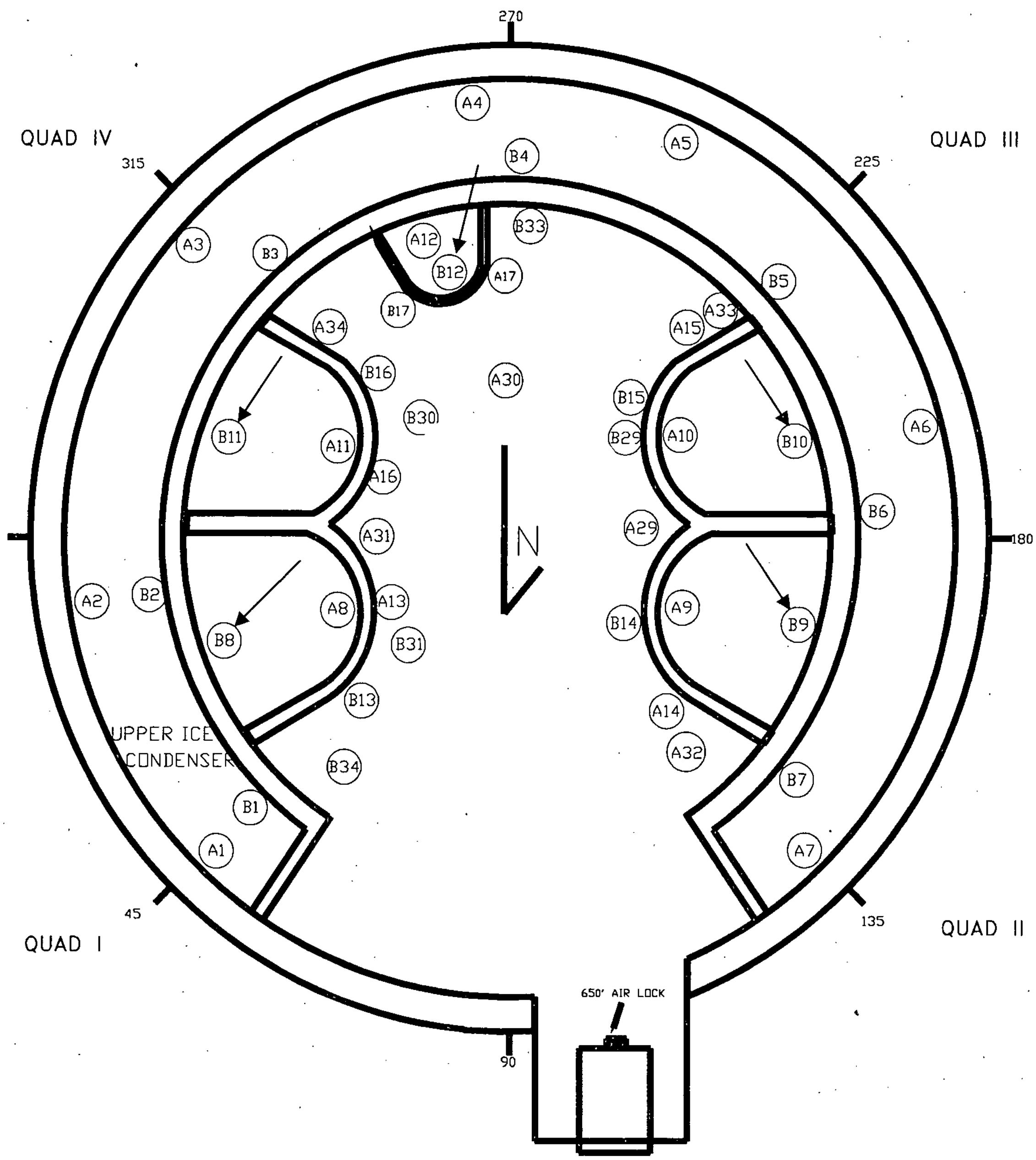


Figure 3
Unit 2 - Containment Elevation 650 feet and Above
The approximate locations of the Train B ignitor strings powered by lower containment phase 3 are indicated by arrows.



Attachment to AEP-NRC-2010-12

DONALD C. COOK NUCLEAR PLANT UNIT 2 TECHNICAL SPECIFICATION PAGES MARKED TO SHOW CHANGES

3.6.9-1

3.6.9-2

3.6 CONTAINMENT SYSTEMS

3.6.9 Distributed Ignition System (DIS)

LCO 3.6.9 Two DIS trains shall be OPERABLE. (See footnote)

AND

Each containment region shall have at least one OPERABLE hydrogen ignitor.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One DIS train inoperable. (See footnote)	A.1	Restore DIS train to OPERABLE status.	7 days
	OR		
	A.2	Perform SR 3.6.9.1 on the OPERABLE train.	Once per 7 days
B. One containment region with no OPERABLE hydrogen ignitor.	B.1	Restore one hydrogen ignitor in the affected containment region to OPERABLE status.	7 days
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	6 hours

Footnote: For the remainder of Fuel Cycle 18, or until the next entry into a MODE which allows replacement of the affected ignitors, DIS Train B may be considered OPERABLE with one lower containment Phase 2 Power Supply ignitor inoperable and with one lower containment Phase 3 Power Supply ignitor inoperable.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.9.1	Energize each DIS train power supply breaker and verify ≥ 34 ignitors (or ≥ 33 ignitors if allowed by footnote) are energized in each train.	184 days
SR 3.6.9.2	Verify at least one hydrogen ignitor is OPERABLE in each containment region.	184 days
SR 3.6.9.3	Energize each hydrogen ignitor and verify temperature is ≥ 1700°F. (See footnote)	24 months

Footnote: For the remainder of Fuel Cycle 18, or until the next entry into a MODE which allows replacement of the affected ignitors, DIS Train B may be considered OPERABLE with one lower containment Phase 2 Power Supply ignitor inoperable and with one lower containment Phase 3 Power Supply ignitor inoperable.