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Exelon Nuclear

10 CFR 50.90

RS-02-027

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

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Request for Technical Specifications Change
Revision to Technical Specification 3.7.1, "Main Steam Safety Valves (MSSVs)"

Reference: Technical Specifications Task Force (TSTF) Standard Technical Specification (TS) Change Traveler TSTF-235, Revision 1, MSSV Changes

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (Exelon) is proposing a change to the Technical Specifications (TS) of Facility Operating License Nos. NPF-72, NPF-77, NPF-37, and NPF-66 for the Braidwood Station, Units 1 and 2, and the Byron Station, Units 1 and 2, respectively.

TS 3.7.1, "Main Steam Safety Valves (MSSVs)," requires the MSSVs to be operable as specified in Table 3.7.1-1, "Operable Main Steam Safety Valves versus Applicable Power in Percent of Rated Thermal Power," and Table 3.7.1-2, "Main Steam Safety Valve Lift Settings." With one or more required MSSVs inoperable, reactor power must be reduced to less than or equal to the applicable percent Rated Thermal Power (% RTP) listed in Table 3.7.1-1 within four hours. If power is not reduced to the applicable % RTP within four hours or if there are one or more steam generators with less than two MSSVs operable, the unit must be placed in Mode 3 within six hours and Mode 4 within 12 hours.

The proposed change revises the Limiting Condition for Operation (LCO), the associated Conditions and Required Actions of TS 3.7.1, and the values in Table 3.7.1-1. The proposed change revises the LCO by requiring five MSSVs per steam generator to be operable consistent with the accident analyses assumptions. The proposed change modifies the associated Required Actions of TS 3.7.1 by adding a requirement to reduce the Power Range Neutron Flux – High reactor trip setpoint when one or more steam generators with one or more MSSVs are inoperable. This additional requirement is needed because, if there are inoperable MSSVs, it is necessary to limit the primary system power during steady-state operation and Anticipated Operational

A001

Occurrences (AOOs) to a value that does not result in exceeding the combined steam flow capacity of the turbine (if available) and the remaining operable MSSVs. It has been demonstrated that for those events that challenge the relieving capacity of the MSSVs (i.e., decreased heat removal events resulting in a Reactor Coolant System (RCS) heatup and reactivity insertion events), it is necessary to limit the AOO by reducing the setpoint of the Power Range Neutron Flux – High reactor trip function. For example, with one or more MSSVs on one or more steam generators inoperable, during an RCS heatup event (e.g., turbine trip) when the Moderator Temperature Coefficient (MTC) is positive, the reactor power may increase above the value assumed in the analysis at the start of the transient. Likewise, a reactivity insertion event, such as an uncontrolled rod cluster control assembly (RCCA) withdrawal from partial power level, may result in an increase in reactor power that exceeds the combined steam flow capacity of the turbine and the remaining operable MSSVs. Thus, for any number of inoperable MSSVs on one or more steam generators, it is necessary to prevent a power increase by lowering the Power Range Neutron Flux – High reactor trip setpoint to an appropriate value. Additionally, the proposed change revises the values in Table 3.7.1-1 to reflect current uprated power conditions and include an appropriate allowance to account for Nuclear Instrumentation System reactor trip channel uncertainties.

The proposed change is based on the referenced NRC approved Technical Specifications Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-235, Revision 1, with exceptions due to plant specific considerations.

We request approval of the proposed change by April 15, 2003. Currently, administrative controls consistent with the proposed changes are in place to address the current non-conservative TS in accordance with the direction provided in NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety." Upon discovery of having a non-conservative TS, the issue was entered into the Corrective Action Program.

This proposed amendment request is subdivided as follows.

1. Attachment A gives a description and safety analysis of the proposed change.

2. Attachments B-1 and B-2 include the marked-up TS pages with the requested change indicated for Braidwood Station and Byron Station, respectively. Attachments B-3 and B-4 include the associated TS pages with the proposed change incorporated for Braidwood Station and Byron Station, respectively. Attachments B-5 and B-6 include the associated TS Bases pages for information only with the proposed change incorporated for Braidwood Station and Byron Station, respectively.

3. Attachment C describes our evaluation performed using the criteria in 10 CFR 50.91(a), "Notice for public comment," paragraph (1), which provides information supporting a finding of no significant hazards consideration using the standards in 10 CFR 50.92, "Issuance of amendment," paragraph (c).

4. Attachment D provides information supporting an environmental assessment and a finding that the proposed change satisfies the criteria for a categorical exclusion.

This proposed change has been reviewed and approved by the Braidwood Station and Byron Station Plant Operations Review Committees and the respective Nuclear Safety Review Board in accordance with the requirements of the Exelon Quality Assurance Program.

Exelon is notifying the State of Illinois of this application for a change to the TS by sending a copy of this letter and its attachments to the designated State Official.

Should you have any questions concerning this letter, please contact J. A. Bauer at (630) 657-2801.

Respectfully,

K. A. Ainger for

Keith R. Jury
Director - Licensing
Midwest Regional Operating Group

Attachments: Affidavit
Attachment A: Description and Safety Analysis of the Proposed Change
Attachment B-1: Marked-Up TS Pages for Proposed Change for Braidwood Station
Attachment B-2: Marked-Up TS Pages for Proposed Change for Byron Station
Attachment B-3: Incorporated TS Pages for Proposed Change for Braidwood Station
Attachment B-4: Incorporated TS Pages for Proposed Change for Byron Station
Attachment B-5: Incorporated TS Bases Pages for Braidwood Station – Information Only
Attachment B-6: Incorporated TS Bases Pages for Byron Station - Information Only
Attachment C: Information Supporting a Finding of No Significant Hazards Consideration
Attachment D: Information Supporting an Environmental Assessment

cc: Regional Administrator - NRC Region III
NRC Senior Resident Inspector - Braidwood Station
NRC Senior Resident Inspector - Byron Station
Office of Nuclear Facility Safety - Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
COUNTY OF DUPAGE	)	
IN THE MATTER OF	)	
EXELON GENERATION COMPANY, LLC	)	**Docket Numbers**
BRAIDWOOD STATION UNITS 1 AND 2	)	**STN 50-456 AND STN 50-457**
BYRON STATION UNITS 1 AND 2	)	**STN 50-454 AND STN 50-455**

SUBJECT: Request for Technical Specifications Change
Revision to Technical Specification 3.7.1, "Main Steam Safety Valves (MSSVs)"

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

K. A. Ainger
Manager - Licensing

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 7th day of August, 2002.

Notary Public

"OFFICIAL SEAL"
TIMOTHY A. BYAM
NOTARY PUBLIC STATE OF ILLINOIS
COMMISSION EXPIRES 12/04/05

ATTACHMENT A

DESCRIPTION AND SAFETY ANALYSIS FOR PROPOSED CHANGE

A. SUMMARY OF PROPOSED CHANGE

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (Exelon) is proposing a change to the Technical Specifications (TS) of Facility Operating License Nos. NPF-72, NPF-77, NPF-37 and NPF-66 for the Braidwood Station, Units 1 and 2, and the Byron Station, Units 1 and 2, respectively.

TS 3.7.1, "Main Steam Safety Valves (MSSVs)," requires the MSSVs to be operable as specified in Table 3.7.1-1, "Operable Main Steam Safety Valves versus Applicable Power in Percent of Rated Thermal Power," and Table 3.7.1-2, "Main Steam Safety Valve Lift Settings." With one or more required MSSVs inoperable, power must be reduced to less than or equal to the applicable percent Rated Thermal Power (% RTP) listed in Table 3.7.1-1 within four hours. If power is not reduced to the applicable % RTP within four hours or if there are one or more steam generators with less than two MSSVs operable, the unit must be placed in Mode 3 within six hours and Mode 4 within 12 hours. The applicable % RTP listed in Table 3.7.1-1 is determined by a simple heat balance calculation as described in the attachment to NRC Information Notice 94-60, "Potential Overpressurization of the Main Steam Safety System," dated August 22, 1994 (i.e., Reference 1) with an allowance to account for uncertainties.

