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

July 25, 2016

Mr. Oscar A. Limpias
Vice President-Nuclear and CNO
Nebraska Public Power District
72676 648A Avenue
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION - ISSUANCE OF AMENDMENT TO RELOCATE THE PRESSURE-TEMPERATURE CURVES TO A PRESSURE-TEMPERATURE LIMITS REPORT (CAC NO. MF6582)

Dear Mr. Limpias:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 256 to Renewed Facility Operating License No. DPR-46 for the Cooper Nuclear Station (CNS). The amendment consists of changes to the technical specifications (TSs) in response to your application dated August 6, 2015, as supplemented by letter dated March 17, 2016.

The amendment approves a revision to the CNS TS Section 1.1, "Definitions"; TS Section 3.4.9, "RCS [Reactor Coolant System] Pressure and Temperature (P/T) Limits"; and Administrative Controls TS Section 5.6, "Reporting Requirements." Editorial corrections have also been made to the TS Table of Contents. The amendment relocates the RCS pressure-temperature (P-T) limits from the TS limiting condition for operation to a new licensee-controlled document – the Pressure-Temperature Limits Report (PTLR). The actual RCS P-T limit curves, as currently established in the CNS TSs, and all associated parameters, which are valid through 32 effective full power years of facility operation, are not affected by the TS amendment.

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

Sincerely,

Alan Wang For

Thomas J. Wengert, Project Manager
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosures:
1. Amendment No. 256 to DPR-46
2. Safety Evaluation

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

NEBRASKA PUBLIC POWER DISTRICT

DOCKET NO. 50-298

COOPER NUCLEAR STATION

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 256
License No. DPR-46

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

   A. The application for amendment by Nebraska Public Power District (the licensee), dated August 6, 2015, as supplemented by letter dated March 17, 2016, 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 license 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 Renewed Facility Operating License No. DPR-46 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 256, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Shaun M. Anderson, Acting Chief
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility
Operating License No. DPR-46
and Technical Specifications

Date of Issuance: July 25, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 256

COOPER NUCLEAR STATION

RENEWED FACILITY OPERATING LICENSE NO. DPR-46

DOCKET NO. 50-298

Replace the following pages of the Renewed Facility Operating License No. DPR-46 and Appendix A Technical Specifications with the enclosed revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Renewed Facility Operating License

REMOVE	INSERT
-3-	-3-

Technical Specifications

REMOVE	INSERT
i	i
ii	ii
iii	iii
iv	----
1.1-4	1.1-4
3.4-19	3.4-19
3.4-20	3.4-20
3.4-21	3.4-21
3.4-22	3.4-22
3.4-23	3.4-23
3.4-24	----
3.4-25	----
3.4-26	----
5.0-21	5.0-21
5.0-22	5.0-22
5.0-23	5.0-23

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

C. This license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 2419 megawatts (thermal).

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 256, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) Physical Protection

The licensee shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined set of plans, which contain Safeguards Information protected under 10 CFR 73.21, are entitled: "Cooper Nuclear Station Safeguards Plan," submitted by letter dated May 17, 2006.

NPPD shall fully implement and maintain in effect all provisions of the Commission-approved cyber security plan (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The NPPD CSP was approved by License Amendment No. 238 as supplemented by changes approved by License Amendments 244 and 249.

(4) Fire Protection

NPPD shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the license amendment request dated April 24, 2012 (and supplements dated July 12, 2012, January 14, 2013, February 12, 2013, March 13, 2013, June 13, 2013, December 12, 2013, January 17, 2014, February 18, 2014, and April 11, 2014), and as approved in the safety evaluation dated April 29, 2014. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if

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1.1 Definitions

LOGIC SYTEM FUNCTIONAL TEST (continued)	from as close to the sensor as practicable up to, but not including, the actuated device, to verify OPERABILITY. The LOGIC SYSTEM FUNCTIONAL TEST may be performed by means of any series of sequential, overlapping, or total system steps so that the entire logic system is tested.
MINIMUM CRITICAL POWER RATIO (MCPR)	The MCPR shall be the smallest critical power ratio (CPR) that exists in the core for each class of fuel. The CPR is that power in the assembly that is calculated by application of the appropriate correlation(s) to cause some point in the assembly to experience boiling transition, divided by the actual assembly operating power.
MODE	A MODE shall correspond to any one inclusive combination of mode switch position, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1 with fuel in the reactor vessel.
OPERABLE – OPERABILITY	A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).
PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)	The PTLR is the unit specific document that provides the reactor vessel pressure and temperature limits, including heatup and cooldown rates, for the current reactor vessel fluence period. These pressure and temperature limits shall be determined for each fluence period in accordance with Specification 5.6.7.
RATED THERMAL POWER (RTP)	RTP shall be a total reactor core heat transfer rate to the reactor coolant of 2419 MWt.
REACTOR PROTECTION SYSTEM (RPS) RESPONSE TIME	The RPS RESPONSE TIME shall be that time segment from the time the sensor contacts actuate to the time the scram solenoid valves deenergize.
SHUTDOWN MARGIN (SDM)	SDM shall be the amount of reactivity by which the reactor is subcritical or would be subcritical throughout the operating cycle assuming that: a. The reactor is xenon free;

(continued)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.9 RCS Pressure and Temperature (P/T) Limits

LCO 3.4.9 RCS pressure, RCS temperature, RCS heatup and cooldown rates, and the recirculation pump starting temperature requirements shall be maintained within the limits specified in the PTLR.

