50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Hope Creek Generating Station Unit 1

Activity/Document Number: DCP 80102144

Title: Revise Dose Analysis Calculations and Update UFSAR to Remove 120 second Isolation Time for PCIV's

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:
(Provide a brief, concise description of what the proposed activity involves.)

The following proposed activity is being performed:

Hope Creek Generating Station (HCGS) calculation H-1-ZZ-MDC-1880 "Post-LOCA EAB, LPZ, and CR Doses" is revised (Revision 4) to incorporate the following changes:

1. The release of containment airborne activity through the primary containment isolation valves (PCIV) is removed from the calculation. Revision 3 models an increase in the PCIV isolation time to 120 seconds by including a 120 second release of primary coolant activity through the PCIV. The removal of this pathway from the calculation is consistent with the current PCIV isolation times and the same approach used in Revision 2.

2. Elemental iodine removal in the main steam lines is calculated using the J. E. Cline methodology. Revision 3 assumes a factor of two reduction in the elemental iodine based on the analysis in AEB 98-03. This approach may not be appropriate to HCGS since AEB 98-03 is specific to Perry. Use of the J. E. Cline methodology is the same as the approach in Revision 2.

3. Main steam isolation valve (MSIV) leakage is modeled using one well mixed volume in each steam line. This is a change from the two compartment model used in Revision 3. It is also different from Revision 2, which used a one compartment model but assumed a plug flow model rather than a well mixed model.

4. Aerosol removal by deposition in the main steam lines is based on the 40th percentile settling velocity. Revision 3 uses a two compartment steam line model for both steam lines. Different settling velocities are used in the two compartments to account for changes in the aerosol size distribution between the two compartments. The use of a single settling velocity is consistent with the change to a single compartment model. The 40th percentile settling velocity is the same settling velocity used in Revision 2.

5. Containment and MSIV leakage rates are held constant for the loss-of-coolant accident (LOCA) duration, rather than being reduced by 50% after 24 hours. This is a change to the approach used in both Revision 3 and Revision 2, which assumed the 50% reduction after 24 hours.

6. Control room unfiltered inleakage rate is reduced from 350 cfm to 300 cfm and 50 cfm was modeled as filtered. This is a change to the approach used in both Revision 3 and Revision 2, and is based on the results in the recently performed (year 2009) inleakage testing performed in accordance with the CRE Program (TS 6.16, RG 1.197).

7. The dose impact of including 12 Isotope Test Assemblies (ITA) in the reactor core is evaluated[1]. The ITAs will contain Co-59 targets that will be irradiated in the reactor core to produce Co-60.

This 10CFR50.59 also addresses Revision 3 to calculation H-1-ZZ-MDC-1923 "Access to Areas Requiring Continuous Occupancy" and Revision 2 to calculation H-1-ZZ-MDC-1927 "Vital Area Mission Doses", which are revised to be consistent with H-1-ZZ-MDC-1880 Revision 4.

This 10CFR50.59 also addresses a revision to the HCGS UFSAR to be consistent with the three revised calculations.

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1 Note that this 10 CFR 50.59 Evaluation is solely addressing the dose impact of adding Co-60 to the HCGS core; the acceptability/evaluation of placing the Co-60 ITAs in the core does require a license amendment (LAR H09-01).

50.59 REVIEW COVERSHEET FORM

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These changes in calculations H-1-ZZ-MDC-1880, H-1-ZZ-MDC-1923, H-1-ZZ-MDC-1927 and the HCGS UFSAR hereafter are collectively called the "proposed activity."

Reason for Activity:
(Discuss why the proposed activity is being performed.)

The proposed activity is being performed in response to Notification 20470663, which indicates the increase in PCIV isolation time to 120 seconds has not been justified or implemented. The proposed activity also addresses the use of the ITAs in the reactor core. In addition, there are NRC Staff concerns about Revision 3 of the LOCA analysis in the form of RAIs issued against the Cobalt-60 Test Assembly License Amendment Request (LAR H09-01). To address the issues, the increased PCIV closure times and some of the changes to the MSIV leakage model contained in Revision 3 of H-1-ZZ-MDC-1880 are removed. The resulting Revision 4 to H-1-ZZ-MDC-1880 includes elements of the MSIV model that were in Revision 2 to the calculation, which was reviewed by the NRC as part of the extended power uprate license amendment (ADAMS ML081230640).

Both Revision 2 and Revision 3 of H1-ZZ-MDC-1880 take credit for containment and MSIV leakage reduction based on the post-LOCA drywell pressure and temperature. This credit is conservatively removed in Revision 4.

The maximum control room (CR) inleakage is measured to be 155 ± 10 cfm in the recently performed (year 2009) tracer gas testing. In the last two tracer gas tests, all CR inleakage is consistently measured to be filtered. Although all CR inleakage is filtered, the Revision 3 analysis assumed 350 cfm unfiltered inleakage, which is conservative compared to the test results. The Revision 4 analysis models the CR unfiltered inleakage is 300 cfm, including 10 cfm for ingress/egress and 50 cfm filtered. This assumption remains conservative with respect to the measured inleakage and the fact that all CR inleakage is filtered.

