



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

February 28, 2023

Mr. David P. Rhoades  
Senior Vice President  
Constellation Energy Generation, LLC  
President and Chief Nuclear Officer  
Constellation Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: NINE MILE POINT NUCLEAR STATION, UNIT 1 - ISSUANCE OF  
AMENDMENT NO. 248, REVISION TO ALTERNATIVE SOURCE TERM  
CALCULATION FOR MAIN STEAM ISOLATION VALVE LEAKAGE AND  
NON-MAIN STEAM ISOLATION VALVE LEAKAGE (EPID L-2022-LLA-0094)

Dear Mr. Rhoades:

The U.S. Nuclear Regulatory Commission (NRC or the Commission) has issued the enclosed Amendment No. 248 to Renewed Facility Operating License No. DPR-63 for the Nine Mile Point Nuclear Station, Unit 1 (Nine Mile Point 1). The amendment consists of changes to the licensing basis for post-loss-of-coolant accident alternative source term analysis for containment leakage at Nine Mile Point 1 in response to your application dated June 29, 2022.

The amendment includes corrections to the chemical group assignment for various radionuclides modeled in the RADionuclide, Transport, Removal and Dose Estimation computer code, Version 3.03, and updates to the modeling of both Main Steam Isolation Valve (MSIV) leakage and non-MSIV leakage. The amendment request was submitted in response to an Inspection Finding from the NRC which identified that changes were made to the original 2007 AST analysis that when taken consecutively, would not have been allowed under the guidance for meeting the requirements specified in Title 10 of the *Code of Federal Regulations*, Section 50.59, Changes, Tests, and experiments.

A copy of the related safety evaluation is enclosed. A Notice of Issuance will be included in the next Commission's monthly *Federal Register* notice.

Sincerely,

***/RA/***

Richard V. Guzman, Senior Project Manager  
Plant Licensing Branch I  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosures:

1. Amendment No. 248 to DPR-63
2. Safety Evaluation

cc: Listserv



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NUCLEAR REGULATORY COMMISSION  
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NINE MILE POINT NUCLEAR STATION, LLC

CONSTELLATION ENERGY GENERATION, LLC

DOCKET NO. 50-220

NINE MILE POINT NUCLEAR STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 248  
Renewed License No. NPF-63

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Constellation Energy Generation, LLC dated June 29, 2022, 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 regulations of the Commission;
  - C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 248, Renewed Facility License No. DPR-63 is hereby amended to authorize revision to the Nine Mile Point Nuclear Station, Unit No. 1 licensing basis associated with the post-loss-of-coolant accident alternative source term analysis, as set forth in the application dated June 29, 2022.
3. This 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

Hipólito J. González, Chief  
Plant Licensing Branch I  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Date of Issuance: February 28, 2023



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO THE REVISION OF THE ALTERNATIVE SOURCE TERM CALCULATION FOR  
MAIN STEAM ISOLATION VALVE AND NON-MAIN STEAM ISOLATION VALVE LEAKAGE  
AMENDMENT NO. 248 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-63  
CONSTELLATION ENERGY GENERATION, LLC  
NINE MILE POINT NUCLEAR STATION, UNIT 1  
DOCKET NO. 50-220

1.0 INTRODUCTION

In a letter dated June 29, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22180A020), Constellation Energy Generation, LLC requested approval of proposed changes to the post-loss-of-coolant accident (LOCA) Alternative Source Term (AST) analysis for containment leakage at Nine Mile Point Nuclear Station, Unit 1 (NMP1). The proposed changes include corrections to the chemical group assignment for various radionuclides modeled in the RADionuclide, Transport, Removal and Dose Estimation (RadTrad) computer code, Version 3.03, and updates to the modeling of both Main Steam Isolation Valve (MSIV) leakage and non-MSIV leakage. This request was submitted in response to an Inspection Finding from the U.S. Nuclear Regulatory Commission (NRC) which identified that changes were made to the original 2007 AST analysis that when taken consecutively, would not have been allowed under the guidance for meeting the requirements specified in Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.59 Changes, Tests, and experiments.

2.0 REGULATORY EVALUATION

The NRC staff evaluated the radiological consequences of affected design basis accidents (DBAs) for NMP1 as proposed by the licensee against the dose criteria specified in 10 CFR 50.67(b)(2). These criteria are: 25 roentgen equivalent man (rem) total effective dose equivalent (TEDE) at the exclusion area boundary (EAB) for any 2-hour period following the onset of the postulated fission product release; 25 rem TEDE at the outer boundary of the low population zone (LPZ) for the duration of the postulated fission product release; and 5 rem TEDE for access and occupancy of the control room (CR) for the duration of the postulated fission product release.

