Duke Power®
A Duke Energy Company

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July 7, 2005

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

SUBJECT: Duke Energy Corporation

McGuire Nuclear Station Units, 1 and 2
Docket Nos. 50-369, 50-370

Catawba Nuclear Station Units, 1 and 2
Docket Nos. 50-413, 50-414

License Amendment Request Applicable to
Technical Specification 3.9.1,
"Boron Concentration"

Pursuant to 10 CFR 50.90, Duke Energy Corporation (Duke) is requesting an amendment (LAR) to McGuire Nuclear Station, Units 1 and 2; and Catawba Nuclear Station, Units 1 and 2 Technical Specifications (TS). This LAR clarifies the TS 3.9.1 requirements for boron concentration when the refueling canal and the refueling cavity are not connected to the reactor coolant system. This LAR is based upon, and consistent with, Industry Technical Specification Task Force (TSTF), Standard Technical Specification Traveler, TSTF-272-A, Revision 1, "Refueling Boron Concentration Clarification." TSTF-272-A, Revision 1 has been approved by the NRC. Editorial changes were made to the TS Bases included in the TSTF by adding definitions for "refueling cavity", "refueling canal" and "connected".

The contents of this submittal package are as follows:

- An Affidavit is included within this cover letter.
- Attachments 1a and 1b provide a marked copy of the existing McGuire, and Catawba TS and Bases, respectively. The marked copies show the proposed changes.

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- Attachments 2a and 2b provide a copy of the retyped McGuire, and Catawba TS and Bases, respectively.

- Attachment 3 provides a Description of the Proposed Changes and Technical Justification.

- Pursuant to 10 CFR 50.92, Attachment 4 documents Duke's determination that this LAR contains No Significant Hazards Consideration.

- Pursuant to 10 CFR 51.22(c)(9), Attachment 5 provides the basis for the categorical exclusion of this LAR from the requirement to perform an environmental assessment or environmental impact statement.

Duke is requesting NRC review and approval of this LAR by September 1, 2005 in order that it can be used during the upcoming fall outage for McGuire Unit 1 (1EOC17). Duke has determined that the NRC's standard 30-day implementation grace period will be sufficient to implement this LAR.

Implementation of this LAR in the Facility Operating Licenses and TS will not impact the McGuire or Catawba Updated Final Safety Analysis Report (UFSAR).

In accordance with Duke administrative procedures and the Quality Assurance Program Topical Report, the plant-specific changes contained in this proposed amendment have been reviewed and approved by the respective McGuire or Catawba Plant Operations Review Committee. This LAR has also been reviewed and approved by the Duke Nuclear Safety Review Board. Pursuant to 10 CFR 50.91, a copy of this amendment request is being sent to the designated officials of the State of North Carolina and the State of South Carolina.

Inquiries on this matter should be directed to Norman T. Simms at (704) 875-4685.

Sincerely,

Gary R. Peterson

Attachments

xc w/Attachments:

W. D. Travers, Regional Administrator
U. S. Nuclear Regulatory Commission, Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, GA 30303

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NRC Project Manager (McGuire and Catawba)
U. S. Nuclear Regulatory Commission
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Washington, DC 20555-0001

J. B. Brady
Senior Resident Inspector
U. S. Nuclear Regulatory Commission
McGuire Nuclear Site

E. F. Guthrie
Senior Resident Inspector
U. S. Nuclear Regulatory Commission
Catawba Nuclear Site

Beverly O. Hall, Section Chief
Radiation Protection Section
1645 Mail Service Center
Raleigh, NC 27699-1645

H. J. Porter, Director
Division of Radioactive Waste Management
South Carolina Bureau of Land and Waste Management
2600 Bull Street
Columbia, SC 29201

Gary R. Peterson, affirms that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth herein are true and correct to the best of his knowledge.

