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

March 30, 2012

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2 AND BYRON STATION, UNIT NOS. 1 AND 2 - ISSUANCE OF AMENDMENTS RE: REVISION OF TECHNICAL SPECIFICATIONS (TS) 3.3.1, "REACTOR TRIP SYSTEM INSTRUMENTATION," AND TS 3.3.2, "ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION" (TAC NOS. ME5836, ME5837, ME5838, AND ME5839)

Dear Mr. Pacilio:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 169 to Facility Operating License No. NPF-72 and Amendment No.169 to Facility Operating License No. NPF-77 for the, Braidwood Station, Units 1 and 2, respectively, and Amendment No. 176 to Facility Operating License No. NPF-37 and Amendment No. 176 to Facility Operating License No. NPF-66 for the Byron Station, Unit Nos. 1 and 2, respectively. The amendments are in response to your application dated March 14, 2011, as supplemented by letters dated September 2, 2011, and November 18, 2011.

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,

FOR

Brenda L. Mozafari, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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

Enclosures:
1. Amendment No. 169 to NPF-72
2. Amendment No. 169 to NPF-77
3. Amendment No. 176 to NPF-37
4. Amendment No. 176 to NPF-66
5. Safety Evaluation

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

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-456

BRAIDWOOD STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 169
License No. NPF-72

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated March 14, 2011, as supplemented by letters dated September 2, 2011, and November 18, 2011, 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.

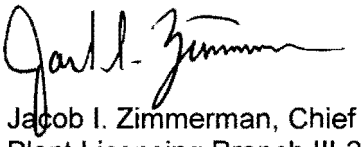
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-72 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 169 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 within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Jacob I. Zimmerman, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications and Facility Operating License

Date of Issuance: March 30, 2012

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

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-457

BRAIDWOOD STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 169
License No. NPF-77

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated March 14, 2011, as supplemented by letters dated September 2, 2011, and November 18, 2011, 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.

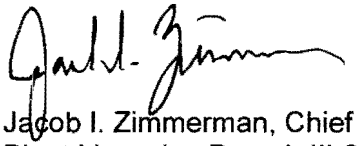
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-77 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 169 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 if its issuance and shall be implemented within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Jacob I. Zimmerman, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications and Facility Operating License

Date of Issuance: March 30, 2012

ATTACHMENT TO LICENSE AMENDMENT NOS. 169 AND 169

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

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

Replace the following pages of the Facility Operating Licenses and Appendix "A" Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
License NPF-72 Page 3	License NPF-72 Page 3
License NPF-77 Page 3	License NPF-77 Page 3
TSs 3.3.1 – 2 through 3.3.1 – 20 3.3.2 – 2 through 3.3.2 – 16	TSs 3.3.1 - 2 through 3.3.1 - 20 3.3.2 – 2 through 3.3.2 – 16

(3) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(4) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(5) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. The license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at reactor core power levels is not in excess of 3586.6 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein and other items identified in Attachment 1 to this license. The items identified in Attachment 1 to this license shall be completed as specified. Attachment 1 is hereby incorporated into this license.

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 169, 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) Emergency Planning

In the event that the NRC finds that the lack of progress in completion of the procedures in the Federal Emergency Management Agency's final rule, 44 CFR Part 350, is an indication that a major substantive problem exists in achieving or maintaining an adequate state of emergency preparedness, the provisions of 10 CFR Section 50.54(s)(2) will apply.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One channel or train inoperable.	----------NOTE---------- While this LCO is not met for Function 18, 19, or 20 in MODE 5, making the Rod Control System capable of rod withdrawal is not permitted. ----------	
	C.1 Restore channel or train to OPERABLE status.	48 hours
	OR	
	C.2.1 Initiate action to fully insert all rods.	48 hours
	AND	
	C.2.2 Place the Rod Control System in a condition incapable of rod withdrawal.	49 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One Power Range Neutron Flux-High channel inoperable.	----------NOTES---------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment of other channels. ---------- D.1 Place channel in trip. OR D.2 Be in MODE 3.	 72 hours 78 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One channel inoperable.	----------NOTES---------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	E.1 Place channel in trip. OR E.2 Be in MODE 3.	72 hours 78 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
F. One Intermediate Range Neutron Flux channel inoperable.	F.1	Reduce THERMAL POWER to < P-6.	2 hours
	OR		
	F.2	Increase THERMAL POWER to > P-10.	2 hours
G. Two Intermediate Range Neutron Flux channels inoperable.	G.1	Suspend operations involving positive reactivity additions.	Immediately
	AND		
	G.2	Reduce THERMAL POWER to < P-6.	2 hours
H. One Source Range Neutron Flux channel inoperable.	H.1	Suspend operations involving positive reactivity additions.	Immediately
I. Two Source Range Neutron Flux channels inoperable.	I.1	Open Reactor Trip Breakers (RTBs).	Immediately
J. One Source Range Neutron Flux channel inoperable.	J.1	Restore channel to OPERABLE status.	48 hours
	OR		
	J.2.1	Initiate action to fully insert all rods.	48 hours
	AND		
	J.2.2	Place the Rod Control System in a condition incapable of rod withdrawal.	49 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
K. One channel inoperable.	----------NOTES---------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	K.1 Place channel in trip.	72 hours
	OR	
	K.2 Reduce THERMAL POWER to < P-7.	78 hours
L. One Turbine Trip channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	L.1 Place channel in trip.	72 hours
	OR	
	L.2 Reduce THERMAL POWER to < P-8.	78 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
M. One train inoperable.	----------NOTE---------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ---------- M.1 Restore train to OPERABLE status. OR M.2 Be in MODE 3.	 24 hours 30 hours
N. One RTB train inoperable.	----------NOTE---------- One train may be bypassed for up to 4 hours for surveillance testing, provided the other train is OPERABLE. ---------- N.1 Restore train to OPERABLE status. OR N.2 Be in MODE 3.	 24 hours 30 hours
O. One or more channels inoperable.	O.1 Verify interlock is in required state for existing unit conditions. OR O.2 Be in MODE 3.	1 hour 7 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
P. One or more channels inoperable.	P.1 Verify interlock is in required state for existing unit conditions. OR P.2 Be in MODE 2.	1 hour 7 hours
Q. One trip mechanism inoperable for one RTB.	Q.1 Restore inoperable trip mechanism to OPERABLE status. OR Q.2 Be in MODE 3.	48 hours 54 hours
R. One Reactor Coolant Pump (RCP) Breaker Position channel (per train) inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels. ---------- R.1 Place channel in trip. OR R.2 Reduce THERMAL POWER to < P-7.	 6 hours 12 hours

SURVEILLANCE REQUIREMENTS

----------NOTE----------
Refer to Table 3.3.1-1 to determine which SRs apply for each RTS Function.

	SURVEILLANCE	FREQUENCY
SR 3.3.1.1	Perform CHANNEL CHECK.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.2	----------NOTES---------- 1. Adjust NIS channel if absolute difference is > 2%. 2. Not required to be performed until 12 hours after THERMAL POWER is ≥ 15% RTP. --- Compare results of calorimetric heat balance calculation to Nuclear Instrumentation System (NIS) channel output.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.3	----------NOTES---------- 1. Adjust NIS channel if absolute difference is ≥ 3%. 2. Only required to be performed with THERMAL POWER > 15% RTP. ---------- Compare results of the incore measurements to NIS AFD.	Prior to exceeding 75% RTP after each refueling AND In accordance with the Surveillance Frequency Control Program
SR 3.3.1.4	----------NOTE---------- This Surveillance must be performed on the RTBB prior to placing the bypass breaker in service. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.5	Perform ACTUATION LOGIC TEST.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.6	----------NOTE---------- Not required to be performed until 24 hours after THERMAL POWER is ≥ 75% RTP. ---------- Calibrate excore channels to agree with incore measurements.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.7	----------NOTE---------- Not required to be performed for source range instrumentation prior to entering MODE 3 from MODE 2 until 4 hours after entry into MODE 3. ---------- Perform COT.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.8	----------NOTE---------- This Surveillance shall include verification that interlocks P-6 and P-10 are in their required state for existing unit conditions. ----------	
	Perform COT.	-----NOTE---- Only required when not performed within the Frequency specified in the Surveillance Frequency Control Program ---------- Prior to reactor startup AND Four hours after reducing power below P-10 for power and intermediate instrumentation AND Four hours after reducing power below P-6 for source range instrumentation AND In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.9	----------NOTE---------- Verification of setpoint is not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.10	----------NOTE---------- This Surveillance shall include verification that the time constants are adjusted to the prescribed values. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.11	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.12	Perform COT.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.13	----------NOTE---------- Verification of setpoint is not required. ----------	
	Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.14	----------NOTE---------- Verification of setpoint is not required. ----------	
	Perform TADOT.	-----NOTE----- Only required when not performed within previous 31 days ---------- Prior to reactor startup
SR 3.3.1.15	----------NOTE---------- Neutron detectors are excluded from response time testing. ----------	
	Verify RTS RESPONSE TIME is within limits.	In accordance with the Surveillance Frequency Control Program

Table 3.3.1-1 (page 1 of 6)
Reactor Trip System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1.	Manual Reactor Trip	1,2	2	B	SR 3.3.1.13	NA
		3[a], 4[a], 5[a]	2	C	SR 3.3.1.13	NA
2.	Power Range Neutron Flux					
	a. High	1,2	4	D	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.15	≤ 110.8% RTP
	b. Low	1[b],2	4	E	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.15	≤ 27.0% RTP
3.	Power Range Neutron Flux-High Positive Rate	1,2	4	E	SR 3.3.1.7 SR 3.3.1.11	≤ 6.2% RTP with time constant ≥ 2 sec
4.	Intermediate Range Neutron Flux	1[b], 2[c]	2	F,G	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 30.0% RTP
5.	Source Range Neutron Flux	2[d]	2	H,I	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.15	≤ 1.42 E5 cps
		3[a], 4[a], 5[a]	2	I,J	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.15	≤ 1.42 E5 cps

(continued)

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(b) Below the P-10 (Power Range Neutron Flux) interlock.

(c) Above the P-6 (Source Range Block Permissive) interlock.

