



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

August 17, 2011

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

SUBJECT: CLINTON POWER STATION, UNIT NO. 1 - ISSUANCE OF AMENDMENT
NO. 195 RE: REVISION OF TECHNICAL SPECIFICATION 3.7.6, MAIN
TURBINE BYPASS SYSTEM (TAC NO. ME4771)

Dear Mr. Pacilio:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 195 to Facility Operating License No. NPF-62 for the Clinton Power Station (CPS), Unit No. 1. The amendment is in response to your application dated September 23, 2010, as supplemented by letter dated April 22, 2011.

The amendment requested a revision to Technical Specification Limiting Condition for Operation 3.7.6, "Main Turbine Bypass System (MTBS)," to revise the reactor operational limits, as specified in the CPS Core Operating Limits Report, to compensate for the inoperability of the MTBS.

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

Sincerely,

A handwritten signature in black ink, reading "Nicholas J. DiFrancesco, Sr.", is written over the typed name.

Nicholas J. DiFrancesco, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosures:

1. Amendment No. 195 to NPF-62
2. Safety Evaluation

cc w/encls: Distribution via Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-461

CLINTON POWER STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 195
License No. NPF-62

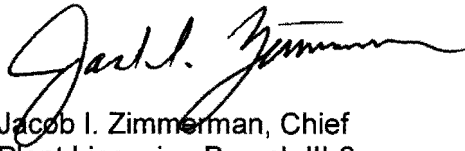
1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee), dated September 23, 2010, as supplemented by letter dated April 22, 2011, complies with the standards and requirements of the Atomic Energy 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-62 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 195, are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

A handwritten signature in black ink, appearing to read "Jacob I. Zimmerman", is written over the typed name and title.

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: August 17, 2011

ATTACHMENT TO LICENSE AMENDMENT NO. 195

FACILITY OPERATING LICENSE NO. NPF-62

DOCKET NO. 50-461

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

Remove

License NPF-62
Page 3

TSs

3.7-13

3.7-14

5.0-18

Insert

License NPF-62
Page 3

TSs

3.7-13

3.7-14

3.7-15

5.0-18

- (4) Exelon Generation Company, pursuant to the Act and to 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;
 - (5) 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
 - (6) 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. This 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

Exelon Generation Company is authorized to operate the facility at reactor core power levels not in excess of 3473 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.
 - (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 195, are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3.7 PLANT SYSTEMS

3.7.6 Main Turbine Bypass System

LCO 3.7.6 The Main Turbine Bypass System shall be OPERABLE.

OR

The following limits are made applicable:

- a. Reactor THERMAL POWER limit for an inoperable Main Turbine Bypass System as specified in the COLR; and
- b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," limit for an inoperable Main Turbine Bypass System as specified in the COLR; and
- c. LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," limit for an inoperable Main Turbine Bypass System as specified in the COLR.

APPLICABILITY: THERMAL POWER \geq 21.6% RTP.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of the LCO not met.	A.1 Satisfy the requirements of the LCO.	2 hours
B. Required Action and associated Completion Time not met.	B.1 Reduce THERMAL POWER to < 21.6% RTP.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.7.6.1 Verify one complete cycle of each main turbine bypass valve.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.6.2	Perform a system functional test.	In accordance with the Surveillance Frequency Control Program
SR 3.7.6.3	Verify the TURBINE BYPASS SYSTEM RESPONSE TIME is within limits.	In accordance with the Surveillance Frequency Control Program

3.7 PLANT SYSTEMS

3.7.7 Fuel Pool Water Level

LCO 3.7.7 The fuel pool water level shall be ≥ 23 ft over the top of irradiated fuel assemblies seated in the spent fuel storage pool and upper containment fuel storage pool racks.