TS 3.7.1 is currently consistent with NUREG-1431, "Standard Technical Specifications, Westinghouse Plants," Revision 1 (i.e., Reference 2). The proposed change is based on NRC approved Technical Specifications Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-235, Revision 1 (i.e., Reference 3) with exceptions due to plant specific considerations. The exceptions to TSTF-235, Revision 1 are described below in Section E, "Description of the Proposed Change." It should be noted that TSTF-235, Revision 1 has been incorporated into Revision 2 of NUREG-1431 (i.e., Reference 4).

The proposed change revises the Limiting Condition for Operation (LCO), the associated Conditions and Required Actions of TS 3.7.1, and the values in Table 3.7.1-1. The proposed change revises the LCO by requiring five MSSVs per steam generator to be operable consistent with the accident analyses assumptions. Thus, Condition A is entered when less than five MSSVs per steam generator are operable. The proposed change modifies the associated Required Actions of TS 3.7.1 by adding a requirement to reduce the Power Range Neutron Flux – High reactor trip setpoint when one or more steam generators with one or more MSSVs are inoperable. If there are inoperable MSSVs, it is necessary to limit the primary system power during steady-state operation and Anticipated Operational Occurrences (AOOs) to a value that does not result in exceeding the combined steam flow capacity of the turbine (if available) and the remaining operable MSSVs. It has been demonstrated that for those events that challenge the relieving capacity of the MSSVs, i.e., decreased heat removal events resulting in a Reactor Coolant System (RCS) heatup and reactivity insertion events, it is necessary to limit the AOO by reducing the setpoint of the Power Range Neutron Flux – High reactor trip function. For example, with one or more MSSVs on one or more steam generators inoperable, during an RCS heatup event (e.g., turbine trip) when the Moderator Temperature Coefficient (MTC) is positive, the reactor power may increase above the value assumed in the analysis at the start of the transient. Likewise, a reactivity insertion event, such as an uncontrolled rod cluster control assembly (RCCA) withdrawal from partial power level, may result in an increase in reactor power that exceeds the combined steam flow capacity of the

turbine and the remaining operable MSSVs. Thus, for any number of inoperable MSSVs on one or more steam generators, it is necessary to prevent a power increase by lowering the Power Range Neutron Flux – High reactor trip setpoint to an appropriate value. A Completion Time of 36 hours is proposed to reduce the Power Range Neutron Flux – High reactor trip setpoints. The Completion Time of 36 hours is based on a reasonable time to correct the MSSV inoperability, the time required to perform the power reduction, operating experience in resetting all channels of a protective function, and on the low probability of the occurrence of a transient that could result in steam generator overpressure during this period. Additionally, the proposed change revises the values in Table 3.7.1-1 to reflect current uprated power conditions and include an appropriate allowance to account for Nuclear Instrumentation System reactor trip channel uncertainties.

We request approval of the proposed change by April 15, 2003. Currently, administrative controls consistent with the proposed changes are in place to address the current non-conservative TS in accordance with the direction provided in NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety." Upon discovery of having a non-conservative TS, the issue was entered into the Corrective Action Program.

The proposed changes are described in detail in Section E of this Attachment. Attachments B-1 and B-2 include the marked-up TS pages with the requested change indicated for Braidwood Station and Byron Station, respectively. Attachments B-3 and B-4 include the associated typed pages with the proposed change incorporated for Braidwood Station and Byron Station, respectively. Attachments B-5 and B-6 include the associated TS Bases pages for information only with the proposed change incorporated for Braidwood Station and Byron Station, respectively.

B. DESCRIPTION OF THE CURRENT REQUIREMENTS

TS 3.7.1 requires the MSSVs to be operable as specified in Table 3.7.1-1 and Table 3.7.1-2. With one or more required MSSVs inoperable, power must be reduced to less than or equal to the applicable % RTP listed in Table 3.7.1-1 within four hours. If power is not reduced to the applicable % RTP within four hours or if there are one or more steam generators with less than two MSSVs operable, the unit must be placed in Mode 3 within six hours and Mode 4 within 12 hours. Table 3.7.1-1 provides the minimum number of MSSVs per steam generator required to be operable as a function of Applicable Power (% RTP). Table 3.7.1-2 provides a listing of the valve numbers and their corresponding lift settings.

C. BASES FOR THE CURRENT REQUIREMENTS

The primary purpose of the MSSVs is to provide overpressure protection for the secondary system. The MSSVs also provide protection against overpressurizing the Reactor Coolant Pressure Boundary (RCPB) by providing a heat sink for the removal of energy from the RCS if the preferred heat sink, provided by the condenser and Circulating Water System, is not available.

Five MSSVs are located on each main steam header, outside the containment, upstream of the main steam isolation valves. The design basis for the MSSVs originates from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section III, "Rules for Construction of Nuclear Power Plant Components." The design basis purpose is to limit the secondary system pressure to $\leq$ 110% of steam generator design pressure for any AOO or accident considered in the Design Basis Accident (DBA) and transient analyses.

Operation with less than all five MSSVs operable for each steam generator is permissible, if thermal power is limited to the relief capacity of the remaining MSSVs. This is accomplished by restricting thermal power so that the energy transfer to the most limiting steam generator is not greater than the available relief capacity in that steam generator. The applicable power limits of Table 3.7.1-1 are derived from a simple heat balance calculation as described in the attachment to Reference 1 and is provided below.

$$Applicable\,Power = \frac{100}{Q}\left(\frac{w_s h_{fg} N}{K}\right)$$

Where:

Q	=	Nominal Nuclear Steam Supply System (NSSS) power rating of the plant including reactor coolant pump heat, in Mwt (=3427.6 Mwt).
K	=	Conversion Factor = 947.82 (BTU/sec)/Mwt.
w_s	=	Minimum total steam flow rate capability of the operable MSSVs on any one steam generator at the highest MSSV opening pressure including tolerance and accumulation, as appropriate, in lb_m/sec.
h_{fg}	=	Heat of vaporization for steam at the highest MSSV opening pressure including tolerance and accumulation, as appropriate, in BTU/lb_m.
N	=	Number of loops in the plant (=4).

The values calculated from this simple heat balance equation were conservatively adjusted lower for use in Table 3.7.1-1 to account for uncertainties (i.e., 9% RTP).

D. NEED FOR REVISION OF THE REQUIREMENT

In some circumstances it is necessary to limit the primary side heat generation that can be achieved during an AOO by reducing the setpoint of the Power Range Neutron Flux – High reactor trip function. For plants licensed to operate at partial power levels with a positive MTC it is necessary to limit the primary side heat generation that may occur during an RCS heatup event (e.g., turbine trip) because the reactor power may increase above the value assumed in the analysis at the start of the transient. Thus for any number of inoperable MSSVs it is necessary to reduce the trip setpoint if a positive MTC may exist at partial power conditions.

In addition to the RCS heatup event, reactivity insertion events may also challenge the relieving capacity of the MSSVs. The uncontrolled RCCA bank withdrawal at power event is characterized by an increase in core power and steam generation rate until reactor trip occurs when either the Overtemperature Delta Temperature (ΔT) or Power Range Neutron Flux – High setpoint is reached. While the core power and steam generation rate may increase significantly prior to the reactor trip, the turbine steam load would remain unchanged. Therefore, excess steam would have to be relieved to prevent Main Steam (MS) System overpressurization. Assuming no credit for operation of the steam generator Power Operated Relief Valves (PORVs) or condenser steam dump valves, steam pressure would increase until the MSSVs actuated. With reduced capacity resulting from

inoperable MSSVs, the available steam relief capacity may not be sufficient to address the difference between the turbine load and the increased core power. Overpressurization of the MS System could then occur.

Changes are also required to the values in Table 3.7.1-1. The existing values provided in Table 3.7.1-1 are based on a nominal NSSS power rating including reactor coolant pump heat of 3427.6 MWt with a 9% allowance for uncertainties. This nominal NSSS power rating reflects non-uprated power conditions. Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2 recently received power uprate approval (i.e., Reference 5) authorizing an increase in reactor core power level to 3586.6 MWt, an approximate 5% increase in reactor core power. The values in Table 3.7.1-1 were not revised as part of the power uprate license amendment since the values were determined to be adequately conservative for the existing TS which only requires a reduction in power and not a corresponding reduction in the Power Range Neutron Flux – High reactor trip setpoint. Since an appropriate allowance for calorimetric power uncertainty need only be considered when requiring a power reduction (i.e., typically 2%) and since the current values in Table 3.7.1-1 include a conservative allowance of 9% for uncertainties, adequate margin existed to account for an approximate 5% increase in reactor core power. However, changes are required to the values in Table 3.7.1-1 to account for a reduction in the Power Range Neutron Flux – High reactor trip setpoint along with uprated power conditions. With a reduction in the Power Range Neutron Flux – High reactor trip setpoint required, an appropriate allowance is required to account for Nuclear Instrumentation System reactor trip channel uncertainty (i.e., typically 9%).