Effect of Activity:
(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

Post-LOCA exclusion area boundary (EAB), low population zone (LPZ) and CR doses are dependent on the activity released to the environment via different release paths. The effect of the changes described above is that the CR radiological consequences are reduced, and the offsite radiological consequences are increased, relative to the results of H-1-ZZ-MDC-1880, Revision 3.

The proposed change neither modifies the plant equipment design functions nor impacts the equipment reliabilities.

Summary of Conclusion for the Activity's 50.59 Review:
(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The calculation H-1-ZZ-MDC-1880 Revision 4 changes had a net effect of reducing the post-LOCA CR radiological consequences, and increasing the offsite radiological consequences, relative to the doses calculated in calculation H-1-ZZ-MDC-1880, Revision 3. The changes to input parameters as a result of the proposed activity when combined with the changes to the LOCA model result in a less than minimal increase in the consequences of a LOCA. In addition, the changes to the model in the LOCA analysis do not result in the departure from a method of analysis described in the UFSAR, and include elements of the MSIV model that were in Revision 2 of the calculation. Therefore, no license amendment request is required.

50.59 REVIEW COVERSHEET FORM

Station/Unit(s): Hope Creek Generating Station Unit 1

Activity/Document Number: DCP 80102144

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Calculation H-1-ZZ-MDC-1923, Revision 3, evaluates the post-LOCA doses to areas requiring continuous occupancy at the technical support center (TSC), guard house (GH), and operational support center (OSC) due to changes implemented in H-1-ZZ-MDC-1880 Revision 4. The resulting TSC dose is larger than calculated in calculation H-1-ZZ-MDC-1923, Revision 2. However, the TSC calculated dose is still within regulatory limits. In addition, the GH and OSC doses are procedurally controlled, ensuring that they will be within regulatory limits. Calculation H-1-ZZ-MDC-1927, Revision 2, evaluates the post-LOCA mission doses to various vital areas due to changes implemented in H-1-ZZ-MDC-1880 Revision 4. The resulting TEDE doses for the mission locations will be less than the regulatory limit. Therefore, the proposed activity results in a less than minimal increase to the dose to operators performing required actions outside the control room and a license amendment is not required.

Attachments:
Attach all 50.59 Review forms completed, as appropriate.
(NOTE: if both a Screening and Evaluation are completed, no Screening No. is required.)

Forms Attached: (Check all that apply.)

☒ **Applicability Review**				
☒ **50.59 Screening**	**50.59 Screening No.**	**HC 10-125**	**Rev.**	**0**
☒ **50.59 Evaluation**	**50.59 Evaluation No.**	**HC 10-125**	**Rev.**	**0**

50.59 APPLICABILITY REVIEW FORM

Activity/Document Number: 80102144

Address the questions below for all aspects of the Activity. If the answer is yes for any portion of the Activity, apply the identified process(es) to that portion of the Activity. Note that it is not unusual to have more than one process apply to a given Activity.

See Section 4 of the Resource Manual (RM) for additional guidance.

I.	Does the proposed Activity involve a change:		
	1. Technical Specifications or Operating License (10CFR50.90)?	☒ NO ☐ YES	See Section 4.2.1.1 of the RM
	2. Conditions of License Quality Assurance program (10CFR50.54(a))? Security Plan (10CFR50.54(p))? Emergency Plan (10CFR50.54(q))?	☒ NO ☐ YES ☒ NO ☐ YES ☒ NO ☐ YES	See Section 4.2.1.2 of the RM
	3. Codes and Standards IST Program Plan (10CFR50.55a(f))? ISI Program Plan (10CFR50.55a(g))?	☒ NO ☐ YES ☒ NO ☐ YES	See Section 4.2.1.3 of the RM
	4. ECCS Acceptance Criteria (10CFR50.46)?	☒ NO ☐ YES	See Section 4.2.1.4 of the RM
	5. Specific Exemptions (10CFR50.12)?	☒ NO ☐ YES	See Section 4.2.1.5 of the RM
	6. Radiation Protection Program (10CFR20)?	☒ NO ☐ YES	See Section 4.2.1.6 of the RM
	7. Fire Protection Program (applicable UFSAR or operating license condition)?	☒ NO ☐ YES	See Section 4.2.1.7 of the RM
	8. Programs controlled by the Operating License or the Technical Specifications (such as the ODCM).	☒ NO ☐ YES	See Section 4.2.1.7 of the RM
	9. Environmental Protection Program	☒ NO ☐ YES	See Section 4.2.1.7 of the RM
	10. Other programs controlled by other regulations.	☒ NO ☐ YES	See Section 4.2.1 of the RM
II.	Does the proposed Activity involve maintenance which restores SSCs to their original condition or involve a temporary alteration supporting maintenance that will be in effect during at-power operations for 90 days or less?	☒ NO ☐ YES	See Section 4.2.2 of the RM
III.	Does the proposed Activity involve a change to the:		
	1. UFSAR (including documents incorporated by reference) that is excluded from the requirement to perform a 50.59 Review by NEI 96-07 or NEI 98-03?	☒ NO ☐ YES	See Section 4.2.3 of the RM
	2. Managerial or administrative procedures governing the conduct of facility operations (subject to the control of 10CFR50, Appendix B)	☒ NO ☐ YES	See Section 4.2.4 of the RM
	3. Procedures for performing maintenance activities (subject to 10CFR50, Appendix B)?	☒ NO ☐ YES	See Section 4.2.4 of the RM
	4. Regulatory commitment not covered by another regulation based change process (see NEI 99-04)?	☒ NO ☐ YES	See Section 4.2.3/4.2.4 of the RM
IV.	Does the proposed Activity involve a change to the Independent Spent Fuel Storage Installation (ISFSI) (subject to control by 10 CFR 72.48)	☒ NO ☐ YES	See Section 4.2.6 of the RM

Check one of the following:

☐ **If** all aspects of the Activity are controlled by one or more of the above processes, **then** a 50.59 Screening is not required and the Activity may be implemented in accordance with its governing procedure.