(d) Below the P-6 (Source Range Block Permissive) interlock.

Table 3.3.1-1 (page 2 of 6)
Reactor Trip System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
6.	Overtemperature ΔT	1,2	4	E	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	Refer to Note 1
7.	Overpower ΔT	1,2	4	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	Refer to Note 2
8.	Pressurizer Pressure					
	a. Low	1[e]	4	K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≥ 1875 psig
	b. High	1,2	4	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≤ 2393 psig
9.	Pressurizer Water Level-High	1[e]	3	K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≤ 93.5% of instrument span
10.	Reactor Coolant Flow-Low (per loop)	1[e]	3	K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≥ 89.3% of loop minimum measured flow
11.	Reactor Coolant Pump (RCP) Breaker Position (per train)	1[e]	4	R	SR 3.3.1.13	NA

(continued)

(e) Above the P-7 (Low Power Reactor Trips Block) interlock.

Table 3.3.1-1 (page 3 of 6)
Reactor Trip System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
12.	Undervoltage RCPs (per train)	1[e]	4	K	SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.15	≥ 4920 V
13.	Underfrequency RCPs (per train)	1[e]	4	K	SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.15	≥ 56.08 Hz
14.	Steam Generator (SG) Water Level-Low Low (per SG)					
	a. Unit 1	1,2	4	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≥ 16.1% of narrow range instrument span
	b. Unit 2	1,2	4	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≥ 34.8% of narrow range instrument span
15.	Turbine Trip					
	a. Emergency Trip Header Pressure (per train)	1[f]	3	L	SR 3.3.1.10 SR 3.3.1.14	≥ 910 psig
	b. Turbine Throttle Valve Closure (per train)	1[f]	4	L	SR 3.3.1.10 SR 3.3.1.14	≥ 1% open
16.	Safety Injection (SI) Input from Engineered Safety Feature Actuation System (ESFAS)	1,2	2 trains	M	SR 3.3.1.13	NA

(continued)

(e) Above the P-7 (Low Power Reactor Trips Block) interlock.

(f) Above the P-8 (Power Range Neutron Flux) interlock.

Table 3.3.1-1 (page 4 of 6)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
17. Reactor Trip System Interlocks					
a. Source Range Block Permissive, P-6	2[d]	2	O	SR 3.3.1.11 SR 3.3.1.12	≥ 6E-11 amp
b. Low Power Reactor Trips Block, P-7					
(1) P-10 Input	1	3	P	SR 3.3.1.11 SR 3.3.1.12	NA
(2) P-13 Input	1	2	P	SR 3.3.1.10 SR 3.3.1.12	NA
c. Power Range Neutron Flux, P-8	1	3	P	SR 3.3.1.11 SR 3.3.1.12	≤ 32.1% RTP
d. Power Range Neutron Flux, P-10	1,2	3	O	SR 3.3.1.11 SR 3.3.1.12	≥ 7.9% RTP and ≤ 12.1% RTP
e. Turbine Impulse Pressure, P-13	1	2	P	SR 3.3.1.10 SR 3.3.1.12	≤ 12.1% turbine power
18. Reactor Trip Breakers (RTBs)[g]	1,2	2 trains	N	SR 3.3.1.4	NA
	3[a], 4[a], 5[a]	2 trains	C	SR 3.3.1.4	NA
19. Reactor Trip Breaker Undervoltage and Shunt Trip Mechanisms	1,2	1 each per RTB	Q	SR 3.3.1.4	NA
	3[a], 4[a], 5[a]	1 each per RTB	C	SR 3.3.1.4	NA
20. Automatic Trip Logic	1,2	2 trains	M	SR 3.3.1.5	NA
	3[a], 4[a], 5[a]	2 trains	C	SR 3.3.1.5	NA

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(d) Below the P-6 (Source Range Block Permissive) interlock.

(g) Including any reactor trip bypass breakers that are racked in and closed for bypassing an RTB.

Table 3.3.1-1 (page 5 of 6)
Reactor Trip System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following Trip Setpoint by more than 1.04% of ΔT span.

$$\Delta T \frac{(1+\tau_1 s)}{(1+\tau_2 s)} \left[\frac{1}{1+\tau_3 s}\right] \leq \Delta T_0 \left\{K_1 - K_2 \frac{(1+\tau_4 s)}{(1+\tau_5 s)} \left[T \frac{1}{(1+\tau_6 s)} - T'\right] + K_3 (P - P') - f_1(\Delta I)\right\}$$

Where: ΔT is measured Reactor Coolant System (RCS) ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the nominal T_{avg} at RTP, ≤ *.

P is the measured pressurizer pressure, psig.
P' is the nominal RCS operating pressure, = *.

K_1 = * K_2 = * K_3 = *
τ_1 = * τ_2 = * τ_3 ≤ *
τ_4 = * τ_5 = * τ_6 ≤ *

$f_1(\Delta I)$ = *{* + ($q_t - q_b$)} when $q_t - q_b$ < * RTP
0% of RTP when * RTP ≤ $q_t - q_b$ ≤ * RTP
*{($q_t - q_b$) − *} when $q_t - q_b$ > * RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

* As specified in the COLR.

Table 3.3.1-1 (page 6 of 6)
Reactor Trip System Instrumentation

Note 2: Overpower ΔT

The Overpower ΔT Function Allowable Value shall not exceed the following Trip Setpoint by more than 3.60% of ΔT span.

$$\Delta T \frac{(1+\tau_1 s)}{(1+\tau_2 s)}\left(\frac{1}{1+\tau_3 s}\right) \leq \Delta T_0 \left\{K_4 - K_5 \frac{\tau_7 s}{1+\tau_7 s}\left(\frac{1}{1+\tau_6 s}\right) T - K_6\left[T \frac{1}{1+\tau_6 s} - T''\right] - f_2(\Delta I)\right\}$$

Where: ΔT is measured RCS ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T'' is the nominal T_{avg} at RTP, ≤ *.

K_4 = *
K_5 = * for increasing T_{avg}
* for decreasing T_{avg}
K_6 = * when T > T"
* when T ≤ T"

τ_1 = *
τ_2 = *
$\tau_3 \leq$ *
$\tau_6 \leq$ *
τ_7 = *

$f_2(\Delta I)$ = *

* As specified in the COLR.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One train inoperable.	C.1 --------NOTE-------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ---------- Restore train to OPERABLE status.	24 hours
	OR	
	C.2.1 Be in MODE 3.	30 hours
	AND	
	C.2.2 Be in MODE 5.	60 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. One channel inoperable.	D.1	--------NOTES-------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
		Place channel in trip.	72 hours
	OR		
	D.2.1	Be in MODE 3.	78 hours
	AND		
	D.2.2	Be in MODE 4.	84 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
E. One Containment Pressure channel inoperable.	E.1	--------NOTE-------- One additional channel may be bypassed for up to 12 hours for surveillance testing. ----------	
		Place channel in bypass.	72 hours
	OR		
	E.2.1	Be in MODE 3.	78 hours
	AND		
	E.2.2	Be in MODE 4.	84 hours
F. One channel or train inoperable.	F.1	Restore channel or train to OPERABLE status.	48 hours
	OR		
	F.2.1	Be in MODE 3.	54 hours
	AND		
	F.2.2	Be in MODE 4.	60 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
G. One train inoperable.	G.1	--------NOTE-------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ----------	
		Restore train to OPERABLE status.	24 hours
	OR		
	G.2.1	Be in MODE 3.	30 hours
	AND		
	G.2.2	Be in MODE 4.	36 hours
H. One channel inoperable.	H.1	--------NOTE-------- One channel may be bypassed for up to 2 hours for surveillance testing provided the other channel is OPERABLE. ----------	
		Place channel in trip.	1 hour
	OR		
	H.2.1	Be in MODE 3.	7 hours
	AND		
	H.2.2	Be in MODE 4.	13 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
I. One channel inoperable.	I.1	--------NOTE-------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
		Place channel in trip.	72 hours
	OR		
	I.2	Be in MODE 3.	78 hours
J. One or more trains inoperable.	J.1	Declare associated auxiliary feedwater pump inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
K. One channel inoperable.	K.1	---------NOTES------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
		Place channel in trip.	72 hours
	OR		
	K.2.1	Be in MODE 3.	78 hours
	AND		
	K.2.2	Be in MODE 5.	108 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
L. One or more channels inoperable.	L.1 Verify interlock is in required state for existing unit condition.	1 hour
	OR	
	L.2.1 Be in MODE 3.	7 hours
	AND	
	L.2.2 Be in MODE 4.	13 hours

SURVEILLANCE REQUIREMENTS

----------NOTE----------
Refer to Table 3.3.2-1 to determine which SRs apply for each ESFAS Function.

SURVEILLANCE	FREQUENCY
SR 3.3.2.1 Perform CHANNEL CHECK.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.2 Perform COT.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.2.3	----------NOTE---------- Verification of relay setpoints not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.4	Perform ACTUATION LOGIC TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.5	Perform MASTER RELAY TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.6	Perform COT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.7	----------NOTE---------- Verification of relay setpoints not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.2.8	Perform SLAVE RELAY TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.9	----------NOTE---------- Verification of setpoint not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.10	----------NOTE---------- This Surveillance shall include verification that the time constants are adjusted to the prescribed values. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.11	Verify ESFAS RESPONSE TIMES are within limit.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.12	Verify ESFAS RESPONSE TIMES are within limit.	In accordance with the Surveillance Frequency Control Program

Table 3.3.2-1 (page 1 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Safety Injection					
a. Manual Initiation	1,2,3,4	2	B	SR 3.3.2.9	NA
b. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
c. Containment Pressure-High 1	1,2,3	3	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 4.6 psig
d. Pressurizer Pressure-Low	1,2,3[a]	4	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 1817 psig
e. Steam Line Pressure-Low	1,2,3[a]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 614 psig[b]
2. Containment Spray					
a. Manual Initiation	1,2,3,4	2	B	SR 3.3.2.9	NA
b. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
c. Containment Pressure High-3	1,2,3	4	E	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 21.2 psig

(continued)

(a) Above the P-11 (Pressurizer Pressure) interlock.