APPLICABILITY: At all times.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. ----------NOTE---------- Required Action A.2 shall be completed if this Condition is entered. ---------- Requirements of the LCO not met in MODE 1, 2, or 3.	A.1	Restore parameter(s) to within limits.	30 minutes
	AND		
	A.2	Determine RCS is acceptable for continued operation.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	Be in MODE 3.	12 hours
	AND		
	B.2	Be in MODE 4.	36 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. ----------NOTE---------- Required Action C.2 shall be completed if this Condition is entered. ---------- Requirements of the LCO not met in other than MODES 1, 2, and 3.	C.1 Initiate action to restore parameter(s) to within limits. AND C.2 Determine RCS is acceptable for operation.	Immediately Prior to entering MODE 2 or 3.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.9.1	----------NOTE---------- Only required to be performed during RCS heatup and cooldown operations and RCS inservice leak and hydrostatic testing. ----------	
	Verify:	30 minutes
	a. RCS pressure and RCS temperature are within the applicable limits specified in the curves in the PTLR; and	
	b. RCS heatup and cooldown rates are within limits specified in the PTLR.	

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.4.9.2	Verify RCS pressure and RCS temperature are within the criticality limits specified in the PTLR.	Once within 15 minutes prior to control rod withdrawal for the purpose of achieving criticality
SR 3.4.9.3	----------NOTE---------- Only required to be met in MODES 1, 2, 3, and 4 during recirculation pump startup. ----------	
	Verify the difference between the bottom head coolant temperature and the reactor pressure vessel (RPV) coolant temperature is within the limits specified in the PTLR.	Once within 15 minutes prior to each startup of a recirculation pump
SR 3.4.9.4	----------NOTE---------- Only required to be met in MODES 1, 2, 3, and 4 during recirculation pump startup. ----------	
	Verify the difference between the reactor coolant temperature in the recirculation loop to be started and the RPV coolant temperature is within the limits specified in the PTLR.	Once within 15 minutes prior to each startup of a recirculation pump

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.4.9.5	----------NOTE---------- Only required to be performed when tensioning the reactor vessel head bolting studs. ---------- Verify reactor vessel flange and head flange temperatures are within the limits specified in the PTLR.	30 minutes
SR 3.4.9.6	----------NOTE---------- Not required to be performed until 30 minutes after RCS temperature ≤ 80°F in MODE 4. ---------- Verify reactor vessel flange and head flange temperatures are within the limits specified in the PTLR.	30 minutes
SR 3.4.9.7	----------NOTE---------- Not required to be performed until 12 hours after RCS temperature ≤ 90°F in MODE 4. ---------- Verify reactor vessel flange and head flange temperatures are within the limits specified in the PTLR.	12 hours

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Reactor Steam Dome Pressure

LCO 3.4.10 The reactor steam dome pressure shall be ≤ 1020 psig.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Reactor steam dome pressure not within limit.	A.1	Restore reactor steam dome pressure to within limit.	15 minutes
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.10.1	Verify reactor steam dome pressure is ≤ 1020 psig.	12 hours

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

2. NEDE-23785-1-P-A, "The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident", Volume III, Revision 1, October 1984.

3. NEDO-31960 and NEDO-31960 Supplement 1, "BWR Owner's Group Long-Term Stability Solutions Licensing Methodology" (the approved Revision at the time the reload analysis is performed).

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.

5.6.6 Post Accident Monitoring (PAM) Instrumentation Report

When a report is required by Condition B or F of LCO 3.3.3.1, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.7 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

a. Reactor pressure and temperature limit for heatup, cooldown, low temperature operation, criticality, and hydrostatic testing as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

1. Limiting Conditions for Operations Section 3.4.9, "RCS Pressure and Temperature (P/T) Limits."

2. Surveillance Requirements Section 3.4.9, "RCS Pressure and Temperature (P/T) Limits."

b. The analytical methods used to determine the RCS pressure and temperature limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

(continued)

5.6 Reporting Requirements

5.6.7 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT PTLR) (continued)

1. BWROG-TP-11-022-A, Revision 1 (SIR-05-044, Revision 1-A), "Pressure-Temperature Limits Report Methodology for Boiling Water Reactors," dated August 2013.

2. BWROG-TP-11-023-A, Revision 0 (0900876.401, Revision 0-A), "Linear Elastic Fracture Mechanics Evaluation of General Electric Boiling Water Reactor Water Level Instrument Nozzles for Pressure-Temperature Curve Evaluations," dated May 2013.

c. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto.