☒ **If** any portion of the Activity is **not** controlled by one or more of the above processes, then process a 50.59 Screening for the portion not covered by any of the above processes. The remaining portion of the activity should be implemented in accordance with its governing procedure.

Signoff:

50.59 Screener/50.59 Evaluator: Gopal. J. Patel Sign: _____ Date: 08/10/2010

(Circle One) (Print name) (Signature)

50.59 SCREENING FORM

50.59 Screening No. HC 10 -125 **Rev. No.** 0

Activity/Document Number: DCP 80102144

I. 50.59 Screening Questions (Check correct response and provide separate written response providing the basis for the answer to each question)(See Section 5 of the Resource Manual (RM) for additional guidance):

1. Does the proposed Activity involve a change to an SSC that adversely affects an UFSAR described design function? (See Section 5.2.2.1 of the RM) ☒ YES ☐ NO

Calculation H-1-ZZ-MDC-1880 Revision 4 incorporates a number of changes relative to calculation H-1-ZZ-MDC-1880 Revision 3 (similar changes are incorporated into calculation H-1-ZZ-MDC-1923 Revision 3 relative to Revision 2, and into calculation H-1-ZZ-MDC-1927 Revision 2 relative to Revision 1). These changes affect both elements of the method of evaluation and evaluation input parameters. The changes to the evaluation input parameters are:

1. Containment and MSIV leakage rates are held constant for the LOCA event duration, rather than being reduced by 50% after 24 hours.

2. Control room unfiltered inleakage rate is reduced from 350 cfm to 300 cfm and 50 cfm is modeled as filtered.

3. The dose impact of inserting 12 Co-60 ITAs in the reactor core.

The proposed activity changes the evaluation input parameters that credit the design functions of SSCs to control the progression of a design basis accident (DBA) LOCA and to mitigate the dose consequences such that the resulting onsite and offsite doses are less than regulatory allowable limits. The proposed activity in the revised analyses uses the UFSAR described design functions of the SSCs and their performance values specified in the HCGS Technical Specifications for the SSCs including, but not limited to the following:

1. The containment isolation system to maintain the integrity of containment and RCS pressure boundary by limiting the containment, MSIV, and ESF leakages to predetermined values,
2. FRVS recirculation and exhaust system to provide adequate mixing of the activity in the reactor building (RB) and filtration of the exhaust from the RB, and
3. Control Room Emergency Filtration (CREF) system to provide adequate radiological protection to the CR operator.

The containment and MSIV leakage rates determine the amount of activity released to the environment through the containment leakage and MSIV pathways. The effect of holding the containment and MSIV leakage rates constant is to increase the leakage rates for the accident period after 24 hours. This is a change to the design function of the containment isolation system that will result in an increase in the amount of activity released and an increase in the resulting CR and offsite dose. Therefore this change is considered adverse.

The amount of activity that enters the CR, and the resulting operator dose, is determined in part by the unfiltered inleakage rate. Reducing the unfiltered inleakage rate is a change to the design function of the CREF that reduces the activity entering the CR and the resulting operator dose. This is much more than current test results show, so this change is not considered adverse. However, this will still be addressed in the evaluation to address the aggregate impact.

The ITAs will change the isotopic composition of the reactor core and will therefore affect the core inventory used in the calculations. Since this change results in an increase in the Co-60 inventory, the safety analysis (dose calculation) needs to be re-run to determine the effect. Therefore, it is considered adverse.

Since the proposed activity involves a change to an SSC that adversely affects an UFSAR described design function, and the proposed activity requires a 50.59 Evaluation.

50.59 SCREENING FORM

50.59 Screening No. HC 10 -125 **Rev. No.** 0

Activity/Document Number: DCP 80102144

2. Does the proposed Activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 5.2.2.2 of the RM) ☐ YES ☒ NO

   The only aspect of the proposed activity affecting a procedure is the proposed decrease in the allowable CR unfiltered inleakage rate from 350 to 300 cfm and 50 cfm filtered. The decreased CR unfiltered inleakage rate neither introduces a control mechanism nor alters the design functions related to the existing system configuration, and therefore does not adversely impact the manner in which the SSC design functions are performed or controlled. The CR inleakage test limit in HCGS procedure VHC.MD-ST.GK-0002(Q), Control Room Envelope Inleakage Test for unfiltered inleakage, will be changed from 350 cfm to 300 cfm. The procedure is neither listed by name or number in the UFSAR, nor incorporated into the UFSAR by reference, and therefore it is not consider as "Procedures as described in the UFSAR." Also this procedure does not contain information on how SSCs are operated or controlled, and as such does not meet the definition of "procedures as described in the UFSAR" and is not subject to 10 CFR 50.59.