APPLICABILITY: During movement of irradiated fuel assemblies in the associated fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Fuel pool water level not within limit.	<p>A.1 -----NOTE----- LCO 3.0.3 is not applicable. -----</p> <p>Suspend movement of irradiated fuel assemblies in the associated fuel storage pool(s).</p>	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.7.7.1 Verify the fuel pool water level is ≥ 23 ft over the top of irradiated fuel assemblies seated in the storage racks.	In accordance with the Surveillance Frequency Control Program

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

- a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:
 - 1. LCO 3.2.1, Average Planar Linear Heat Generation Rate (APLHGR),
 - 2. LCO 3.2.2, Minimum Critical Power Ratio (MCPR),
 - 3. LCO 3.2.3, Linear Heat Generation Rate (LHGR),
 - 4. LCO 3.3.1.1, RPS Instrumentation (SR 3.3.1.1.14),
 - 5. LCO 3.3.1.3, Oscillation Power Range Monitor (OPRM) Instrumentation, and
 - 6. LCO 3.7.6, Main Turbine Bypass System, (cycle dependent thermal power limits for an inoperable Main Turbine Bypass System).
- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in
 - (1) General Electric Standard Application for Reactor Fuel (GESTAR), NEDE-24011-P-A, or
 - (2) NEDO-32465, "BWR Owners' Group Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology and Reload Applications."
- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

(continued)



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 195 TO FACILITY OPERATING LICENSE NO. NPF-62

EXELON GENERATION COMPANY, LLC

CLINTON POWER STATION, UNIT NO. 1

DOCKET NO. 50-461

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC, the Commission) dated September 23, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML102700455), as supplemented by letter dated April 22, 2011 (ADAMS Accession No. ML111150091), Exelon Generation Company, LLC, (the licensee) requested changes to the technical specifications (TSs) for Clinton Power Station (CPS), Unit No. 1. The proposed change would revise the reactor operational limits of TS Limiting Condition for Operation (LCO) 3.7.6, "Main Turbine Bypass System (MTBS)," to revise the reactor operational limits, as specified in the CPS Core Operating Limits Report (COLR), to compensate for the inoperability of the MTBS.

The supplemental letter (Reference 2) contained clarifying information and did not change the NRC staff's initial proposed finding of no significant hazards consideration.

2.0 REGULATORY EVALUATION

The NRC requirements and review criteria that the staff considered to be most applicable include:

- Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36(c), requires that the TS include (1) safety limits, limiting safety system settings, and limiting control settings, (2) LCOs, (3) surveillance requirements, (4) design features, and (5) administrative controls.
- 10 CFR 50.46(b)(1) requires that the calculated maximum fuel element cladding temperature shall not exceed 2200 °F.
- Criterion 3 of 10 CFR 50.36(c)(2)(ii) specifies that TS LCOs must be established for a structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

- NUREG-1434, "Standard Technical Specifications-General Electric Plants (BWR/6)", provides guidance for implementation of the requirements of 10 CFR 50.36 for General Electric (GE) Plants.
- 10 CFR 50, Appendix A, General Design Criteria (GDC) 10, "Reactor Design," requires that the reactor core and associated coolant control, and protection systems be designed with appropriate margins to assure that specified acceptable fuel design limits (SAFDLs) are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences (AOOs).
- NRC Generic Letter (GL) 88-16, "Removal of Cycle-Specific Parameter Limits (RCPL) from Technical Specifications," allows licensees to move cycle-specific parameters into the COLR.

3.0 TECHNICAL EVALUATION

System Description

By letter dated September 23, 2010, the licensee stated that the MTBS at CPS is used to control steam pressure when reactor steam generation exceeds turbine requirements during plant startup, sudden load reduction, and cooldown. It allows excess steam flow from the reactor to the condenser without going through the turbine. The bypass capacity of the MTBS is about 28.8 percent of the nuclear steam supply system rated steam flow. Sudden load reductions within the capacity of the MTBS can be accommodated without a reactor trip. The MTBS consists of two valve chests, and each chest contains three bypass valves. The valve chests are connected to the main steam lines between the main steam isolation valves and the turbine stop valves. Each of the bypass valves is sequentially operated by hydraulic cylinders. The bypass valves are controlled by the pressure regulation function of the turbine electrohydraulic control system. The bypass valves are normally closed, and the pressure regulator controls the turbine control valves, directing all steam flow to the turbine. If the speed governor or the load limiter restricts steam flow to the turbine, the pressure regulator controls the system pressure by opening the bypass valves that lead the steam flow from the bypass chest, through connecting piping, to the main condenser.

The MTBS is required to be operable to limit the reactor pressure and power increases during applicable transients assumed in the accident analysis so that SAFDLs are not exceeded during AOOs. The SAFDLs are the minimum critical power ratio (MCPR), linear heat generation rate (LHGR), and average planar linear heat generation rate (APLHGR) limits.

The MCPR is a ratio of the fuel assembly power that results in the onset of boiling transition to the actual fuel assembly power. Operating limits on the MCPR are specified to assure that no fuel damage occurs during AOOs.

