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February 8, 2021

PG&E Letter HBL-21-001 10 CFR 50.90

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

Humboldt Bay Power Plant, Unit 3
Docket No. 50-133, OL-DPR-7
License Amendment Request 21-01
Revise Methodology in License Termination Plan

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.90, Pacific Gas and Electric Company (PG&E) hereby requests approval of the enclosed proposed amendment to Facility Operating License No. DPR-7 for Humboldt Bay Power Plant (HBPP), Unit 3. The enclosed license amendment request (LAR) proposes to revise the License Termination Plan (LTP). The proposed revisions to the LTP include the following:

- Deleting information associated with developing surrogate ratios;
- Deleting the deselection process currently described in LTP, Section 6.2.5; and
- Adding a new methodology for determining dose contribution from deselected Hard-to-Detect radionuclides.

The Enclosure provides a detailed description and evaluation of the proposed changes. Attachment 1 contains proposed markups of the LTP. Attachment 2 contains the retyped clean copies of the LTP.

PG&E is requesting approval of this amendment as soon as possible to support submittal of the remaining Final Status Survey Reports and the request to terminate the license for HBPP.

PG&E makes no regulatory commitments (as defined by NEI 99-04) in this letter. This letter includes no revisions to existing regulatory commitments.

Pursuant to 10 CFR 50.91, PG&E is sending a copy of this proposed amendment to the California Department of Public Health.

If you have any questions or require additional information, please contact Mr. Philippe Soenen at 805-459-3701.

I state under penalty of perjury that the foregoing is true and correct.

Executed on February 8, 2021.

Sincerely,

Maureen R. Zawalick
Vice President Generation Business and Technical Services

Enclosure
cc: Humboldt Distribution
cc/enc: John Hickman, NRC Project Manager
Scott A. Morris, NRC Region IV Administrator
Gonzalo L. Perez, Branch Chief, California Department of Public Health

Evaluation of the Proposed Change

License Amendment Request 21-01
Revise Methodology in License Termination Plan

ATTACHMENTS:

1. License Termination Plan Markups
2. Retyped License Termination Plan

EVALUATION

1. SUMMARY DESCRIPTION

Humboldt Bay Power Plant (HBPP) Unit 3, was a 63 Megawatt electric Boiling Water Reactor, which was last operated in 1976 and was permanently defueled in 1984. Pacific Gas and Electric (PG&E) began actively decommissioning Unit 3 in June 2009. The HBPP Unit 3 License Termination Plan (LTP) describes the activities PG&E is required to perform to complete nuclear decommissioning. The LTP addresses PG&E's plans for demonstrating to the Nuclear Regulatory Commission (NRC) that the HBPP Unit 3 license for possession of radioactive material is ready to be terminated.

The current LTP, Section 5.2.1.3 for HBPP, Unit 3 describes a process for developing surrogate ratio Derived Concentration Guideline Levels (DCGLs). In addition, LTP, Section 6.2.5 describes a deselection method which requires potential dose from deselected nuclides to be determined using their minimum detectable concentration (MDC) value decayed to a license termination date of September 5, 2019. The proposed change requests to delete the information included in LTP Section 5.2.1.3 associated with developing surrogate ratios. Due to the time since reactor shutdown to beginning of decommissioning, typical radionuclides used for surrogate ratioing to Hard-to-Detect (HTD) radionuclides was not feasible for HBPP. In addition, the deselection process described in LTP, Section 6.2.5 is proposed for deletion and a new methodology for determining dose contribution from deselected HTD radionuclides is proposed to be added in LTP Section 5.2.1.3. The proposed methodology is similar to the original methodology with the input parameters to the process being either from actual analytical characterization data or chosen MDC values.