   In summary, the revision of the affected procedure does not adversely impact the UFSAR described SSC design function performance and control.

3. Does the proposed Activity involve an adverse change to an element of a UFSAR described evaluation methodology, or use of an alternative evaluation methodology, that is used in establishing the design bases or used in the safety analyses? (See Section 5.2.2.3 of the RM) ☒ YES ☐ NO

   The following changes within the proposed activity can be considered to be changes to elements of a UFSAR described evaluation methodology.

   1. The release of containment airborne activity through the PCIV is removed from the calculation.
   2. Elemental iodine removal in the main steam lines is calculated using the J. E. Cline methodology.
   3. Aerosol removal by deposition in the main steam lines is based on the 40th percentile settling velocity.
   4. Main steam isolation valve (MSIV) leakage is modeled using one well mixed volume in each steam line.

   The proposed method changes differ from the LOCA dose analysis model described in the HCGS UFSAR. As such, the proposed activity is a change to an element of a UFSAR described evaluation methodology, or use of an alternative evaluation methodology, that is used in establishing the design bases or used in the safety analyses.

4. Does the proposed Activity involve a test or experiment not described in the UFSAR, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 5.2.2.4 of the RM) ☐ YES ☒ NO

   The proposed activity does not involve any test or experiment. Therefore, there are no tests or experiments not described in the UFSAR.

50.59 SCREENING FORM

50.59 Screening No. HC 10 -125 **Rev. No.** 0

Activity/Document Number: DCP 80102144

5. Does the proposed Activity require a change in the Technical Specifications or Operating License? (See Section 5.2.2.5 of the RM) ☐ YES ☒ NO

   The MSIV leak rate modeled is consistent with the Technical Specification 3.6.1.2.c, "Primary Containment Leakage Limiting Condition For Operation."

   The control room inleakage model is consistent with Technical Specification 6.16, "Control Room Envelope Habitability Program."

   In summary, the change does not constitute a change in the Technical Specifications or Operating License.

II. List the documents (e.g., UFSAR, Technical Specifications, other licensing basis, technical, commitments, etc.) reviewed, including sections numbers where relevant information was found (if not identified in the response to each question).

1. Hope Creek Calculation No. H-1-ZZ-MDC-1880, Rev 4, Post-LOCA EAB, LPZ, and CR Doses
2. Hope Creek Calculation No. H-1-ZZ-MDC-1923, Rev 3, Areas Requiring Continuous Occupancy
3. Hope Creek Calculation No. H-1-ZZ-MDC-1927, Rev 2, Vital Area Mission Doses
4. NRC Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors", July 2000
5. 10 CFR 50.67, Accident Source Term
6. HCGS procedure VHC.MD-ST.GK-0002(Q), Control Room Envelope Inleakage Test
7. UFSAR Section 1.10, 12.3.2.2.6, 15.6.5.5.2,
8. UFSAR Table 12.3-3, 15.6-12
9. TS 6.8.1, 6.8.4.a

III. Select the appropriate conditions:

☐ **If** all questions are answered NO, **then** complete the 50.59 Screening and implement the Activity per the applicable governing procedure.

☒ **If** question 1, 2, 3, or 4 is answered YES and question 5 is answered NO, **then** a 50.59 Evaluation shall be performed.

☐ **If** questions 1, 2, 3, and 4 are answered NO and question 5 is answered YES, **then** a License Amendment is required prior to implementation of the Activity.

☐ **If** question 5 is answered YES for any portion of an Activity, **then** a License Amendment is required prior to implementation of that portion of the Activity. In addition, **if** question 1, 2, 3, or 4 is answered YES for the remaining portions of the Activity, **then** a 50.59 Evaluation shall be performed for the remaining portions of the Activity.

IV. Screening Signoffs:

50.59 Screener: Gopal J. Patel (Print name) Sign: _____ (Signature) Date: 08/10/2010

50.59 Reviewer: James S. Boyer (Print name) Sign: _____ (Signature) Date: 08/10/2010

50.59 EVALUATION FORM

50.59 Evaluation No.: HC 10-125 **Rev. No.:** 0

Activity/Document Number: DCP 80102144

I. Complete the 50.59 Evaluation:

NOTES: Provide a separate written response providing the basis for the answer to each question below. The Resource Manual (RM) should be used to determine the content of each response (see Section 6.2 for additional guidance).

If the Screening indicated that only a change in method of evaluation exists, only Question 8 is required to be answered. If the Screening indicated that no change in method of evaluation exists, Question 8 does need not be answered.

1. Does the proposed activity result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the UFSAR? (See Section 6.2.1 of the RM) ☐ YES ☒ NO

   The proposed activity, which is an update to the LOCA analysis to remove the PCIV leakage pathway, modify the MSIV leakage model, increase the primary containment and MSIV leakage after 24 hours, decrease the CR unfiltered inleakage, and evaluate the dose effects of the ITAs, does not change the frequency of an accident because these changes do not affect initiators of any accident and no new failure modes are introduced.