The LHGR is a measure of the heat generation rate of a fuel rod in a fuel assembly at any axial location. Operating limits on the LHGR are specified to assure that the fuel design limits are not exceeded anywhere in the core during AOOs.

The APLHGR is a measure of the average LHGR of all the fuel rods in a fuel assembly at any axial location. Operating limits on the APLHGR are specified to assure that the peak cladding

temperature during the postulated loss-of-coolant accident (LOCA) does not exceed the limit specified in 10 CFR 50.46. While APLHGR limits are used as part of LOCA bases protection, LHGR limits ensure that the fuel integrity is maintained during AOOs.

The MTBS out-of-service affects only AOO bases for the CPS core and does not affect LOCA bases. Therefore, only the MCPR and LHGR limits are required for protection. With the MTBS being inoperable, the licensee would assess the need to implement the alternate operating limits of the MCPR and LHGR in the core. The proposed TS changes would avoid a power reduction to less than 21.6 percent rated thermal power (RTP) as specified in current TS 3.7.6 with the MTBS being inoperable, while the reactor power, operating MCPR and LHGR limits are within the revised ranges specified in the COLR. The changes would increase plant flexibility.

3.1 TS Changes

The current CPS TS LCO 3.7.6, "Main Turbine Bypass System," states that "[t]he Main Turbine Bypass System shall be OPERABLE." This requirement is applicable when the power level is greater than 21.6 percent RTP.

The proposed changes would modify the LCO to add an onsite representative (OR) statement allowing the alternative of taking the application penalties as specified in the COLR when the MTBS is inoperable. The added OR statement is as follows:

OR

The following limits are made applicable:

- (a) Reactor THERMAL POWER limit for an inoperable Main Turbine Bypass System as specified in the COLR; and
- (b) LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," limit for an inoperable Main Turbine Bypass System as specified in the COLR; and
- (c) LCO 3.2.3, "LINEAR HEAT GENERATION RATE (LHGR)," limit for an inoperable Main Turbine Bypass System as specified in the COLR

Condition A of the LCO currently states that the MTBS is inoperable. The proposed Condition A would be to state as follows:

A. Requirements of the LCO not met.

Required Action A.1 currently requires restoration of the MTBS to an OPERABLE status within two hours whenever the MTBS is inoperable. In support of the proposed Condition A, the Required Action A.1 would be revised by requiring satisfaction of the requirement of the LCO within two hours as follows:

A.1 Satisfy the requirements of the LCO.

The current Required Action B remains unchanged. It will continue to require a reduction in thermal power to less than 21.6 percent of the RTP in four hours.

3.2 Balance of Plant Review

3.2.1 Background

In its Updated Safety Analysis Report (USAR), Chapter 10.4.4, the licensee states that one of the power generator design basis functions of MTBS is to control steam pressure during startups and shutdowns. The licensee describes the function of the steam bypass and pressure regulation system, which utilizes the MTBS to control pressure in the reactor steam space. Also, the pressure regulator uses MTBS to relieve any excess steam production from the reactor above the turbine requirements in order to limit any pressure increases and subsequent overpower transients in the reactor. The USAR description of the MTBS depicts six valves: three valves in two steam chests on the main steam line headers. The licensee credits the MTBS with the ability to relieve up to 28.8 percent of the nuclear steam supply system rated steam rated flow. The licensee classifies the MTBS as nonsafety-related. The MTBS is credited for mitigation during load reductions and operational transients. A failure of the pressure regulation system is discussed in USAR Section 15.1.3, Pressure Regulator Failure – Open; and USAR, Section 15.2.1, Feedwater Controller Failure – Maximum Demand. The licensee also provides an evaluation of a failure of the bypass valves to open when needed in USAR, Section 15.2.2, Generator Load Rejection, and USAR Section 15.2.3, Turbine Trip.