As an interim measure, administrative controls consistent with the proposed changes are in place to address the current non-conservative TS in accordance with the direction provided in NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety." The administrative controls are sufficiently conservative to address the current licensed reactor core power level including an appropriate allowance for uncertainties.

E. DESCRIPTION OF THE PROPOSED CHANGE

The proposed change revises TS 3.7.1 LCO, Conditions, associated Required Actions, and Table 3.7.1-1. Specifically, the following changes are being proposed for TS 3.7.1 as illustrated by Attachments B-1 and B-2.

LCO

The proposed change revises the LCO by requiring five MSSVs per steam generator to be operable.

Conditions and Associated Required Actions

The proposed change modifies the Conditions and associated Required Actions of TS 3.7.1 as follows.

- Condition A and Required Action A.1 are reworded to be more explicit and consistent with the wording of revised Table 3.7.1-1. Condition A is entered when one or more steam generators with one or more MSSVs are inoperable. Required Action A.1 requires reducing the Thermal Power to less than or equal to the Maximum Allowable % RTP specified in Table 3.7.1-1 for the number of operable MSSVs within four hours. Required Action A.2 is added and requires a reduction in the Power Range Neutron Flux – High reactor trip setpoint to less than or equal to

the Maximum Allowable % RTP specified in Table 3.7.1-1 for the number of operable MSSVs within 36 hours. Required Action A.2 is modified by a Note, indicating that the Power Range Neutron Flux – High reactor trip setpoint reduction is only required in Mode 1.

- Condition B is reworded without changing the intent of this Condition. Condition B requires the unit be placed in Mode 3 within six hours and in Mode 4 within 12 hours when the Required Actions and associated Completion Time cannot be met or when one or more steam generators with greater than or equal to four MSSVs are inoperable.

Table 3.7.1-1

The proposed change revises the values in Table 3.7.1-1 as follows:

Number of Operable MSSVs per steam generator	Maximum Allowable Power (%RTP)
4	56
3	39
2	23

The proposed change also revises the title of Table 3.7.1-1 to "Operable Main Steam Safety Valves versus Maximum Allowable Power."

Bases

Changes to the TS 3.7.1 Bases based on TSTF-235, Revision 1 are also provided in Attachments B-5 and B-6 for informational purposes. Deviations from TSTF-235, Revision 1 are due to plant specific considerations described below.

Exceptions to TSTF-235, Revision 1

The proposed changes are based on TSTF-235, Revision 1 with exceptions due to plant specific considerations. The Conditions and Required Actions specified in TSTF-235, Revision 1 can be considered generic to all Westinghouse pressurized water reactors, but dependent on whether a plant is licensed to operate at partial power with a positive moderator temperature coefficient (PMTC). Exelon performed plant specific sensitivity studies that indicated the Conditions and Required Actions of TSTF-235, Revision 1 for a plant licensed to operate with a PMTC at partial power were inadequate in protecting Byron and Braidwood Stations against secondary system overpressurization under certain circumstances. Condition A of TSTF-235, Revision 1 requires only a reduction in Thermal Power when one MSSV is inoperable on one or more steam generators and the MTC is zero or negative at all power levels. Plant specific sensitivity studies demonstrated that a reduction in Thermal Power alone without a corresponding reduction in the Power Range Neutron Flux – High reactor trip setpoint would result in exceeding 110% of secondary system pressure even with only one MSSV inoperable on one or more steam generators for the uncontrolled RCCA withdrawal at partial power limiting secondary system pressure case which assumes a negative MTC.

F. SAFETY ANALYSIS OF THE PROPOSED CHANGES

The design basis for the MSSVs originates from the ASME B&PV Code, Section III, "Rules for Construction of Nuclear Power Plant Components." The design basis purpose is to limit the secondary system pressure to ≤ 110% of steam generator design pressure for any AOO or accident considered in the DBA and transient analyses.

The events that challenge the relieving capacity of the MSSVs, and thus the RCS pressure, are those characterized as decreased heat removal events (i.e., RCS heatup events), which are presented in the Byron/Braidwood Stations' Updated Final Safety Analysis Report (UFSAR), Section 15.2, "Decrease in Heat Removal by the Secondary System." Of these, the full power turbine trip without steam dump is typically the limiting AOO. This event also terminates normal feedwater flow to the steam generators. The safety analysis demonstrates that the transient response for turbine trip occurring from full power without a direct reactor trip presents no hazard to the integrity of the RCS or the MS System. This accident is analyzed for two specific cases, one for minimum Departure from Nucleate Boiling Ratio (DNBR) and one for maximum RCS and secondary pressures. For the minimum DNBR case, the analysis is performed assuming operation of the pressurizer PORVs and the pressurizer spray valves in order to reduce RCS pressure and, thus, yield a minimum DNBR. Pressurizer safety valves are also assumed to be available. For the pressure case, no credit is taken for operation of the pressurizer PORVs or pressurizer spray valves. This case credits reactor trip on high pressurizer pressure and operation of the pressurizer safety valves. This analysis demonstrates that the maximum RCS pressure does not exceed 110% of the design pressure. All cases analyzed demonstrate that the MSSVs maintain MS System integrity by limiting the maximum pressure to ≤ 110% of the steam generator design pressure.

In addition to the decreased heat removal events, reactivity insertion events may also challenge the relieving capacity of the MSSVs. The uncontrolled RCCA bank withdrawal at power event is characterized by an increase in core power and steam generation rate until reactor trip occurs when either the Overtemperature ΔT or Power Range Neutron Flux – High setpoint is reached. Steam flow to the turbine will not increase from its initial value for this event. The increased heat transfer to the secondary side causes an increase in steam pressure and may result in opening of the MSSVs prior to reactor trip, assuming no credit for operation of the steam generator PORVs or condenser steam dump valves. The UFSAR Section 15.4, "Reactivity and Power Distribution Anomalies," safety analysis of the RCCA bank withdrawal at power event for a range of initial core power levels demonstrates that the MSSVs are capable of preventing secondary side overpressurization for this AOO.

The UFSAR safety analyses discussed above assume that all of the MSSVs for each steam generator are operable. If there are inoperable MSSVs, it is necessary to limit the primary system power during steady-state operation and AOOs to a value that does not result in exceeding the combined steam flow capacity of the turbine (if available) and the remaining operable MSSVs. The required limitation on primary system power necessary to prevent secondary system overpressurization may be determined by system transient analyses or conservatively arrived at by a simple heat balance calculation. Plant specific sensitivity studies demonstrate that in some circumstances it is necessary to limit the primary side heat generation that can be achieved during an AOO by reducing the setpoint of the Power Range Neutron Flux – High reactor trip setpoint. For example, with one or more MSSVs on one or more steam generators inoperable, during an RCS heatup event (e.g., turbine trip) when the MTC is positive, the reactor power may increase above the initial power value. An uncontrolled RCCA bank withdrawal at power event occurring from a partial power level may result in an increase in reactor power that exceeds the combined steam flow capacity of the turbine and the remaining

operable MSSVs. Thus, for any number of inoperable MSSVs on one or more steam generators it is necessary to prevent a power increase by lowering the Power Range Neutron Flux – High reactor trip setpoint to an appropriate value. Therefore, Required Action A.1 requires an appropriate reduction in reactor power within four hours. An additional 32 hours is allowed in Required Action A.2 to reduce the Power Range Neutron Flux – High reactor trip setpoints. The Completion Time of 36 hours is based on a reasonable time to correct the MSSV inoperability, the time required to perform the power reduction, operating experience in resetting all channels of a protective function, and on the low probability of the occurrence of a transient that could result in steam generator overpressure during this period.