2. Does the proposed activity result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety previously evaluated in the UFSAR? (See Section 6.2.2 of the RM) ☐ YES ☒ NO

   The proposed activity, which is an update to the LOCA analysis to remove the PCIV leakage pathway, modify the MSIV leakage model, increase the primary containment and MSIV leakage after 24 hours, decrease the CR unfiltered inleakage, and evaluate the dose effects of the ITAs, does not change the likelihood of occurrence of a malfunction because these changes do not affect initiators of any malfunction and no new failure modes are introduced.

3. Does the proposed activity result in more than a minimal increase in the consequences of an accident previously evaluated in the UFSAR? (See Section 6.2.3 of the RM) ☐ YES ☒ NO

   The proposed activity is an update to the LOCA analysis to remove the PCIV leakage pathway, modify the MSIV leakage model, increase the primary containment and MSIV leakage after 24 hours, decrease the CR unfiltered inleakage, and evaluate the dose effects of the ITAs. These changes result in changes in the post-LOCA doses and dose rates determined in calculations H-1-ZZ-MDC-1880, H-1-ZZ-MDC-1923, and H-1-ZZ-MDC-1927.

   The CR and offsite doses that result from implementation of the changes to the inputs to the LOCA evaluation and the changes to the elements of the evaluation as implemented in Revision 4 of H-1-ZZ-MDC-1880 are compared to the current results (Revision 3) in the table below.

Post-LOCA Doses (rem TEDE) from Calculation H-1-ZZ-MDC-1880

Dose Location	Revision 3	Revision 4	Dose Increase	Minimal Increase	Regulatory Limit
Control Room	4.17	4.04	-0.13	0.083	5
Exclusion Area Boundary	1.43	1.78	0.35	2.35	25
Low Population Zone	0.548	0.674	0.13	2.44	25

The calculation H-1-ZZ-MDC-1880, Revision 4, changes had a net effect of reducing the post-LOCA CR dose relative to the doses calculated in calculation H-1-ZZ-MDC-1880, Revision 3. The offsite doses increase slightly, but all dose consequences are less than the regulatory limit. The table above contains the calculated minimal increase, which is the increase that results in a 10% reduction in available margin. These results indicate the proposed activity will not result in a more than minimal increase in the consequences of an accident previously evaluated in the UFSAR.

50.59 Evaluation No.: HC 10-125 **Rev. No.: 0**

Activity/Document Number: DCP 80102144

The vital area mission doses in calculation H-1-ZZ-MDC-1927 determine the adequacy of the plant shielding to provide the required protection to an operator performing a post-accident vital function and occupancy based on the calculated maximum location specific dose rates. HCGS procedure LS-AA-104-100, "50.59 Resource Manual," page 6-14, contains the following guidance:

> For changes affecting the dose to operators performing required actions outside the control room, an increase is considered more than minimal if the resultant "mission dose" exceeds applicable GDC 19 criteria.

The GDC 19 criterion that is applicable to HCGS is that the operator dose is less than 5 rem TEDE. Calculation H-1-ZZ-MDC-1927, Revision 2, evaluates the post-LOCA mission doses to various vital area areas due to changes implemented in H-1-ZZ-MDC-1880 Revision 4. The dose to an operator performing a mission in a vital area is the dose rate in the area multiplied by the time required to complete the mission, known as the occupancy time. The maximum TEDE dose rates in Revision 2 are larger than the Revision 1 dose rates. The increase in dose rate will cause a decrease in allowable occupancy time, as indicated in the table below. The occupancy times are determined by dividing the limit, 5 rem, by the dose rate. These occupancy times are then compared to the occupancy times required to complete the missions in the vital areas, which is identified as the licensing basis occupancy time. As the table indicates, the allowable occupancy times are greater than the licensing basis occupancy times, and therefore the calculated operator doses are less than the limit of 5 rem.

Vital Access Area Locations	Revision 1 Allowable Occupancy Time (hr)	Revision 2 Allowable Occupancy Time (hr)	Original Licensing Basis Occupancy Time (hr)
Diesel Generator & Accessories	4.5	2.9	1
FRVS RMS Skid	3.1	2.4	1.5
Remote Shutdown Panel Area	3.1	1.1	1
HP/Access Control Point	3.1	1.1	1

Calculation H-1-ZZ-MDC-1923, Revision 3, evaluates the post-LOCA doses to areas requiring continuous occupancy, which are the technical support center (TSC), guard house (GH), and operational support center (OSC), due to changes implemented in H-1-ZZ-MDC-1880 Revision 4. The resulting TSC is 3.77 rem, which is less than the GDC-19 limit of 5 rem. The calculated OSC dose exceeds the GDC-19 limit. However, procedures NC.EP-EP.ZZ-0202(Q) and NC.EP-EP.ZZ-0304(Q) provide for continuous monitoring of the OSC and relocation to the TSC or other location if loss of habitability occurs. Similarly, the calculated GH dose exceeds the GDC-19 limit. However, procedure SY-AA-101-109-1003 identifies the actions to be taken to reduce the risk to security personnel in the event of a radiological release. Therefore, access to the OSC and GH are procedurally controlled under adverse radiological conditions, which will ensure the exposure to plant personnel will be less than the GDC-19 limits. Since the post-LOCA doses to operators performing vital missions outside the CR are less than 5 rem, and since the TSC, GH and OSC doses will be less than the GDC-19 limit, the proposed activity does not result in a more than minimal increase in the dose to operators performing required actions outside the CR.