In boiling water reactors (BWRs), the licensee is expected to establish a safety limit critical power ratio (SLCPR) to assure compliance with the SAFDLs. Maintaining reactor operation above the SLCPRs ensures the fuel rods will not experience a boiling transition during normal operation and AOOs. The licensee credits the MTBS in the safety analysis to mitigate applicable transients in order to prevent exceeding the MCPR, LHGR, and APLHGR safety limits during normal operation and AOOs. The licensee also specifies additional SAFDLs, LHGR and APLHGR safety limits, in order to avoid exceeding the fuel design limits. Currently, if the licensee decides to continue plant operation with the MTBS inoperable, then the licensee can reduce reactor power to less than 21.6 percent until the MTBS is returned to service. With the proposed change, the licensee can maintain reactor power, but will evaluate any required changes to the operating limits for the MCPR, LHGR, and APLHGR in order to retain adequate margin in the event of an AOO to assure that safety limits are not exceeded during a transient. The licensee proposes to impose additional limits on the MCPR, APLHGR, and LHGR, referred to as penalties, in order to assure an adequate margin is maintained.

3.2.2 Evaluation

The NRC staff reviewed the licensee's proposed TS revision for compliance with 10 CFR 50.36(c)(2)(ii) using the guidance of NUREG-1434, "Standard Technical Specifications General Electric Plants (BWR/6)." NUREG-1434 provides the following guidance for TS 3.7.6:

LCO 3.7.6 The MTBS shall be OPERABLE.

OR

The following limits are made applicable:

- (a) LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)," limits for an inoperable MTBS, as specified in the [COLR] and]
- (b) LCO 3.2.2, "MCPR," limits for an inoperable MTBS, as specified in the [COLR].]

In its letter, dated September 23, 2010, the licensee proposes with the MTBS inoperable, an appropriate penalty is required for reactor power and LHGR, to ensure appropriate core operating limits. The licensee contends that due to the specifics of CSP's core design a penalty for LHGR is appropriate in lieu of APLHGR.

The licensee proposes to calculate appropriate penalties for reactor power and LHGR using approved NRC methods.

NRC GL 88-16, "RCPL from Technical Specifications," allows licensees to move cycle-specific parameters into the COLR. In accordance with GL 88-16, the licensee is permitted to maintain the limits for MCPR, LHGR, and the associated penalties for when the MTBS is inoperable in the COLR.

3.2.3 Summary and Conclusion

The NRC staff has reviewed the licensee's proposed TS review for compliance with 10 CFR 50.36. The NRC staff finds that the licensee has adequately evaluated the impact of the proposed license amendment from a balance of plant perspective. On the basis of its review, the NRC staff concludes that the proposed TS change to incur penalties in reactor power and LHGR when the MTBS is inoperable in lieu of reducing reactor power below 21 percent complies with 10 CFR 50.36. Therefore, the NRC staff finds the TS change is acceptable.

3.3 Reactor Systems Review

3.3.1 Background

The NRC staff has reviewed the licensee's analysis (Reference 2) and the licensee's response (Reference 3) to the request for additional information in support of the proposed TS changes, to assure the licensee's compliance with the regulatory requirements discussed in Section 2.0 above.

As described in Reference 1, the MTBS, together with the reactor protection system, is used to protect the reactor core from exceeding the SAFDLs required by GDC 10 during AOOs. Compliance with the GDC 10 requirements is demonstrated in the analysis documented in Chapter 15 of the CPS USAR. In support of the TS changes for operation with inoperable MTBS, the licensee performed an assessment of the following applicable USAR non-LOCA transients to determine which transients would be affected by a one-turbine bypass valve out-of-service (1TBVOOS) or the turbine bypass system out-of-service (TBSOOS):

- Loss of Feedwater Heater (USAR 15.1.1)
- Feedwater Controller Failure (USAR 15.1.2)
- Pressure Regulator Failure Open (USAR 15.1.3)