2. DETAILED DESCRIPTION

LTP, Section 5.2.1.3 describes a process for developing surrogate ratio DCGLs. Generally, surrogate ratio DCGLs are developed and applied to land areas and material with volumetric residual radioactivity where constant radionuclide concentration ratios can be demonstrated to exist. They are derived using pre-remediation site characterization data collected prior to the Final Status Survey (FSS). Due to the time since reactor shutdown to the beginning of active decommissioning, radionuclides used for surrogate ratioing to HTD radionuclides was not feasible for HBPP because of the decay of shorter half-life gamma emitters. As a result, PG&E is requesting to delete the information included in Section 5.2.1.3 associated with surrogate ratios.

LTP, Section 6.2.5 lists the site-specific radionuclides potentially present at HBPP and describes a method for determining potential dose from any

deselected nuclides. The method requires samples to be taken of soils and building surfaces in areas deemed to have the highest activity present in those media. The samples are required to be analyzed for all the site-specific radionuclides. If any radionuclides are not identified in the analyses they are deselected from the survey, but the potential dose from the deselected nuclides is determined using MDC values decayed to a license termination date of September 5, 2019, as compared to the respective DCGLs. Radiological conditions at HBPP make the use of this methodology impractical:

1. Significant fuel failure in its operating history created an inventory of HTD radionuclides greater than most other nuclear power reactors.

2. The significant duration of time between HBPP ceasing operation and starting decommissioning activities (1976 until start of active decommissioning in approximately 2012) allowed for short half-life nuclides to decay below normal detection levels.

Because the MDC values derived from site specific sampling were not sufficiently low, the process of deselecting those radionuclides could not be maintained at a minor dose contribution (i.e., less than 10 percent of the clearance level). Therefore, PG&E is requesting to delete the deselection process described in LTP, Section 6.2.5 and add a new deselection methodology to LTP, Section 5.2.1.3. The new methodology will utilize a similar deselection process, but allow for more flexible use of actual analytical characterization data or MDC values based on process knowledge for a given survey area to be evaluated. The bases for chosen MDC values will be included with the deselection process documentation.

LTP Section 5.2.1.3 is proposed to be revised to include the following:

It has been determined that due to the time since reactor shutdown, surrogate ratios are not appropriate due to decay of shorter half-life gamma emitters. In lieu of surrogate ratios, a deselection of specific radionuclides will be implemented. The deselection process for radionuclides that were not specifically statistically evaluated in each specific survey area shall be performed. The sum-of-fractions for the deselected radionuclides shall be no more than 10 percent of the limit. A more flexible use of actual analytical characterization data or MDC values selection based on additional characterization data or process knowledge for a given survey area to be evaluated will be utilized. The bases for chosen values will be included with the deselection process documentation.

The proposed changes are provided on the marked-up LTP pages included in Attachment 1. The clean retyped LTP pages are provided in Attachment 2.

In summary, the proposed changes include the following revisions to the LTP:

- delete the information included in LTP, Section 5.2.1.3 associated with surrogate ratios;
- delete the deselection methodology described in LTP, Section 6.2.5; and
- add a description of the new methodology to LTP, Section 5.2.1.3.

3. TECHNICAL EVALUATION

Based on the information above, PG&E determined that the deselection process described in the LTP was not practical based on the site-specific conditions at HBPP. Therefore, a new methodology is proposed to account for potential dose contributions associated with deselected radionuclides. The details associated with the new methodology are discussed further below.

NUREG 1757 V.2 Section 3.3 States:

> *Once a licensee has demonstrated that radionuclides or exposure pathways are insignificant, then (a) the dose from the insignificant radionuclides and pathways must be accounted for in demonstrating compliance, but (b) the insignificant radionuclides and pathways may be eliminated from further detailed evaluations.*

Therefore, it is necessary to calculate and account for the potential dose from the undetected (insignificant) radionuclides and compare the aggregate potential dose to ensure that it does not exceed 10 percent of the dose limit (i.e. 2.5 millirem/year [mrem/yr] total effective dose equivalent [TEDE]). HBPP identified, through the course of characterization, that not all radionuclides existing in the HBPP site-specific suite of nuclides included in LTP, Section 6.2.5, Table 6-4 would be present in significant quantities in every survey area on site. As a result, certain insignificant radionuclides were deselected on a case-by-case basis. In accordance with NUREG 1757 V.2 Section 3.3, the aggregate dose contribution for the insignificant radionuclides deselected from analysis needed to be determined.

