

Mr. Oliver D. Kingsley, President
 Exelon Nuclear
 Exelon Generation Company, LLC
 1400 Opus Place, Suite 500
 Downers Grove, IL 60515

April 6, 2001

Distribution
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 ACRS

SUBJECT: BYRON AND BRAIDWOOD - ISSUANCE OF AMENDMENTS (TAC NOS. MA9385, MA9386, MA9383 AND MA9384)

Dear Mr. Kingsley:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 117 to Facility Operating License No. NPF-37 and Amendment No. 117 to Facility Operating License No. NPF-66 for the Byron Station, Unit Nos. 1 and 2, respectively, and Amendment No. 111 to Facility Operating License No. NPF-72 and Amendment No. 111 to Facility Operating License No. NPF-77 for the Braidwood Station, Unit Nos. 1 and 2, respectively. The amendments are in response to your application dated June 19, 2000, and supplemental submittals dated March 16, 2001, and April 4, 2001.

Subsequent to the date of the original amendment request, ComEd was merged into Exelon Generation Company, LLC (Exelon). By letter dated February 7, 2001, Exelon informed the NRC that it assumed responsibility for all pending NRC actions that were requested by ComEd.

The proposed amendments would revise the technical specifications to remove their applicability related to the Boron Dilution Protection System (BDPS) after the next refueling outage for each unit. During the refueling outages, modifications are scheduled to be made which will permit mitigation of a boron dilution event without the use of the BDPS. Approval of the amendments is based on the information provided to us regarding the current plant configurations, as well as proposed modifications. The amendments are effective immediately and will be implemented upon the completion of the proposed modifications. We request notification when the modification is complete for each unit.

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

/RA/
 Mahesh Chawla, Project Manager, Section 2
 Project Directorate III
 Division of Licensing Project Management
 Office of Nuclear Reactor Regulation

Docket Nos. STN 50-454, STN 50-455,
 STN 50-456 and STN 50-457

- Enclosures: 1. Amendment No. 117 to NPF-37
 2. Amendment No. 117 to NPF-66
 3. Amendment No. 111 to NPF-72
 4. Amendment No. 111 to NPF-77
 5. Safety Evaluation

cc w/encls: See next page

*See Previous Concurrence Sheet

OFFICE	PM:LPD3	PM:LPD3*	LA:LPD3	BC:RTSB*	SC:SRXB*	SC:IOLB*
NAME	MChawla	GDick	CRosenberg	RDenning	FAkstulewicz	DTrimble
DATE	4/6/01	4/ /01	4/ /01	4/ 04/01	4/4/01	4/4/01

OFFICE	OGC*	SC:LPD3
NAME	CMarco	AMendiola
DATE	4/6/01	4/6/01

DOCUMENT NAME: G:\PDIII-2\braid-by\BDPS.amd.wpd
 OFFICIAL RECORD COPY

NRR-058



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

April 6, 2001

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
1400 Opus Place, Suite 500
Downers Grove, IL 60515

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MA9385, MA9386, MA9383 AND MA9384)

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Subsequent to the date of the original amendment request, ComEd was merged into Exelon Generation Company, LLC (Exelon). By letter dated February 7, 2001, Exelon informed the NRC that it assumed responsibility for all pending NRC actions that were requested by ComEd.

The proposed amendments would revise the technical specifications to remove their applicability related to the Boron Dilution Protection System (BDPS) after the next refueling outage for each unit. During the refueling outages, modifications are scheduled to be made which will permit mitigation of a boron dilution event without the use of the BDPS. Approval of the amendments is based on the information provided to us regarding the current plant configurations, as well as proposed modifications. The amendments are effective immediately and will be implemented upon the completion of the proposed modifications. We request notification when the modification is complete for each unit.

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

A handwritten signature in black ink, appearing to read "Mahesh Chawla".

Mahesh Chawla, Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-454, STN 50-455,
STN 50-456 and STN 50-457

Enclosures: 1. Amendment No. 117 to NPF-37
2. Amendment No. 117 to NPF-66
3. Amendment No. 111 to NPF-72
4. Amendment No. 111 to NPF-77
5. Safety Evaluation

cc w/encls: See next page

O. Kingsley
Exelon Generation Company, LLC

cc:

Ms. C. Sue Hauser, Project Manager
Westinghouse Electric Corporation
Energy Systems Business Unit
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Howard A. Learner
Environmental Law and Policy
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Chicago, Illinois 60601-2110

U.S. Nuclear Regulatory Commission
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4448 N. German Church Road
Byron, Illinois 61010-9750

Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
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Lisle, Illinois 60532-4351

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Oregon, Illinois 61061

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Attorney General
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Byron/Braidwood Stations

Illinois Department of Nuclear Safety
Office of Nuclear Facility Safety
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Springfield, Illinois 62704