5.0 ADMINISTRATIVE CONTROLS

5.7 High Radiation Area

5.7.1 In lieu of the "control device" or "alarm signal" required by paragraph 20.1601 of 10 CFR Part 20, each high radiation area in which the deep dose equivalent in excess of 100 mrem but less than 1000 mrem in one hour (measurement made at 12 inches from source of radiation) shall be barricaded (barricade will impede physical movement across the entrance or access to the high radiation area; i.e., doors, yellow and magenta rope, turnstile) and conspicuously posted as a high radiation area and entrance thereto shall be controlled by requiring issuance of a Special Work Permit (SWP). Radiation protection personnel or personnel escorted by radiation protection personnel shall be exempt from the SWP issuance requirement during the performance of their assigned duties, provided they are otherwise following plant radiation protection procedures for entry into high radiation areas. Any individual or group of individuals permitted to enter such areas shall be provided with or accompanied by one or more of the following:

a. A monitoring device which continuously indicates the radiation dose rate in the area.

b. A monitoring device which continuously integrates the radiation dose in the area and alarms when a preset integrated dose is received. Entry into such areas with this monitoring device may be made after the dose rates in the area have been established and personnel have been made knowledgeable of them.

c. A radiation protection qualified individual (i.e., qualified in radiation protection procedures), with a dose rate monitoring device, who is responsible for providing positive control over the activities within the area and shall perform periodic dose rate monitoring at the frequency specified by Health Physics supervision.

5.7.2 In addition to the requirements of Specification 5.7.1, areas accessible to personnel with dose rates such that a major portion of the body could receive in 1 hour a deep dose equivalent in excess of 1000 mrem (measurement made at 12 inches from source of radiation) shall be provided with locked doors to prevent unauthorized entry. Doors shall remain locked except during periods of access by personnel under an approved SWP which shall specify the dose rates in the immediate work area. For individual high radiation areas accessible to personnel that are located within large areas, such as the containment, or areas where no enclosure exists for purposes of locking and no enclosure can be reasonably constructed around the individual areas, then that area shall be barricaded and conspicuously posted. Area radiation monitors that have been set to alarm if radiation levels increase, provide both a visual and an audible signal to alert personnel in the area of the increase. These monitors may be used to meet Specification 5.7.1.a provided that the dose rates and alarms have been established by radiation protection personnel. Stay times or continuous surveillance, direct or remote (such as use of closed circuit TV cameras), may be made by personnel qualified in radiation protection procedures to provide additional positive exposure control over the activities within the area.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 256 TO

RENEWED FACILITY OPERATING LICENSE NO. DPR-46

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

DOCKET NO. 50-298

1.0 INTRODUCTION

By letter dated August 6, 2015 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML15229A031), as supplemented by letter dated March 17, 2016 (ADAMS Package Accession No. ML16084A181), Nebraska Public Power District (NPPD, the licensee) submitted a license amendment request (LAR) for Cooper Nuclear Station (CNS), pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 90 (10 CFR 50.90), "Application for amendment of license, construction permit, or early site permit."

The LAR proposed changes to the CNS Technical Specifications (TSs) that would relocate the reactor coolant system (RCS) pressure-temperature (P-T) limits from the TS limiting condition for operation (LCO) to a new licensee-controlled document – the P-T Limits Report (PTLR). The actual RCS P-T limit curves, as currently established in the CNS TSs, and all associated parameters, which are valid through 32 effective full power years (EFPY) of facility operation, would not be affected by the TS changes proposed in the LAR. The proposed CNS PTLR for 32 EFPY was developed based on the U.S. Nuclear Regulatory Commission (NRC)-approved methodologies described in the Boiling Water Reactor (BWR) Owners Group (BWROG) licensing topical reports (TRs): BWROG-TP-11-022-A, Revision 1, "Pressure-Temperature Limits Report Methodology for Boiling Water Reactors," August 2013 (ADAMS Accession No. ML13277A557) and BWROG-TP-11-023-A, Revision 0, "Linear Elastic Fracture Mechanics Evaluation of General Electric Boiling Water Reactor Water Level Instrument Nozzles for Pressure-Temperature Curve Evaluations," May 2013 (ADAMS Accession No. ML13183A017).

The licensee's supplemental letter dated March 17, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on November 3, 2015 (80 FR 67802).

2.0 REGULATORY EVALUATION

The proposed amendment involves changes to the TS requirements for the CNS RCS P-T limits. CNS TS Section 3.4.9, "RCS Pressure and Temperature (P/T) Limits," contains the TS requirements for operation of the CNS RCS in accordance with the P-T limits. The P-T limits are established in the TSs to protect the integrity of the reactor pressure vessel (RPV) during normal operating and pressure test conditions, per the requirements of 10 CFR 50.60, "Acceptance criteria for fracture prevention measures for light-water nuclear power reactors for normal operation," and 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements." The P-T limits are also established to meet the general design criteria for reactor coolant pressure boundary (RCPB) integrity, which are established in 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants." The ferritic RPV materials are less tough at low temperatures than at normal operating temperatures. Therefore, acceptable operation of the RCS is defined by maintaining RCS pressure less than and RCS temperature greater than that of the P-T limits for all modes of reactor operation when the RPV closure head is tensioned to the vessel.

The NRC's regulatory requirements related to the content of the TSs are contained in 10 CFR 50.36, "Technical Specifications." The requirements for TS content in 10 CFR 50.36 include the following categories of plant safety criteria: (1) safety limits, limiting safety systems settings and control settings, (2) LCOs, (3) surveillance requirements, (4) design features, and (5) administrative controls.