This safety evaluation (SE) addresses the impact of the proposed changes on previously analyzed DBA radiological consequences and the acceptability of the revised analysis results. The regulatory requirements from which the NRC staff based its acceptance are the accident

dose criteria in § 50.67, as supplemented in Regulatory Position 4.4 of Regulatory Guide (RG) 1.183 and NUREG-0800 Standard Review Plan Section 15.0.1. The NRC staff's evaluation is based upon the following regulatory codes, guides, and standards:

- 10 CFR Part 50.67, Accident Source Term.
- 10 CFR Part 50, Appendix A, "General Design Criterion [GDC] for Nuclear Power Plants: GDC 19, Control room.
- RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," Rev. 0, July 2000.

The licensee has not proposed any significant deviation or departure from the guidance provided in RG 1.183.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Background

In a letter dated December 19, 2007 (ML073230597), the NRC issued License Amendment No. 194 implementing AST methodology for NMP1. The dose consequence values in the LOCA evaluation approved in license Amendment No. 194 were based on Revision 0 of Calculation H21C092, NMP1 LOCA w/[loss of off-site power] LOOP, AST Methodology, dated December 14, 2006. On January 24, 2008, the licensee's Nuclear Analysis Group issued Incident Report (IR) 02036454 identifying a conservative error in Calculation H21C092 Revision 0. The error related to the source term used by the RadTrad 3.03 code to calculate the dose consequences to the CR personnel and offsite locations. Specifically, 20 radionuclides out of the 63 modeled were assigned incorrect chemical groups. The error resulted in the dose consequences as documented in Calculation H21C092, Revision 0, being overestimated by approximately 10 percent.

On April 8, 2008, the Nuclear Analysis Group issued Revision 1 of Calculation H21C092. The revised calculation corrected the identified errors and modified the dose consequence results accordingly. The objective of Revision 1 was to determine the increase in bypass leakage that would yield dose consequences that would be bounded by the original AST licensing basis. Revision 1 to Calculation H21C092 provided two sets of LOCA dose consequences. Revision 1 indicated a reduction in doses as a result of assigning the affected radionuclides to their correct chemical groups while keeping all other assumptions consistent with Revision 0. For example, if the leakage values were maintained at the Revision 0 values of 50 standard cubic feet per hour (scfh) per line (100 scfh total) for MSIV leakage and 41.5 scfh for other bypass leakage, the revised CR dose would be reduced from 4.81 rem TEDE to 4.37 rem TEDE.

Revision 1 also evaluated the dose consequences for an increase in bypass leakage from the Revision 0 value of 41.5 scfh to a value that would not result in an increase in the Revision 0 CR dose value while keeping the total MSIV leakage to 100 scfh. H21C092 Revision 1, Section 2.0 Conclusions, indicated that with a total MSIV leakage value of 100 scfh, the bypass leakage could be increased to a value of 91 scfh without exceeding the previous licensing basis CR dose value of 4.81 rem.

On March 26, 2021, the Nuclear Analysis Group issued Revision 2 of calculation H21C092 which included sections of Revision 0, Revision 1, as well as a new analysis to evaluate current

leakage rates to achieve greater flexibility on the combination of MSIV leakage rates and bypass leakage rates. This flexibility allows varying combinations of these leakage rates as long as the sum of the leakage from both pathways does not exceed 191 scfh.

### 3.2 NRC Staff Review of the Revisions to NMP1 AST Licensing Basis

The licensee's revisions to the current licensing basis (CLB) AST LOCA analysis were limited to the primary containment leakage pathways that bypass the reactor building (RB). The licensee modeled these pathways as leakage through lines which penetrate the primary containment and the reactor building. Postulated leakage through both closed containment isolation valves in these lines will bypass the reactor building and will not be filtered by the RB emergency ventilation system, thereby resulting in unfiltered ground level releases. These release pathways include leakage through MSIVs and leakage via other systems (i.e., feedwater, torus vent, drywell vent and emergency condenser vent and drain) that provide pathways from the primary containment. The CLB MSIV leakage limitation is 100 scfh, with a maximum of 50 scfh per main steam line. The CLB limitation for the combined leakage of the remaining non-MSIV bypass pathways is 41.5 scfh. As a result of the correction of errors in the calculation supporting these leakage values (H21C092 Revision 0) the licensee determined that the primary containment bypass leakage could be increased from a combined total of 141.5 scfh to a combined total of 191 scfh without exceeding the CLB dose values. The NRC staff reviewed the revisions to H21C092 and notes that the licensee maintained all the critical CLB assumptions such as atmospheric dispersion factors and aerosol deposition removal assumptions in the revisions to H21C092. The NRC staff notes that the revised dose consequences for the NMP1 LOCA analysis resulted in a reduction in the off-site estimates while the CR doses remained the same as the previous licensing basis value of 4.81 rem TEDE.