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Byron Station Manager
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Byron, Illinois 61010-9794

Exelon Generation Company, LLC
Site Vice President - Byron
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Byron, Illinois 61010-9794

U.S. Nuclear Regulatory Commission
Braidwood Resident Inspectors Office
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Illinois Emergency Services
and Disaster Agency
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Springfield, Illinois 62706

Chairman
Will County Board of Supervisors
Will County Board Courthouse
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Exelon Generation Company, LLC
Braidwood Station Manager
35100 S. Rt. 53, Suite 84
Braceville, Illinois 60407-9619

O. Kingsley
Exelon Generation Company, LLC

- 2 -

Byron/Braidwood Stations

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Appleseed Coordinator
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Senior Vice President, Nuclear Services
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Mr. John Cotton
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Downers Grove, Illinois 60515

Exelon Generation Company, LLC
Regulatory Assurance Supervisor - Braidwood
35100 S. Rt. 53, Suite 84
Braceville, Illinois 60407-9619



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-454

BYRON STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 117
License No. NPF-37

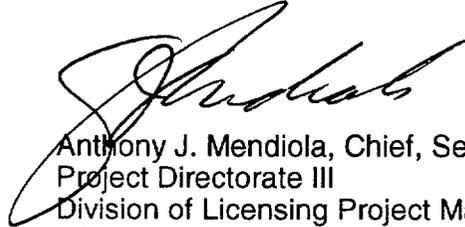
1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated June 19, 2000, as supplemented by letters dated March 16, 2001, and April 4, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-37 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 117 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented upon completion of the modifications scheduled to be completed during the spring 2002 refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION



Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 6, 2001



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-455

BYRON STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 117
License No. NPF-66

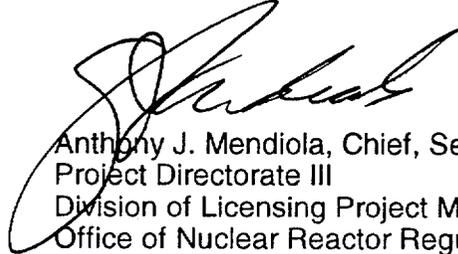
1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated June 19, 2000, as supplemented by letters dated March 16, 2001, and April 4, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-66 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A (NUREG-1113), as revised through Amendment No. 117, and the Environmental Protection Plan contained in Appendix B, both of which were attached to License No. NPF-37, dated February 14, 1985, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented upon completion of the modifications scheduled to be completed during the spring 2001 refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION



Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 6, 2001

ATTACHMENT TO LICENSE AMENDMENT NOS. 117 AND 117

FACILITY OPERATING LICENSE NOS. NPF-37 AND NPF-66

DOCKET NOS. STN 50-454 AND STN 50-455

Revise the Appendix A Technical Specifications by removing the page identified below and inserting the attached page. The revised page is identified by the captioned amendment number and contains marginal lines indicating the area of change.

Remove Pages

3.3.9-1
3.3.9-2
3.3.9-3
3.3.9-4

Insert Pages

3.3.9-1
3.3.9-2
3.3.9-3
3.3.9-4

3.3 INSTRUMENTATION

3.3.9 Boron Dilution Protection System (BDPS)

LCO 3.3.9 BDPS shall be OPERABLE with:

- a. One or more reactor coolant pump(s) in operation;
- b. Each Reactor Coolant System (RCS) loop isolation valve open; and
- c. The BDPS instrumentation in Table 3.3.9-1 OPERABLE.

-----NOTE-----
 The Boron Dilution Alert Alarm may be bypassed in MODE 3 during reactor startup.

APPLICABILITY: MODES 3, 4, and 5.

ACTIONS

-----NOTE-----
 Unborated water source isolation valves may be unisolated intermittently under administrative controls.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One Boron Dilution Alert channel inoperable.	A.1 Restore channel to OPERABLE status.	72 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>B. Required Action and associated Completion Time of Condition A not met.</p>	<p>B.1 Close unborated water source isolation valves.</p> <p><u>AND</u></p> <p>B.2 Verify unborated water source isolation valves closed.</p>	<p>1 hour</p> <p>Once per 31 days</p>
<p>C. Two Boron Dilution Alert channels inoperable.</p> <p><u>OR</u></p> <p>No reactor coolant pump in operation.</p> <p><u>OR</u></p> <p>One or more RCS loop isolation valve(s) not open.</p>	<p>C.1 Close unborated water source isolation valves.</p> <p><u>AND</u></p> <p>C.2 Perform SR 3.1.1.1.</p> <p><u>AND</u></p> <p>C.3 Verify unborated water source isolation valves closed.</p>	<p>1 hour</p> <p>1 hour</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per 12 hours</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.9.1	Verify one or more reactor coolant pump(s) in operation.	12 hours
SR 3.3.9.2	Verify each RCS loop isolation valve is open.	12 hours
SR 3.3.9.3	Perform CHANNEL CHECK.	12 hours
SR 3.3.9.4	Verify each Boron Dilution Alert channel selector switch is in the Normal position.	12 hours
SR 3.3.9.5	Verify each manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.3.9.6	Perform COT.	92 days
SR 3.3.9.7	<p style="text-align: center;">-----NOTE-----</p> <p>The CHANNEL CALIBRATION is only required to include that portion of the channel associated with the Boron Dilution Alert function.</p> <p style="text-align: center;">-----</p> <p>Perform CHANNEL CALIBRATION.</p>	18 months