The maximum allowable power level specified in TS Table 3.7.1-1 was determined using the simple heat balance calculation described above assuming a nominal NSSS power rating, including reactor coolant pump heat, representing uprated power conditions (e.g., 3600.6 Mwt). The maximum allowable power level was conservatively adjusted lower by 9.0% RTP to account for Nuclear Instrumentation System reactor trip channel uncertainties. Plant specific sensitivity studies demonstrate that use of this simple heat balance calculation is sufficiently conservative at all power levels if an allowance of 7.4% for Nuclear Instrumentation System channel uncertainty and a MSSV setpoint tolerance of 4% are assumed in plant specific analyses. The Nuclear Instrumentation System reactor trip channel uncertainty assumption used in the plant specific analyses is bounded by the calculated value. The MSSV setpoint tolerance assumption is bounded by the setpoint tolerance specified in Table 3.7.1-2.

Required Action A.2 is modified by a Note, indicating that the Power Range Neutron Flux – High reactor trip setpoint reduction is only required in Mode 1. In Modes 2 and 3 the reactor protection system trips specified in TS 3.3.1, "Reactor Trip System Instrumentation," provide sufficient protection.

If the MSSVs cannot be restored to operable status or the Required Actions cannot be completed within the associated Completion Time, or if one or more steam generators have ≥ 4 inoperable MSSVs (e.g., Condition B), the unit must be placed in a Mode in which the LCO does not apply. To achieve this status, the unit must be placed in at least Mode 3 within six hours, and in Mode 4 within 12 hours.

G. IMPACT ON PREVIOUS SUBMITTALS

We have reviewed the proposed change regarding its impact on any previous submittals and have determined that there is no impact on any previous submittals.

H. SCHEDULE REQUIREMENTS

We request approval of the proposed change by April 15, 2003. Currently, administrative controls consistent with the proposed changes are in place to address the current non-conservative TS in accordance with the direction provided in NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety."

I. REFERENCES

(1) NRC Information Notice 94-60, "Potential Overpressurization of the Main Steam Safety System," dated August 22, 1994

(2) NUREG-1431, "Standard Technical Specifications, Westinghouse Plants," Revision 1, dated April 1995

(3) Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-235, Revision 1, MSSV Changes

(4) NUREG-1431, "Standard Technical Specifications, Westinghouse Plants," Revision 2, dated April 2001

(5) Letter from G.F. Dick (NRC) to O.D. Kinglsey (Exelon Generation Company, LLC), "Issuance of Amendments; Increase in Reactor Power, Byron Station, Units 1 and 2, and Braidwood Stations, Unit 1 and 2," dated May 4, 2001

ATTACHMENT B-1

MARKED-UP TS PAGES FOR PROPOSED CHANGE
BRAIDWOOD STATION, UNITS 1 AND 2

MARKED-UP TS PAGE

3.7.1-1
3.7.1-3

3.7 PLANT SYSTEMS

3.7.1 Main Steam Safety Valves (MSSVs)

LCO 3.7.1 The MSSVs shall be OPERABLE as specified in Table 3.7.1-1 and Table 3.7.1-2.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

NOTE
Separate Condition entry is allowed for each MSSV.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required MSSVs inoperable.	A.1	Reduce power to less than or equal to the Maximum Allowable applicable % RTP listed in Table 3.7.1-1	4 hours
B. Required Action and associated Completion Time not met. OR One or more steam generators with less than two MSSVs OPERABLE	B.1 AND B.2	Be in MODE 3. Be in MODE 4.	6 hours 12 hours

Insert:

CONDITION	REQUIRED ACTION	COMPLETION TIME
	AND	
	A.2 ---------NOTE--------- Only required in MODE 1. ---------- Reduce the Power Range Neutron Flux - High reactor trip setpoint to less than or equal to the Maximum Allowable % RTP specified in Table 3.7.1-1 for the number of OPERABLE MSSVs.	36 hours

Table 3.7.1-1 (page 1 of 1)
OPERABLE Main Steam Safety Valves versus
~~Applicable Power in Percent of RATED THERMAL POWER~~
Maximum Allowable Power

~~MINIMUM~~ NUMBER OF OPERABLE MSSVs PER STEAM GENERATOR ~~REQUIRED OPERABLE~~	MAXIMUM ALLOWABLE ~~APPLICABLE~~ POWER (% RTP)
~~5~~	~~≤ 100~~
4	≤ ~~60~~ 56
3	≤ ~~43~~ 39
2	≤ ~~25~~ 23

ATTACHMENT B-2

MARKED-UP TS PAGES FOR PROPOSED CHANGE
BYRON STATION, UNITS 1 AND 2

MARKED-UP TS PAGE

3.7.1-1
3.7.1-3

3.7 PLANT SYSTEMS

3.7.1 Main Steam Safety Valves (MSSVs)

LCO 3.7.1 The MSSVs shall be OPERABLE as specified in Table 3.7.1-1 and Table 3.7.1-2.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

NOTE
Separate Condition entry is allowed for each MSSV.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required MSSVs inoperable.	A.1 Reduce power to less than or equal to the applicable % RTP listed in Table 3.7.1-1.	4 hours
B. Required Action and associated Completion Time not met. OR One or more steam generators with less than two MSSVs OPERABLE.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours 12 hours

Insert:

CONDITION	REQUIRED ACTION	COMPLETION TIME
	AND	
	A.2 ---------NOTE--------- Only required in MODE 1. ---------- Reduce the Power Range Neutron Flux - High reactor trip setpoint to less than or equal to the Maximum Allowable % RTP specified in Table 3.7.1-1 for the number of OPERABLE MSSVs.	36 hours

Table 3.7.1-1 (page 1 of 1)
OPERABLE Main Steam Safety Valves versus
~~Applicable Power in Percent of RATED THERMAL POWER~~
Maximum Allowable Power

~~MINIMUM~~ OPERABLE NUMBER OF MSSVs PER STEAM GENERATOR ~~REQUIRED OPERABLE~~	~~MAXIMUM ALLOWABLE~~ ~~APPLICABLE~~ POWER (% RTP)
~~5~~	~~≤ 100~~
4	≤ ~~60~~ 56
3	≤ ~~43~~ 39
2	≤ ~~25~~ 23

ATTACHMENT B-3

INCORPORATED TS PAGES FOR PROPOSED CHANGE
BRAIDWOOD STATION, UNITS 1 AND 2

TS PAGE

3.7.1-1
3.7.1-2
3.7.1-3
3.7.1-4

3.7 PLANT SYSTEMS

3.7.1 Main Steam Safety Valves (MSSVs)

LCO 3.7.1 Five MSSVs per steam generator shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each MSSV.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more steam generators with one or more MSSVs inoperable.	A.1 Reduce THERMAL POWER to less than or equal to the Maximum Allowable % RTP specified in Table 3.7.1-1 for the number of OPERABLE MSSVs. AND A.2 -------NOTE-------- Only required in Mode 1. ---------- Reduce the Power Range Neutron Flux - High reactor trip setpoint to less than or equal to the Maximum Allowable % RTP specified in Table 3.7.1-1 for the number of OPERABLE MSSVs.	4 hours 36 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met. OR One or more steam generators with ≥ 4 MSSVs inoperable.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.1.1	----------NOTE---------- Only required to be performed in MODES 1 and 2. ---------- Verify each required MSSV lift setpoint per Table 3.7.1-2 in accordance with the Inservice Testing Program. Following testing, lift setting shall be within ± 1%.	In accordance with the Inservice Testing Program

Table 3.7.1-1 (page 1 of 1)
OPERABLE Main Steam Safety Valves versus
Maximum Allowable Power

NUMBER OF OPERABLE MSSVs PER STEAM GENERATOR	MAXIMUM ALLOWABLE POWER (% RTP)
4	≤ 56
3	≤ 39
2	≤ 23

Table 3.7.1-2 (page 1 of 1)
Main Steam Safety Valve Lift Settings

VALVE NUMBER STEAM GENERATOR				LIFT SETTING (psig ± 3%)
A	B	C	D	
MS013A	MS013B	MS013C	MS013D	1235
MS014A	MS014B	MS014C	MS014D	1220
MS015A	MS015B	MS015C	MS015D	1205
MS016A	MS016B	MS016C	MS016D	1190
MS017A	MS017B	MS017C	MS017D	1175