Table 3.1 HBPP Site Specific Suite of Nuclides
(LTP, Section 6.2.5, Table 6-4)

Radionuclide	Half Life (Years)	Decay Mode
*Cm-243/244	1.81E+01	α, γ
*Cm-245/246	4.75E+03	α, γ
Am-241	4.32E+02	α, γ
C-14	5.73E+03	β-

Radionuclide	Half Life (Years)	Decay Mode
Co-60	5.27E+00	β-, γ
Cs-137	3.02E+01	β-
Eu-152	1.36E+01	β-, γ
Eu-154	8.80E+00	β-, γ
H-3	1.23E+01	β-
Nb-94	2.03E+04	β-, γ
Ni-59	7.50E+04	Γ
Ni-63	1.00E+02	β-
Np-237	2.14E+06	α, γ
Pu-238	8.78E+01	α, γ
Pu-239	2.41E+04	α, γ
Pu-240	6.60E+03	α, γ
Pu-241	1.44E+01	β-
Sr-90	2.86E+01	β-
Tc-99	2.13E+05	β-, γ

To deselect any radionuclide in the HBPP suite of nuclides an a-priori dose contribution value needed to be derived. HBPP accomplished the derivation by analyzing a high activity media sample (i.e., Reactor Drain Tank (RDT) Vault) and selecting the Minimum Detectable Activity (MDA) values for each potential insignificant nuclide (or the actual reported activity value if higher than the MDA) as the dose contribution value. The HTD nuclides in Table 3.1 are listed below in Table 3.2 with their a-priori dose contribution values.

Table 3.2 A-priori Dose Contribution Values for HTD Nuclides

Nuclide	MDA Activity (pCi/g)	DCGL (pCi/g)	Dose Contribution (mrem/yr)
Cm-243/244(1)	4.48E-02	2.90E+01	3.86E-02
Cm-245/246(1)	1.26E-01	1.70E+01	1.85E-01
Ni-59	8.50E+01	1.90E+03	1.12E+00
Ni-63	1.89E+00	7.2E+02	6.56E-02
Pu-238	1.69E-01	2.90E+01	1.46E-01
Pu-239/240(1)	2.84E-01	2.60E+01	2.73E-01
Pu-241	5.29E+00	8.60E+02	1.54E-01
Sr-90	4.42E-01(2)	1.50E+00	7.37E+00
Tc-99	8.15E-02	1.20E+01	1.70E-01

Note (1) For radiochemical alpha spectroscopy analysis whose results cannot discriminate between two isotopes (i.e., Pu-239/240, Cm-243/244, and Cm-245/246), the lower of the two DCGLs were selected from Table 5-1 of the LTP.

Note (2) Actual reported activity result used as it was greater than the reported MDA of 1.14E-02 pCi/g.

Based on the derived *a-priori* dose values it was noted that the inclusion of Strontium 90 in the deselection process would drive the aggregate potential dose contribution above the 2.5 mrem/year TEDE limit (i.e., 9.52E+00 mrem/year).

Because the described methodology exceeded the 10 percent value to be considered insignificant, other reasonable, but conservative, input parameters for the sum-of-fractions calculation were devised. The still conservative input parameters would be based on analytical characterization data or MDC values based on other available knowledge of the site or specific area in question. Below are examples of how the input parameters may be determined using the proposed methodology:

- For specific areas where no activated concrete would be present, the C-14 could be delisted with no value added for that radionuclide.
- Additional characterization data may be developed other than that in the original MDA values from the RDT vault samples.
- Knowledge of specific areas, such as wetlands not associated with reactor operations, may not require HTD dose assessment at all.