Gary R. Peterson, Vice President, McGuire Nuclear Station

Subscribed and sworn to me: July 7, 2006
Date

Freda K. Crump, Notary Public

My commission expires: August 17, 2006
Date

SEAL

bxc w/Attachments:

B. G. Davenport - ON03RC
L. A. Keller - CN01RC
J. E. Smith - ON03RC
K. L. Crane - MG01RC
K. E. Nicholson - CN01RC
J. M. Ferguson (Date File) - CN01SA
NRIA File/ELL - EC05O
McGuire Master File - MG01DM
Catawba Master File 801.01 - CN04DM

Catawba Owners:

Saluda River Electric Corporation
P. O. Box 929
Laurens, SC 29360-0929

T. R. Puryear
NC Electric Membership Corporation
CN03OG

NC Municipal Power Agency No. 1
P. O. Box 29513
Raleigh, NC 27626-0513

Piedmont Municipal Power Agency
121 Village Drive
Greer, SC 29651

Attachment 1a

McGuire Units 1 and 2

Proposed Technical Specifications and
Bases Changes (Mark-up)

3.9 REFUELING OPERATIONS

3.9.1 Boron Concentration

LCO 3.9.1 Boron concentrations of the Reactor Coolant System, the refueling canal, and the refueling cavity shall be maintained within the limit specified in the COLR.

APPLICABILITY: MODE 6.

INSERT 1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Boron concentration not within limit.	A.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2 Suspend positive reactivity additions.	Immediately
	AND	
	A.3 Initiate action to restore boron concentration to within limit.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.1.1	Verify boron concentration is within the limit specified in COLR.	72 hours

BASES

BACKGROUND (continued)

cavity mix the added concentrated boric acid with the water in the refueling canal. The RHR System is in operation during refueling (see LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation–High Water Level," and LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation–Low Water Level") to provide forced circulation in the RCS and assist in maintaining the boron concentrations in the RCS, the refueling canal, and the refueling cavity above the COLR limit.

APPLICABLE SAFETY ANALYSES

During refueling operations, the reactivity condition of the core is consistent with the initial conditions assumed for the boron dilution accident in the accident analysis and is conservative for MODE 6. The boron concentration limit specified in the COLR is based on the core reactivity at the beginning of each fuel cycle (the end of refueling) and includes an uncertainty allowance.

The required boron concentration and the plant refueling procedures that verify the correct fuel loading plan (including full core mapping) ensure that the k_{eff} of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% $\Delta k/k$ margin of safety is established during refueling.

During refueling, the water volume in the spent fuel pool, the transfer canal, the refueling canal, the refueling cavity, and the reactor vessel form a single mass. As a result, the soluble boron concentration is relatively the same in each of these volumes.

The RCS boron concentration satisfies Criterion 2 of 10 CFR 50.36 (Ref. 2).

LCO

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core k_{eff} of ≤ 0.95 is maintained during fuel handling operations. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

APPLICABILITY

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a $k_{eff} \leq 0.95$. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," ensure that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

INSERT 2

BASES

ACTIONS

A.1 and A.2

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron concentration of any coolant volume in the RCS, the refueling canal, or the refueling cavity is less than its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be suspended immediately.

Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position. Operations that individually add limited positive reactivity (e.g., temperature fluctuations from inventory addition or temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this action.

A.3

In addition to immediately suspending CORE ALTERATIONS and positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions. An acceptable method is to borate at greater than or equal to 30 gpm of a solution containing greater than or equal to 7000 ppm boron or its equivalent.

Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

and connected portions of

This SR ensures that the coolant boron concentration in the RCS, the refueling canal and the refueling cavity is within the COLR limits. The boron concentration of the coolant in each volume is determined periodically by chemical analysis. One sample from the refueling canal or refueling cavity is sufficient to determine the boron concentration in that volume of water. An additional sample is taken from the RCS.

required

INSERT 3

Inserts

Insert 1

----------NOTE----------
Only applicable to the refueling canal and refueling cavity when connected to the RCS.

Insert 2

The Applicability is modified by a Note. The Note states that the limits on boron concentration are only applicable to the refueling canal and the refueling cavity when those volumes are connected to the Reactor Coolant System. When the refueling canal and the refueling cavity are isolated from the RCS, no potential path for boron dilution of the RCS exits.

"Refueling cavity" includes the shallow and deep end of the refueling cavity. "Refueling canal" is the fuel transfer canal in the Reactor Building. "Connected" is when the water in the reactor vessel and the refueling cavity is hydraulically connected.

Insert 3

Prior to re-connecting portions of the refueling canal or the refueling cavity to the RCS, this SR must be met per SR 3.0.4. If any dilution activity has occurred while the cavity or canal were disconnected from the RCS, this SR ensures the correct boron concentration prior to communication with the RCS.