- Inadvertent Steam Relief Valve (SRV) Opening (USAR 15.1.4)
- Steam Piping Breaks for a pressurized-water reactor (USAR 15.1.5 is not applicable to the CPS since it is a BWR)
- Inadvertent Residual-Heat-Removal (RHR) Shutdown Cooling Operation (USAR 15.1.6)
- Pressure Regulator Failure Closed (USAR 15.2.1)
- Generator Load Rejection (with and without Bypass) (USAR 15.2.2)
- Turbine Trip (with and without Bypass) (USAR 15.2.3)
- Main Steam Isolation Valve (MSIV) Closure Direct Scram (MSIVDS), Single MSIV Closure and MSIV Flux Scram (USAR 15.2.4)
- Loss of Condenser Vacuum (USAR 15.2.5)
- Loss of Alternating Current (AC) Power (USAR 15.2.6)
- Loss of Feedwater (USAR 15.2.7)
- Failure of RHR Shutdown Cooling (USAR 15.2.9)
- Loss of Instrument Air (USAR 15.2.10)
- Recirculation Pump Trip (USAR 15.3.1)
- Recirculation Flow Controller Failure - Decreasing Flow (USAR 15.3.2)
- Recirculation Pump Seizure (USAR 15.3.3)
- Recirculation Pump Shaft Break (USAR 15.3.4)
- Control Rod Withdrawal Error Low Power (USAR 15.4.1)
- Control Rod Withdrawal Error At Power (USAR 15.4.2)
- Control Rod Mal-operation (USAR 15.4.3)
- Abnormal Startup of an Idle Recirculation Pump (USAR 15.4.4)
- Recirculation Flow Controller Failure – Increasing Flow (USAR 15.4.5)
- Chemical and Volume Control Malfunction (USAR 15.4.6 is not applicable to the CPS since the CPS is a BWR)
- Misplaced Bundle Accident (USAR 15.4.7)
- Spectrum of Rod Ejection Assemblies (USAR 15.4.8)
- Control Rod Drop Analysis (USAR 15.4.9)
- Inadvertent High-Pressure-Core-Spray (HPCS)/Reactor-Core-Isolation Cooling (RCIC) Pump Startup (USAR 15.5.1)
- Chemical Volume Control System Malfunction (USAR 15.5.2 is not applicable to the CPS since it is a BWR)
- BWR Transients which Increase Reactor Coolant Inventory (USAR 15.5.3)
- Single Turbine Control Valve (TCV) Closure (This is not an USAR event)
- Anticipated Transients without Scram

The licensee provided a rationale in a table in Section 4.1, Reference 2, for each of the above transients to explain whether the transient would be affected by a 1TBVOOS or TBSOOS. The licensee stated that the transients unaffected by a 1TBVOOS or the TBSOOS are those identified in the USAR as non-limiting transients, transients that are bounded by other transients in the same transient category that does not credit the turbine bypass system, transients that are not credible to the CPS, or transients that do not rely on the MTBS for consequence mitigation. The NRC staff found that the licensee's assessment of the impact of a 1TBVOOS or the TBSOOS on the above transients was adequate and acceptable.

The licensee stated that for rated power conditions, the following three transients would be affected by a 1TBVOOS or the TBSOOS:

- (1) feedwater controller failure (FWCF);
- (2) loss of feedwater heater (LFWH); and
- (3) control rod withdrawal error (RWE).

For offrated power conditions, the licensee stated that the following two transients would be affected by a 1TBVOOS or the TBSOOS:

- (1) FWCF; and
- (2) slow flow runout (i.e., slow recirculation flow increase), which is a newly identified event.

The licensee performed analyses of the transients using the methodology described in an NRC-approved topical report (Revision 16 NEDE-24011-P-A, Reference 5) with the following NRC-approved computer codes: PANACEA (Reference 4) for determining the core state and three-dimensional nuclear parameters; ODYN (Reference 6) for calculating the peak reactor coolant system (RCS) pressure, the change in power, and the heat flux and thermal-hydraulic parameters changes required as input to both hot channel analysis and to the transient critical power methodology; ISCOR (References 5 and 8) for calculating reactor core bypass flow behavior as a function of power and flow and hydraulic loss coefficients required as input to PANACEA; and TASC (Reference 7) for calculating Δ CPR from the initial critical power ratio. The licensee confirmed (Reference 3) that it met the following limitations specified in the NRC safety evaluation report (SER) approving the ODYN code: (1) the downcomer level must remain above the jet pump section, and no prolonged level in the active channel is allowed; (2) the duration of the simulation after the jet plenum subcools should be limited; (3) the mass in the separators should not remain zero and, therefore, the code is restricted to applications where the water level remains at or above the top of active fuel plus 5 feet; (4) the code is not presently qualified to perform stability calculations, and (5) no lower plenum void is allowed. Although there were no specific NRC-SER limitations imposed on the use of PANACEA, ISCOR and TASC, the licensee confirmed that its use of the codes was within the codes' capabilities. Therefore, the NRC staff concludes that the licensee's use of the NRC-approved codes and methodologies was acceptable.