If a description of the basis for input parameters chosen is included with the area's deselection documentation, the conservative nature of new input parameters may be assessed. The result of the input change will be more reasonable dose estimates for the HTD radionuclides to be applied to the overall dose assessment for comparison to the radiological dose criteria for license termination. The detailed description of how the input parameters are determined for a specific survey area will be included in the final status survey reports submitted to the NRC for review and approval.

4. REGULATORY ANALYSIS

The proposed changes have been evaluated to determine whether applicable regulations and requirements continue to be met. PG&E has determined that the proposed changes do not require any exemptions or relief from regulatory requirements.

4.1 <u>Applicable Regulatory Requirements/Criteria</u>

4.1.1 10 CFR 50.82, Termination of license

(a)(6) Licensees shall not perform any decommissioning activities, as defined in § 50.2, that—

(i) Foreclose release of the site for possible unrestricted use;

(ii) Result in significant environmental impacts not previously reviewed; or

(iii) Result in there no longer being reasonable assurance that adequate funds will be available for decommissioning.

The proposed changes are associated with a change in methodology for accounting for potential dose from deselected radionuclides. Therefore, the proposed changes do not impact the criteria listed above in 10 CFR 50.82(a)(6).

(a)(9) All power reactor licensees must submit an application for termination of license. The application for termination of license must be accompanied or preceded by a license termination plan to be submitted for NRC approval.

(i) The license termination plan must be a supplement to the FSAR or equivalent and must be submitted at least 2 years before termination of the license date.

(ii) The license termination plan must include—

(A) A site characterization;

(B) Identification of remaining dismantlement activities;

(C) Plans for site remediation;

(D) Detailed plans for the final radiation survey;

(E) A description of the end use of the site, if restricted;

(F) An updated site-specific estimate of remaining decommissioning costs;

(G) A supplement to the environmental report, pursuant to § 51.53, describing any new information or significant environmental change associated with the licensee's proposed termination activities; and

(H) Identification of parts, if any, of the facility or site that were released for use before approval of the license termination plan.

The initial LTP was submitted to the NRC in accordance with the criteria above and incorporated into the HBPP Defueled Safety Analysis Report as Appendix A. With the proposed changes, the LTP continues to include the information required by 10 CFR 50.82(a)(9)(ii).

4.1.2 HBPP License Number DPR-7, Condition 2.C.5

License Termination Plan (LTP)

NRC License Amendment No. 45 approves the LTP. In addition to the criteria specified in 10 CFR 50.59 and 10 CFR 50.82(a)(6), a change to the LTP requires prior NRC approval if the change:

(a) Increases the probability of making a Type 1 decision error, as that

term is described in the NRC's Multi-Agency Radiation Survey and Site Investigation Manual, NUREG-1575, Revision 1 (August 2000) (MARSSIM), above the level stated in the LTP.

(b) Increases the radionuclide-specific derived concentration guideline levels (DCGL), as that term is described in MARSSIM, and related minimum detectable concentrations.

(c) Increases the radioactivity level, relative to the applicable DCGL, at which investigation occurs.

(d) Changes the statistical test applied other than the Sign Test or Wilcoxon Rank Sum Test.

(e) Results in significant environmental impacts not previously reviewed.

Reclassification of survey areas as described in MARSSIM from a less to a more restrictive classification (e.g., from a Class 3 to a Class 2 area) may be done without prior NRC notification; however, reclassification to a less restrictive classification (Class 1 to Class 2 area) will require NRC notification at least 14 days prior to implementation.

The proposed changes to the LTP do not meet the additional criteria included in HBPP License DPR-7, Condition 2.C.5 for requiring NRC approval for a change to the LTP.

4.1.3 10 CFR 50.59, Changes, Tests and Experiments

(c)(2) A licensee shall obtain a license amendment pursuant to Section 50.90 prior to implementing a proposed change, test, or experiment if the change, test, or experiment would:

(viii) Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses.

PG&E evaluated the changes included in this LAR against the criteria in 10 CFR 50.59 and determined NRC approval is required in accordance with 10 CFR 50.59(c)(2)(viii).