As shown below, Table 1 from RG 1.183 specifies the boiling water reactor (BWR) core inventory fractions that are assumed to be released into the containment for the LOCA dose consequence analysis.

**RG 1.183 Table 1  
BWR Core Inventory Fraction Released Into Containment**

Group	Gap Release Phase	Early In-vessel Phase	Total
Noble Gases	0.05	0.95	1.0
Halogens	0.05	0.25	0.3
Alkali Metals	0.05	0.20	0.25
Tellurium Metals	0.00	0.05	0.05
Ba, Sr	0.00	0.02	0.02
Noble Metals	0.00	0.0025	0.0025
Cerium Group	0.00	0.0005	0.0005
Lanthanides	0.00	0.0002	0.0002

As described in the Nuclear Analysis Group's Report number IR02036454, several radionuclides were assigned incorrect early in-vessel release fractions in Revision 0 of H21C092. In some cases, barium (Ba) isotopes were assigned to the strontium group but since these groups have the same release fractions (0.02) there was no impact on the dose

consequence analysis. However, there were six noble metal isotopes (release fraction 0.0025) that were assigned to the Ba group (release fraction 0.02). In addition, there were 12 lanthanide radionuclides (release fraction 0.0002) that were assigned to the noble metals group (release fraction 0.0025). These discrepancies resulted in the over prediction of dose consequences in Revision 0 of calculation H21C092. For instance, correction of these errors resulted in a reduction in the calculated CR TEDE dose of 0.44 rem, from 4.81 rem to 4.37 rem as documented in Revision 1 of H21C092. Revision 1 of H21C092 also determined that with a total MSIV leakage rate of 100 scfh, the other permanent bypass leakage could be increased from the previous limitation of 41.5 scfh to a value of 91 scfh without increasing the previous limiting CLB CR dose of 4.81 rem.

The NRC staff notes that as mentioned in the Nuclear Analysis Group's report, the incorrect assignment of chemical groups may have occurred during the process of adding an additional nuclide (determined to have dose significance) to the default radionuclide inventory file developed by the NRC for using the RadTrad code, Version 3.03. The NRC staff recognized the limited number of nuclides in the original RadTrad code some time ago and included a significantly increased nuclide inventory (from 63 nuclides to over 800 nuclides) in the current version of RadTrad which is part of the Symbolic Nuclear Analysis Package.

Revision 2 of H21C092 provided additional flexibility by calculating dose consequences for varying rates of total MSIV leakage in combination with varying rates of other permanent bypass leakage such that the summation of the leakage from these pathways remained at a value of 191 scfh. The licensee determined that the limiting combination of leakage from these pathways in terms of dose consequences would be from an MSIV leakage of 100 scfh and a value for other permanent bypass leakage of 91 scfh. This combination of leakage values was used to compute the NMP1 updated final safety analysis report (UFSAR) revised licensing basis LOCA dose consequences for the control room, the EAB and the outer boundary of the LPZ as shown in Revision 27 of the UFSAR Table XV-32.

**(From NMP Unit 1 UFSAR October 2021 Revision 27)  
Table XV-32  
LOSS-OF-COOLANT ACCIDENT DOSES**

<b><u>Receptor</u></b>	<b><u>Total Dose (rem TEDE)</u></b>	<b><u>Acceptance Criteria (rem TEDE)</u></b>
Control Room	4.81	5
EAB*	8.00	25
LPZ	1.58	25
* Worst 2-hour period of the accident duration		

The changes in the total LOCA dose consequences from the original calculation through the two revisions are shown in the summary table below. The NRC staff notes that H21C092 Revision 1 listed both the reduction in the dose consequences based on correction of the errors in the original calculation as well as the allowable increase in other permanent bypass leakage that



could be accommodated without exceeding the CLB dose consequences as calculated in H21C092 Revision 0 and approved by the NRC in Amendment No. 194.