ATTACHMENT B-4

INCORPORATED TS PAGES FOR PROPOSED CHANGE
BYRON STATION, UNITS 1 AND 2

TS PAGE

3.7.1-1
3.7.1-2
3.7.1-3
3.7.1-4

3.7 PLANT SYSTEMS

3.7.1 Main Steam Safety Valves (MSSVs)

LCO 3.7.1 Five MSSVs per steam generator shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each MSSV.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more steam generators with one or more MSSVs inoperable.	A.1 Reduce THERMAL POWER to less than or equal to the Maximum Allowable % RTP specified in Table 3.7.1-1 for the number of OPERABLE MSSVs. AND	4 hours
	A.2 -------NOTE-------- Only required in Mode 1. ---------- Reduce the Power Range Neutron Flux-High reactor trip setpoint to less than or equal to the Maximum Allowable % RTP specified in Table 3.7.1-1 for the number of OPERABLE MSSVs.	36 hours

ACTIONS (continued)

B. Required Action and associated Completion Time not met. OR One or more steam generators with ≥ 4 MSSVs inoperable.	B.1 AND B.2	Be in MODE 3. Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.1.1	----------NOTE---------- Only required to be performed in MODES 1 and 2. ----------	
	Verify each required MSSV lift setpoint per Table 3.7.1-2 in accordance with the Inservice Testing Program. Following testing, lift setting shall be within ± 1%.	In accordance with the Inservice Testing Program

Table 3.7.1-1 (page 1 of 1)
OPERABLE Main Steam Safety Valves versus
Maximum Allowable Power

NUMBER OF OPERABLE MSSVs PER STEAM GENERATOR	MAXIMUM ALLOWABLE POWER (% RTP)
4	≤ 56
3	≤ 39
2	≤ 23

Table 3.7.1-2 (page 1 of 1)
Main Steam Safety Valve Lift Settings

VALVE NUMBER STEAM GENERATOR				LIFT SETTING (psig ± 3%)
A	B	C	D	
MS013A	MS013B	MS013C	MS013D	1235
MS014A	MS014B	MS014C	MS014D	1220
MS015A	MS015B	MS015C	MS015D	1205
MS016A	MS016B	MS016C	MS016D	1190
MS017A	MS017B	MS017C	MS017D	1175

ATTACHMENT B-5

INCORPORATED TS BASES PAGES FOR PROPOSED CHANGE
BRAIDWOOD STATION, UNITS 1 AND 2
(FOR INFORMATION ONLY)

TS BASES PAGES

B 3.7.1-1
B 3.7.1-2
B 3.7.1-3
B 3.7.1-4
B 3.7.1-5
B 3.7.1-6
B 3.7.1-7
B 3.7.1-8

B 3.7 PLANT SYSTEMS

B 3.7.1 Main Steam Safety Valves (MSSVs)

BASES

BACKGROUND

The primary purpose of the MSSVs is to provide overpressure protection for the secondary system. The MSSVs also provide protection against overpressurizing the Reactor Coolant Pressure Boundary (RCPB) by providing a heat sink for the removal of energy from the Reactor Coolant System (RCS) if the preferred heat sink, provided by the Condenser and Circulating Water System, is not available. The MSSVs also serve as Containment Isolation Valves (CIVs); however, the CIV function is addressed in LCO 3.6.3, "Containment Isolation Valves."

Five MSSVs are located on each main steam header, outside containment, upstream of the main steam isolation valves, as described in the UFSAR, Section 10.3.1 (Ref. 1). The MSSVs must have sufficient capacity to limit the secondary system pressure to ≤ 110% of the steam generator design pressure in order to meet the requirements of the ASME Code, Section III (Ref. 2). The MSSV design includes staggered setpoints, according to Table 3.7.1-2 in the accompanying LCO, so that only the needed valves will actuate. Staggered setpoints reduce the potential for valve chattering that is due to steam pressure insufficient to fully open all valves following a turbine reactor trip.

APPLICABLE SAFETY ANALYSES

The design basis for the MSSVs comes from Reference 2 and its purpose is to limit the secondary system pressure to ≤ 110% of steam generator design pressure for any Anticipated Operational Occurrence (AOO) or accident considered in the Design Basis Accident (DBA) and transient analysis. The MSSVs are also credited as CIVs (refer to LCO 3.6.3).

The events that challenge the relieving capacity of the MSSVs, and thus RCS pressure, are those characterized as decreased heat removal events (i.e., RCS heatup events), which are presented in the UFSAR, Section 15.2 (Ref. 3). Of these, the full power turbine trip without steam dump is typically the limiting AOO. This event also terminates normal feedwater flow to the steam generators.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The safety analysis demonstrates that the transient response for turbine trip occurring from full power without a direct reactor trip presents no hazard to the integrity of the RCS or the Main Steam System. This accident is analyzed for two specific cases, one for minimum Departure from Nucleate Boiling Ratio (DNBR) and one for maximum RCS and secondary pressures. For the minimum DNBR case, the analysis is performed assuming operation of the pressurizer Power Operated Relief Valves (PORVs and the pressurizer spray valves in order to reduce RCS pressure and, thus, yield a minimum DNBR. Pressurizer safety valves are also assumed to be available. For the pressure case, no credit is taken for operation of the presurizer PORVs or pressurizer spray valves. This case credits reactor trip on high pressurizer pressure and operation of the pressurizer safety valves. This analysis demonstrates that RCS integrity is maintained by showing that the maximum RCS pressure does not exceed 110% of the design pressure. All cases analyzed demonstrate that the MSSVs maintain Main Steam System integrity by limiting the maximum steam pressure to $\leq$ 100% of the steam generator design pressure.

In addition to the decreased heat removal events, reactivity insertion events may also challenge the relieving capacity of the MSSVs. The uncontrolled Rod Cluster Control Assembly (RCCA) bank withdrawal at power event is characterized by an increase in core power and steam generation rate until reactor trip occurs when either the Overtemperature ΔT or Power Range Neutron Flux-High setpoint is reached. Steam flow to the turbine will not increase from its initial value for this event. The increased heat transfer to the secondary side causes an increase in steam pressure and may result in opening of the MSSVs prior to reactor trip, assuming no credit for operation of the steam generator PORVs or condenser steam dump valves. The UFSAR Section 15.4 safety analysis of the uncontrolled RCCA bank withdrawal at power event for a range of initial core power levels demonstrates that the MSSVs are capable of preventing secondary side overpressurization for this AOO.

The UFSAR safety analyses discussed above assume that all of the MSSVs for each steam generator are OPERABLE. If there are inoperable MSSV(s), it is necessary to limit the primary system power during steady-state operation and AOOs to a value that does not result in exceeding the combined steam flow capacity of the turbine (if available) and the remaining OPERABLE MSSVs. The required limitation on primary system power necessary to prevent secondary system

BASES

APPLICABLE SAFETY ANALYSES (continued)

overpressurization may be determined by system transient analyses or conservatively arrived at by a simple heat balance calculation. Plant specific sensitivity studies demonstrate that in some circumstances it is necessary to limit the primary side heat generation that can be achieved during an AOO by reducing the setpoint of the Power Range Neutron Flux-High reactor trip function. For example, with one or more MSSVs on one or more steam generators inoperable, during an RCS heatup event (e.g., turbine trip) when the Moderator Temperature Coefficient (MTC) is positive, the reactor power may increase above the initial value. An uncontrolled RCCA bank withdrawal at power event occurring from a partial power level may result in an increase in reactor power that exceeds the combined steam flow capacity of the turbine and the remaining OPERABLE MSSVs. Thus, for any number of inoperable MSSVs on one or more steam generators it is necessary to prevent a power increase by lowering the Power Range Neutron Flux-High reactor trip setpoint to an appropriate value.

The MSSVs are assumed to have two active and one passive failure modes. The active failure modes are spurious opening, and failure to reclose once opened. The passive failure mode is failure to open upon demand.

The MSSVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The accident analysis requires that five MSSVs per steam generator be OPERABLE to provide overpressure protection for design basis transients. The LCO requires that five MSSVs per steam generator be OPERABLE in compliance with Reference 2, and the DBA analysis.

The OPERABILITY of the MSSVs is defined as the ability to open upon demand within the setpoint tolerances, to relieve steam generator overpressure, and reseat when pressure has been reduced. The OPERABILITY of the MSSVs is determined by periodic surveillance testing in accordance with the Inservice Testing Program.