(b) Time constants used in the lead/lag controller are $t_1 \geq 50$ seconds and $t_2 \leq 5$ seconds.

Table 3.3.2-1 (page 2 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. Containment Isolation					
a. Phase A Isolation					
(1) Manual Initiation	1,2,3,4	2	B	SR 3.3.2.9	NA
(2) Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
(3) Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.				
b. Phase B Isolation					
(1) Manual Initiation	1,2,3,4	2	B	SR 3.3.2.9	NA
(2) Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
(3) Containment Pressure High-3	1,2,3	4	E	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 21.2 psig

(continued)

Table 3.3.2-1 (page 3 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. Steam Line Isolation					
a. Manual Initiation	1,2[c],3[c]	2	F	SR 3.3.2.9	NA
b. Automatic Actuation Logic and Actuation Relays	1,2[g],3[g]	2 trains	G	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
c. Containment Pressure-High 2	1,2[g],3[g]	3	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 9.4 psig
d. Steam Line Pressure					
(1) Low	1,2[g],3[a][f][g]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 614 psig[b]
(2) Negative Rate-High	3[d][g]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 165.3 psi[e]

(continued)

(a) Above the P-11 (Pressurizer Pressure) interlock.

(b) Time constants used in the lead/lag controller are $t_1 \geq 50$ seconds and $t_2 \leq 5$ seconds.

(c) Except when all Main Steam Isolation Valves (MSIVs) are closed.

(d) Below the P-11 (Pressurizer Pressure) interlock with Function 4.d.1 blocked.

(e) Time constant utilized in the rate/lag controller is ≥ 50 seconds.

(f) Below the P-11 (Pressurizer Pressure) interlock with Function 4.d.2 not enabled.

(g) Except when all Main Steam Isolation Valves (MSIVs) and MSIV bypass valves are closed.

Table 3.3.2-1 (page 4 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. Turbine Trip and Feedwater Isolation					
a. Automatic Actuation Logic and Actuation Relays	1,2(h),3(h)	2 trains	G	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
b. Steam Generator (SG) Water Level-High High (P-14)					
1) Unit 1	1,2(h),3(h)	4 per SG	D	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6 SR 3.3.2.8 SR 3.3.2.10 SR 3.3.2.12	≤ 89.9% of narrow range instrument span
2) Unit 2	1,2(h),3(h)	4 per SG	D	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6 SR 3.3.2.8 SR 3.3.2.10 SR 3.3.2.12	≤ 81.5% of narrow range instrument span
c. Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.				

(continued)

(h) Except when all Feedwater Isolation Valves are closed or isolated by a closed manual valve.

Table 3.3.2-1 (page 5 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
6. Auxiliary Feedwater					
a. Automatic Actuation Logic and Actuation Relays	1,2,3	2 trains	G	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
b. SG Water Level-Low Low					
1) Unit 1	1,2,3	4 per SG	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 16.1% of narrow range instrument span
2) Unit 2	1,2,3	4 per SG	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 34.8% of narrow range instrument span
c. Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.				
d. Loss of Offsite Power (Undervoltage on Bus 141(241))	1,2,3	2	H	SR 3.3.2.3 SR 3.3.2.10 SR 3.3.2.11	≥ 2730 V
e. Undervoltage Reactor Coolant Pump (per train)	1,2	4	I	SR 3.3.2.7 SR 3.3.2.10 SR 3.3.2.12	≥ 4920 V
f. Auxiliary Feedwater Pump Suction Transfer on Suction Pressure-Low	1,2,3	1 per train	J	SR 3.3.2.1 SR 3.3.2.2 SR 3.3.2.10	≥ 17.4 psia
7. Switchover to Containment Sump					
a. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
b. Refueling Water Storage Tank (RWST) Level-Low Low	1,2,3,4	4	K	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 44.7% of instrument span
Coincident with Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.				

(continued)

Table 3.3.2-1 (page 6 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. ESFAS Interlocks					
a. Reactor Trip, P-4	1,2,3	2 per train	F	SR 3.3.2.9	NA
b. Pressurizer Pressure, P-11	1,2,3	2	L	SR 3.3.2.6 SR 3.3.2.10	≤ 1936 psig
c. T_{avg}-Low Low, P-12	1,2,3	3	L	SR 3.3.2.6 SR 3.3.2.10	≥ 548.0°F

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. 176
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 March 14, 2011, as supplemented by letters dated September 2, 2011, and November 18, 2011, 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.

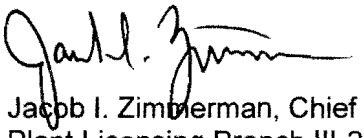
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-37 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 176 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 within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Jacob I. Zimmerman, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications and Facility Operating License

Date of Issuance: March 30, 2012

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. 176
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 March 14, 2011 as supplemented by letters dated September 2, 2011, and November 18, 2011, 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.

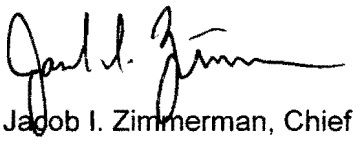
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-66 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A (NUREG-1113), as revised through Amendment No. 176 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 within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Jacob I. Zimmerman, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications and Facility Operating License

Date of Issuance: March 30, 2012

ATTACHMENT TO LICENSE AMENDMENT NOS. 176 AND 176

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

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

Replace the following pages of the Facility Operating License and Appendix A Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
License NPF-37 Page 3	License NPF-37 Page 3
License NPF-66 Page 3	License NPF-66 Page 3
TSs 3.3.1 – 2 through 3.3.1 – 20 3.3.2 – 2 through 3.3.2 – 16	TSs 3.3.1 - 2 through 3.3.1 - 20 3.3.2 – 2 through 3.3.2 – 16

(4) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(5) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulation set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at reactor core power levels not in excess of 3586.6 megawatts thermal (100 percent power) in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 176, 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) Deleted.

(4) Deleted.

(5) Deleted.

(6) The licensee shall implement and maintain in effect all provisions of the approved fire protection program as described in the licensee's Fire Protection Report, and as approved in the SER dated February 1987 through Supplement No. 8, subject to the following provision:

The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One channel or train inoperable.	----------NOTE---------- While this LCO is not met for Function 18, 19, or 20 in MODE 5, making the Rod Control System capable of rod withdrawal is not permitted. ----------	
	C.1 Restore channel or train to OPERABLE status.	48 hours
	OR	
	C.2.1 Initiate action to fully insert all rods.	48 hours
	AND	
	C.2.2 Place the Rod Control System in a condition incapable of rod withdrawal.	49 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One Power Range Neutron Flux-High channel inoperable.	----------NOTES---------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment of other channels. ----------	
	D.1 Place channel in trip.	72 hours
	OR	
	D.2 Be in MODE 3.	78 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One channel inoperable.	----------NOTES---------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	E.1 Place channel in trip.	72 hours
	OR	
	E.2 Be in MODE 3.	78 hours
F. One Intermediate Range Neutron Flux channel inoperable.	F.1 Reduce THERMAL POWER to < P-6.	2 hours
	OR	
	F.2 Increase THERMAL POWER to > P-10.	2 hours
G. Two Intermediate Range Neutron Flux channels inoperable.	G.1 Suspend operations involving positive reactivity additions.	Immediately
	AND	
	G.2 Reduce THERMAL POWER to < P-6.	2 hours
H. One Source Range Neutron Flux channel inoperable.	H.1 Suspend operations involving positive reactivity additions.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
I. Two Source Range Neutron Flux channels inoperable.	I.1 Open Reactor Trip Breakers (RTBs).	Immediately
J. One Source Range Neutron Flux channel inoperable.	J.1 Restore channel to OPERABLE status. OR J.2.1 Initiate action to fully insert all rods. AND J.2.2 Place the Rod Control System in a condition incapable of rod withdrawal.	48 hours 48 hours 49 hours
K. One channel inoperable.	----------NOTES---------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ---------- K.1 Place channel in trip. OR K.2 Reduce THERMAL POWER to < P-7.	 72 hours 78 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
L. One Turbine Trip channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	L.1 Place channel in trip.	72 hours
	OR	
	L.2 Reduce THERMAL POWER to < P-8.	78 hours
M. One train inoperable.	----------NOTE---------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ----------	
	M.1 Restore train to OPERABLE status.	24 hours
	OR	
	M.2 Be in MODE 3.	30 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
N. One RTB train inoperable.	----------NOTE---------- One train may be bypassed for up to 4 hours for surveillance testing, provided the other train is OPERABLE. ----------	
	N.1 Restore train to OPERABLE status.	24 hour
	OR	
	N.2 Be in MODE 3.	30 hours
O. One or more channels inoperable.	O.1 Verify interlock is in required state for existing unit conditions.	1 hour
	OR	
	O.2 Be in MODE 3.	7 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
P. One or more channels inoperable.	P.1 Verify interlock is in required state for existing unit conditions. OR P.2 Be in MODE 2.	1 hour 7 hours
Q. One trip mechanism inoperable for one RTB.	Q.1 Restore inoperable trip mechanism to OPERABLE status. OR Q.2 Be in MODE 3.	48 hours 54 hours
R. One Reactor Coolant Pump (RCP) Breaker Position channel(per train) inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels. ---------- R.1 Place channel in trip. OR R.2 Reduce THERMAL POWER to < P-7.	 6 hours 12 hours

SURVEILLANCE REQUIREMENTS

----------NOTE----------
Refer to Table 3.3.1-1 to determine which SRs apply for each RTS Function.