Attachment 1b

Catawba Units 1 and 2

Proposed Technical Specifications and
Bases Changes (Mark-up)

3.9 REFUELING OPERATIONS

3.9.1 Boron Concentration

LCO 3.9.1 Boron concentrations of the Reactor Coolant System, the refueling canal, and the refueling cavity shall be maintained within the limit specified in the COLR.

APPLICABILITY: MODE 6.

INSERT 1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Boron concentration not within limit.	A.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2 Suspend positive reactivity additions.	Immediately
	AND	
	A.3 Initiate action to restore boron concentration to within limit.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.1.1	Verify boron concentration is within the limit specified in COLR.	72 hours

BASES

APPLICABLE SAFETY ANALYSES

During refueling operations, the reactivity condition of the core is consistent with the initial conditions assumed for the boron dilution accident in the accident analysis and is conservative for MODE 6. The boron concentration limit specified in the COLR is based on the core reactivity at the beginning of each fuel cycle (the end of refueling) and includes an uncertainty allowance.

The required boron concentration and the plant refueling procedures that verify the correct fuel loading plan (including full core mapping) ensure that the k_{eff} of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% $\Delta k/k$ margin of safety is established during refueling.

During refueling, the water volume in the spent fuel pool, the transfer canal, the refueling canal, the refueling cavity, and the reactor vessel form a single mass. As a result, the soluble boron concentration is relatively the same in each of these volumes.

The RCS boron concentration satisfies Criterion 2 of 10 CFR 50.36 (Ref. 2).

LCO

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core k_{eff} of ≤ 0.95 is maintained during fuel handling operations. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

APPLICABILITY

INSERT 2

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a $k_{eff} \leq 0.95$. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," ensures that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

ACTIONS

A.1 and A.2

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron concentration of any coolant volume in the RCS, the refueling canal, or the refueling cavity is less than its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be suspended immediately.

Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position. Operations

BASES

ACTIONS (continued)

that individually add limited positive reactivity (e.g., temperature fluctuations from inventory addition or temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this Action.

A.3

In addition to immediately suspending CORE ALTERATIONS and positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions. An acceptable method is to borate at greater than or equal to 30 gpm of a solution containing greater than or equal to 7000 ppm boron or its equivalent.

Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

and connected portions of

This SR ensures that the coolant boron concentration in the RCS, the refueling canal and the refueling cavity is within the COLR limits. The boron concentration of the coolant in each required volume is determined periodically by chemical analysis. One sample from the refueling canal or reactor cavity is sufficient to determine the boron concentration in that volume of water. An additional sample is taken from the RCS.

INSERT 3

A minimum Frequency of once every 72 hours is a reasonable amount of time to verify the boron concentration of representative samples. The Frequency is based on operating experience, which has shown 72 hours to be adequate.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26.

2. 10 CFR 50.36, Technical Specifications (c)(2)(ii).

Inserts

Insert 1

----------NOTE----------
Only applicable to the refueling canal and refueling cavity when connected to the RCS.

Insert 2

The Applicability is modified by a Note. The Note states that the limits on boron concentration are only applicable to the refueling canal and the refueling cavity when those volumes are connected to the Reactor Coolant System. When the refueling canal and the refueling cavity are isolated from the RCS, no potential path for boron dilution of the RCS exits.

"Refueling cavity" includes the shallow and deep end of the refueling cavity. "Refueling canal" is the fuel transfer canal in the Reactor Building. "Connected" is when the water in the reactor vessel and the refueling cavity is hydraulically connected.

Insert 3

Prior to re-connecting portions of the refueling canal or the refueling cavity to the RCS, this SR must be met per SR 3.0.4. If any dilution activity has occurred while the cavity or canal were disconnected from the RCS, this SR ensures the correct boron concentration prior to communication with the RCS.

Attachment 2a

McGuire Units 1 and 2

Proposed Technical Specifications and
Bases Changes (Retyped)

3.9 REFUELING OPERATIONS

3.9.1 Boron Concentration

LCO 3.9.1 Boron concentrations of the Reactor Coolant System, the refueling canal, and the refueling cavity shall be maintained within the limit specified in the COLR.