2.1 Requirements for P-T Limits

Appendix A to 10 CFR Part 50, General Design Criterion (GDC) 14, "Reactor coolant pressure boundary," requires the design, fabrication, erection, and testing of the RCPB so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

Appendix A to 10 CFR Part 50, GDC 30, "Quality of reactor coolant pressure boundary," requires, in part, that components comprising the RCPB be designed, fabricated, erected, and tested to the highest quality standards practical.

Appendix A to 10 CFR Part 50, GDC 31, "Fracture Prevention of Reactor Coolant Pressure Boundary," states the RCPB shall be designed with sufficient margin to assure that when stressed under operating, maintenance, testing, and postulated accident conditions (1) the boundary behaves in a non-brittle manner and (2) the probability of rapidly propagating fracture is minimized. The design shall reflect consideration of service temperatures and other conditions of the boundary material under operating maintenance, testing and postulated accident conditions and the uncertainties in determining (1) material properties, (2) the effects of irradiation on material properties, (3) residual, steady state and transient stresses, and (4) size of flaws.

Section 50.60 of 10 CFR requires that all light-water nuclear power reactors meet the fracture toughness and material surveillance program requirements set forth in 10 CFR Part 50,

Appendix G and 10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements," in order to protect the integrity of the RCPB.

Appendix G to 10 CFR Part 50, specifies fracture toughness requirements to protect the integrity of the RCPB in nuclear power plants and requires that the P-T limits for an operating light-water nuclear reactor be at least as conservative as those that would be generated if the methods of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Appendix G were used to generate the P-T limits. Appendix G to 10 CFR Part 50 also requires that applicable surveillance data from RPV material surveillance programs be incorporated into the calculations of plant-specific P-T limits and that the P-T limits for operating reactors be generated using a method that accounts for the effects of neutron irradiation on the material properties of the RPV beltline materials.

Table 1, "Pressure and Temperature Requirements for the Reactor Pressure Vessel," of 10 CFR Part 50, Appendix G, provides the specific requirements for generating the P-T limit curves based on the methods of the ASME Code, Section XI, Appendix G, as well as the minimum temperature requirements for the RPV. These requirements are for normal operating conditions, including the normal RCS heatup and cooldown transients, with the reactor core critical and core not critical, as well as for pressure testing conditions. In addition, the NRC staff's regulatory guidance related to the evaluation of RPV neutron embrittlement for P-T limit curves is found in Regulatory Guide (RG) 1.99, "Radiation Embrittlement of Reactor Vessel Materials," Revision 2 (ADAMS Accession No. ML003740284). Additional guidance related to the staff's review of P-T limit curve submittals is found in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Edition]," Chapter 5, Section 5.3.2, "Pressure-Temperature Limits, Upper Shelf Energy, and Pressurized Thermal Shock." Revision 2, March 2007 (ADAMS Accession No. ML070380185).

The ASME Code, Section XI, Appendix G, methodology for generating P-T limit curves is based upon the principles of linear elastic fracture mechanics. The fundamental parameter of this methodology is the stress intensity factor, K_I, which is a function of the stress state in the component and flaw configuration. The ASME Code, Section XI, Appendix G requires a safety factor of 2.0 on stress intensities resulting from reactor pressure during normal operating conditions and a safety factor of 1.5 on these stress intensities for hydrostatic and pressure testing limits. The ASME Code, Section XI, Appendix G specifies that the P-T limits shall be generated by postulating a flaw with a depth that is equal to one-quarter of the RPV section thickness (1/4t) (t = vessel beltline thickness)and a length equal to 1.5 times the RPV section thickness. The critical locations in the RPV section thickness for calculating the P-T limit curves are the 1/4t and 3/4t locations, which correspond to the maximum depth of the postulated inside surface and outside surface flaws, respectively.

The ASME Code, Section XI, Appendix G, specifies that P-T limit curve calculations shall be based, in part, on the reference nil-ductility temperature (RT_{NDT}), for the material. The RT_{NDT} is the fundamental parameter for defining the critical stress intensity factor (K_{IC}, also referred to as plane strain fracture toughness) for the material as a function of temperature. Appendix G to 10 CFR Part 50 requires that RT_{NDT} values for materials in the RPV beltline region be adjusted to account for the effects of neutron irradiation. RG 1.99, Revision 2, contains methodologies for calculating the adjusted RT_{NDT} (ART) due to neutron irradiation. The ART is defined as the sum of the initial (unirradiated) RT_{NDT}, the mean value of the shift in reference temperature

caused by irradiation (ΔRT_{NDT}), and a margin term. The ΔRT_{NDT} is a product of a chemistry factor (CF) and a fluence factor. The CF is dependent upon the amount of copper (Cu) and nickel (Ni) in the material and may be determined from tables in RG 1.99, Revision 2, or from surveillance data. The fluence factor is dependent upon the neutron fluence at the postulated flaw depths described above. The margin term is dependent upon whether the initial RT_{NDT} is a plant-specific or a generic value and whether the CF was determined using the tables in RG 1.99, Revision 2, or surveillance data. The margin term is used to account for uncertainties in the values of the initial RT_{NDT}, the Cu and Ni contents, the neutron fluence and the calculational procedures. RG 1.99, Revision 2, describes the methodology to be used in calculating the margin term.