	SURVEILLANCE	FREQUENCY
SR 3.3.1.1	Perform CHANNEL CHECK.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.2	----------NOTES---------- 1. Adjust NIS channel if absolute difference is > 2%. 2. Not required to be performed until 12 hours after THERMAL POWER is ≥ 15% RTP. --- Compare results of calorimetric heat balance calculation to Nuclear Instrumentation System (NIS) channel output.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.3	----------NOTES---------- 1. Adjust NIS channel if absolute difference is ≥ 3%. 2. Only required to be performed with THERMAL POWER > 15% RTP. ----------	
	Compare results of the incore measurements to NIS AFD.	Prior to exceeding 75% RTP after each refueling AND In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.4	----------NOTE---------- This Surveillance must be performed on the RTBB prior to placing the bypass breaker in service. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.5	Perform ACTUATION LOGIC TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.6	----------NOTE---------- Not required to be performed until 24 hours after THERMAL POWER is ≥ 75% RTP. ---------- Calibrate excore channels to agree with incore measurements.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.7	----------NOTE---------- Not required to be performed until for source range instrumentation prior to entering MODE 3 from MODE 2 until 4 hours after entry into MODE 3 ---------- Perform COT.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.8	----------NOTE---------- This Surveillance shall include verification that interlocks P-6 and P-10 are in their required state for existing unit conditions. ----------	
	Perform COT.	-----NOTE---- Only required when not performed within the Frequency specified in the Surveillance Frequency Control Program ---------- Prior to reactor startup AND Four hours after reducing power below P-10 for power and intermediate instrumentation AND Four hours after reducing power below P-6 for source range instrumentation AND In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.9	----------NOTE---------- Verification of setpoint is not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.10	----------NOTE---------- This Surveillance shall include verification that the time constants are adjusted to the prescribed values. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.11	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.12	Perform COT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.13	----------NOTE---------- Verification of setpoint is not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.1.14	----------NOTE---------- Verification of setpoint is not required. ---------- Perform TADOT.	-----NOTE----- Only required when not performed within previous 31 days ---------- Prior to reactor startup
SR 3.3.1.15	----------NOTE---------- Neutron detectors are excluded from response time testing. ---------- Verify RTS RESPONSE TIME is within limits.	In accordance with the Surveillance Frequency Control Program

Table 3.3.1-1 (page 1 of 6)
Reactor Trip System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1.	Manual Reactor Trip	1,2	2	B	SR 3.3.1.13	NA
		3[a], 4[a], 5[a]	2	C	SR 3.3.1.13	NA
2.	Power Range Neutron Flux					
	a. High	1,2	4	D	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.15	≤ 110.8% RTP
	b. Low	1[b],2	4	E	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.15	≤ 27.0% RTP
3.	Power Range Neutron Flux-High Positive Rate	1,2	4	E	SR 3.3.1.7 SR 3.3.1.11	≤ 6.2% RTP with time constant ≥ 2 sec
4.	Intermediate Range Neutron Flux	1[b], 2[c]	2	F,G	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 30.0% RTP
5.	Source Range Neutron Flux	2[d]	2	H,I	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.15	≤ 1.42 E5 cps
		3[a], 4[a], 5[a]	2	I,J	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.15	≤ 1.42 E5 cps

(continued)

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(b) Below the P-10 (Power Range Neutron Flux) interlock.

(c) Above the P-6 (Source Range Block Permissive) interlock.

(d) Below the P-6 (Source Range Block Permissive) interlock.

Table 3.3.1-1 (page 2 of 6)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
6. Overtemperature ΔT	1,2	4	E	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	Refer to Note 1
7. Overpower ΔT	1,2	4	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	Refer to Note 2
8. Pressurizer Pressure					
a. Low	1(e)	4	K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≥ 1875 psig
b. High	1,2	4	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≤ 2393 psig
9. Pressurizer Water Level-High	1(e)	3	K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≤ 93.5% of instrument span
10. Reactor Coolant Flow-Low (per loop)	1(e)	3	K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≥ 89.3% of loop minimum measured flow
11. Reactor Coolant Pump (RCP) Breaker Position (per train)	1(e)	4	R	SR 3.3.1.13	NA

(continued)

(e) Above the P-7 (Low Power Reactor Trips Block) interlock.

Table 3.3.1-1 (page 3 of 6)
Reactor Trip System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
12.	Undervoltage RCPs (per train)	1[e]	4	K	SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.15	≥ 4920 V
13.	Underfrequency RCPs (per train)	1[e]	4	K	SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.15	≥ 56.08 Hz
14.	Steam Generator (SG) Water Level-Low Low (per SG)					
	a. Unit 1	1,2	4	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≥ 16.1% of narrow range instrument span
	b. Unit 2	1,2	4	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.15	≥ 34.8% of narrow range instrument span
15.	Turbine Trip					
	a. Emergency Trip Header Pressure (per train)	1[f]	3	L	SR 3.3.1.10 SR 3.3.1.14	≥ 910 psig
	b. Turbine Throttle Valve Closure (per train)	1[f]	4	L	SR 3.3.1.10 SR 3.3.1.14	≥ 1% open
16.	Safety Injection (SI) Input from Engineered Safety Feature Actuation System (ESFAS)	1,2	2 trains	M	SR 3.3.1.13	NA

(continued)

(e) Above the P-7 (Low Power Reactor Trips Block) interlock.

(f) Above the P-8 (Power Range Neutron Flux) interlock.

Table 3.3.1-1 (page 4 of 6)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
17. Reactor Trip System Interlocks					
a. Source Range Block Permissive, P-6	2(d)	2	O	SR 3.3.1.11 SR 3.3.1.12	≥ 6E-11 amp
b. Low Power Reactor Trips Block, P-7					
(1) P-10 Input	1	3	P	SR 3.3.1.11 SR 3.3.1.12	NA
(2) P-13 Input	1	2	P	SR 3.3.1.10 SR 3.3.1.12	NA
c. Power Range Neutron Flux, P-8	1	3	P	SR 3.3.1.11 SR 3.3.1.12	≤ 32.1% RTP
d. Power Range Neutron Flux, P-10	1,2	3	O	SR 3.3.1.11 SR 3.3.1.12	≥ 7.9% RTP and ≤ 12.1% RTP
e. Turbine Impulse Pressure, P-13	1	2	P	SR 3.3.1.10 SR 3.3.1.12	≤ 12.1% turbine power
18. Reactor Trip Breakers (RTBs)(g)	1,2	2 trains	N	SR 3.3.1.4	NA
	3(a), 4(a), 5(a)	2 trains	C	SR 3.3.1.4	NA
19. Reactor Trip Breaker Undervoltage and Shunt Trip Mechanisms	1,2	1 each per RTB	Q	SR 3.3.1.4	NA
	3(a), 4(a), 5(a)	1 each per RTB	C	SR 3.3.1.4	NA
20. Automatic Trip Logic	1,2	2 trains	M	SR 3.3.1.5	NA
	3(a), 4(a), 5(a)	2 trains	C	SR 3.3.1.5	NA

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(d) Below the P-6 (Source Range Block Permissive) interlock.

(g) Including any reactor trip bypass breakers that are racked in and closed for bypassing an RTB.

Table 3.3.1-1 (page 5 of 6)
Reactor Trip System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following Trip Setpoint by more than 1.04% of ΔT span.

$$\Delta T \frac{(1+\tau_1 s)}{(1+\tau_2 s)}\left[\frac{1}{1+\tau_3 s}\right] \leq \Delta T_0 \left\{K_1 - K_2 \frac{(1+\tau_4 s)}{(1+\tau_5 s)}\left[T \frac{1}{(1+\tau_6 s)} - T'\right] + K_3 (P - P') - f_1(\Delta I)\right\}$$

Where: ΔT is measured Reactor Coolant System (RCS) ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the nominal T_{avg} at RTP, ≤ *.

P is the measured pressurizer pressure, psig.
P' is the nominal RCS operating pressure, = *.

K_1 = * K_2 = * K_3 = *
τ_1 = * τ_2 = * τ_3 ≤ *
τ_4 = * τ_5 = * τ_6 ≤ *

$f_1(\Delta I)$ = *{* + ($q_t - q_b$)} when $q_t - q_b$ < * RTP
0% of RTP when * RTP ≤ $q_t - q_b$ ≤ * RTP
*{($q_t - q_b$) − *} when $q_t - q_b$ > * RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

* As specified in the COLR.

Table 3.3.1-1 (page 6 of 6)
Reactor Trip System Instrumentation

Note 2: Overpower ΔT

The Overpower ΔT Function Allowable Value shall not exceed the following Trip Setpoint by more than 3.60% of ΔT span.

$$\Delta T \frac{(1+\tau_1 s)}{(1+\tau_2 s)} \left(\frac{1}{1+\tau_3 s}\right) \leq \Delta T_0 \left\{K_4 - K_5 \frac{\tau_7 s}{1+\tau_7 s} \left(\frac{1}{1+\tau_6 s}\right) T - K_6 \left[T \frac{1}{1+\tau_6 s} - T''\right] - f_2(\Delta I)\right\}$$

Where: ΔT is measured RCS ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T'' is the nominal T_{avg} at RTP, ≤ *.

K_4 = * K_5 = * for increasing T_{avg}; * for decreasing T_{avg} K_6 = * when T > T"; * when T ≤ T"

τ_1 = * τ_2 = * τ_3 ≤ *
τ_6 ≤ * τ_7 = *

$f_2(\Delta I)$ = *

* As specified in the COLR.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One train inoperable.	C.1	--------NOTE-------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ----------	
		Restore train to OPERABLE status.	24 hours
	OR		
	C.2.1	Be in MODE 3.	30 hours
	AND		
	C.2.2	Be in MODE 5.	60 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One channel inoperable.	D.1 --------NOTES-------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ---------- Place channel in trip.	72 hours
	OR	
	D.2.1 Be in MODE 3.	78 hours
	AND	
	D.2.2 Be in MODE 4.	84 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
E. One Containment Pressure channel inoperable.	E.1	--------NOTE-------- One additional channel may be bypassed for up to 12 hours for surveillance testing. ----------	
		Place channel in bypass.	72 hours
	OR		
	E.2.1	Be in MODE 3.	78 hours
	AND		
	E.2.2	Be in MODE 4.	84 hours
F. One channel or train inoperable.	F.1	Restore channel or train to OPERABLE status.	48 hours
	OR		
	F.2.1	Be in MODE 3.	54 hours
	AND		
	F.2.2	Be in MODE 4.	60 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
G. One train inoperable.	G.1	--------NOTE-------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ----------	
		Restore train to OPERABLE status.	24 hours
	OR		
	G.2.1	Be in MODE 3.	30 hours
	AND		
	G.2.2	Be in MODE 4.	36 hours
H. One channel inoperable.	H.1	--------NOTE-------- One channel may be bypassed for up to 2 hours for surveillance testing provided the other channel is OPERABLE. ----------	
		Place channel in trip.	1 hour
	OR		
	H.2.1	Be in MODE 3.	7 hours
	AND		
	H.2.2	Be in MODE 4.	13 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
I. One channel inoperable.	I.1	--------NOTE-------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
		Place channel in trip.	72 hours
	OR		
	I.2	Be in MODE 3.	78 hours
J. One or more trains inoperable.	J.1	Declare associated auxiliary feedwater pump inoperable.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
K. One channel inoperable.	K.1 --------NOTES-------- 1. For Functions with installed bypass test capability, one channel may be bypassed for up to 12 hours for surveillance testing. 2. For Functions with no installed bypass test capability, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ---------- Place channel in trip.	72 hours
	OR	
	K.2.1 Be in MODE 3.	78 hours
	AND	
	K.2.2 Be in MODE 5.	108 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
L. One or more channels inoperable.	L.1 Verify interlock is in required state for existing unit condition. OR L.2.1 Be in MODE 3. AND L.2.2 Be in MODE 4.	1 hour 7 hours 13 hours