---NOTE---
Only applicable to the refueling canal and refueling cavity when connected to the RCS.

APPLICABILITY: MODE 6.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Boron concentration not within limit.	A.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2 Suspend positive reactivity additions.	Immediately
	AND	
	A.3 Initiate action to restore boron concentration to within limit.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.1.1	Verify boron concentration is within the limit specified in COLR.	72 hours

B 3.9 REFUELING OPERATIONS

B 3.9.1 Boron Concentration

BASES

BACKGROUND

The limit on the boron concentrations of the Reactor Coolant System (RCS), the refueling canal, and the refueling cavity during refueling ensures that the reactor remains subcritical during MODE 6. Refueling boron concentration is the soluble boron concentration in the coolant in each of these volumes having direct access to the reactor core during refueling.

The soluble boron concentration offsets the core reactivity and is measured by chemical analysis of a representative sample of the coolant in each of the volumes. The refueling boron concentration limit is specified in the COLR. Plant procedures ensure the specified boron concentration in order to maintain an overall core reactivity of $k_{eff} \leq 0.95$ during fuel handling, with control rods and fuel assemblies assumed to be in the most adverse configuration (least negative reactivity) allowed by plant procedures.

GDC 26 of 10 CFR 50, Appendix A, requires that two independent reactivity control systems of different design principles be provided (Ref. 1). One of these systems must be capable of holding the reactor core subcritical under cold conditions. The Chemical and Volume Control System (CVCS) is the system capable of maintaining the reactor subcritical in cold conditions by maintaining the boron concentration.

The reactor is brought to shutdown conditions before beginning operations to open the reactor vessel for refueling. After the RCS is cooled and depressurized and the vessel head is unbolted, the head is slowly removed to form the refueling cavity. The refueling canal and the refueling cavity are then flooded with borated water by one of the following methods:

1. gravity fill directly from the refueling water storage tank (RWST),
2. refueling water pump taking suction directly from RWST,
3. refueling water pump taking suction from the spent fuel cooling water purification loop, or
4. RHR pumps taking suction from the RWST.

The pumping action of the RHR System in the RCS and the natural circulation due to thermal driving heads in the reactor vessel and refueling

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BACKGROUND (continued)

cavity mix the added concentrated boric acid with the water in the refueling canal. The RHR System is in operation during refueling (see LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation–High Water Level," and LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation–Low Water Level") to provide forced circulation in the RCS and assist in maintaining the boron concentrations in the RCS, the refueling canal, and the refueling cavity above the COLR limit.

APPLICABLE SAFETY ANALYSES

During refueling operations, the reactivity condition of the core is consistent with the initial conditions assumed for the boron dilution accident in the accident analysis and is conservative for MODE 6. The boron concentration limit specified in the COLR is based on the core reactivity at the beginning of each fuel cycle (the end of refueling) and includes an uncertainty allowance.

The required boron concentration and the plant refueling procedures that verify the correct fuel loading plan (including full core mapping) ensure that the k_{eff} of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% $\Delta k/k$ margin of safety is established during refueling.

During refueling, the water volume in the spent fuel pool, the transfer canal, the refueling canal, the refueling cavity, and the reactor vessel form a single mass. As a result, the soluble boron concentration is relatively the same in each of these volumes.

The RCS boron concentration satisfies Criterion 2 of 10 CFR 50.36 (Ref. 2).

LCO

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core k_{eff} of ≤ 0.95 is maintained during fuel handling operations. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

APPLICABILITY

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a $k_{eff} \leq 0.95$. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," ensure that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

The Applicability is modified by a Note. The Note states that the limits on boron concentration are only applicable to the refueling canal and the

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refueling cavity when those volumes are connected to the Reactor Coolant System. When the refueling canal and the refueling cavity are isolated from the RCS, no potential path for boron dilution of the RCS exists.

"Refueling cavity" includes the shallow and deep end of the refueling cavity. "Refueling canal" is the fuel transfer canal in the Reactor Building. "Connected" is when the water in the reactor vessel and the refueling cavity is hydraulically connected.

ACTIONS

A.1 and A.2

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron concentration of any coolant volume in the RCS, the refueling canal, or the refueling cavity is less than its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be suspended immediately.

Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position. Operations that individually add limited positive reactivity (e.g., temperature fluctuations from inventory addition or temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this action.