Table 3.3.9-1 (page 1 of 1)
Boron Dilution Protection System Instrumentation

FUNCTION	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
Boron Dilution Alert Channels			
Volume Control Tank Level High	2	SR 3.3.9.3 SR 3.3.9.6 SR 3.3.9.7	≤ 71.15%



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-456

BRAIDWOOD STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 111
License No. NPF-72

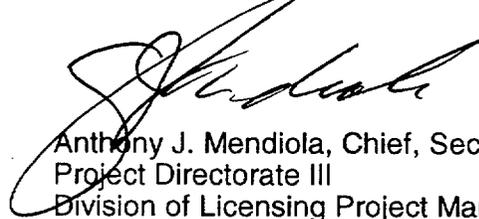
1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated June 19, 2000, as supplemented by letters dated March 16, 2001, and April 4, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-72 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 111 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented upon completion of the modifications scheduled to be completed during the fall 2001 refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION



Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 6, 2001



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-457

BRAIDWOOD STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 111
License No. NPF-77

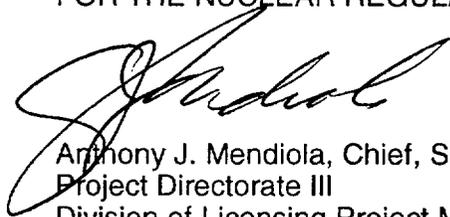
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 - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated June 19, 2000, as supplemented by letters dated March 16, 2001, and April 4, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-77 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 111 and the Environmental Protection Plan contained in Appendix B, both of which were attached to License No. NPF-72, dated July 2, 1987, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented upon completion of the modifications scheduled to be completed during the spring 2002 refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION



Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 6, 2001

ATTACHMENT TO LICENSE AMENDMENT NOS. 111 AND 111

FACILITY OPERATING LICENSE NOS. NPF-72 AND NPF-77

DOCKET NOS. STN 50-456 AND STN 50-457

Replace the following page of the Appendix "A" Technical Specifications with the attached page. The revised page is identified by amendment number and contains vertical lines indicating the area of change.

Remove Pages

3.3.9-1
3.3.9-2
3.3.9-3
3.3.9-4

Insert Pages

3.3.9-1
3.3.9-2
3.3.9-3
3.3.9-4

3.3 INSTRUMENTATION

3.3.9 Boron Dilution Protection System (BDPS)

LCO 3.3.9 BDPS shall be OPERABLE with:

- a. One or more reactor coolant pump(s) in operation;
- b. Each Reactor Coolant System (RCS) loop isolation valve open; and
- c. The BDPS instrumentation in Table 3.3.9-1 OPERABLE.

-----NOTE-----

The Boron Dilution Alert Alarm may be bypassed in MODE 3 during reactor startup.

APPLICABILITY: MODES 3, 4, and 5.

ACTIONS

-----NOTE-----

Unborated water source isolation valves may be unisolated intermittently under administrative controls.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One Boron Dilution Alert channel inoperable.	A.1 Restore channel to OPERABLE status.	72 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>B. Required Action and associated Completion Time of Condition A not met.</p>	<p>B.1 Close unborated water source isolation valves.</p> <p><u>AND</u></p> <p>B.2 Verify unborated water source isolation valves closed.</p>	<p>1 hour</p> <p>Once per 31 days</p>
<p>C. Two Boron Dilution Alert channels inoperable.</p> <p><u>OR</u></p> <p>No reactor coolant pump in operation.</p> <p><u>OR</u></p> <p>One or more RCS loop isolation valve(s) not open.</p>	<p>C.1 Close unborated water source isolation valves.</p> <p><u>AND</u></p> <p>C.2 Perform SR 3.1.1.1.</p> <p><u>AND</u></p> <p>C.3 Verify unborated water source isolation valves closed.</p>	<p>1 hour</p> <p>1 hour</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per 12 hours</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.9.1	Verify one or more reactor coolant pump(s) in operation.	12 hours
SR 3.3.9.2	Verify each RCS loop isolation valve is open.	12 hours
SR 3.3.9.3	Perform CHANNEL CHECK.	12 hours
SR 3.3.9.4	Verify each Boron Dilution Alert channel selector switch is in the Normal position.	12 hours
SR 3.3.9.5	Verify each manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.3.9.6	Perform COT.	92 days
SR 3.3.9.7	<p>-----NOTE----- The CHANNEL CALIBRATION is only required to include that portion of the channel associated with the Boron Dilution Alert function. -----</p> <p>Perform CHANNEL CALIBRATION.</p>	18 months