**Summary Table of NMP1 LOCA Results**

<b>NMP Unit 1 AST LOCA Dose consequence calculations</b>	<b>30-day CR TEDE (rem)</b>	<b>Max 2-hour EAB TEDE (rem)</b>	<b>30-day LPZ TEDE (rem)</b>
NMP Unit 1 LOCA w/LOOP, AST Methodology H21C092 R0 Results	4.81	9.02	1.60
Reduction in doses from H21C092 R0 from the correction of the radionuclide chemical grouping	-0.44	-1.59	-0.15
Dose Results from Table 3-1 of H21C092 R1 maintaining leakage limits from H21C092 R0 (other bypass leakage = 41.5 scfh and total MSIV leakage = 100 scfh)	4.37	7.43	1.45
Results from the conclusion of H21C092 R1 Table 2-1 with an increase in other permanent bypass leakage to 91 scfh and total MSIV leakage = 100 scfh	4.80	8.00	1.58
Dose Impact from the values in Table 3-1 of H21C092 R1 to the H21C092 R2 Results for limiting combination of MSIV and other permanent bypass leakage	+0.44	+0.57	+0.13
NMP-1 Post-LOCA AST Dose Results based on calculation H21C092 R2	4.81	8.00	1.58

The NRC staff notes that NMP1 does not have specific technical specification limitations on MSIV leakage. For NMP1, MSIV leakage is treated as a component of containment leakage and is tested in accordance with Appendix J to Part 50, Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors. The combinations of acceptable MSIV leakage rates and the corresponding other permanent bypass leakage rates are documented in Table P.10 of H21C092 R2 and are shown below. Note that the doses in Table P.10 are only from MSIV and other permanent Bypass leakage as contributions to the total LOCA dose consequence.

**H21C092 R2 Table P.10  
MSIV and Other Bypass Leakage Cases Analyzed and Dose Consequences**

Total MSIV Leakage (scfh)	Other Permanent Bypass Leakage (scfh)	CR Dose (rem TEDE)	EAB Dose (rem TEDE)	LPZ Dose (rem TEDE)
190	1	1.01E+00	7.74E-01	3.84E-01
180	11	1.02E+00	8.19E-01	3.85E-01
170	21	1.04E+00	8.67E-01	3.86E-01
160	31	1.07E+00	9.21E-01	3.90E-01
150	41	1.09E+00	9.74E-01	3.92E-01
140	51	1.11E+00	1.03E+00	3.94E-01
130	61	1.13E+00	1.09E+00	3.97E-01
120	71	1.16E+00	1.15E+00	4.00E-01
110	81	1.18E+00	1.22E+00	4.04E-01
<b>100</b>	<b>91</b>	<b>1.21E+00</b>	<b>1.28E+00</b>	<b>4.07E-01</b>

**\*Bold indicates the bounding case.**

These combinations of acceptable leakage rates will be controlled by implementation of procedure N1-TSP-201-550, Local Leak Rate Test Summary (Type B and C Tests) for 10 CFR 50, Appendix J, and Secondary Containment Bypass Leakage, in accordance with NMP1 TS 6.5.7, 10 CFR 50, Appendix J, Testing Program Plan.

### 3.3 Technical Evaluation Conclusion

The NRC staff reviewed the assumptions, inputs, and methods used by the licensee to assess the radiological consequences of the LOCA dose consequence analysis for NMP1. The NRC staff finds that the licensee used assumptions, inputs, and methods consistent with the regulatory requirements and guidance identified in Section 2.0 of this SE. The NRC staff compared the doses estimated by the licensee to the applicable criteria identified in Section 2.0 of this SE. The NRC staff concludes, with reasonable assurance, that the licensee's estimates of the EAB, LPZ, and CR doses will comply with these criteria. The NRC staff further finds reasonable assurance that NMP1 as modified by this license amendment, will continue to provide sufficient safety margins with adequate defense-in-depth to address unanticipated events and to compensate for uncertainties in accident progression and analysis assumptions and parameters. Therefore, the proposed license amendment is acceptable with respect to the radiological consequences of the LOCA dose consequence analysis for NMP1.

### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New York State official was notified of the proposed issuance of the amendment on December 19, 2022. 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. 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 (87 FR 60217). 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: J. Parillo, NRR

Date: February 28, 2023

SUBJECT: NINE MILE POINT NUCLEAR STATION, UNIT 1 - ISSUANCE OF AMENDMENT NO. 248, REVISION TO ALTERNATIVE SOURCE TERM CALCULATION FOR MAIN STEAM ISOLATION VALVE LEAKAGE AND NON-MAIN STEAM ISOLATION VALVE LEAKAGE (EPID L-2022-LLA-0094) DATED: FEBRUARY 28, 2023

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**ADAMS Accession No.: ML23025A412**

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