4.2 Precedent

None.

4.3 Significant Hazards Consideration

PG&E has evaluated whether a significant hazards consideration is involved with the proposed amendment by focusing on the three

standards set forth in 10 CFR 50.92, “Issuance of amendment,” as discussed below:

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

Response: No.

The proposed change revises the methodology used for determining dose contributions from Hard-to-Detect (HTD) radionuclides at Humboldt Bay Power Plant (HBPP). There are no physical changes proposed at HBPP. Therefore, the proposed change does not significantly increase the probability or consequences of an accident previously evaluated.

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

Response: No.

The proposed change revises the methodology used for determining dose contributions from HTD radionuclides at HBPP. There are no physical changes proposed at HBPP. Therefore, the proposed change does not create the possibility of a new or different accident from any accident previously evaluated.

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

Response: No.

The proposed change revises the methodology used for determining dose contributions from HTD radionuclides at HBPP. The methodology is used to demonstrate that the survey areas at HBPP meet the release criteria in accordance with NRC regulations. There are no physical changes proposed at HBPP. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above evaluation, PG&E concludes that the proposed change does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of “no significant hazards consideration” is justified.

4.4 Conclusions

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

5. ENVIRONMENTAL CONSIDERATION

PG&E has evaluated the proposed amendment and has determined that the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6. REFERENCES

None.

Proposed License Termination Plan Changes (marked-up sections)

5.2.1.3 *Surrogate Ratio DCGLs and Deselection Process* ~~*(Note: Surrogate not used)*~~

It has been determined that due to the time since reactor shutdown, surrogate ratios are not appropriate due to decay of shorter half-life gamma emitters. In lieu of surrogate ratios, a deselection of specific radionuclides will be implemented. The deselection process for radionuclides that were not specifically statistically evaluated in each specific survey area shall be performed. The sum-of-fractions for the deselected radionuclides shall be no more than 10% of the limit. The input for the Hard-to-Detect (HTD) isotopes for the sum-of-fractions calculation may be based on actual analytical characterization data or Minimum Detectable Concentration (MDC) values. The basis for input parameters chosen should be included with the area's deselection documentation. CR 14-04

CR 14-03

~~Generally, surrogate ratio DCGLs are developed and applied to land areas and materials with volumetric residual radioactivity where constant radionuclide concentration ratios can be demonstrated to exist. They are derived using pre-remediation site characterization data collected prior to the FSS. The established ratio among the radionuclide concentrations allows the concentration of every radionuclide to be expressed in terms of any one of them. Likewise, a surrogate ratio DCGL allows the DCGLs specific to Hard-to-Detect (HTD) radionuclides in a mixture to be expressed in terms of a single radionuclide that is more readily measurable. The measured radionuclide is called the surrogate radionuclide. Cs-137 is the primary surrogate radionuclide for HBPP. A sufficient number of measurements, representative of the area of interest, are taken to establish a consistent ratio of radionuclide concentrations. The number of measurements needed to determine the ratio is based on the chemical, physical, and radiological characteristics of the radionuclides and the site. Measurements from different media types will not be mixed to derive the ratio. The surrogate ratio is acceptable if the mean values for individual samples for a given media are within two standard deviations of the overall mean value for the media. Once an appropriate surrogate ratio is determined, the DCGL of the measured radionuclide is~~ CR 14-02

~~modified to account for the represented radionuclide according to the following Equation 5-1 (MARSSIM Equation 4-1):~~

$$\cancel{DCGL_{SR} = DCGL_{SUR} \times \frac{DCGL_{REP}}{[(C_{REP} \div C_{SUR})(DCGL_{SUR})] + DCGL_{REP}}}$$

~~**Equation 5-1**~~

~~where:~~

~~$DCGL_{SR}$ = modified DCGL for surrogate ratio~~

~~$DCGL_{SUR}$ = DCGL for surrogate radionuclide~~

~~$DCGL_{REP}$ = DCGL for represented radionuclide~~

~~C_{REP} = Concentration of represented radionuclide~~

~~C_{SUR} = Concentration of surrogate radionuclide~~

~~The following process is applied to assess the need to use surrogate ratios for final status surveys:~~ CR 14-02