Revision 4 to the calculation contains a quantitative evaluation of the effect of the ITAs on the core source term and the resulting doses. The evaluation addresses both the increase in Co-60 activity in the core and a conservative increase in the Co-60 release fraction. The additional Co-60 activity released during the LOCA is very small compared to the core source term. Therefore the effect of the ITA on the core source term and the post LOCA doses is negligible.[1]

Based on the discussion above, it is concluded that the proposed activity will not result in a more than minimal increase in the consequences of an accident evaluated in the UFSAR.

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[1] Note that this 10 CFR 50.59 Evaluation is solely addressing the dose impact of adding Co-60 to the HCGS core; the acceptability/evaluation of placing the Co-60 ITAs in the core does require a license amendment (LAR H09-01).

50.59 EVALUATION FORM

50.59 Evaluation No.: HC 10-125 **Rev. No.:** 0

Activity/Document Number: DCP 80102144

4. Does the proposed activity result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the UFSAR? (See Section 6.2.4 of the RM) ☐ YES ☒ NO

   The proposed activity, which is an update to the LOCA analysis to remove the PCIV leakage pathway, modify the MSIV leakage model, increase the primary containment and MSIV leakage after 24 hours, decrease the CR unfiltered inleakage, and evaluate the dose effects of the ITAs, does not result in more than a minimal increase in the consequences of a malfunction because these changes do not affect initiators of any malfunction and no new failure modes are introduced.

5. Does the proposed activity create a possibility for an accident of a different type than any previously evaluated in the UFSAR? (See Section 6.2.5 of the RM) ☐ YES ☒ NO

   The proposed activity, which is an update to the LOCA analysis to remove the PCIV leakage pathway, modify the MSIV leakage model, increase the primary containment and MSIV leakage after 24 hours, decrease the CR unfiltered inleakage, and evaluate the dose effects of the ITAs, does not create a possibility for an accident of a different type because these changes do not affect initiators of any malfunction and no new failure modes are introduced.

6. Does the proposed activity create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in UFSAR? (See Section 6.2.6 of the RM) ☐ YES ☒ NO

   The proposed activity, which is an update to the LOCA analysis to remove the PCIV leakage pathway, modify the MSIV leakage model, increase the primary containment and MSIV leakage after 24 hours, decrease the CR unfiltered inleakage, and evaluate the dose effects of the ITAs, does not create the possibility for a malfunction of a different type because these changes do not affect initiators of any malfunction and no new failure modes are introduced.

7. Does the proposed activity result in a design basis limit for a fission product barrier as described in the UFSAR being exceeded or altered? (See Section 6.2.7 of the RM) ☐ YES ☒ NO

   There are three fission product barriers that need to be considered: fuel cladding, reactor coolant system pressure boundary, and the primary containment boundary. The proposed activity, which is an update to the LOCA analysis to remove the PCIV leakage pathway, modify the MSIV leakage model, increase the primary containment and MSIV leakage after 24 hours, decrease the CR unfiltered inleakage, and evaluate the dose effects of the ITAs, includes the implicit assumption that the first two boundaries (fuel cladding and reactor pressure boundary) have failed. Credit is taken for the containment boundary to mitigate the releases to the environment. The changes to the primary containment and MSIV leak rate are associated with the containment boundary. However, the values used in the analysis are based on current design limits. Therefore, the proposed activity does not exceed or alter a design basis limit for a fission product barrier as described in the UFSAR.

8. Does the proposed activity result in a departure from a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analyses? (See Section 6.2.8 of the RM) ☐ YES ☒ NO

   Per the 10 CFR 50.59 screen for the proposed activity, the following changes incorporated into calculations H-1-ZZ-MDC-1880, H-1-ZZ-MDC-1923, and H-1-ZZ-MDC-1927 can be considered to be changes to elements of a UFSAR described evaluation methodology:

   1. The release of containment airborne activity through the PCIV is removed from the calculation.
   2. Elemental iodine removal in the main steam lines is calculated using the J. E. Cline methodology.
   3. Aerosol removal by deposition in the main steam lines is based on the 40th percentile settling velocity.
   4. MSIV leakage is modeled using one well mixed volume in each steam line.

50.59 Evaluation No.: HC 10-125 **Rev. No.:** 0

Activity/Document Number: DCP 80102144

Per Section 3.4 of the 50.59 Resource Manual, "departure from a method of evaluation described in the FSAR (as updated) means (i) changing any of the elements of the method described in the FSAR (as updated) unless the results of the analysis are conservative or essentially the same; or (ii) changing from a method described in the FSAR to another method unless that method has been approved by NRC for the intended application."

Three of the changes to elements of the method of evaluation involve the transport through the MSIV leakage pathway. Each of these is evaluated below.