To satisfy the requirements of 10 CFR Part 50, Appendix G, methods for determining fast neutron fluence are necessary to determine the fracture toughness of the RPV materials. Appendix H to 10 CFR Part 50, requires the installation of surveillance capsules, including material test specimens and neutron flux dosimeters, to provide data for material damage correlations as a function of neutron fluence. RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence" (ADAMS Accession No. ML010890301), describes methods and assumptions acceptable to the NRC staff for determining the RPV neutron fluence with respect to meeting the regulatory requirements discussed above.

2.2 Criteria for PTLRs

On January 31, 1996, the NRC staff issued Generic Letter (GL) 96-03, "Relocation of Pressure Temperature Limit Curves and Low Temperature Overpressure Protection System Limits" (ADAMS Accession No. ML031110004), to inform licensees that they may request a license amendment to relocate the P-T limits from the TS LCOs to a PTLR or other licensee-controlled document that would be governed by the TS administrative controls. In order to permit relocation of the P-T limits, GL 96-03 states that licensees shall generate their P-T limits in accordance with an NRC-approved methodology and that the methodology used to generate the P-T limits shall comply with the requirements of 10 CFR Part 50, Appendices G and H. GL 96-03 also states that the methodology used to generate the P-T limits must be incorporated by reference in the administrative controls section of the TSs and that the PTLR be defined in Section 1.0 of the TSs. Attachment 1 to GL 96-03 provided a list of the seven technical criteria that the PTLR methodology and plant-specific PTLR license amendments would be required to meet.

Technical Specification Task Force (TSTF) Traveler TSTF-419, Revision 0, "Revise PTLR Definition and References in ISTS [Improved Standard Technical Specification] 5.6.6, RCS PTLR," was approved by the NRC staff in a letter dated March 21, 2002 (ADAMS Accession No. ML020800488). This TSTF traveler amended the Standard TS (STS) for all domestic LWR designs to: (1) delete references to the TS LCOs for the P-T limits and low-temperature overpressure protection (LTOP) system limits in the TS definition of the PTLR, and (2) revise the standard administrative controls for the PTLR in STS Section 5.6 to allow NRC-approved topical reports for PTLR methodologies to be identified by number and title. Supplemental guidance related to TSTF-419, Revision 0, was subsequently provided in an NRC letter dated August 4, 2011 (ADAMS Accession No. ML110660285) that required the full topical report or methodology citation to be included in the TSs, not in the PTLR. The TSTF did not change the requirement that the PTLR methodology be approved by the NRC or the TS requirement to

operate the RCS within the limits specified in the PTLR. Any changes to a PTLR methodology that had not been approved by the NRC staff would continue to require staff review and approval pursuant to the LAR provisions of 10 CFR 50.90. TSTF-419, Revision 0, has since been incorporated into NUREG-1433, "Standard Technical Specifications - General Electric BWR/4 Plants: Specifications," Revision 4, Volume 1, April 2012 (ADAMS Accession No. ML12104A192).

Throughout the licensee's LAR application, the licensee refers to TSTF-419-A, dated August 4, 2003, as a basis for the requested amendment to relocate the P-T limit curves to a PTLR. The NRC staff notes that the "-A" designation added to TSTF-419 is an industry convention used to indicate that the TSTF has been approved by the NRC. TSTF-419 and TSTF-419-A are the same document. However, since TSTF-419-A is not an NRC designation, this safety evaluation (SE) refers to the TS change traveler as TSTF-419, Revision 0.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Evaluation

3.1.1 Proposed TS Revisions

The licensee states that the proposed TS changes associated with the relocation of the current P-T limits to a PTLR, are consistent with the guidance provided in GL 96-03, as supplemented by TSTF-419, Revision 0 and the guidance contained in an NRC letter dated August 4, 2011, which requires the full methodology citation in TS Section 5.6, "Reporting Requirements." Specifically, the TS revisions, as proposed in the subject LAR, include the following:

1. TS Section 1.1, "Definitions," is revised to include a new definition: "PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)." The subject LAR states that the wording of this definition is consistent with that provided in TSTF-419, Revision 0.

2. TS Section 3.4.9, "RCS Pressure and Temperature (P/T) Limits," LCO and Surveillance Requirements are revised to replace all specified P-T limit figures, heatup and cooldown rates, and minimum temperature criteria with a reference to the PTLR.

3. TS Section 5.6, "Reporting Requirements," is revised to include a new TS: TS 5.6.7, "Reactor Coolant System (RCS) Pressure and Temperature Limits Report (PTLR)," has been added. The LAR states that the format and content of the new TS 5.6.7 is consistent with TSTF-419, Revision 0. The LAR also states that this new section identifies the individual TS sections that require operation per the PTLR; references the NRC-approved topical report that documents the PTLR methodology; and requires that the PTLR and any revision or supplement thereto, be submitted to the NRC.