SURVEILLANCE REQUIREMENTS

----------NOTE----------
Refer to Table 3.3.2-1 to determine which SRs apply for each ESFAS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.2.1	Perform CHANNEL CHECK.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.2	Perform COT.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.2.3	----------NOTE---------- Verification of relay setpoints not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.4	Perform ACTUATION LOGIC TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.5	Perform MASTER RELAY TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.6	Perform COT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.7	----------NOTE---------- Verification of relay setpoints not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.2.8	Perform SLAVE RELAY TEST.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.9	----------NOTE---------- Verification of setpoint not required. ---------- Perform TADOT.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.10	----------NOTE---------- This Surveillance shall include verification that the time constants are adjusted to the prescribed values. ---------- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.11	Verify ESFAS RESPONSE TIMES are within limit.	In accordance with the Surveillance Frequency Control Program
SR 3.3.2.12	Verify ESFAS RESPONSE TIMES are within limit.	In accordance with the Surveillance Frequency Control Program

Table 3.3.2-1 (page 1 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Safety Injection					
a. Manual Initiation	1,2,3,4	2	B	SR 3.3.2.9	NA
b. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
c. Containment Pressure-High 1	1,2,3	3	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 4.6 psig
d. Pressurizer Pressure-Low	1,2,3[a]	4	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 1817 psig
e. Steam Line Pressure-Low	1,2,3[a]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 614 psig[b]
2. Containment Spray					
a. Manual Initiation	1,2,3,4	2	B	SR 3.3.2.9	NA
b. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
c. Containment Pressure High-3	1,2,3	4	E	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 21.2 psig

(continued)

(a) Above the P-11 (Pressurizer Pressure) interlock.

(b) Time constants used in the lead/lag controller are $t_1 \geq 50$ seconds and $t_2 \leq 5$ seconds.

Table 3.3.2-1 (page 2 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. Containment Isolation					
a. Phase A Isolation					
(1) Manual Initiation	1,2,3,4	2	B	SR 3.3.2.9	NA
(2) Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
(3) Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.				
b. Phase B Isolation					
(1) Manual Initiation	1,2,3,4	2	B	SR 3.3.2.9	NA
(2) Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
(3) Containment Pressure High-3	1,2,3	4	E	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 21.2 psig

(continued)

Table 3.3.2-1 (page 3 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. Steam Line Isolation					
a. Manual Initiation	1,2[c],3[c]	2	F	SR 3.3.2.9	NA
b. Automatic Actuation Logic and Actuation Relays	1,2[g],3[g]	2 trains	G	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
c. Containment Pressure-High 2	1,2[g],3[g]	3	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 9.4 psig
d. Steam Line Pressure					
(1) Low	1,2[g],3[a][f][g]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 614 psig[b]
(2) Negative Rate-High	3[d][g]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≤ 165.3 psi[e]

(continued)

(a) Above the P-11 (Pressurizer Pressure) interlock.

(b) Time constants used in the lead/lag controller are $t_1 \geq 50$ seconds and $t_2 \leq 5$ seconds.

(c) Except when all Main Steam Isolation Valves (MSIVs) are closed.

(d) Below the P-11 (Pressurizer Pressure) interlock with Function 4.d.1 blocked.

(e) Time constant utilized in the rate/lag controller is ≥ 50 seconds.

(f) Below the P-11 (Pressurizer Pressure) interlock with Function 4.d.2 not enabled.

(g) Except when all Main Steam Isolation Valves (MSIVs) and MSIV bypass valves are closed.

Table 3.3.2-1 (page 4 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. Turbine Trip and Feedwater Isolation					
a. Automatic Actuation Logic and Actuation Relays	1,2(h),3(h)	2 trains	G	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
b. Steam Generator (SG) Water Level-High High (P-14)					
1) Unit 1	1,2(h),3(h)	4 per SG	D	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6 SR 3.3.2.8 SR 3.3.2.10 SR 3.3.2.12	≤ 89.9% of narrow range instrument span
2) Unit 2	1,2(h),3(h)	4 per SG	D	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6 SR 3.3.2.8 SR 3.3.2.10 SR 3.3.2.12	≤ 81.5% of narrow range instrument span
c. Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.				

(continued)

(h) Except when all Feedwater Isolation Valves are closed or isolated by a closed manual valve.

Table 3.3.2-1 (page 5 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
6. Auxiliary Feedwater					
a. Automatic Actuation Logic and Actuation Relays	1,2,3	2 trains	G	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
b. SG Water Level-Low Low					
1) Unit 1	1,2,3	4 per SG	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 16.1% of narrow range instrument span
2) Unit 2	1,2,3	4 per SG	D	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 34.8% of narrow range instrument span
c. Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.				
d. Loss of Offsite Power (Undervoltage on Bus 141(241))	1,2,3	2	H	SR 3.3.2.3 SR 3.3.2.10 SR 3.3.2.11	≥ 2730 V
e. Undervoltage Reactor Coolant Pump (per train)	1,2	4	I	SR 3.3.2.7 SR 3.3.2.10 SR 3.3.2.12	≥ 4920 V
f. Auxiliary Feedwater Pump Suction Transfer on Suction Pressure-Low	1,2,3	1 per train	J	SR 3.3.2.1 SR 3.3.2.2 SR 3.3.2.10	≥ 17.4 psia
7. Switchover to Containment Sump					
a. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.8	NA
b. Refueling Water Storage Tank (RWST) Level-Low Low	1,2,3,4	4	K	SR 3.3.2.1 SR 3.3.2.6 SR 3.3.2.10 SR 3.3.2.12	≥ 44.7% of instrument span
Coincident with Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.				

(continued)

Table 3.3.2-1 (page 6 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. ESFAS Interlocks					
a. Reactor Trip, P-4	1,2,3	2 per train	F	SR 3.3.2.9	NA
b. Pressurizer Pressure, P-11	1,2,3	2	L	SR 3.3.2.6 SR 3.3.2.10	≤ 1936 psig
c. T_{avg}-Low Low, P-12	1,2,3	3	L	SR 3.3.2.6 SR 3.3.2.10	≥ 548.0°F

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 169 TO FACILITY OPERATING LICENSE NO. NPF-72,

AMENDMENT NO. 169 TO FACILITY OPERATING LICENSE NO. NPF-77,

AMENDMENT NO. 176 TO FACILITY OPERATING LICENSE NO. NPF-37,

AND AMENDMENT NO. 176 TO FACILITY OPERATING LICENSE NO. NPF-66

EXELON GENERATION COMPANY, LLC

BRAIDWOOD STATION, UNITS 1 AND 2

BYRON STATION, UNIT NOS. 1 AND 2

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

STN 50-454, AND STN 50-455,

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated March 14, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110760088), as supplemented by letter dated September 2, 2011 (ADAMS Accession No. ML11256A132), and letter dated November 18, 2011 (ADAMS Accession No. ML113220181), Exelon Generation Company, LLC (the licensee) requested a license amendment for Braidwood Station Units 1 and 2 (Braidwood) and Byron Station Units Nos. 1 and 2 (Bryon). The proposed amendment would revise certain Required Action Notes in the Braidwood and Byron Technical Specifications (TS) 3.3.1, Reactor Trip System (RTS) Instrumentation, and TS 3.3.2, Engineered Safety Features Actuation System (ESFAS) Instrumentation, to reflect installed bypass test capability. The changes to the Required Action Notes will reflect standard wording incorporated in NUREG 1431, Revision 3, "Standard Technical Specifications, Westinghouse Plants," for plants with installed bypass test capability.

The proposed change is needed to support utilization of bypass test capability which is planned to be installed to reduce the potential for unnecessary reactor trips or safeguards actuation due to a failure or transient in a redundant channel. To facilitate testing in bypass, the licensee proposes to implement certain design and hardware changes to the nuclear instrumentation system (NIS) and the 7300 process protection system (PPS). The licensee submitted the Westinghouse Electric Company, LLC (Westinghouse) plant specific report WCAP-17349-P, Revision 1, "Bypass Test Instrumentation for Byron and Braidwood, Units 1 and 2," February 2011 (Proprietary) to support this proposed change as one attachment to the license amendment request.

2.0 REGULATORY EVALUATION

The NRC staff considered the codes, criteria, and standards that follow to evaluate the usage of the bypass test capability to be installed at Braidwood and Byron.

- Title 10 of the *Code of Federal Regulations*, Part 50, Section 36 (10 CFR 50.36) requires that each license authorizing operation of a production or utilization facility to include TS. The TS are required to include surveillance requirements (SRs), which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met. This requested amendment changes the Required Action Notes to allow certain RTS and ESFAS instrumentation SRs to be performed without entering a TS Action statement.

- 10 CFR 50.55a(a)(1), requires that "Structures, systems, and components must be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety function to be performed."

- 10 CFR 50.55a(h)(2), provides that each licensee's protection system must meet the requirements stated in either Institute of Electrical and Electronics Engineer (IEEE) Standard 279, "Criteria for Protection Systems for Nuclear Power Generating Stations," or IEEE Standard 603-1991, "Criteria for Safety Systems for Nuclear Power Generating Stations," and the correction sheet dated January 30, 1995. For Byron and Braidwood, the protection systems are designed in accordance with the requirements of the proposed IEEE Standard 279-1971. The proposed installed bypass test capability is designed to meet the intent of that standard.