This LCO provides assurance that the MSSVs will perform their designed safety functions to mitigate the consequences of accidents that could result in a challenge to the RCPB or Main Steam System integrity.

BASES

APPLICABILITY

In MODES 1, 2, and 3, five MSSVs per steam generator are required to be OPERABLE to prevent Main Steam System overpressurization.

In MODES 4 and 5, there are no credible transients requiring the MSSVs. The steam generators are not normally used for heat removal in MODES 5 and 6, and thus cannot be overpressurized; there is no requirement for the MSSVs to be OPERABLE in these MODES.

ACTIONS

The ACTIONS table is modified by a Note indicating that separate Condition entry is allowed for each MSSV.

A.1 AND A.2

With one or more MSSVs inoperable, action must be taken so that the available MSSV relieving capacity meets Reference 2 requirements.

Operation with less than all five MSSVs OPERABLE for each steam generator is permissible, if THERMAL POWER is limited to the relief capacity of the remaining MSSVs. This is accomplished by restricting THERMAL POWER so that the energy transfer to the most limiting steam generator is not greater than the available relief capacity in that steam generator.

With one or more MSSVs inoperable on one or more steam generators, a reactor power reduction alone may result in insufficient total steam flow capacity provided by the remaining OPERABLE MSSVs to preclude overpressurization in the event of an RCS heatup event when the MTC is positive since reactor power may increase. Furthermore, reactor power may increase due to a reactivity insertion event, such as an uncontrolled RCCA bank withdrawal at partial power event, such that the flow capacity of the turbine and remaining OPERABLE MSSVs is insufficient. Therefore, Required Action A.1 requires an appropriate reduction in reactor power within 4 hours. An additional 32 hours is allowed in Required Action A.2 to reduce the Power Range Neutron Flux-High reactor trip setpoints. The Completion Time of 36 hours is based on a reasonable time to correct the MSSV inoperability, the time required to perform the power reduction, operating experience in resetting all channels of a protective function, and on the low probability of the occurrence of a transient that could result in steam generator overpressure during this period.

BASES

ACTIONS (continued)

The maximum THERMAL POWER corresponding to the heat removal capacity of the remaining OPERABLE MSSVs is determined by a simple heat balance calculation as described in the attachment to Reference 4, with an appropriate allowance for Nuclear Instrumentation System trip channel uncertainities. The following equation is used to determine the maximum allowable power level for continued operation with inoperable MSSV(s):

$$MaximmumAllowablePower \leq = \frac{100}{Q}\left(\frac{w_S\, h_{fg}\, N}{K}\right)$$

Where:

Q = Nominal NSSS power rating of the plant (including reactor coolant pump heat), in Mwt (= 3600.6 Mwt).

K = Conversion factor = 947.82 (BTU/sec)/Mwt.

w_s = minimum total steam flow rate capability of the OPERABLE MSSVs on any one steam generator at the highest OPERABLE MSSV opening pressure including tolerance and accumulation, as appropriate, in lbm/sec.

h_{fg} = Heat of vaporization for steam at the highest MSSV opening pressure including tolerance and accumulation, as appropriate, in BTU/lbm.

N = Number of loops in the plant (= 4).

The maximum allowable power level determined by this simple heat balance calculation was adjusted lower by 9.0% RTP to account for Nuclear Instrumentation System trip channel uncertainties. Plant specific sensitivity studies demonstrate that use of this simple heat balance calculation is sufficiently conservative at all power levels if an allowance of 7.4% for Nuclear Instrumentation System trip channel uncertainty and a MSSV setpoint tolerance of 4% are assumed in plant specific analyses. The Nuclear Instrumentation System trip channel uncertainty assumption used in the plant specific analyses is bounded by the

BASES

ACTIONS (continued)

calculated value. The MSSV setpoint tolerance assumption used in the plant specific analyses is bounded by the setpoint tolerance specified in Table 3.7.1-2.

Required Action A.2 is modified by a Note, indicating that the Power Range Neutron Flux-High reactor trip setpoint reduction is only required in Mode 1. In Modes 2 and 3 the rector protection system trips specified in LCO 3.3.1, "Reactor Trip System Instrumentation," provide sufficient protection.

The allowed Completion Times are reasonable based on operating experience to accomplish the Required Actions in an orderly manner without challenging plant systems.

B.1 and B.2

If the MSSVs cannot be restored to OPERABLE status or the Required Actions cannot be completed within the associated Completion Time, or if one or more steam generators have ≥ 4 inoperable MSSVs, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1

This SR verifies the OPERABILITY of the MSSVs by the verification of each MSSV lift setpoint in accordance with the Inservice Testing Program. The ASME Code, Section XI (Ref. 5), requires that safety and relief valve tests be performed in accordance with ANSI/ASME OM-1-1987 (Ref. 6). According to Reference 6, the following tests are required.

a. Visual examination;

b. Seat tightness determination;

c. Setpoint pressure determination (lift setting);

d. Compliance with owner's seat tightness criteria; and

e. Verification of the balancing device integrity on balanced valves.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1 (continued)

The ANSI/ASME Standard requires that all valves be tested every 5 years, and a minimum of 20% of the valves be tested every 24 months. The ASME Code specifies the activities and frequencies necessary to satisfy the requirements. Table 3.7.1-2 allows a ± 3% setpoint tolerance for OPERABILITY; however, the valves are reset to ± 1% during the Surveillance to allow for drift. The lift settings, according to Table 3.7.1-2, correspond to ambient conditions of the valve at nominal operating temperature and pressure.

This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. The MSSVs may be either bench tested or tested in situ at hot conditions using an assist device to simulate lift pressure. If the MSSVs are not tested at hot conditions, the lift setting pressure shall be corrected to ambient conditions of the valve at operating temperature and pressure.

REFERENCES

1. UFSAR, Section 10.3.1.
2. ASME, Boiler and Pressure Vessel Code, Section III, Article NC-7000, Class 2 Components.
3. UFSAR, Section 15.2.
4. NRC Information Notice 94-60, "Potential Overpressurization of the Main Steam System," August 22, 1994.
5. ASME, Boiler and Pressure Vessel Code, Section XI.
6. ANSI/ASME OM-1-1987 and applicable Addenda.

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ATTACHMENT B-6

INCORPORATED TS BASES PAGES FOR PROPOSED CHANGE
BYRON STATION, UNITS 1 AND 2
(FOR INFORMATION ONLY)

TS BASES PAGES

B 3.7.1-1
B 3.7.1-2
B 3.7.1-3
B 3.7.1-4
B 3.7.1-5
B 3.7.1-6
B 3.7.1-7
B 3.7.1-8

B 3.7 PLANT SYSTEMS

B 3.7.1 Main Steam Safety Valves (MSSVs)

BASES

BACKGROUND

The primary purpose of the MSSVs is to provide overpressure protection for the secondary system. The MSSVs also provide protection against overpressurizing the Reactor Coolant Pressure Boundary (RCPB) by providing a heat sink for the removal of energy from the Reactor Coolant System (RCS) if the preferred heat sink, provided by the Condenser and Circulating Water System, is not available. The MSSVs also serve as Containment Isolation Valves (CIVs); however, the CIV function is addressed in LCO 3.6.3, "Containment Isolation Valves."

Five MSSVs are located on each main steam header, outside containment, upstream of the main steam isolation valves, as described in the UFSAR, Section 10.3.1 (Ref. 1). The MSSVs must have sufficient capacity to limit the secondary system pressure to ≤ 110% of the steam generator design pressure in order to meet the requirements of the ASME Code, Section III (Ref. 2). The MSSV design includes staggered setpoints, according to Table 3.7.1-2 in the accompanying LCO, so that only the needed valves will actuate. Staggered setpoints reduce the potential for valve chattering that is due to steam pressure insufficient to fully open all valves following a turbine reactor trip.

APPLICABLE SAFETY ANALYSES

The design basis for the MSSVs comes from Reference 2 and its purpose is to limit the secondary system pressure to ≤ 110% of steam generator design pressure for any Anticipated Operational Occurrence (AOO) or accident considered in the Design Basis Accident (DBA) and transient analysis. The MSSVs are also credited as CIVs (refer to LCO 3.6.3).