A.3

In addition to immediately suspending CORE ALTERATIONS and positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions. An acceptable method is to borate at greater than or equal to 30 gpm of a solution containing greater than or equal to 7000 ppm boron or its equivalent.

Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

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SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

This SR ensures that the coolant boron concentration in the RCS, and connected portions of the refueling canal and the refueling cavity, is within the COLR limits. The boron concentration of the coolant in each required volume is determined periodically by chemical analysis. Prior to re-connecting portions of the refueling canal or the refueling cavity to the RCS, this SR must be met per SR 3.0.4. If any dilution activity has occurred while the cavity or canal were disconnected from the RCS, this SR ensures the correct boron concentration prior to communication with the RCS. One sample from the refueling canal or refueling cavity is sufficient to determine the boron concentration in that volume of water. An additional sample is taken from the RCS.

A minimum Frequency of once every 72 hours is a reasonable amount of time to verify the boron concentration of representative samples. The Frequency is based on operating experience, which has shown 72 hours to be adequate.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26.

2. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).

Attachment 2b

Catawba Units 1 and 2

Proposed Technical Specifications and
Bases Changes (Retyped)

3.9 REFUELING OPERATIONS

3.9.1 Boron Concentration

LCO 3.9.1 Boron concentrations of the Reactor Coolant System, the refueling canal, and the refueling cavity shall be maintained within the limit specified in the COLR.

---NOTE---
Only applicable to the refueling canal and refueling cavity when connected to the RCS.

APPLICABILITY: MODE 6.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Boron concentration not within limit.	A.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2 Suspend positive reactivity additions.	Immediately
	AND	
	A.3 Initiate action to restore boron concentration to within limit.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.1.1	Verify boron concentration is within the limit specified in COLR.	72 hours

B 3.9 REFUELING OPERATIONS

B 3.9.1 Boron Concentration

BASES

BACKGROUND

The limit on the boron concentrations of the Reactor Coolant System (RCS), the refueling canal, and the refueling cavity during refueling ensures that the reactor remains subcritical during MODE 6. Refueling boron concentration is the soluble boron concentration in the coolant in each of these volumes having direct access to the reactor core during refueling.

The soluble boron concentration offsets the core reactivity and is measured by chemical analysis of a representative sample of the coolant in each of the volumes. The refueling boron concentration limit is specified in the COLR. Plant procedures ensure the specified boron concentration in order to maintain an overall core reactivity of $k_{eff} \leq 0.95$ during fuel handling, with control rods and fuel assemblies assumed to be in the most adverse configuration (least negative reactivity) allowed by plant procedures.

GDC 26 of 10 CFR 50, Appendix A, requires that two independent reactivity control systems of different design principles be provided (Ref. 1). One of these systems must be capable of holding the reactor core subcritical under cold conditions. The Chemical and Volume Control System (CVCS) is the system capable of maintaining the reactor subcritical in cold conditions by maintaining the boron concentration.

The reactor is brought to shutdown conditions before beginning operations to open the reactor vessel for refueling. After the RCS is cooled and depressurized and the vessel head is unbolted, the head is slowly removed to form the refueling cavity. The refueling canal and the refueling cavity are then flooded with borated water from the refueling water storage tank through the open reactor vessel by gravity feeding to approximately 75 percent of its required level and then using the refueling water pump to complete the filling process or by the use of the Residual Heat Removal (RHR) System pumps.

The pumping action of the RHR System in the RCS and the natural circulation due to thermal driving heads in the reactor vessel and refueling cavity mix the added concentrated boric acid with the water in the refueling canal. The RHR System is in operation during refueling (see LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation—High Water Level," and LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation—Low Water Level") to provide forced circulation in the RCS and assist in maintaining the boron concentrations in the RCS, the refueling canal, and the refueling cavity above the COLR limit.

BASES

APPLICABLE SAFETY ANALYSES

During refueling operations, the reactivity condition of the core is consistent with the initial conditions assumed for the boron dilution accident in the accident analysis and is conservative for MODE 6. The boron concentration limit specified in the COLR is based on the core reactivity at the beginning of each fuel cycle (the end of refueling) and includes an uncertainty allowance.