- 10 CFR 50, Appendix A, General Design Criteria for Nuclear Power Plants (GDC):

    - GDC 2, "Design bases for protection against natural phenomena."
    - GDC 19, "Control room."
    - GDC 20, "Protection system functions."
    - GDC 21, "Protection system reliability and testability."
    - GDC 22, "Protective system independence."
    - GDC 23, "Protection system failure modes."
    - GDC 24, "Separation of protection and control systems."

The following NRC Regulatory Guides (RG) are referenced in the Byron and Braidwood Updated Final Safety Analysis Report (UFSAR) and are applicable to the installation of the Bypass Test Instrumentation (BTI):

- RG 1.47 "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems," Revision 0, dated May 1973
- RG 1.53 "Application of the Single Failure-Criterion to Nuclear Power Plant Protection Systems," Revision 0, dated June 1973

- RG 1.75 "Physical Independence of Electric Systems," Revision 2, dated September 1978
- RG 1.89 "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," Revision 0, dated November 1974
- RG 1.100 "Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants", Revision 1, dated August 1977
- RG 1.118 "Periodic Testing of Electric Power and Protection Systems", Revision 3, dated April 1995

3.0 TECHNICAL EVALUATION

3.1 The Licensee's Proposed TS Changes

The licensee's proposed change will allow certain functions in the RTS and ESFAS instrumentation to be tested in bypass following implementation of the bypass test instrumentation modification. The licensee proposed to modify the following functions in the RTS and ESFAS instrumentation to have installed bypass capability and permit testing in bypass:

TS Section 3.3.1

Function 2	Power Range Neutron Flux
Function 3	Power Range Neutron Flux – High Positive Rate
Function 6	Overtemperature ΔT
Function 7	Overpower ΔT
Function 8	Pressurizer Pressure
Function 9	Pressurizer Water Level – High
Function 10	Reactor Coolant Flow – Low (per loop)
Function 14	Steam Generator Water Level – Low Low

TS Section 3.3.2

Function 1.c	Safety Injection – Containment Pressure – High 1
Function 1.d	Safety Injection – Pressurizer Pressure – Low
Function 1.e	Safety Injection – Steam Line Pressure – Low
Function 4.c	Steam Line Isolation – Containment Pressure – High 2
Function 4.d	Steam Line Isolation – Steam Line Pressure
Function 5.b	Turbine Trip and Feedwater Isolation – Steam Generator (SG) Water Level – High High (P-14)
Function 6.b	Auxiliary Feedwater – SG Water Level – Low Low
Function 7.b	Switchover to Containment Sump – Refueling Water Storage Tank (RWST) Level – Low Low

In addition, the licensee proposed to revise the Required Action Notes D, E, and K of TS 3.3.1 "RTS Instrumentation," and Required Action Notes D and K of TS 3.3.2 "ESFAS Instrumentation" for Braidwood and Byron. These revisions would allow the surveillance testing

(and setpoint adjustment) to be done in bypass with installed bypass capability, and are discussed in the following paragraphs.

TS 3.3.1, Condition D, Required Action Note would be changed. The current Required Action Note states, "The inoperable channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment of other channels." The new Required Action Note states, "One channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment."

TS 3.3.1, Condition E, Required Action Note would be changed. The current Required Action Note states, "The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels." The new Required Action Note states, "One channel may be bypassed for up to 12 hours for surveillance testing."

The Required Action Note for TS 3.3.1, Condition K would be changed to have two Required Action Notes. The current Required Action Note states, "The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels." A new Required Action Note 1, would be added that states, "For Functions with installed bypass test capability (Function 8a, 9, 10), one channel may be bypassed for up to 12 hours for surveillance testing." The current Required Action Note, to be made Required Action Note 2, would be changed to state, "For Functions with no installed bypass test capability (Functions 12 and 13), the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels."

The TS 3.3.2, Condition D, Required Action Note would be changed. The current Required Action Note states, "The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels." The new Required Action Note states, "One channel may be bypassed for up to 12 hours for surveillance testing."

The TS 3.3.2, Condition K, Required Action Note would be changed. The current Required Action Note states, "The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels." The new Required Action Note states, "One channel may be bypassed for up to 12 hours for surveillance testing."

3.2 Evaluation of WCAP-17349-P

The licensee will implement necessary hardware changes to the NIS and PPS to facilitate bypass testing under 10 CFR 50.59, which is not in the scope of this safety evaluation (SE). In order to use the bypass test capability planned to be installed, the licensee is required to revise the TS Table 3.3.1 and Table 3.3.2 Required Action Notes. Since this TS change is supported by WCAP-17349-P, Revision 1, the NRC staff has evaluated the regulatory compliance related to the usage of BTI within this plant-specific report as discussed below.

3.2.2 General Design Criteria (GDC)

The following sections discuss the NRC staff's review of the applicable GDCs for both Byron and Braidwood BTI:

3.2.2.1 GDC 2 – "Design Bases for Protection Against Natural Phenomena"

GDC 2 states in part, that, "Systems, structures, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions."

The licensee stated that the new BTI equipment to be installed in Class 1E instrumentation racks had been subjected to multi-axis, multi-frequency inputs in accordance with RG 1.100. The equipment was subjected to Westinghouse generic Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE) testing.

The NRC staff noted that BTI is being added to the process protection racks and the Class 1E NIS cabinets. Therefore, the BTI cannot adversely affect the already proven seismic qualification of the cabinets, nor can the BTI become a missile in a seismic event and adversely affect safety related equipment.

Therefore, the NRC staff finds that the BTI conforms to GDC 2.

3.2.2.2 GDC 19 – "Control Room"

GDC 19 states in part, that, "A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents"

The licensee stated that the BTI has been designed to meet this criterion by providing the operator as well as the test technician with accurate information concerning the status of the channels being tested. By the licensee's September 2, 2011, response to the NRC staff's request for additional information (RAI), the NRC staff noted that Main Control Room alarm/status light indicators and sequence of event recorder (SER) points are provided in the plants to ensure that the operator knows which protection set (a physical grouping of process channels with the same Class-1E electrical channel designation) channel instrumentation loops are in the bypass condition at all times.

Therefore, the NRC staff finds that the BTI conforms to GDC 19.

3.2.2.3 GDC 20 – "Protection System Functions"

GDC 20 states in part, that, "The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded..."

This criterion is applicable to the BTI of Byron and Braidwood because the protection system must still be able to perform its function after the installation of the BTI. The BTI are located in the cabinets where the protection channels are located. The NRC staff noted that no protection system signals pass through the BTI and it is not within the protection system circuitry when the BTI is not powered. The PPS utilizes the same type of hardware that was originally designed for

surveillance testing. The licensee stated that due to the design of the bypass systems and the location at which the bypass is initiated, the removal of the 7300 cards and removal of an entire NIS drawer is possible while in bypass. Thus, card and/or drawer repair can be done away from the cabinet without impact to the channel function.

The licensee stated that no additional actions are required to determine operability of the channel after removal of the bypassed condition. The NRC staff noted that automatic alarm/status light indicators, and SER points are provided in the Main Control Room to ensure that the operator knows which protection set channel instrumentation loops are in the bypass condition at all times. The NRC staff also noted that by observation of the local bypass or bypass panel status light the technician can verify that the bypass has been removed.

Therefore, the NRC staff finds that the BTI conforms to GDC 20.

3.2.2.4 GDC 21 – "Protection System Reliability and Testability"

GDC 21 states in part, that, "The protection system shall be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed. Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single failure results in loss of the protection function..."

The licensee stated that BTI components are of a quality consistent with minimum maintenance requirements and low failure rates. The quality of components used in the BTI is consistent with components used in the protection system. All of the components are mechanical or electro-mechanical and are reliable through at least 50,000 operations (based on manufacturers' reports) under normal operating conditions.

The NRC staff noted that power is provided to the NIS bypass circuit only when the circuit breaker is closed and the keylock switch is turned from "NORMAL" to "BYPASS ENABLE". Hence, no single failure could inadvertently provide power to the NIS bypass panel. The relay in the PPS energizes to enable a channel bypass. So the most common failure of an open coil would return the channel to normal operation because both NIS and PPS require power to bypass a RTS or an ESFAS function.

Any bypass system failures that would inadvertently cause the channel in bypass to trip are failures in a safe direction and, therefore, will not be discussed here. The licensee analyzed failures in the bypass systems that need to be addressed as those that could possibly:

1. Cause a channel to go into the bypass condition inadvertently.

2. Cause a channel to fail to come out of the bypass condition while indicating that it has.

The NRC staff noted that all of these types of failures could cause the same result. That is, the possibility could exist for more than one redundant protection set to be in bypass at the same time. For example, for a 2-out-of-3 logic circuit, with two channels bypassed, a reactor trip will not be generated. In response to NRC staff's RAI, the licensee's September 2, 2011 submittal provided schematic diagrams showing that it would require several contacts to spuriously close on the NIS bypass system to cause an inadvertent bypass. The RAI response also shows that

one contact spuriously changing state could cause an inadvertent bypass on the PPS, but this contact failure is easily observed with the associated light emitting diode (LED) not lit. For a channel to fail to come out of bypass while indicating that it has returned to normal, one contact would have to stick closed in the associated relay. The operator will know that the bypass still remains by observing the annunciator and SER point in the Main Control Room (MCR) when the loop remains in the bypass condition.

Since the failures discussed above would be detected by the indications in the MCR or by observation of the local bypass status lights, there is no credible single failure of the BTI that could result in the protection system being unable to perform its intended safety function. In addition, the licensee will apply administrative control over the distribution of the keys for the NIS panel and PPS cabinet doors as described in the next section.

Therefore, the NRC staff finds that the BTI conforms to GDC 21.

3.2.2.5 GDC 22 – "Protection System Independence"

GDC 22 states in part, that, "The protection system shall be designed to assure that the effects of natural phenomena and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis."