The key inputs for the analysis were discussed in Table 3.2-1 of Reference 2. The 1TBVOOS or TBSOOS in combination with the CPS base case operation was considered in the analysis. The base case operation was defined by the licensee as two safety relief valves (2SRV) out-of-service (OOS), one automatic depressurization system OOS (1ADSOOS), 50 °F reduction in feedwater temperature (50 °F FWTR) and one main steam isolation valve OOS (1MSIVOOS). The 2SRVOOS, 1MSIVOOS, 1TBVOOS, TBSOOS and the 50 °F FWTR were specifically analyzed. The 1MSIVOOS was limited to the power level less than 75 percent of the RTP. However, the cases assuming a 1TBVOOS or the TBSOOS in combination with an ADSOOS or a pressure regulator OOS (PROOS) were not analyzed, since ADSOOS was related to small break LOCA analyses, which were not affected by the turbine bypass availability. As for the

PROOS, the main concern was that a pressure regulator failure event resulted in a demand to close all control valves with no bypass valve demand. Since turbine bypass valves could not be demanded open in this event, no analysis was needed.

The licensee discussed in Enclosure 2 of Reference 3, the following key plant parameters and initial condition considerations used in the analysis: the feedwater runout flow, reactor trip setpoint, turbine stop valve closure time, control rod insertion speed, power level, core flow, feedwater temperature, water level, core exposure, loss of feedwater heating ΔT , flow runout slope and flow runout. The values used for the parameters and initial conditions were either to maximize the RCS subcooling and the reactor power increase, resulting in a higher increase in ΔCPR and LHGR, and/or were consistent with the analysis for cases with operable MTBS presented in the USAR. Therefore, the NRC staff determined that the assumptions and values used for the key parameters were conservative, resulting in a smaller margin to the SAFDLs and were acceptable.

3.3.2 Evaluation

The following are the results of the analysis discussed in Sections 5.1 and 5.2 of Reference 2 for the rated and off-rated power conditions, respectively.

- For the FWCF with a 1TBVOOS event initiated from the rated power conditions, there was no effect to the rated power operating limit minimum critical power ratio (OLMCPR). For the FWCF with the assumption of TBSOOS, the OLMCPR required an increase of 0.05 for the Cycle 12 reload core.
- For the LFWH and RWE events initiated from the rated power conditions with an assumption of a 1TBVOOS, there were no effects on the thermal safety limits. For cases with the TBSOOS, a core power level reduction to less than or equal to a specific (GE proprietary) value in percent of the rated thermal power (RTP) was required.
- For the FWCF with the 1TBVOOS or TBSOOS initiated from off-rated power (75 percent, 50 percent, 33 percent, and 21.6 percent of the RTP) conditions, there were no thermal limits (i.e., MCPR, power-dependent MCPR multiplier ($K(p)$), and LHGR as shown in Table 5.2-1 of Reference 2) exceeding the current SAFDLs for the CPS.
- For the slow recirculation flow increase with a 1TBVOOS or the TBSOOS initiated from off-rated power conditions, the new limits of the flow dependent MCPR ($MCPR(F)$) and linear heat generation rate multiplier ($LHGRFAC(f)$) were calculated and shown in Tables 5.2-2 and 5.2-3 of Reference 2. The event was assumed to start from low core flow on the MELLLA (maximum extended load line limit analysis) boundary with normal feedwater temperature and the flow was increased to the maximum core flow runout basis.

APLHGR was determined by averaging the LHGR over each fuel rod in a plane. The limit for APLHGR was expressed as the maximum APLHGR (MAPLHGR) for any plane in the fuel assembly. The MAPLHGR was determined to meet the 10 CFR 50.46 criteria that require the peak cladding temperature for design basis LOCAs to not exceed 2200 °F. An inoperable MTBS did not result in an increase in severity of results associated with

the LOCA analyses (page 4 of Attachment 1 to Reference 1), therefore, the MAPLHGR limits remained unchanged for an inoperable MTBS.

Based on the discussion in Section 3.2 above, the NRC staff found that the licensee's analysis used NRC-approved methodologies and computer codes, the results of the analysis showed that the revised set of operating limits to offset the impact of losing the MTBS function were based on the SAFDLs required by GDC 10, and the safety limits in the USAR were not exceeded, thus meeting the GDC 10 requirements related to the SAFDLs for maintaining integrity of the fuel rods during AOOs. Therefore, the NRC staff concludes that the analysis was acceptable.