- The MSIV leakage is modeled using one well mixed volume in each steam line. The current revision to the LOCA calculation uses two well mixed volumes in each steam line. The number of steam line volumes affects the amount of activity released to the environment because deposition of aerosol activity and elemental iodine activity on the main steam line wall is assumed to occur in each volume. The activity removal is modeled by calculating an effective removal efficiency for each volume. Although the removal efficiency in each volume of the two volume model will be less than the single volume model, when the two removal efficiencies are applied in series the total removal in the two volume model is larger than in the single volume model. Therefore, the single volume model results in more activity released and the change is conservative.
- The aerosol deposition rate in the single volume model is based on the 40th percentile value of the settling velocity from AEB 98-03. The two volume model in the current calculation revision used the 50th percentile settling velocity in the first volume and the 30th percentile settling velocity in the second volume to account for changes in the aerosol size distribution between the two volumes. The recommended settling velocity in AEB 98-03 is the 50th percentile value, so the use of the 40th percentile value is conservative relative to the guidance in AEB 98-03. The use of the 40th percentile settling velocity in the single volume model results in removal efficiencies of 97.93% in the failed line and 98.88% in the intact line. For the two volume model, the minimum removal efficiencies are 98.92% for the failed line and 99.94% for the intact line. Since the one volume model has smaller removal efficiencies, the single volume model with the 40th percentile settling velocity results in the release of more aerosol activity and is therefore conservative.
- The J. E. Cline model for elemental iodine deposition is a model that conservatively accounts for resuspension of iodine activity in the steam line. It is a function of steam line temperature, and is therefore time dependent. The net removal efficiency prior to 6 hours is less than the 50% removal efficiency that is consistent with the factor of two reduction used in Revision 3. Therefore, for the EAB dose, which occurs in the first few hours of the accident, the J. E. Cline methodology results in a larger release of elemental iodine activity and a larger dose, which is conservative. For time periods beyond 6 hours, the removal efficiency calculated using the J. E. Cline method is greater than the Revision 3 removal efficiency. This will result in a reduced amount of elemental airborne activity released in the period between 6 hours and 96 hours, when credit for removal of elemental iodine is terminated. This is expected to offset the increased releases during the first 6 hours, resulting in an overall reduction in the release of elemental iodine compared with Revision 3. Since this change reduces the amount of activity released and therefore the resulting dose, it is not conservative for the CR and LPZ dose results, which extend over a period of 30 days. However, the Cline methodology was approved by the NRC for the Intended Application. The method was used in calculation Revisions 0, 1, and 2. The analyses were reviewed and approved by the NRC in Amendments 134 (Revision 0) and Amendment 146 (Revision 1). Revision 2 was submitted in support of our EPU submittal and was reviewed by the NRC (Amendment 174). The Amendment 174 SE states: "The staff reviewed the methods, parameters, and assumptions that the licensee used in its radiological dose consequence analyses and finds that they are consistent with the conservative guidance provided in RG 1.183". therefore, this does not represent a departure in methodology.

All of the changes to the MSIV transport model are conservative, except for the effect of the elemental iodine deposition model on the CR and LPZ doses, which does not represent a departure in methodology. Additionally, when these changes are combined they result in more activity released to the environment and therefore higher dose consequences for the CR and LPZ, these changes do not constitute a departure from a method of evaluation described in the UFSAR.

50.59 Evaluation No.: HC 10-125 **Rev. No.:** 0

Activity/Document Number: DCP 80102144

The remaining change to an element of the method of evaluation is the removal of the PCIV leakage pathway that was included in Revision 3 of the LOCA analysis. This pathway was added because the intent was to increase the isolation time for the containment isolation valves to 120 seconds. Prior to the preparation of Revision 3 to the LOCA analysis, the PCIV pathway was not included in the HCGS LOCA model. This is because the lines that provide a direct pathway to the environment (the containment purge lines) were designed to comply with the requirements of Branch Technical Position 6-4, "Containment Purging During Normal Plant Operations" (BTP 6-4), as specified in the Bases for Technical Specification 3.6.1.8, "Drywell and Suppression Chamber Purge System." The purge pathway is an insignificant contributor to post-LOCA dose if the requirements of BTP 6-4 for the purge pathway are met. One requirement from BTP 6-4 is that the isolation times not exceed 5 seconds. The increase of the isolation time to 120 seconds is not in compliance with BTP 6-4, so an analysis of the dose resulting from purging coincident with a LOCA was required and included in Revision 3 of the LOCA analysis. The elimination of the increase in the PCIV isolation time brings the purge system into compliance with BTP 6-4, and it is not necessary to include this pathway in the LOCA analysis. Since this method of evaluation is consistent with the approved methodology in BTP 6-4, it does not represent a departure from a method of evaluation.

In summary, the proposed activity does not result in a departure from a method of evaluation described in the UFSAR used in establishing the design bases or in the safety analyses.