The events that challenge the relieving capacity of the MSSVs, and thus RCS pressure, are those characterized as decreased heat removal events (i.e., RCS heatup events), which are presented in the UFSAR, Section 15.2 (Ref. 3). Of these, the full power turbine trip without steam dump is typically the limiting AOO. This event also terminates normal feedwater flow to the steam generators.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The safety analysis demonstrates that the transient response for turbine trip occurring from full power without a direct reactor trip presents no hazard to the integrity of the RCS or the Main Steam System. This accident is analyzed for two specific cases, one for minimum Departure from Nucleate Boiling Ration (DNBR) and one for maximum RCS and secondary pressures. For the minimum DNBR case, the analysis is performed assuming operation of the pressurizer Power Operated Relief Valves (PORVs) and the pressurizer spray valves in order to reduce RCS pressure and, thus, yield a minimum DNBR. Pressurizer safety valves are also assumed to be available. For the pressure case, no credit is taken for operation of the pressurizer PORVs or pressurizer spray valves. This case credits reactor trip on high pressurizer pressure and operation of the pressurizer safety valves. This analysis demonstrates that RCS integrity is maintained by showing that the maximum RCS pressure does not exceed 110% of the design pressure. All cases analyzed demonstrate that the MSSVs maintain Main Steam System integrity by limiting the maximum steam pressure to $\leq$ 110% of the steam generator design pressure.

In addition to the decreased heat removal events, reactivity insertion events may also challenge the relieving capacity of the MSSVs. The uncontrolled Rod Cluster Control Assembly (RCCA) bank withdrawal at power event is characterized by an increase in core power and steam generation rate until reactor trip occurs when either the Overtemperature ΔT or Power Range Neutron Flux-High setpoint is reached. Steam flow to the turbine will not increase from its initial value for this event. The increased heat transfer to the secondary side causes an increase in steam pressure and may result in opening of the MSSVs prior to reactor trip, assuming no credit for operation of the steam generator PORVs or condenser steam dump valves. The UFSAR Section 15.4 safety analysis of the uncontrolled RCCA bank withdrawal at power event for a range of initial core power levels demonstrates that the MSSVs are capable of preventing secondary side overpressurization for this AOO.

The UFSAR safety analyses discussed above assume that all of the MSSVs for each steam generator are OPERABLE. If there are inoperable MSSV(s), it is necessary to limit the primary system power during steady-state operation and AOOs to a value that does not result in exceeding the combined steam flow capacity of the turbine (if available) and the remaining OPERABLE MSSVs. The required limitation on primary system power necessary to prevent secondary system

BASES

APPLICABLE SAFETY ANALYSES (continued)

overpressurization may be determined by system transient analyses or conservatively arrived at by a simple heat balance calculation. Plant specific sensitivity studies demonstrate that in some circumstances it is necessary to limit the primary side heat generation that can be achieved during an AOO by reducing the setpoint of the Power Range Neutron Flux-High reactor trip function. For example, with one or more MSSVs on one or more steam generators inoperable, during an RCS heatup event (e.g, turbine trip) when the Moderator Temperature Coefficient (MTC) is positive, the reactor power may increase above the initial value. An uncontrolled RCCA bank withdrawal at power event occurring from a partial power level may result in an increase in reactor power that exceeds that combined steam flow capacity of the turbine and the remaining OPERABLE MSSVs. Thus, for any number of inoperable MSSVs on one or more steam generators it is necessary to prevent a power increase by lowering the Power Range Neutron Flux-High reactor trip setpoint to an appropriate value.

The MSSVs are assumed to have two active and one passive failure modes. The active failure modes are spurious opening, and failure to reclose once opened. The passive failure mode is failure to open upon demand.

The MSSVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The accident analysis requires five MSSVs per steam generator be OPERABLE to provide overpressure protection for design basis transients. The LCO requires that five MSSVs per steam generator be OPERABLE in compliance with Reference 2, and the DBA analysis.

The OPERABILITY of the MSSVs is defined as the ability to open upon demand within the setpoint tolerances, to relieve steam generator overpressure, and reseat when pressure has been reduced. The OPERABILITY of the MSSVs is determined by periodic surveillance testing in accordance with the Inservice Testing Program.

This LCO provides assurance that the MSSVs will perform their designed safety functions to mitigate the consequences of accidents that could result in a challenge to the RCPB or Main Steam System integrity.

BASES

APPLICABILITY

In MODES 1, 2, and 3 five MSSVs per steam generator are required to be OPERABLE to prevent Main Steam System overpressurization.

In MODES 4 and 5, there are no credible transients requiring the MSSVs. The steam generators are not normally used for heat removal in MODES 5 and 6, and thus cannot be overpressurized; there is no requirement for the MSSVs to be OPERABLE in these MODES.

ACTIONS

The ACTIONS table is modified by a Note indicating that separate Condition entry is allowed for each MSSV.

A.1 and A.2

With one or more MSSVs inoperable, action must be taken so that the available MSSV relieving capacity meets Reference 2 requirements.

Operation with less than all five MSSVs OPERABLE for each steam generator is permissible, if THERMAL POWER is limited to the relief capacity of the remaining MSSVs. This is accomplished by restricting THERMAL POWER so that the energy transfer to the most limiting steam generator is not greater than the available relief capacity in that steam generator.

With one or more MSSVs inoperable on one or more steam generators, a reactor power reduction alone may result in insufficient total steam flow capacity provided by the remaining OPERABLE MSSVs to preclude overpressurization in the event of an RCS heatup event when the MTC is positive since reactor power may increase. Furthermore, reactor power may increase due to a reactivity insertion event, such as an uncontrolled RCCA bank withdrawal at partial power event, such that the flow capacity of the turbine and remaining OPERABLE MSSVs is insufficient. Therefore, Required Action A.1 requires an appropriate reduction in reactor power within 4 hours. An additional 32 hours is allowed in Required Action A.2 to reduce the Power Range Neutron Flux-High reactor trip setpoints. The Completion Time of 36 hours is based on a reasonable time to correct the MSSV inoperability, the time required to perform the power reduction, operating experience in resetting all channels of a protective function, and on the low probability of the occurrence of a transient that could result in steam generator overpressure during this period.

BASES

ACTIONS (continued)

The maximum THERMAL POWER corresponding to the heat removal capacity of the remaining OPERABLE MSSVs is determined by a simple heat balance calculation as described in the attachment to Reference 4, with an appropriate allowance for Nuclear Instrumentation System trip channel uncertainties. The following equation is used to determine the maximum allowable power level for continued operation with inoperable MSSV(s):

$$Maximum\ Allowable\ Power = \frac{100}{Q}\left(\frac{w_S\ h_{fg}\ N}{K}\right)$$

Where:

Q = Nominal NSSS power rating of the plant (including reactor coolant pump heat), in Mwt (= 3600.6 Mwt).

K = Conversion factor = 947.82 (BTU/sec)/Mwt.

W_s = minimum total steam flow rate capability of the OPERABLE MSSVs on any one steam generator at the highest OPERABLE MSSV opening pressure including tolerance and accumulation, as appropriate, in lbm/sec.

h_{fg} = Heat of vaporization for steam at the highest MSSV opening pressure including tolerance and accumulation, as appropriate, in BTU/lbm.

N = Number of loops in the plant (= 4).

The maximum allowable power level determined by this simple heat balance calculation was adjusted lower by 9.0% RTP to account for Nuclear Instrumentation System trip channel uncertainties. Plant specific sensitivity studies demonstrate that use of this simple heat balance calculation is sufficiently conservative at all power levels if an allowance of 7.4% of Nuclear Instrumentation System trip channel uncertainty and a MSSV setpoint tolerance of 4% are assumed in plant specific analyses. The Nuclear

BASES

ACTIONS (continued)

Instrumentation System trip channel uncertainty assumption used in the plant specific analyses is bounded by the calculated value. The MSSV setpoint tolerance assumption used in the plant specific analyses is bounded by the setpoint tolerance specified in Table 3.7.1-2.

Required Action A.2 is modified by a Note, indicating that the Power Range Neutron Flux-High reactor trip setpoint reduction is only required in Mode 1. In Modes 2 and 3 the reactor protection system trips specified in LCO 3.3.1, "Reactor Trip System Instrumentation," provide sufficient protection.

The allowed Completion Times are reasonable based on operating experience to accomplish the Required Actions in an orderly manner without challenging plant systems.