The cycle specific operating limits based on the design function of the MTBS are currently documented in the CPS COLR. Operating limits for the entire cycle are based on an operable MTBS. The proposed changes would allow the COLR to contain operating limits that are applicable when the MTBS function is not operable.

Guidance in GL 88-16 would allow licensees to move cycle-specific parameters from the plant specific TSs to a licensee-controlled document, the COLR. The GL states that for plants implementing a COLR process, the analytical methods used to determine the core operating limits shall be those previously reviewed and approved by NRC and shall be included in the TS. The proposed TS 3.7.6 and TS 5.6.5 allow the reactor thermal power, MCPR and LHGR operating limits for an inoperable MTBS to be specified in the COLR. The NRC staff agrees with the licensee that the operating limits referenced in TS 3.7.6 and TS 5.6.5 are cycle-specific parameters and, therefore, the location of the subject operating limits in the COLR is acceptable. The NRC staff also found that the NRC approved method documented in NEDE-24011-P-A is included in TS 5.6.5, "Core Operating Limits Report." In addition, the licensee confirmed (Reference 3) that Revision 16 of NEDE-24011-P-A is currently the NRC-approved methodology referenced in the CPS COLR. As discussed in Section 3.2.3 of this SER, Revision 16 of NEDE-24011-P-A (Reference 5) is the NRC-approved method used to determine the operating limits for operation with the MTBS out-of-service. Therefore, the NRC staff has determined that the current NRC-approved method was adequately included in TS 5.6.5 and the CPS COLR, and concludes that proposed TS 3.7.6 and TS 5.6.5 meet the GL 88-16 guidance.

NUREG-1434 provides a TS corresponding to CPS TS 3.7.6, in Standard TS 3.7.6, "Main Turbine Bypass System." The standard TS 3.7.6 states that "[t]he Main Turbine Bypass System shall be OPERABLE." For inoperable MTBS, the following limits are made applicable:

- (a) LCO 3.2.1, "AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR), limits for an inoperable Main Turbine Bypass System, as specified in the [COLR] and]
- (b) LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," limits for an inoperable Main Turbine Bypass System, as specified in the [COLR].]

The requirements are applicable when the power level is greater than or equal to 25 percent of the RTP.

The corresponding ACTION A.1 would require the MTBS be returned to OPERABLE or to apply the limits as specified in the COLR within two hours whenever the MTBS is inoperable. ACTION A.1 is stated as follows:

- A.1 [Satisfy the requirements of the LCO or restore the Main Turbine Bypass System to OPERABLE status] within two hours.

The requirements in the brackets are plant-specific related requirements.

The associated ACTION B.1 would require a reduction in thermal power to less than 25 percent of the RTP within four hours whenever the MTBS is inoperable.

The NRC staff compared CPS TS 3.7.6 (discussed in above Section 3.1) with standard TS 3.7.6 and found that:

- (1) both TSs allow operation with an inoperable MTBS;
- (2) for operation with the MTBS being inoperable, the operating thermal limits are required to be included in COLRs for both TSs;
- (3) CPS TS LCO 3.7.6 contains operating limits for three parameters including the reactor power level, MCPR and LHGR limits, while standard TS 3.7.6 limits applies safety limits for two parameters including the APLHGR and MCPR limits. As discussed in Section 1.0 of this evaluation, APLHGR limits are used as part of LOCA bases protection, while LHGR limits ensure that the fuel integrity maintains during AOOs. The MTBS out-of-service affects only AOO bases for the CPS core, therefore, only the MCPR and LHGR limits are required for protection. A reactor power limit added to TS 3.6.7 and TS 5.6.5 is based on the acceptable plant specific analysis discussed in above in Section 3.2;
- (4) applicable power levels for TS LCO 3.7.6 are comparable (21.6 percent vs. 25 percent RTP); and
- (5) ACTION statements are similar in the required actions and completion times.

Therefore, the NRC staff concludes that proposed CPS TS LCO 3.7.6 meets the intent of standard TS. 3.7.6 in NUREG-1434.