Table 3.3.9-1 (page 1 of 1)
Boron Dilution Protection System Instrumentation

FUNCTION	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
Boron Dilution Alert Channels			
Volume Control Tank Level High	2	SR 3.3.9.3 SR 3.3.9.6 SR 3.3.9.7	≤ 71.15%



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 117 TO FACILITY OPERATING LICENSE NO. NPF-37,
AMENDMENT NO. 117 TO FACILITY OPERATING LICENSE NO. NPF-66,
AMENDMENT NO. 111 TO FACILITY OPERATING LICENSE NO. NPF-72,
AND AMENDMENT NO. 111 TO FACILITY OPERATING LICENSE NO. NPF-77
EXELON GENERATION COMPANY, LLC
BYRON STATION, UNIT NOS. 1 AND 2
BRAIDWOOD STATION, UNIT NOS. 1 AND 2
DOCKET NOS. STN 50-454, STN 50-455, STN 50-456 AND STN 50-457

1.0 INTRODUCTION

In a letter dated June 19, 2000, as supplemented by letters dated March 16, 2001, and April 4, 2001, Exelon Generation Company, LLC (previously Commonwealth Edison Company) requested an amendment to the Byron and Braidwood Station's operating licenses which would revise the applicable technical specification (TS) requirements associated with the boron dilution protection system (BDPS) to make them applicable only until that respective unit's refueling outage. After the refueling outage, the unit will rely on an alternative "system" which includes new alarms, indicators, procedures and controls, and the operator to mitigate potential boron dilution events.

In discussions with the licensee on January 25, 2001, the licensee was made aware of the applicability of 10CFR 50.36 requirements to the additional instrumentation, the requirements to have one or more reactor coolant pump(s) in operation and each Reactor Coolant System (RCS) loop isolation valve open. This is different from the previously approved amendments for Comanche Peak and Wolf Creek plants. Also, there was additional information requested by the staff which was transmitted to the licensee via e-mail on February 16, 2001, (ADAMS Accession No. ML010470501). This was followed by NRC letter dated February 21, 2001, (ADAMS Accession No. ML010520554) to indicate the staff's position on the 10CFR 50.36 applicability and the Technical Specification requirements for the new hardware replacing the BDPS. The follow-up discussion between the NRC staff and the licensee occurred on March 1, 2001, to discuss the additional information request and the required changes to the Technical Specifications. This resulted in the supplemental submittal by the licensee dated March 16, 2001, to propose technical specifications in support of the alternative approach to mitigating boron dilution events. The licensee proposed supplemental changes to TS Limiting Condition for Operation (LCO) 3.3.9.

Further discussions were held with the licensee on April 2, 2001, to get additional clarification on the proposed supplemental changes to the TS and the various alarms for mitigating boron dilution events. In a letter dated April 4, 2001, the licensee provided additional information regarding the alarms.

Since the proposed additional changes provided in this supplement are more restrictive than the originally proposed changes, it does not change the previous determination of no significant hazards consideration determination published in the *Federal Register* on September 6, 2000.

Subsequent to the date of the original amendment request, ComEd was merged into Exelon Generation Company, LLC (Exelon). By letter dated February 7, 2001, Exelon informed the NRC that it assumed responsibility for all pending NRC actions that were requested by ComEd.

2.0 BACKGROUND

The BDPS was developed to detect and mitigate a boron dilution event in Modes 3, 4, and 5 prior to a complete loss of shutdown margin (i.e., approach to criticality). The current analysis of the inadvertent boron dilution event for Modes 3, 4, and 5, described in the Byron and Braidwood Final Safety Analysis Report (FSAR), Section 15.4.6, was based on the operation of the BDPS. The BDPS is not required to be operable in Modes 1 and 2 (power operation and startup) because an inadvertent boron dilution would be terminated by plant operator actions after being alerted to the dilution event by a reactor trip on source range neutron flux high, power range neutron flux high, or overtemperature delta temperature (OTΔT), or after being alerted by the low and low-low control rod insertion limit alarms. The BDPS is also not required to be operable in Mode 6 (refueling) because a dilution event is precluded by administrative controls which require valves to be secured closed to isolate the reactor coolant system (RCS) from the potential source of unborated water.