4. Editorial revisions are made to the TS Table of Contents.

3.1.2 Licensee's Evaluation for the Proposed TS Revisions for PTLR Implementation

The licensee's evaluation of the proposed TS revisions is provided in Section 3.0 of the LAR. The licensee's evaluation states that the current P-T limits for 32 EFPY, as established in the CNS TS, are to be relocated to the PTLR. The licensee identified that these P-T limit curves were previously approved by the NRC staff through the issuance of License Amendment No. 245 dated February 22, 2013 (ADAMS Accession No. ML13032A526). The licensee further states that the NRC staff's SE accompanying Amendment No. 245 concluded that the P-T limits for all regions of the RPV are in compliance with the requirements of 10 CFR Part 50, Appendix G.

The licensee identified that the implementation of a PTLR requires that the analytical methods used to develop the P-T limits must be consistent with those previously reviewed and approved by the NRC and must be referenced in the Administrative Controls section of the plant's TSs. The licensee stated that the current P-T limits established in the CNS TSs were developed using the generic methodology established in the NRC-approved Structural Integrity Associates, Inc. (SIA) TR, SIR-05-044-A, Revision 0, "Pressure-Temperature Limits Report Methodology for Boiling Water Reactors," dated April 12, 2007 (ADAMS Accession No. ML072340283). The licensee noted that the proposed PTLR has been prepared in accordance with the latest NRC-approved SIA methodologies for developing PTLRs for BWRs:

- Revision 1-A of SIA TR SIR-05-044 (also NRC-approved), which is contained within the BWROG report, BWROG-TP-11-022-A, Revision 1, August 2013, and

- SIA Report 0900876.401, Revision 0-A, contained within BWROG-TP-11-023-A, Revision 0, May 2013.

The licensee indicated that these latest NRC-approved PTLR methodologies result in P-T limits that are equivalent to those established in the CNS TS for 32 EFPY. The licensee provided the proposed 32 EFPY PTLR in an enclosure to its August 6, 2015, LAR.

3.2 NRC Staff Evaluation

3.2.1 NRC Staff Evaluation of the Proposed TS Revisions

The NRC staff reviewed the licensee's proposed TS revisions for implementation of the proposed PTLR to determine whether they satisfy the criteria of TSTF-419, Revision 0, as modified by guidance in an NRC letter dated August 4, 2011 (which is now incorporated in NUREG-1433). The staff's findings are documented below:

1. The NRC staff verified that the licensee's revision to TS Section 1.1, "Definitions," to include the new definition of the PTLR, "PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)," is consistent with that provided in TSTF-419, Revision 0 and NUREG-1433. Therefore, it is acceptable.

2. TS Section 3.4.9, "RCS Pressure and Temperature (P/T) Limits," LCO and Surveillance Requirements are revised to replace all specified P-T limit figures, heatup and cooldown rates, and minimum temperature criteria with a reference

to the PTLR, and specifically requires RCS operation within the limits specified in the PTLR. The NRC staff verified that this is consistent with TSTF-419, Revision 0 and NUREG-1433. Therefore, it is acceptable.

3. A new TS requirement has been added to the CNS TS Administrative Controls section. Specifically, TS 5.6.7, "Reactor Coolant System (RCS) Pressure and Temperature Limits Report (PTLR)," has been added to TS Section 5.6, "Reporting Requirements." This TS contains the TS administrative controls governing the content and reporting requirements for the PTLR. The NRC staff verified that the new TS 5.6.7 is consistent with TSTF-419, Revision 0, as modified by guidance in NRC letter dated August 4, 2011, and NUREG-1433, because this section identifies that the P-T limits for heatup, cooldown, low temperature operation, criticality, and hydrostatic testing, including the heatup and cooldown rates, shall be established in the PTLR. The staff also verified that TS 5.6.7 correctly identifies the TS sections (TS Section 3.4.9 LCO, Action Statements, and Surveillance Requirements) that require operation in accordance with the limits in the PTLR, per TSTF-419, Revision 0; guidance in NRC letter dated August 4, 2011; and NUREG-1433. Finally, the staff verified that TS 5.6.7 references the latest NRC-approved PTLR methodologies for BWRs, as established within the BWROG TRs, BWROG-TP-11-022-A, Revision 1 and BWROG-TP-11-023-A, Revision 0, and it contains the necessary NRC reporting requirements for any future revisions to the PTLR following implementation. Therefore, the staff determined that the addition of TS 5.6.7 is acceptable.

4. TS pages 1.1-4, 3.4-19, 3.4-20, 3.4-21, 3.4-22, 3.4-23, 3.4-24, 3.4-25, 5.0-21 and 5.0-22 have been revised to reflect the changes described above. TS pages 3.4-26 and 5.0-23 have been revised for this license amendment for pagination purposes only. In addition, revisions have been made to the TS Table of Contents, pages i – iv, to conform to the pagination changes in the amended TSs. Changes were also made to the Table of Contents to correct several pre-existing editorial errors. The NRC staff confirmed that these editorial revisions to the TS Table of Contents are consistent with the TS changes evaluated above for implementation of the PTLR or to make other conforming editorial changes. Since these page changes are purely administrative, they are acceptable.