3.3.3 Summary and Conclusion

Based on its review, the NRC staff has found that the licensee's analysis used NRC-approved methodologies and computer codes to determine the operating thermal limits, and the results of the analysis showed that the determined set of operating limits to offset the impact of losing the MTBS function was based on the SAFDLs required by GDC 10 for operation with an inoperable MTBS. Thus, the NRC staff has determined that the analysis was acceptable. The NRC staff has also found that proposed TS 3.7.6 and TS 5.6.5, allowing revision of reactor operating limits (as specified in the COLR) to compensate for the inoperability of the MTBS, adequately reflected the results of the acceptable analysis, were in compliance with the GL 88-16 guidance, and met the intent of the standard TS 3.7.6 in NUREG-1434. Thus, the NRC staff has

determined that there is reasonable assurance that proposed TS 3.7.6 and TS 5.6.5 would provide adequate requirements to avoid fuel damage during AOOs. Therefore, the NRC staff has concluded that the analysis and the associated proposed TS 3.7.6 and TS 5.6.5 are acceptable and meet the requirements of 10 CFR 50.36, 10 CFR 50.46, and GDC 10.

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 amendment changes requirements with respect to installation or use of a facility's components 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 5618; February 1, 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.

6.0 CONCLUSION

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

7.0 REFERENCES

1. Letter from J. L. Hansen (Exelon) to NRC, "License Amendment Request to Revise Technical Specifications Limiting Condition for Operation 3.7.6, Main Turbine Bypass System," dated September 23, 2010. (ADAMS Accession No. ML102700455).
2. Attachment 4 (0000-0086-4634-R2-P, Proprietary Version) to Reference 1, "Clinton Power Station One Bypass Out of Service or Turbine Bypass System Out of Service Analysis - Final", dated July 2010. (ADAMS Accession No. ML102700459, non-public/ML102700455, public).
3. Letter from J. L. Hansen (Exelon) to NRC, "Additional Information Related to License Amendment Request to Revise Technical Specifications Limiting Condition for Operation 3.7.6, Main Turbine Bypass System," dated April 22, 2011. (ADAMS Accession No. ML111150091).

4. Attachment from S. Richard (NRC) to Watford (GE), "Amendment 26 to GE Topical Report NEDE-24011-P-A, 'GESTAR' – Implementing Improved Steady State methods (TAC No. MA6481)," dated November 4, 1999. (ADAMS Accession No. ML993220235, non-public).
5. NEDE-24011-P-A-16, "General Electric Standard Application for Reactor Fuel GESTAR-II," dated July 1, 2006. (ADAMS Accession No. ML061580257, non-public)
6. NEDO 24154-A, Volumes 1-3, "Qualification of the One-dimensional core Transient Model (ODYN) for Boiling Water Reactors," dated February 1986, and Supplemental 1, Volume 4, dated February 2000 (ADAMS Accession No. ML071070420).
7. NEDC-32084P-A, Revision 2, "TASC-03A A Computer Program for Transient Analysis of a Single Channel," dated July 2002 (ADAMS Accession No. ML100220485).
8. Letter with an SER (Section 5.1.1) from D. Eisenhut (NRC) to R. Gridley (GE) Included in Enclosure 2 to NEDE-24011-P-A, Revision 17, dated September 30, 2010. (ADAMS Accession No. ML102660105, non-public).

Principal Contributors: S. Gardocki, NRR/DSS
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Date of issuance: August 17, 2011

August 17, 2011

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

SUBJECT: CLINTON POWER STATION, UNIT NO. 1 - ISSUANCE OF AMENDMENT
NO. 195 RE: REVISION OF TECHNICAL SPECIFICATION 3.7.6, MAIN
TURBINE BYPASS SYSTEM (TAC NO. ME4771)

Dear Mr. Pacilio:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 195 to Facility Operating License No. NPF-62 for the Clinton Power Station (CPS), Unit No. 1. The amendment is in response to your application dated September 23, 2010, as supplemented by letter dated April 22, 2011.

The amendment requested a revision to Technical Specification Limiting Condition for Operation 3.7.6, "Main Turbine Bypass System (MTBS)," to revise the reactor operational limits, as specified in the CPS Core Operating Limits Report, to compensate for the inoperability of the MTBS.

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

Sincerely,

/RA by J.Wiebe for/

Nicholas J. DiFrancesco, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosures:

1. Amendment No. 195 to NPF-62
2. Safety Evaluation

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NRR-058

OFFICE	LPL3-2/PM	LPL3-2/PM	LPL3-2/LA	DIRS/ITSB	OGC	LPL3-2/BC
NAME	BHarris	NDiFrancesco	SRohrer	RElliott	STurk (NLO)	JZimmerman
DATE	8/17/11	8/04/11	8/17/11	7/14/11	8/2/11	8/17/11

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