Byron and Braidwood TS 3.3.9 presently requires the BDPS to be operable in Modes 3, 4, and 5 although the boron dilution flux doubling signal may be blocked in Mode 3 during reactor startup. However, as noted in NRC Information Notice 93-32, "Non-conservative Inputs for Boron Dilution Event Analysis," various concerns have been raised about the inverse count rate ratio and the flux multiplication setpoint used by the BDPS in the boron dilution analyses which may render the system unsatisfactory from an accident analysis standpoint. Therefore, Exelon proposes to eliminate the present BDPS from the Byron and Braidwood TS and replace it with a system of new alarms, indicators, procedures and controls. The plants' technical specifications will be revised accordingly.

The proposed changes would revise TS 3.3.9, "Boron Dilution Protection System (BDPS)," for Byron, Units 1 and 2, and Braidwood, Units 1 and 2, to include requirements to have one or more reactor coolant pump(s) in operation; each Reactor Coolant System (RCS) loop isolation valve open; and the BDPS instrumentation in TS Table 3.3.9-1 operable. All existing TS Condition Statements, requirements, and NOTES related to the source range neutron flux channels, BDPS trains and automatic switch-over functions will be deleted as result of those supplemental changes. These additional requirements support assumptions in the boron dilution reanalysis regarding RCS volume and uniform boron concentration. A combination of plant hardware, procedures, and control enhancements will allow plant operators to take manual actions to implement the requirements for mitigating an unanticipated boron dilution event.

The alternative to BDPS proposed by the licensee uses new instrumentation and is based on a new set of analytical assumptions. These aspects of the LAR were reviewed against the requirements of 50.36 *Technical specifications* to determine if the technical specifications proposed by the licensee were acceptable. The four criteria for determining whether a TS is required are contained in 50.36(c)(2)(ii). They are:

- (A) Criterion 1. Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.
- (B) Criterion 2. A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.
- (C) Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission production barrier."
- (D) Criterion 4. A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.

The alternative to BDPS meets Criteria 2 & 3 because:

- 1. All hardware which is required to mitigate fast dilution events through operator action in less than 15 minutes is part of the "primary success path" and therefore shall be included in TS per 10 CFR Part 50.36(c)(2)(ii)(C), Criterion 3.
- 2. In addition, as stated in the June 19, 2000, submittal, the requirements that a reactor coolant pump (RCP) pump be running and all loop stop valves are open are operating restrictions. Being initial conditions of a design basis accident, these restrictions meet 10 CFR Part 50.36(a)(2)(ii)(B), Criterion 2, and therefore, are required to be in TS with appropriate LCO action statements. Therefore, the alternative must be included in TS.

3.0 EVALUATION

NRC Information Notice 93-32, "Non-Conservative Inputs for Boron Dilution Event Analysis," documents various issues that have been raised regarding the non-conservative assumptions and boundary conditions used in the FSAR Chapter 15 safety analysis of the boron dilution event. Because of large uncertainties associated with the indication of a true neutron flux doubling by the source range nuclear instrumentation, the mitigation effectiveness of the BDPS may be unreliable. Therefore, in lieu of crediting the BDPS for automatic boron dilution event mitigation, Byron and Braidwood will provide alarms, indicators, procedures and controls and will rely on the successful performance of certain actions by plant operators to mitigate the event prior to an inadvertent criticality. Currently, Information Notice 97-78, "Crediting of Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times," is the staff's principal guidance document for evaluating licensing actions that affect manual actions. The staff also uses Standard Review Plan (SRP) Chapter 18, "Human Factors Engineering," as its overall guidance document and is using NUREG/CR-6689, "A Proposed Approach for Reviewing Risk-Important Human Actions," as an additional guidance source for evaluating changes made to plant safety systems that affect human performance.

The following changes are proposed to the plant hardware and operations:

- (1) Two new redundant volume control tank (VCT) high level alarms will be installed as an indication of RCS/chemical volume control system (CVCS) mass imbalance and primary predictor of a potential boron dilution event. The two new redundant VCT high level alarms will each be set at 70 percent, which is lower than the existing VCT high-high level alarm, which is set at 95 percent, and will provide improved timeliness in identifying a potential boron dilution event. There will be two new alarm annunciator windows in the main control room titled, "Boron Dilution Alert Channel A," and "Boron Dilution Alert Channel B." The Channel A alarm will be initiated by inputs from its respective new VCT high level channel and the new RCS letdown divert valve CV112A position indication. An alarm on this RCS letdown divert valve annunciates when the valve is not aligned to the VCT. The Channel B alarm will be initiated by inputs from its respective new VCT high level channel and the existing neutron flux doubling channels. During a telephone conference with the staff on April 2, 2001, the licensee clarified that Channel A alarm will be initiated by either the VCT high level alarm or the valve position alarm of the letdown divert valve not aligned to the VCT, and Channel B alarm will be initiated by either the VCT high level alarm or the existing flux doubling channel.
- (2) Operating procedures will be revised to heighten operator awareness during evolutions that may potentially impact boron dilution and to include the new alarms and indications for event recognition as well as the necessary actions required for event termination.
- (3) Revisions will be made to the technical specifications to include requirements for the two new VCT level channels, and at least one reactor coolant pump (RCP) to be in operation and all RCS loop stop valves open when in Modes 3, 4, and 5. This maintains proper mixing of the reactor coolant throughout the full RCS volume. If these conditions are not satisfied, the technical specifications will require the flow paths of potential boron dilution sources to be isolated unless unisolated intermittently under administrative controls as necessary for planned evolutions.