The bypass systems are located in the cabinets where the protection channels are located. So the test technician will be aware of those channels that are in bypass and those that are not, without having to depend on non-local indication.

The NRC staff noted that BTI design facilitates the use of administrative control to avoid putting more than one protection set in bypass at the same time. The NIS bypass panels are provided with keylock switches to provide control over placing any protection function in the bypass condition. The keylock switches are designed so that once a switch is placed in the "BYPASS ENABLE" condition the key cannot be removed from the lock unless the keylock switch is returned to the "NORMAL" position. The PPS bypass test function is only accessible through the protection set rack door which is equipped with a keylock.

The licensee's September 2, 2011 response to NRC staff RAI's shows that the NIS "BYPASS ENABLE" keylock switch and all bypass functions accessed through the toggle switches are each provided with an individual red LED. The "BYPASS ENABLE" LED will light when the keylock switch is turned from "NORMAL" to "BYPASS ENABLE." The "BYPASS" LEDs for both the NIS and PPS will change state when the toggle switch is moved to the "BYPASS" position. The NRC staff noted that BTI bypass systems also provides remote annunciation with associated audible alarm, status lights, and SER points to indicate bypass status to the MCR.

Therefore, the NRC staff finds that the BTI conforms to GDC 22.

3.2.2.6 GDC 23 – "Protection System Failure Modes"

GDC 23 states in part, that, "The protection system shall be designed to fail into a safe state... if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument

air) or postulated adverse environments (e.g., extreme heat or cold, fire, pressure, steam, water, and radiation) are experienced."

The NRC staff noted that either a circuit breaker opening or loss of power to the cabinet will cause the bypass system to terminate any bypassing that was being performed. The bypass systems will then return to their normal operating mode.

Therefore, the NRC staff finds that the BTI conforms to GDC 23.

3.2.2.7 GDC 24 – "Separation of Protection and Control Systems"

GDC 24 states in part, that, "The protection system shall be separated from control systems to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all reliability, redundancy, and independence requirements of the protection system."

The licensee stated that the parts of the NIS BTI panels that are non-Class 1E are isolated from Class 1E circuits by qualified isolators. The NRC staff noted that the BTI uses relay coil to contact isolation equipment as isolators between Class 1E and non-Class 1E circuits for the BTI. Therefore, a control system fault could not propagate to all the bypass panels and simultaneously adversely affect all protection sets. The licensee stated that separation requirements are maintained in the NIS bypass panels through physical separation on the bottom lid of the bypass panel with 6 inches between safety and non-safety 118 volts, alternating current (VAC). The circuit board maintains this required separation by placing a ground layer between the safety and non-safety 118 VAC circuits. The PPS utilizes similar hardware to that originally designed for surveillance testing with annunciator signals provided through qualified isolators. The NRC staff noted that each bypass system is separated by a protection set and, therefore, a single fault would not cause a problem in redundant channels.

Therefore, the NRC staff finds that the BTI conforms to GDC 24.

3.2.3 Regulatory Guides

The followings discuss the NRC staff's review of the applicable RGs for both Byron and Braidwood BTI:

3.2.3.1 RG 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems," Revision 0, dated May 1973.

RG 1.47 describes an acceptable method of complying with the requirements of IEEE Std 279-1971 and states that automatic indication should be provided in the control room for each bypass or deliberately induced inoperable status that meets all of the following conditions:

a. Renders inoperable any redundant portion of the protection system, systems actuated or controlled by the protection system, and auxiliary or supporting systems that must be operable for the protection system and the systems it actuates to perform their safety-related functions.

b. Is expected to occur more frequently than once per year: and

c. Is expected to occur when the affected system is normally required to be operable.

The NRC staff noted that the BTI meets all of these conditions. By placing a protection system channel in the bypass mode, that channel of the protection system is rendered inoperable. The

NRC staff also noted that an automatic annunciation is initiated in the main control room with any channel placed in the bypass mode.

The licensee stated that BTI has the capability to provide timely and accurate information to the control room operator as well as the test technician performing the bypass testing. The NRC staff noted that MCR of Braidwood and Byron provides alarm/status light indicators and SER points to ensure that the operator knows which protection set channel instrumentation loops are in the bypass condition at all times.

The NRC staff noted that the BTI also has the ability to provide local indication of the channel status in the bypass panel. The lit LEDs on the bypass panel will indicate that power is available to the bypass panel. It will be evident from the position of the keylock switch on the NIS bypass panel that the technician has attempted to put the channel in test. The LEDs that are associated with the locking toggle switches will inform the technician that an individual channel has been placed in the bypass condition. When a PPS channel is not placed in bypass, local LEDs on the PPS cards will be on and provide indications.

3.2.3.2 Regulatory Guide 1.53 – "Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems," Revision 0, dated June 1973

RG 1.53 endorses IEEE Std 379-1972 with some clarification (subject to conditions as described in the RG). IEEE Std 379-1972 addresses the single failure criterion in nuclear power plant protection systems. A discussion of the BTI adherence to IEEE Std 379-1972 and the single failure criterion in general has been described in Sections 3.2.4.2 and 3.2.2.4 (respectively) of this SE.

3.2.3.3 Regulatory Guide 1.75 – "Physical Independence of Electrical Systems," Revision 2, dated September 1978

RG 1.75 endorses and delineates acceptable methods for complying with the requirements of IEEE Std 279-1971 with respect to physical independence of electric systems. RG 1.75 discusses requirements for physical separation between Class 1E and non-Class 1E circuits, electrical isolation between Class 1E and non-Class 1E circuits, and requirements for associated circuits. A discussion of the BTI adherence to this RG for the separation requirements has been described in Section 3.2.2.7 of this SE.

3.2.3.4 Regulatory Guide 1.89 – "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," Revision 0, dated November 1974

RG 1.89 endorses IEEE Std 323-1974, which describes the requirements for qualifying Class 1E equipment for nuclear power plants. A discussion of the BTI adherence to the requirements of IEEE Std 323-1974 and this RG has been described in Section 3.2.2.1 and Section 3.2.2.4 of this SE.

3.2.3.5 Regulatory Guide 1.100 – "Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants," Revision 1, dated August 1977

RG 1.100 endorses IEEE Std 344-1987, which describes the recommended practices for performing seismic qualification of Class 1E equipment. A discussion of the BTI adherence to the IEEE Std 344-1975 and this RG has been described in Section 3.2.2.1 of this SE.

3.2.3.6 Regulatory Guide 1.118 – "Periodic Testing of Electric Power and Protection Systems," Revision 3, dated 1995

RG 1.118 endorses IEEE Std 338-1977 which describes the criteria for performing periodic testing of safety systems. This is accomplished by administrative control of access to bypass capability and has been described in Section 3.2.2.5 of this SE.

3.2.4 Institute of Electrical and Electronics Engineers Standards

3.2.4.1 IEEE Std 279-1971

IEEE Std 279-1971 describes the minimum requirements for the safety-related functional performance and reliability of protection systems for nuclear power generating stations. The standard has several requirements which are applicable to the BTI installation at Byron and Braidwood. The clauses that are applicable are discussed as follows:

Clause 4.2 - Single Failure Criterion

This clause requires that any single failure in the protection system shall not prevent proper protective action at the system level when required. The NRC's NUREG-0800, "Standard Review Plan (SRP) Chapter 7, "Instrumentation and Controls," Appendix 7.1-B, Section 4.2, "Single-Failure Criterion," provides acceptance criteria for the single-failure criterion. This section states that the applicant/licensee's analysis should confirm that the requirements of the single-failure criterion are satisfied. A discussion of possible fault conditions and failure detection of the BTI has been presented in Sections 3.2.2.4 of this SE.

Clause 4.3 - Quality of Components

This clause requires that components and modules be of a quality that is consistent with components with minimum maintenance requirements and low failure rates. The licensee stated that the components used in the BTI are of a quality consistent with those requirements. A discussion of the BTI adherence to the requirements of this clause has been described in Section 3.2.2.1 and 3.2.2.4 of this SE.

Clause 4.4 - Equipment Qualification

This clause requires that type test data or reasonable engineering extrapolation based on test data be available to verify that protection system equipment shall meet the performance requirements on a continuing basis. The licensee has conducted generic tests to verify that the NIS bypass panels and the PPS relays that are located in Class 1E instrument cabinets will not go into one of the failure modes identified during a seismic event. A discussion of the equipment seismic qualification of the BTI has been described in Section 3.2.2.1 and 3.2.2.4 this SE.

The NRC staff noted that PPS bypass test cards and NIS bypass panels and associated wiring are completely inside a metal cabinet, therefore, the dominant entry of electromagnetic interference would be expected to be conducted in through field cabling. It should noted that the cabinet doors are normally closed and locked. The licensee stated that WCAP-8892-A "Westinghouse 7300 Process Control System Noise Tests," June 1977, documents successful testing for this source of interference through common non-1E cables. The added internal wiring does not impact the physical relationship between Class 1E and non-Class 1E circuits (i.e., no increase in capacitive coupling) so the results of WCAP-8892-A are still valid. The PPS bypass cards are direct replacements for the test cards that were part of the WCAP-8892-A test and the NIS bypass panels only impact higher level signals that are not susceptible to interference. The licensee stated that the relays have been provided with arc suppression circuits. For these reasons, the NRC staff finds that the BTI meets the criterion of Clause 4.4 of IEEE Std 279-1971.

Clause 4.6 - Channel Independence

This clause requires that channels that provide signals for the same protective function shall be independent and physically separated. In the RAI response dated September 2, 2011, the licensee stated that there is one Bypass Panel per NIS cabinet bay. Thus there is a unique panel for each of the four NIS channels. There are no changes in the cable routings from the NIS cabinet or PPS cabinets to the solid state protection system (SSPS). Isolation for the control functions is also maintained since no changes are made to the control signals or their routing from the NIS drawers or PPS cabinets. Therefore the staff finds that NIS and 7300 PPS channel independence is maintained.

Clause 4.7 - Control and Protection System Interaction

Clause 4.7.2 requires that the control signals from protection system equipment shall be through isolation devices which meet all the protection system requirements. Clause 4.7.3 requires that under single random failure condition, the remaining redundant protection channels shall be capable of providing the protective action. Clause 4.7.3 also requires including provisions to meet this single random failure requirement if a channel is bypassed or removed from service for test or maintenance purposes. The conformation of BTI to this criterion has been discussed previously as follows:

Section 3.2.2.4 of this SE has discussed the safety function performance with single failure of BTI.