B.1 and B.2

If the MSSVs cannot be restored to OPERABLE status or the Required Actions cannot be completed within the associated Completion Time, or if one or more steam generators have ≥ 4 inoperable MSSVs, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1

This SR verifies the OPERABILITY of the MSSVs by the verification of each MSSV lift setpoint in accordance with the Inservice Testing Program. The ASME Code, Section XI (Ref. 5), requires that safety and relief valve tests be performed in accordance with ANSI/ASME OM-1-1987 (Ref. 6). According to Reference 6, the following tests are required:

a. Visual examination;

b. Seat tightness determination;

c. Setpoint pressure determination (lift setting);

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1 (continued)

d. Compliance with owner's seat tightness criteria; and

e. Verification of the balancing device integrity on balanced valves.

The ANSI/ASME Standard requires that all valves be tested every 5 years, and a minimum of 20% of the valves be tested every 24 months. The ASME Code specifies the activities and frequencies necessary to satisfy the requirements. Table 3.7.1-2 allows a ± 3% setpoint tolerance for OPERABILITY; however, the valves are reset to ± 1% during the Surveillance to allow for drift. The lift settings, according to Table 3.7.1-2, in the accompanying LCO, correspond to ambient conditions of the valve at nominal operating temperature and pressure.

This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. The MSSVs may be either bench tested or tested in situ at hot conditions using an assist device to simulate lift pressure. If the MSSVs are not tested at hot conditions, the lift setting pressure shall be corrected to ambient conditions of the valve at operating temperature and pressure.

REFERENCES

1. UFSAR, Section 10.3.1.

2. ASME, Boiler and Pressure Vessel Code, Section III, Article NC-7000, Class 2 Components.

3. UFSAR, Section 15.2.

4. NRC Information Notice 94-60, "Potential Overpressurization of the Main Steam System," August 22, 1994.

5. ASME, Boiler and Pressure Vessel Code, Section XI.

6. ANSI/ASME OM-1-1987 and applicable Addenda.

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ATTACHMENT C

INFORMATION SUPPORTING A FINDING OF NO SIGNIFICANT HAZARDS CONSIDERATION

According to 10 CFR 50.92(c), "Issuance of amendment," a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (Exelon) is proposing a change to the Technical Specifications (TS) of Facility Operating License Nos. NPF-72, NPF-77, NPF-37 and NPF-66 for the Braidwood Station, Units 1 and 2, and the Byron Station, Units 1 and 2, respectively. The proposed change is based on NRC approved Technical Specifications Task Force (TSTF) Standard Technical Specification (TS) Change Traveler TSTF-235, Revision 1, Main Steam Safety Valve (MSSV) Changes with exceptions due to plant specific considerations. The proposed change revises the Limiting Condition for Operation (LCO), the associated Conditions and Required Actions of TS 3.7.1, "MSSVs", and the values in Table 3.7.1-1, "Operable Main Steam Safety Valves versus Applicable Power in Percent of Rated Thermal Power." The proposed change adds a requirement to appropriately reduce the Power Range Neutron Flux – High reactor trip setpoint when one or more steam generators with one or more MSSVs are inoperable.

Information supporting the determination that the criteria set forth in 10 CFR 50.92 are met for this amendment request is indicated below.

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

The proposed change adds a requirement to appropriately reduce the Power Range Neutron Flux – High reactor trip setpoint when one or more steam generators with one or more MSSVs are inoperable. The proposed TS change does not affect the design of the MSSV or increase the likelihood of MSSV failures. Reducing the Power Range Neutron Flux – High reactor trip setpoint does not affect initiators of any accident sequence analyzed in the Byron/Braidwood Stations' Updated Final Safety Analysis Report (UFSAR). Therefore, the probability of occurrence of a previously evaluated accident is not increased.

The design basis for the MSSVs is to limit the secondary system pressure to ≤ 110% of steam generator design pressure for any Anticipated Operational Occurrence (AOO) or accident considered in the Design Basis Accident (DBA) and transient analyses. If there are inoperable MSSVs, it is necessary to limit the primary system power during steady-state operation and Anticipated Operational Occurrences (AOOs) to a value that does not result in exceeding the combined steam flow capacity of the turbine (if available) and the remaining operable MSSVs.

It has been demonstrated that for those events that challenge the relieving capacity of the MSSVs, i.e., decreased heat removal events resulting in a Reactor Coolant System (RCS) heatup and reactivity insertion events, it is necessary to limit the AOO by reducing the setpoint of the Power Range Neutron Flux – High reactor trip function. For example, with one or more MSSVs on one or more steam generators inoperable, during an RCS heatup event (e.g., turbine trip) when the Moderator Temperature Coefficient (MTC) is positive, the reactor power may increase above the value assumed in the analysis at the start of the transient. Likewise, a reactivity insertion event, such as an uncontrolled rod cluster control assembly (RCCA) withdrawal from partial power level, may result in an increase in reactor power that exceeds the combined steam flow capacity of the turbine and the remaining operable MSSVs. Thus, for any number of inoperable MSSVs on one or more steam generators it is necessary to prevent a power increase by lowering the Power Range Neutron Flux – High reactor trip setpoint to an appropriate value. This change will ensure that the consequences of previously evaluated accidents remain bounding. Currently administrative controls are in place to address the current non-conservative TS in accordance with the direction provided in NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety."

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

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

The proposed change does not involve a physical alteration of the units. No new equipment is being introduced, and installed equipment is not being operated in a new or different manner. The design and operation of the MSSVs are unaffected by the proposed change. The proposed change will not alter the manner in which equipment operation is initiated, nor will the functional demands on equipment be changed. No change is being made to procedures relied upon to respond to off-normal events. As such, no new failure modes are being introduced. The proposed change appropriately revises the setpoints at which protective actions are initiated. The proposed change also prevents operating the plant in a configuration that could challenge the safety analyses limiting initial condition assumptions, thereby ensuring previously evaluated accidents remain bounding. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

The primary purpose of the MSSVs is to provide overpressure protection for the secondary system. The MSSVs must have sufficient capacity to limit the secondary pressure to ≤ 110% of the steam generator design pressure in order to meet the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section III, "Rules for Construction of Nuclear Power Plant Components." The proposed change precludes operation in a configuration that could challenge the design requirement of the MSSVs by requiring a reduction in the Power Range Neutron Flux – High reactor trip setpoint, in addition to a reduction in Thermal Power, when one or more steam generators with one or more MSSVs are inoperable. The maximum allowable power specified in TS Table 3.7.1-1 was calculated using a simple heat balance calculation as described in the attachment to NRC Information Notice 94-60, "Potential Overpressurization of the Main Steam Safety System," dated August 22, 1994, assuming uprated power conditions with an appropriate allowance for Nuclear Instrumentation System reactor trip channel uncertainties. Precluding operation in a configuration that could challenge the design requirement of the MSSVs and appropriately

revising the values in Table 3.7.1-1 preserves the margin of safety. This change assures the design basis limit will not be exceeded. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

ATTACHMENT D

INFORMATION SUPPORTING AN ENVIRONMENTAL ASSESSMENT

Exelon Generation Company, LLC (Exelon) has evaluated the proposed change against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21, "Criteria for and identification of licensing and regulatory actions requiring environmental assessments." Exelon has determined that the proposed change meets the criteria for a categorical exclusion set forth in 10 CFR 51.22, "Criteria for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," paragraph (c)(9), and as such, has determined that no irreversible consequences exist in accordance with 10 CFR 50.92, "Issuance of amendment," paragraph (b). This determination is based on the fact that this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," which changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, "Standards for Protection Against Radiation," or which changes an inspection or a surveillance requirement, and the amendment meets the following specific criteria.

(i) The proposed change involves no significant hazards consideration.

As demonstrated in Attachment C, the proposed change does not involve any significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

The proposed change does not allow for an increase in the unit power level, does not increase the production, nor alter the flow path or method of disposal of radioactive waste or by-products. The proposed change does not affect actual unit effluents. Therefore, the proposed change does not change the types or increase the amounts of any effluents released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed change will not result in changes in the operation or configuration of the facility. There will be no change in the level of controls or methodology used for processing of radioactive effluents or handling of solid radioactive waste, nor will the proposal result in any change in the normal radiation levels within the plant. Therefore, there will be no increase in individual or cumulative occupational radiation exposure resulting from the proposed change.