Exelon provided a detailed safety analysis of the postulated inadvertent boron dilution event in Modes 3, 4, and 5 using the hardware and operational changes proposed above. The postulated source of dilution is from the primary water makeup system through the primary water makeup control valve, CV111A, which injects between the VCT and the centrifugal charging pump (CV pump), and a failure of the boric acid blend system. Since all sources of unborated water are locked out during refueling, the boron dilution event is not analyzed from Mode 6 initiation. The event has been reanalyzed to demonstrate compliance with the Standard Review Plan (SRP), NUREG-0800, Revision 2. SRP 15.4.6, "Chemical and Volume Control System Malfunction That Results in a Decrease in Boron Concentration in the Reactor Coolant (PWR)." SRP15.4.6 states that, if operator action is required to terminate a dilution event, the following minimum time intervals must be available between the time when an alarm announces an unplanned moderator dilution and the time of total loss of shutdown margin (criticality):

- (1) during refueling: 30 minutes;
- (2) during startup, cold shutdown, hot standby, power operation: 15 minutes.

The revised Exelon analysis to manually isolate potential boron dilution sources and to restart boration of the RCS discusses two different strategies that depend on the nature of the potential dilution.

Fast Dilution Events

Supporting analyses indicated that there is a class of "fast" dilutions that must be mitigated using the new VCT high level annunciation at 70 percent, and administrative controls to prevent boron dilution if at least one RCP is not in operation or all RCS loop stop valves are not open in Modes 3, 4, and 5. The revised analysis determined the limiting ratio of initial boron concentration to the critical boron concentration in Modes 3, 4, and 5 that must be exceeded for all Byron and Braidwood reactor core designs to ensure that plant operators would have sufficient time, i.e., 15 minutes, to prevent criticality as specified in SRP 15.4.6. As long as the maximum initial to critical boron concentration ratio exceeds the calculated limit, plant operators would have sufficient time to manually prevent criticality in accordance with the SRP acceptance criteria. This would allow the BDPS to not be credited in mitigating an inadvertent boron dilution event. Each cycle reactor core reload is evaluated to ensure that sufficient shutdown margin is maintained. The results of the revised analysis indicate that at least 15 minutes are available between the time an alarm announces an unplanned moderator dilution and the time of loss of shutdown margin for plant operators to perform actions required to prevent criticality in Modes 3, 4, and 5, in accordance with SRP guidance.

The licensee stated that operator action credited in the re-analysis is to switch the CV (centrifugal charging) pump from the VCT to the RWST (refueling water storage tank). The valve repositioning is accomplished by the plant operators closing two VCT isolation valves and opening two RWST isolation valves from the main control room using plant operating procedures (i.e., these are the actions that must be accomplished in at least 15 minutes from the time when the operator is alerted to the event by the VCT high level alarm and when plant operator action would no longer mitigate criticality).

In response to staff questions related to crediting the manual actions, the licensee provided a supplemental submittal dated March 16, 2001. The staff asked the licensee to explain how it was determined that plant operators can reliably perform the required actions in the time allowed to successfully mitigate an inadvertent boron dilution event previously mitigated by the

BDPS. The staff requested additional information because the licensee's analysis assumed that operators could perform the required actions in 15 minutes (i.e., the least amount of time that must be available, per SRP15.4.6, for operators to successfully mitigate the event). The licensee's analysis indicated that the system provided at least 15 minutes for the operator to take the required actions but did not provide evidence to support whether or not the actions could be performed successfully.

The licensee indicated in their supplemental submittal that, "all operators at Braidwood and Byron Stations, as part of their initial license training program, as well as their continuing requalification training program, are trained to recognize and mitigate a boron dilution event." The training occurs in both the classroom and simulator. The licensee further indicated that it had reviewed IN 97-78 and concluded that, "crediting these specific operator actions is consistent with the guidelines discussed in the Information Notice." In addition, the licensee stated that, "certified simulator instructors and Operations Department management personnel observe and evaluate the performance of individual licensed operators and overall operations crew performance in response to various scenarios, including boron dilution events on our plant-referenced simulators. Based on these observations and evaluations of individuals and crew performance in response to boron dilution scenarios, staff has determined that plant operators can reliably perform the required actions in the time allowed to successfully mitigate those inadvertent boron dilution events."