The required boron concentration and the plant refueling procedures that verify the correct fuel loading plan (including full core mapping) ensure that the k_{eff} of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% $\Delta k/k$ margin of safety is established during refueling.

During refueling, the water volume in the spent fuel pool, the transfer canal, the refueling canal, the refueling cavity, and the reactor vessel form a single mass. As a result, the soluble boron concentration is relatively the same in each of these volumes.

The RCS boron concentration satisfies Criterion 2 of 10 CFR 50.36 (Ref. 2).

LCO

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core k_{eff} of ≤ 0.95 is maintained during fuel handling operations. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

APPLICABILITY

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a $k_{eff} \leq 0.95$. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," ensures that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

The Applicability is modified by a Note. The Note states that the limits on boron concentration are only applicable to the refueling canal and the refueling cavity when those volumes are connected to the Reactor Coolant System. When the refueling canal and the refueling cavity are isolated from the RCS, no potential path for boron dilution of the RCS exists.

"Refueling cavity" includes the shallow and deep end of the refueling cavity. "Refueling canal" is the fuel transfer canal in the Reactor Building. "Connected" is when the water in the reactor vessel and the refueling cavity is hydraulically connected.

BASES

ACTIONS

A.1 and A.2

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron concentration of any coolant volume in the RCS, the refueling canal, or the refueling cavity is less than its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be suspended immediately.

Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position. Operations that individually add limited positive reactivity (e.g., temperature fluctuations from inventory addition or temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this Action.

A.3

In addition to immediately suspending CORE ALTERATIONS and positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions. An acceptable method is to borate at greater than or equal to 30 gpm of a solution containing greater than or equal to 7000 ppm boron or its equivalent.

Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

This SR ensures that the coolant boron concentration in the RCS, and connected portions of the refueling canal and the refueling cavity, is within the COLR limits. The boron concentration of the coolant in each required volume is determined periodically by chemical analysis. Prior to re-connecting portions of the refueling canal or the refueling cavity to the RCS, this SR must be met per SR 3.0.4. If any dilution activity has

BASES

SURVEILLANCE REQUIREMENTS (continued)

occurred while the cavity or canal were disconnected from the RCS, this SR ensures the correct boron concentration prior to communication with the RCS. One sample from the refueling canal or reactor cavity is sufficient to determine the boron concentration in that volume of water. An additional sample is taken from the RCS.

A minimum Frequency of once every 72 hours is a reasonable amount of time to verify the boron concentration of representative samples. The Frequency is based on operating experience, which has shown 72 hours to be adequate.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26.

2. 10 CFR 50.36, Technical Specifications (c)(2)(ii).

Attachment 3

Description of Proposed Changes
and Technical Justification

Attachment 3

Description of Proposed Changes and Technical Justification

DESCRIPTION

This license amendment request (LAR) proposes a change to the McGuire Nuclear Station, Units 1 and 2; and the Catawba Nuclear Station, Units 1 and 2, Technical Specifications (TS) and Bases 3.9.1, "Boron Concentration."

The proposed change adds a Note to the Applicability of this TS that states: "Only applicable to the refueling canal and refueling cavity when connected to the RCS." Conforming changes are also being made to the Bases for the Applicability and to the Bases for Surveillance Requirement (SR) 3.9.1.1. Definitions for "refueling cavity," "refueling canal" and "connected" were added to the Bases for clarification.

The proposed change clarifies that boron concentration limits do not apply to the refueling canal and refueling cavity when these areas are not connected to the reactor coolant system (RCS).

TECHNICAL JUSTIFICATION

Discussion

This LAR revises TS 3.9.1 and associated Bases in order to clarify that boron concentration limits do not apply to the refueling canal and refueling cavity when these areas are not connected to the RCS. This TS limits the boron concentrations of the RCS, the refueling canal, and the refueling cavity during refueling to ensure that the reactor remains subcritical during MODE 6. However, when the refueling canal and the refueling cavity are isolated from the RCS, no potential for dilution of the RCS exists. Therefore, in this condition it is not necessary to place a limit on the boron concentration in the refueling cavity and the refueling canal. The Applicability is revised with a note which states that the limits only apply to the refueling canal and refueling cavity when those volumes are connected to the RCS. This proposed change is consistent with the intent of the TS and eliminates restrictions that have no effect on safety.