Section 3.2.2.6 of this SE has described how the BTI are designed to fail into a safe state under postulated adverse environments.

Section 3.2.2.7 of this SE has discussed the interaction between the control and protection systems.

In the response to the NRC staff RAIs, the licensee further stated that the addition of the BTI equipment does not introduce any new control functions or change any protective functions. The PPS and NIS Functional System Design has not changed and the separation of protection and control systems is still maintained. Therefore, the NRC staff finds that the BTI meets the criterion of clause 4.1 of IEEE Std 279-1971.

Clause 4.11 - Channel Bypass or Removal from Operation

This clause requires the system be designed to permit any one channel to be maintained, and when required, tested or calibrated during power operation without initiating a protective action at the systems level. During such operation the active parts of the system shall of themselves continue to meet the single failure criterion.

The licensee stated that the implementation of the BTI for testing at Byron and Braidwood will not affect the compliance of the protection system to this clause. The NRC staff noted that NRC has approved the license amendment dated January 29, 2008 (ADAMS Accession No. ML080110179), which revised the TS for Braidwood and Byron. This license amendment extended completion times, bypass test times, and surveillance test intervals for certain RTS and ESFAS functions, including the increase of the bypass test times from 4 hours to 12 hours for the analog RTS/ESFAS channels with the Probabilistic Risk Analysis.

The licensee stated that when one channel is bypassed for test, there will still be sufficient channels available to trip the reactor or initiate safeguards. The NRC staff noted that within the approved 12-hour bypass time interval required for a maintenance operation, the 2-out-of-3 systems are permitted as a deviation to the single failure criterion during channel bypass period because the probability of an active channel failure has been shown to be small during this short bypass time. For 2-out-of-4 systems during a test, calibration, or maintenance operation, the active parts of the protection system will continue to meet the single failure criterion.

Clause 4.13 - Indication of Bypasses

This clause requires that for a protective function that has been bypassed or deliberately rendered inoperative, this fact must be continuously indicated in the MCR. The design of the BTI at Byron and Braidwood provides alarm/status light and SER point indicators in the control room when a channel is bypassed or tripped. Section 3.2.3.1 of this SE has discussed the annunciation features of the BTI and conformance to this clause.

Clause 4.14 - Access to Means for Bypassing

This clause requires that the BTI design shall permit the administrative control of the means for manually bypassing channels or protective functions. The design of the BTI installed at Byron and Braidwood requires the use of keylock switches for the NIS panel, and door keylocks for the NIS cabinet and the PPS cabinet to place a channel in bypass. The NRC staff notes that the administrative control can be effective with proper control over the distribution of the keys for the

NIS panel and the PPS cabinet doors.

Clause 4.20 - Information Read-out

This clause requires that the protection system be designed to provide the operator with accurate, complete, and timely information pertaining to its own status and the status of the plant. Section 3.2.3.1 of this SE has discussed the annunciation features of the BTI and conformance to this clause.

Based on the review of BTI as discussed above, the NRC staff has therefore determined that the BTI system meets the applicable requirements of IEEE Std 279-1971.

3.2.4.2 IEEE Std 379-1972

IEEE Std 379-1972 describes the application of the single failure criterion to the protection system. A discussion of the safety function performance with single failure of BTI has been presented in Section 3.2.2.4 of this SE. Based on the review of the BTI design, the NRC staff finds that the requirements of IEEE Std 379-1972 have been met.

3.3 Evaluation of the Proposed TS Changes

TS Task Force (TSTF) traveler TSTF-418, "Reactor Protection System and ESFAS Test Times and Completion Times (WCAP-14333)," Revision 2 dated August 22, 2001, established that bypass testing was an acceptable method of testing. In addition, NUREG-1431, Revision 3, has incorporated TSTF-418 for plants with installed bypass test capability. Therefore, by changing the Required Action Notes to reflect STS wording, the proposed change aligns the Braidwood and Byron TS with the STS, and reduces the potential for unnecessary reactor trips or safeguards actuation due to a failure or transient in a redundant channel.

In general, the RTS and ESFAS of Braidwood and Byron units use 2-out-of-3 and 2-out-of-4 coincident logic, respectively, from redundant channels to initiate protective actions. Currently, analog channel comparators within these systems, with the exceptions of the NIS 1-out-of-2 functions and the ESFAS containment spray function are placed in the tripped state for channel testing or in response to an out-of-service channel. By the licensee's September 2, 2011 RAI response, the NRC staff confirmed that all the functions which the licensee proposed to install BTI in this application are either use 2-out-of-3 or 2-out-of-4 logic.

With one channel in the trip state, the 2-out-of-3 logic effectively becomes a 1-out-of-2 logic, and 2-out-of-4 logic effectively becomes a 1-out-of-3 logic for the remaining channels. Therefore, a second comparator trip of a redundant channel caused by human error, a spurious transient, or channel failure would initiate a reactor trip or safeguards actuation with a channel already in the tripped condition. With the implementation of this TS change, the licensee can avoid the spurious reactor trip or safeguards actuation because the partial trip conditions that would have been present are eliminated. Since the logic with a channel in bypass becomes 2-out-of-2, or 2-out-of-3 logic for the remaining channels, the logic requiring signals from two additional channels to actuate the protective function is maintained. This provides the benefits of reducing challenges to the plant safety systems that may result from spurious actuations, human error, or channel failure.

The licensee will implement necessary hardware changes to NIS and PPS to facilitate bypass testing under 10 CFR 50.59 (separate from this amendment request). In order to allow for testing in bypass, the licensee proposed to revise the TS 3.3.1 Required Action Notes D, E, and K, and TS 3.3.2 Required Action Notes D and K for all Braidwood and Byron Units as mentioned in Section 3.1 of this SE. This TS revision would allow the surveillance testing (and setpoint adjustment) to be done in bypass with installed bypass capability.

The NRC staff noted that licensee did not modify trip setpoints, surveillance frequencies, or channel responses associated with this change. The NRC staff reviewed the proposed TS changes and noted that the proposed Required Action Notes revisions reflect STS wording and align the Braidwood and Byron TS with the STS.

The NRC staff noted that in order to test the bypass of a NIS channel, the technician needs to turn the keylock switch from "NORMAL" to "BYPASS ENABLE," and then turn the toggle switch in test position for that channel in the NIS panel. To test the bypass for a channel of the PPS, the technician needs to open the cabinet door keylock, and then turn the toggle switch of that channel to bypass position. Therefore, it will require two independent manual switch actuations to place a channel in bypass. In addition, the licensee uses administrative controls to strictly prevent the simultaneous bypassing of more than one redundant protection set at any one time.

The existing design has been modified such that, in order to bypass a channel, the channel function output to the SSPS trains would be connected to the bypass switch. When the bypass switch is placed in bypass an energized signal is applied to the input of the SSPS trains, thereby continuously providing power to the channel function and maintaining the channel in a non-tripped condition. The locking bypass switch is connected to a status light that provides indication both locally and in the control room when a channel bypass switch is armed. The NIS bypass panel uses a make-before-break, which will allow for seamlessly switching a channel bypass without incurring a trip signal. The PPS bypass test card is designed so that the relay failure will not lead to a channel inadvertently being bypassed.

The NRC staff has reviewed and discussed WCAP-17349-P, which is provided to support this TS change, as described in Section 3.2 of this SE. In the licensee's September 2, 2011 response to the NRC staff's RAIs, the licensee further clarified the single-failure concerns, control room alarms and status lights, operator response actions, actuated logics, and bypass switch relationship of NIS functions.

The licensee has confirmed that bypass switches for each channel are completely independent from the other channels and that the redundancy and diversity of safety functions remain unchanged. Based on the above discussion, the NRC staff finds that the licensee has adequately assured the BTI design modification meets the plant licensing basis and the surveillance testing of the function identified previously can be safely conducted.

Therefore, the proposed TS changes are acceptable.

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change the requirements with respect to 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 (76 FR 50763; August 16, 2011). 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.

4.0 CONCLUSION

Based on the above review, the NRC staff concludes that the Byron and Braidwood bypass testing design meets the applicable NRC requirements in 10 CFR 50.55a(h)(2), 10 CFR 50.55a(a)(1), and 10 CFR 50 Appendix A GDC 2, 19, 20, 21, 22, 23, and 24. The licensee has ensured adequate controls to preclude improper bypass of a channel. In addition, the configuration of bypass testing is consistent with the previously NRC-accepted topical reports and NUREG-1431, Revision 3. The NRC staff, therefore, finds that the proposed TS changes to the RTS and ESFAS to permit bypass testing are acceptable.

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.

Principal Contributor: PChung, NRR

Date: March 30, 2012

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

March 30, 2012

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2 AND BYRON STATION, UNIT NOS. 1 AND 2 - ISSUANCE OF AMENDMENTS RE: REVISION OF TECHNICAL SPECIFICATIONS (TS) 3.3.1, "REACTOR TRIP SYSTEM INSTRUMENTATION," AND TS 3.3.2, "ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION" (TAC NOS. ME5836, ME5837, ME5838, AND ME5839)

Dear Mr. Pacilio:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 169 to Facility Operating License No. NPF-72 and Amendment No.169 to Facility Operating License No. NPF-77 for the, Braidwood Station, Units 1 and 2, respectively, and Amendment No. 176 to Facility Operating License No. NPF-37 and Amendment No. 176 to Facility Operating License No. NPF-66 for the Byron Station, Unit Nos. 1 and 2, respectively. The amendments are in response to your application dated March 14, 2011, as supplemented by letters dates September 2, 2011, and November 18, 2011.

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/ Michael Mahoney for
Brenda L. Mozafari, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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

Enclosures:
1. Amendment No. 169 to NPF-72
2. Amendment No. 169 to NPF-77
3. Amendment No. 176 to NPF-37
4. Amendment No. 176 to NPF-66
5. Safety Evaluation

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Amendment: ML120660494 *Memo Dated

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