Although the simulator exercises cited by the licensee for both cases were based on low flow boron dilution events, the operators successfully diagnosed and terminated these more-difficult-to-diagnose events within the 15 minutes specified by SRP 15.4.6 for high flow events. The operator actions to terminate the event are the same for both the high flow and low flow events. With the licensee having demonstrated that operators can perform the required actions (i.e., diagnose the event and reposition the valves) for low flow dilution events within the SRP time limits, the staff has reasonable assurance that the operators will be able to mitigate the inadvertent high flow boron dilution events within the time allowed by SRP 15.4.6 and, the operator actions to mitigate the inadvertent high flow boron dilution events are acceptable.

Based on the above, the staff has determined that there is reasonable assurance that Braidwood and Byron plant operators will perform the required manual actions necessary to successfully mitigate fast inadvertent boron dilution events in accordance with the operator action limits specified in SRP 15.4.6 and the guidance contained in Information Notice 97-78, "Crediting of Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times," SRP Chapter 18, "Human Factors Engineering," and, NUREG/CR-6689, "A Proposed Approach for Reviewing Risk-Important Human Actions."

Slow Dilution Events

There may be other dilution events which are not obviously bounded by the analysis described above. For example, for small dilution flow rates, the time required to fill the VCT to the high VCT water level setpoint may be greater than the time required to dilute the RCS to the critical condition. However, the time available for operator action involved in this case has been calculated to exceed 30 minutes. Alarms such as the boric acid flow or primary water flow deviation alarms would alert the operator to a potential inadvertent boron dilution. The alarms generated by the nuclear instrumentation system would also be available to alert operators for these slow dilution cases. For these relatively slow transients, SRP 15.4.6 specifies the complete loss of shutdown margin (inadvertent criticality) to be at least 30 minutes. The licensee's analysis indicates that the ratio of initial to critical boron concentration required to

meet this 30 minute time interval is much lower than the SRP guidance. The staff has determined that the licensee's analysis provides reasonable assurance that the above-mentioned other indications would alert the reactor operators to an inadvertent boron dilution event and allow initiation of timely corrective actions.

The staff also asked the licensee to explain their basis for assuming that there is reasonable assurance that plant operators will be able to diagnose and mitigate an inadvertent boron dilution event in 30 minutes, under conditions where the high VCT alarm does not annunciate. In its supplemental submittal, the licensee stated that, under conditions where the high VCT alarm fails to annunciate, the licensed operator will be alerted to a boron dilution event through various other instruments, indications, and alarms as stated previously. The licensee cited that operators are trained to respond to these slow dilution events on the simulator and that these events are typically more difficult to diagnose than large/fast boron dilution events. The licensee concluded that, "Based on operating crew performance on the simulator and operating experience, it is reasonable to assume that operators can terminate this event in 30 minutes or less."

As stated earlier for fast dilution events, the simulator exercises cited by the licensee for both cases were based on low flow boron dilution events. However, the operators successfully diagnosed and terminated the slow dilution events in less than 30 minutes specified by SRP 15.4.6. Therefore, with the licensee having demonstrated that operators can perform the required actions (i.e., diagnose the event and reposition the valves) for low flow dilution events within the SRP time limits, the staff has reasonable assurance that the operators will be able to mitigate the inadvertent low flow boron dilution events within the time allowed by SRP 15.4.6 and, the operator actions to mitigate the inadvertent low flow boron dilution events are acceptable.

SRP 15.4.6 also requires redundancy of alarms that would alert the operator to an unplanned dilution. The licensee has committed to the installation of redundant alarms for high VCT water level with a lower setpoint (70 percent) than the current high-high VCT water level alarm (95 percent) and has taken credit for these alarms in the reanalysis of the rapid dilution events. In addition, the existing VCT alarm associated with the letdown divert valve actuates in the Main Control Room (MCR), when VCT level exceeds 95% and the channel actuates contacts to position the letdown divert valve (CV112A) to the holdup tank (HUT).

These alarms, in addition to the available boric acid flow and primary water flow deviation alarms and the alarms provided by the nuclear instrumentation system, provide an acceptable level of redundancy and diversity to alert operators to an ongoing inadvertent boron dilution event.

Based on the above, the staff has determined that there is reasonable assurance that Braidwood and Byron plant operators will perform the required manual actions necessary to successfully mitigate slow inadvertent boron dilution events in accordance with the operator action limits specified in SRP 15.4.6 and the guidance contained in Information Notice 97-78, "Crediting of Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times," SRP Chapter 18, "Human Factors Engineering," and, NUREG/CR-6689, "A Proposed Approach for Reviewing Risk-Important Human Actions."