Attachment 3

Description of Proposed Changes and Technical Justification

The change proposed in this Duke LAR has been addressed by the nuclear industry's Technical Specification Task Force (TSTF) in a Standard Technical Specification Traveler, TSTF-272-A, Revision 1, "Refueling Boron Concentration Clarification." The NRC has approved TSTF-272-A, Revision 1. Duke has reviewed the change contained in TSTF-272-A, Revision 1, and its supporting material, and has determined and documented that it applies to McGuire and Catawba. Therefore, TSTF-272-A, Revision 1, is referenced as the basis for the changes proposed within this McGuire and Catawba LAR.

Applicable Regulatory Criteria

The NRC regulations related to the content of nuclear power plants' TS are contained in 10 CFR 50.36. Following implementation of the changes proposed in this LAR, the McGuire and Catawba TS will continue to comply with this regulation. This LAR is being submitted to the NRC for review and approval consistent with the agency's regulations contained in 10 CFR 50.90. The proposed change to McGuire and Catawba TS 3.9.1 has been developed in accordance with an NRC-approved TSTF Standard Technical Specification Traveler. The changes contained in the traveler clarify the requirements of TS 3.9.1 and associated Bases and have been determined to be acceptable on the basis that the removal of the current restrictions has no effect on safety. The proposed change has been evaluated by Duke and determined to have no adverse impact on the ability of McGuire or Catawba to fulfill their design basis function as required by 10 CFR 50, Appendix A, GDC-26, or Criterion 2 of 10 CFR 50.36 as discussed in each plant's Bases for TS 3.9.1.

Conclusion

Duke has evaluated the proposed changes to TS 3.9.1 and its associated Bases and the supporting industry document TSTF-272-A, Revision 1, as discussed above, and has determined that these are appropriate for implementation at McGuire and Catawba Nuclear Stations.

Attachment 4

No Significant Hazards Consideration Determination

Attachment 4

No Significant Hazards Consideration Determination

Duke Energy Corporation (Duke) has made the determination that this license amendment request (LAR) involves No Significant Hazards Consideration through the application of the standards established by the NRC's regulations in 10 CFR 50.92. These three standards are discussed below.

1. Would implementation of the changes proposed in this LAR involve a significant increase in the probability or consequences of an accident previously evaluated?

   No. This LAR clarifies Technical Specification 3.9.1 regarding the applicability of boron concentration limits when the refueling canal and refueling cavity are not connected to the reactor coolant system. When the refueling canal and the refueling cavity are isolated from the RCS, no potential path for boron dilution of the RCS exists, thus there is no significant increase in the probability of an accident that has been previously evaluated, nor would there be a significant increase in the consequences of an accident that has been previously evaluated.

2. Would implementation of the changes proposed in this LAR create the possibility of a new or different kind of accident from any accident previously evaluated?

   No. The change proposed in this LAR clarifies the applicability of TS 3.9.1 when the refueling canal and refueling cavity are not connected to the reactor coolant system. When the refueling canal and the refueling cavity are isolated from the RCS, no potential path for boron dilution of the RCS exists, thus there is no means to initiate an accident that is new or different from any accident that has been previously evaluated.

3. Would implementation of the changes proposed in this LAR involve a significant reduction in a margin of safety?

   No. The change proposed in this LAR only clarifies the applicability of TS 3.9.1 when the refueling canal and refueling cavity are not connected to the reactor coolant system, the refueling canal, and the refueling cavity to ensure that the reactor remains subcritical during Mode 6 plant conditions. However, when the refueling canal and the refueling cavity are isolated from the reactor

coolant system, no potential for boron dilution of the RCS exists. Therefore, in this condition it is not necessary to place a limit on the boron concentration in the refueling canal and the refueling cavity, thus there is no significant reduction in a margin of safety since no specific boron limits are being changed.

Based upon the preceding discussion, Duke has concluded that this proposed amendment does not involve a significant hazards consideration.

Attachment 5

Environmental Assessment/Impact Statement

Attachment 5

Environmental Assessment/Impact Statement

A review of this license amendment request has determined it would change a requirement with respect to the installation or use of a facility component located within the restricted area, as defined in 10 CFR 20. However, the proposed changes do not involve: (i) a significant hazards consideration (see Attachment 3), (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 changes meet 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 this license amendment request.