Based on its evaluation of the proposed TS changes, as documented above, the NRC staff finds that they satisfy the criteria of TSTF-419, Revision 0, as modified by guidance in NRC letter dated August 4, 2011, and are consistent with NUREG-1433. Therefore, these TS revisions are acceptable for implementation at CNS.

3.2.2 NRC Staff Evaluation of the CNS PTLR for 32 EFPY

Attachment 1 of GL 96-03 identifies seven technical criteria that must be satisfied for plant-specific PTLRs. The NRC staff reviewed the proposed CNS PTLR to determine whether it satisfies the seven technical criteria of GL 96-03, as documented below:

(1) PTLR Criterion 1 specifies that the PTLR should provide the values of neutron fluence that are used in the ART calculation for the RPV beltline materials. The NRC staff confirmed that the 32 EFPY neutron fluence values for the RPV beltline materials are provided in Table 4 of the CNS PTLR. Therefore, the staff determined that PTLR Criterion 1 is satisfied.

(2) PTLR Criterion 2 specifies that the PTLR should provide the surveillance capsule withdrawal schedule, or reference by title and number the documents in which the schedule is located. The PTLR must also reference the surveillance capsule reports by title and number if ARTs are calculated using surveillance data. The NRC staff determined that the surveillance capsule withdrawal schedule is correctly identified in Appendix A of the CNS PTLR and is based on the licensee's participation in the NRC staff-approved BWR Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP). The staff confirmed that the licensee's participation in the BWRVIP ISP is also approved by the NRC staff for the 60-year license term. The staff identified that the appropriate references for the BWRVIP ISP governing documents, including the BWRVIP ISP implementation plan and the BWRVIP ISP evaluations of the participating plants' surveillance data, are provided in Section 6.0 of the CNS PTLR. In particular, the staff determined that the referencing of the ISP evaluations of the plants' surveillance data satisfies the criterion that the PTLR must reference the surveillance capsule reports by title and number if ARTs are calculated using surveillance data. Therefore, the staff determined that PTLR Criterion 2 is satisfied.

(3) PTLR Criterion 3 specifies that the PTLR should provide the LTOP system setpoint curves or parameters if LTOP system limits are relocated to the PTLR. The NRC staff noted that LTOP systems are not used for BWRs. Therefore, the staff determined that this criterion is not applicable to CNS.

(4) PTLR Criterion 4 specifies that the PTLR should identify the limiting ART values and limiting RPV beltline materials at the 1/4T and 3/4T locations. The NRC staff confirmed that 32 EFPY ART values for all RPV beltline materials, including the limiting RPV beltline materials, are provided in Table 4 of the CNS PTLR. Therefore, the staff determined that PTLR Criterion 4 is satisfied.

(5) PTLR Criterion 5 specifies that the PTLR should provide the P-T limit curves for heatup, cooldown, criticality, and pressure testing conditions. The NRC staff confirmed that P-T limit curves for these conditions are provided in Figures 1, 2, and 3 of the CNS PTLR, and the corresponding tabulated P-T limit values for these conditions are provided in Tables 1, 2, and 3 of the CNS PTLR. Therefore, the staff determined that PTLR Criterion 5 is satisfied.

(6) PTLR Criterion 6 specifies that the PTLR should identify the minimum temperatures on the P-T limit curves, such as the minimum boltup temperature and the hydrotest temperature. The NRC staff confirmed that the applicable minimum temperature criteria, including the minimum boltup temperature and the minimum temperature for criticality are identified in the P-T limit curves provided

in Figures 1, 2, and 3 of the CNS PTLR. Therefore, the staff determined that PTLR Criterion 6 is satisfied.

(7) PTLR Criterion 7 specifies that the PTLR should provide supplemental data and calculations of the CF in the PTLR if the RPV surveillance data are used in the ART calculation. PTLR Criterion 7 also specifies that the PTLR should evaluate the RPV surveillance data to determine if they meet the credibility criteria of RG 1.99, Revision 2 and provide the results of the credibility assessment. The NRC staff noted that Table 4 of the proposed CNS PTLR lists several ART and CF calculations that are based on RPV surveillance data from the BWRVIP ISP, including those for the limiting RPV beltline materials. Therefore, for these specific line entries, the staff issued a request for additional information (RAI), wherein the staff requested that the licensee provide the supporting ISP data and calculations from the BWRVIP ISP Data Source Book (BWRVIP-135) for determining these CFs. In addition, to ensure consistency with PTLR Criterion 7, the staff requested that the licensee supplement the proposed CNS PTLR to include the ISP data and calculations from BWRVIP-135 for determining the CFs.

The licensee's RAI response by letter dated March 17, 2016, provided the applicable pages from BWRVIP-135 containing the ISP data and calculations for determining the CFs for the CNS ISP materials, as well as the credibility evaluation for this data per the credibility criteria of RG 1.99, Revision 2. This information was included as a supplement to the CNS PTLR, consistent with the provisions of PTLR Criterion 7. The NRC staff reviewed these calculations and verified that they are consistent with the provisions of RG 1.99, Revision 2. Therefore, the staff determined that the licensee's RAI response is acceptable and PTLR Criterion 7 is satisfied.