Technical Specifications

The license proposed to document and control key aspects of this alternative to BDPS with appropriate technical specifications. These key aspects meet the requirements of 10 CFR 50.36(c)(2)(ii) Criteria 2 or Criteria 3, and therefore must be covered by LCOs in plant technical specifications. Quoting from the licensee's submittal, dated June 19, 2000, page 2 of Attachment A:

"The current BDPS TS Limiting Condition for Operation (LCO) 3.3.9 satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii), "Technical specifications", which requires that a TS LCO must be established for a "structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier." The BDPS senses abnormal increases in source range neutron flux level and actuates VCT and RWST valves to mitigate the consequences of an inadvertent boron dilution event as described in Chapter 15 of the UFSAR. The accident analysis relies on the automatic BDPS actuation to mitigate the consequences of an inadvertent boron dilution event."

For the proposed alternative, quoting from page 2 of Attachment C of the licensee submittal dated June 19, 2000:

"The revised detection and mitigation methodology being proposed achieves the same basic function as the existing BDPS, i.e., to prevent a return to critical during an inadvertent boron dilution event. The proposed changes will provide an improved response to the inadvertent boron dilution event compared to the BDPS, and thereby will prevent a return to critical."

Criterion 2 of 50.36 (c)(2)(ii)(B) requires technical specifications for:

"A process variable, design feature, or operating restriction in that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barriers."

In its submittal, the licensee states that requirements of at least one Reactor Coolant Pump (RCP) is in operation, and all RCS loop stop valves are open when in Modes 3, 4, and 5 ensure the assumptions used in the revised Exelon analysis remain valid.

The RCP pump and loop stop valve provisions are "operating restrictions" meeting Criterion 2. The licensee has included these restrictions in the proposed technical specifications LCO, which is acceptable.

Criterion 3 of 50.36(c)(2)(ii)(B) requires technical specifications for:

"A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."

For "fast" dilutions, the alternative method includes two new VCT high level alarms whose sole purpose is to serve as the "primary predictor of a potential boron dilution event." These new instruments are needed to credit operator action for the most restrictive (i.e., action in 15 minutes) circumstances in the supporting accident analysis. The operator performs a limited, predetermined set of actions in direct response to the alarm. This constitutes a "primary success path", and the alarms meet Criteria 3 for inclusion in technical specifications. The licensee modified LCO 3.3.9 to cover these alarms and to delete requirements for aspects of the BDPS that are no longer necessary. For "slow" dilutions, the operator uses a range of instruments and diagnoses the status of the plant to detect and mitigate the dilution event. For this case there is no discernible "primary success path" outside of the operator who mitigates the event by taking actions that are not scripted in advance. No technical specifications are required for this scenario.

Other changes in the proposed TS 3.3.9, including the LCO NOTES, Conditions, and Required Actions, reflect the proposed LCO and are acceptable.

The proposed TS 3.3.9 does not include the operability of the letdown divert valve (CV112A), which must be aligned to the VCT to provide for the operability of the VCT high level alarm. However, since the divert valve is equipped with a valve position indication and an alarm annunciation when not aligned to the VCT, the operators would be alerted to take corrective action if needed. The licensee also stated that the letdown divert valve is designed to fail in the VCT position. Therefore, there is reasonable assurance that the letdown divert valve is aligned to the VCT in the event of an inadvertent boron dilution. Therefore, the staff concludes that there is no need to include the letdown divert valve in the TS, and the proposed TS 3.3.9 is acceptable.

4.0 SUMMARY

The staff has reviewed the proposed changes to the plant hardware and operations as well as the revised boron dilution event methodology and the proposed TS changes to TS 3.3.9 for Byron and Braidwood. The new specifications replace the existing BDPS with requirements to have one or more reactor coolant pump(s) in operation; each Reactor Coolant System (RCS) loop isolation valve open; and the BDPS instrumentation in TS Table 3.3.9-1 operable.

The BDPS was designed to detect and mitigate a boron dilution event in Modes 3, 4, and 5 prior to a complete loss of shutdown margin (criticality). However, as stated earlier, the BDPS is not required to be operable in Modes 1 and 2 (power operation and startup), nor is it required to be operable in Mode 6 (refueling). The licensee's revised analysis of the postulated inadvertent boron dilution event in Modes 3, 4, and 5, using the proposed hardware and operational changes, was made with the assumption that the plant operators perform all actions required to prevent criticality.

Based on the above evaluation, the staff concludes that the inclusion of the alternatives to BDPS is acceptable.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Illinois State official was notified of the proposed issuance of the amendments. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (65 FR 54084). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

In consideration of additional changes, it has been determined that the proposed TS change continues to meet criteria for a categorical exclusion set forth in 10 CFR 51.22(c)(9) and that no irreversible consequences exist in accordance with 10 CFR 50.92(b).

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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