II. Identify references used to perform the evaluation (if not provided in the response to each question).

1. HCGS Calculation No. H-1-ZZ-MDC-1880, Rev 4, "Post-LOCA EAB, LPZ, and CR Doses"
2. HCGS Calculation No. H-1-ZZ-MDC-1927, Rev 2, "Vital Area Mission Doses"
3. HCGS Calculation No. H-1-ZZ-MDC-1923, Rev 3, "Areas Requiring Continuous Occupancy"
4. NRC Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors", July 2000
5. NUREG-0800, Standard Review Plan, "Containment Spray as a Fission Product Cleanup System," SRP 6.5.2, Revision 2, 1988
6. NRC Report AEB-98-03, "Assessment of Radiological Consequences for the Perry Pilot Plant Application Using the Revised (NUREG-1465) Source Term"
7. PSE&G Procedure LS-AA-104-1000, Rev 3, 50.59 Resource Manual
8. PSEG Procedure NC-EP.ZZ-0202(Q), Rev 17, OSC Activation and Operations
9. PSEG Procedure NC-EP.ZZ-0304(Q), Rev 12, Operations Support Center (OSC) Radiation Protection Response
10. PSEG Procedure SY-AA-101-109-1003, Rev 2, Security During Hazardous Exterior Conditions
11. UFSAR Section 1.10, 12.3.2.2.6, 15.6.5.5.2,
12. UFSAR Table 12.3-3, 15.6-12
13. TS 6.8.1, 6.8.4.a

50.59 EVALUATION FORM

50.59 Evaluation No.: HC 10-125 **Rev. No.:** 0

Activity/Document Number: DCP 80102144

III. Based upon the results of this Evaluation: (Select one of the following)

- ☒ Implement the Activity per plant procedures without obtaining a License Amendment.
- ☐ Request and receive a License Amendment prior to implementation.

IV. Signoffs:

50.59 Evaluator: Gopal J. Patel (Printed Name) _____ (Signature) Date: : 08/10/2010

50.59 Reviewer: James S. Boyer (Printed Name) _____ (Signature) Date: 08/10/2010

PORC Chairman: KEVIN CHAMBLISS (Printed Name) _____ (Signature) Date: 8/11/2010

H 2010-13
PORC Meeting Number

* PORC Chairman KEVIN CHAMBLISS _____ 8/12/2010

H 2010-15
PORC MEETING NUMBER

* SAFETY EVALUATION REVIEWED AND APPROVED by PORC FOLLOWING EDITORIAL CHANGES TO THE SUPPORTING CALCULATIONS FOR THIS SAFETY EVALUATION.

RADTRAD Electronic Files (CD) for Calculation H-1-ZZ-MDC-1880, Revision 4, "Post-LOCA EAB, LPZ, and CR Doses"

RADTRAD Electronic files (CD) for Attachment 14.2 of Calculation H-1-ZZ-MDC-1880, Revision 4 (GEH Proprietary Information)

Note: Some pages in this attachment include a notation to "LRW-PSG-KT1-10-091" this refers to the GEH letter that provided the material to PSEG

ENCLOSURE 3

LRW-PSG-KT1-10-091

RADTRAD Electronic files (CD) for Attachment 14.2 of Calculation H-1-ZZ-MDC-1880, Revision 4

Compact Disk

GEH Proprietary Information

Proprietary Information Notice

This enclosure contains proprietary information of GE-Hitachi Nuclear Energy Americas LLC (GEH) and is furnished in confidence solely for the purpose(s) stated in the transmittal letter. No other use, direct or indirect, of the document or the information it contains is authorized. Furnishing this enclosure does not convey any license, express or implied, to use any patented invention or, except as specified above, any proprietary information of GEH disclosed herein or any right to publish or make copies of the enclosure without prior written permission of GEH.

The entirety of the enclosed compact disk is proprietary. Therefore, the disk in this enclosure carries the notation "GEH Proprietary Information$^{\{3\}}$." The superscript notation$^{\{3\}}$ refers to Paragraph (3) of the affidavit provided in Enclosure 4, which documents the basis for the proprietary determination.

GE-Hitachi Nuclear Energy Americas LLC
AFFIDAVIT

I, Edward D. Schrull state as follows:

(1) I am the Vice President, Services Licensing, GE-Hitachi Nuclear Energy Americas LLC ("GEH"), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosures 1 and 3 of Global Nuclear Fuel-Americas, LLC letter, LRW-PSG-KT1-10-091, Lauren Watts to Jeffrie Keenan (PSEG Nuclear LLC), entitled "Proprietary Determination of PSEG Enclosures in support of the Response to the NRC June 24, 2010 (ML101760010) Request for Additional Information No. 3 (RAI3) related to License Amendment Request to Modify Hope Creek Generating Station Facility Operating License in support of the Use of Isotope Test Assemblies," dated August 13, 2010. GEH proprietary information contained in Enclosure 1, which is entitled "Attachment 14.2 of Calculation H-1-ZZ-MDC-1880, Revision 4," is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] A "[[" marking at the beginning of a table, figure, or paragraph closed with a "]]" marking at the end of the table, figure or paragraph is used to indicate that the entire content between the double brackets is proprietary. The entirety of the information in Enclosure 3, "RADTRAD Electronic files (CD) for Attachment 14.2 of Calculation H-1-ZZ-MDC-1880, Revision 4," contained on a Compact Disk, is considered proprietary and the disk itself is marked as, "GEH Proprietary Information{3}." In all cases, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(5) To address 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GEH is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed results including the process and methodology for the design and analysis of the GE14i Isotope Test Assembly. The GE14i Isotope Test Assembly has been developed at a significant cost to GEH.

The development of the GE14i Isotope Test Assembly is derived from the extensive experience database that constitutes a major GEH asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 13th day of August 2010.

Edward D. Schrull
Vice President, Regulatory Affairs
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