Based on its evaluation of the seven PTLR technical criteria, as documented above, the NRC staff finds that the proposed CNS PTLR is consistent with GL 96-03 and is therefore acceptable for implementation in accordance with the requirements of TS 5.6.7, as established per this LAR.

With respect to the 32 EFPY P-T limits and associated parameters contained in the proposed CNS PTLR, the NRC staff confirmed that that these P-T limits are identical to those currently established in the CNS TS. The staff also confirmed that these 32 EFPY P-T limits were previously reviewed and approved by the NRC staff for incorporation into the CNS TS, as documented in the staff's SE accompanying License Amendment No. 245 dated February 22, 2013. As documented in its SE for Amendment No. 245, the staff determined that the P-T limits satisfy the requirements of 10 CFR Part 50, Appendix G. Furthermore, all parameters used in the development of the P-T limits (ART calculations, minimum temperature criteria, stress intensity factor calculations, etc.) were evaluated and approved by the NRC staff for Amendment No. 245 based on their meeting the applicable regulatory requirements and guidance described in Section 2.0 of this SE. Therefore, the staff finds that the actual 32 EFPY P-T limits and associated parameters contained in the proposed CNS PTLR are acceptable.

The implementation of a PTLR requires that the methodology used to develop the PTLR and the P-T limits contained therein, must be consistent with those previously reviewed and approved

by the NRC and must be referenced in the administrative controls section of the plant's TSs. The NRC staff noted that the 32 EFPY P-T limits currently established in the CNS TS were developed using the generic methodology established in the NRC-approved TR, SIR-05-044-A, Revision 0. Revision 1-A of SIR-05-044 (also NRC-approved), which is contained within the BWROG TR BWROG-TP-11-022-A, Revision 1, provides the latest methodology for developing RCS P-T limit curves for BWRs. This revision was developed to incorporate additional requirements related to the effects of nozzles within the RPV beltline region. The staff's review of the CNS TS P-T limit curves predates its approval of BWROG-TP-11-022-A, Revision 1. However, the staff determined in its SE for Amendment No. 245 that the current CNS TS P-T limits were correctly calculated to include the effects of the RPV beltline instrument nozzles, based on the NRC-approved methodology for instrument nozzles contained in BWROG-TP-11-023-A, Revision 0. BWROG-TP-11-023-A, was specifically developed to address the analysis of the RPV beltline instrument nozzles, and it was developed for implementation in conjunction with BWROG-TP-11-022-A. As discussed above, both BWROG topical reports are appropriately referenced in the proposed TS 5.6.7, as established per this LAR. Therefore, the staff finds that the 32 EFPY P-T limits contained in the CNS TS (to be relocated to the proposed PTLR) are also consistent with the latest NRC-approved PTLR methodologies in BWROG-TP-11-022-A, Revision 1 and BWROG-TP-11-023-A, Revision 0. Accordingly, the staff finds that these P-T limits are acceptable for incorporation into the new PTLR, to be administratively controlled in accordance with the TS 5.6.7 requirements.

3.4 Technical Evaluation Conclusion

Based on its evaluation, as documented in Section 3.2 of this SE, the NRC staff has determined that the proposed TS changes satisfy the criteria of TSTF-419, Revision 0, guidance in an NRC letter dated August 4, 2011, and are consistent with NUREG-1433. The staff has also determined that the proposed CNS PTLR is consistent with GL 96-03 and is therefore acceptable for implementation in accordance with the requirements of TS 5.6.7, as established per this LAR. Furthermore, the staff has determined that the 32 EFPY P-T limits and associated parameters contained in the proposed CNS PTLR satisfy the requirements of 10 CFR Part 50, Appendix G and are also consistent with the latest NRC-approved PTLR methodologies in BWROG-TP-11-022-A, Revision 1 and BWROG-TP-11-023-A, Revision 0. Therefore, the NRC staff concludes that the proposed TS revisions are acceptable for implementation at CNS, and the proposed CNS PTLR is acceptable for implementation through 32 EFPY, to be administratively controlled in accordance with the requirements of TS 5.6.7, as established per this LAR.

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20, and changes surveillance requirements. The NRC staff has determined that the amendment involves 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 amendment involves no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on November 3, 2015 (80 FR 67802). Accordingly, the amendment meets 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 amendment.

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) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: C. Sydnor
M. Hardgrove

Date: July 25, 2016

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

Sincerely,

/RA Alan Wang for/

Thomas J. Wengert, Project Manager
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosures:
1. Amendment No. 256 to DPR-46
2. Safety Evaluation

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ADAMS Accession No. ML16158A022 ***see previous **via memo**

OFFICE	NRR/DORL/LPL4-2/PM	NRR/DORL/LPL4-2/LA	NRR/DE/EVIB/BC**	NRR/DSS/SRXB/BC**
NAME	WHuffman	PBlechman	JMcHale	EOesterle
DATE	6/23/16	6/23/16	05/31/16	02/02/16
OFFICE	NRR/DSS/STSB/BC	OGC - NLO	NRR/DORL/LPL4-2/BC	NRR/DORL/LPL4-2/PM
NAME	AKlein	STurk	SAnderson	TWengert(AWang for)
DATE	6/24/16	6/29/16	7/12/16	7/25/16

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