- ~~Determine whether HTD radionuclides (e.g., TRU, Sr-90, H-3) are likely to be present in the survey unit based on process knowledge and historical data or characterization.~~

- ~~When HTD radionuclides are likely to be present, establish a relationship using a representative number of samples (typically 6 or more). The samples may come from another survey unit if the source of the contamination and expected concentrations are reasonably the same. These samples will be analyzed for ETD and HTD radionuclides using gross alpha, alpha spectroscopy, gross beta analysis, or gamma spectroscopy techniques.~~

~~Surrogate relationships will be determined using one of the methods described below:~~

- ~~Develop a surrogate relationship for each HTD radionuclide.~~
- ~~Determine the average surrogate DCGL and the standard deviation from the surrogate relationships.~~

~~If the mean values for individual samples for a given media are within two standard deviations of the overall mean value for the media, the surrogate ratio is acceptable. If this criterion is not met, the following steps will be applied:~~

- ~~The lowest surrogate DCGL from the observed radionuclide mix may be applied to the entire survey unit.~~
- ~~Additional samples may be collected and analyzed to allow for a detailed analysis and documented evaluation of the radionuclide distribution in order to establish a DCGL specific to that survey unit.~~
- ~~A corrective action document will be initiated and entered into the corrective action system.~~

~~A general expression for the surrogate equation based on recursive relationships is provided by the following equation for i HTD radionuclides.~~

$$DCGL_{surrogate} = \frac{DCGL_{ETD} \prod_{i=1}^{n} DCGL_i}{\prod_{i=1}^{n} DCGL_i + DCGL_{ETD} \sum_{i=1}^{n} f_i \prod_{\substack{m=1 \\ m \neq i}}^{n} DCGL_m}$$

CR 14-02

~~Equation 5-2~~

~~where:~~

~~$DCGL_{ETD}$ = the DCGL for the easy-to-detect radionuclide~~
~~$DCGL_i$ = the DCGL for the ith hard-to-detect radionuclide~~
~~$DCGL_m$ = the DCGL for the mth hard-to-detect radionuclide for which the corresponding f_i is applied~~
~~f_i = the activity ratio of the ith hard-to-detect radionuclide to the easy-to-detect radionuclide~~

~~Physical or chemical differences between the radionuclides may produce different migration rates, causing the radionuclides to separate and changing the radionuclide ratios. Remediation activities have a reasonable potential to alter the surrogate ratio established prior to remediation. Additional post-remediation samples will be collected to ensure that the data used to establish the ratio are still appropriate and representative of the existing site condition. If these additional post-remediation samples are not consistent with the pre-remediation data, surrogate ratios will be re-established.~~

~~Surrogate relationships will be verified by either performing HTD analyses on post-remedial samples (e.g. 6 or more) or by analyzing a minimum of 10% of the FSS samples for HTD. All FSS samples are held in storage on-site until the survey unit is approved for release by the NRC. In the event that additional analyses are required to reconfirm HTD ratios, these FSS samples will be available for analysis.~~ CR 14-02

Post-remediation surveying will be accomplished utilizing instrumentation and methodologies consistent with FSS surveying:

- Field screening will be performed using 2350-1 instruments with NaI detectors. Scanning rates will be determined so that activity at the $DCGL_W$ will be detected. Scanning may be performed using the ISOCS provided the assay sensitivity allows for the detection of activity at the $DCGL_W$.
- Field sampling analysis will be performed to the MDC criteria addressed in Section 5.5.3.

The remedial action support survey relies on a simple radiological parameter, such as direct radiation near the surface (i.e. surface scans using a 44-10 detector), as an indicator of effectiveness. The investigation level (the level below which there is an acceptable level of assurance that the established DCGLs have been attained) is determined and used for immediate, in-field decisions. There will be radionuclides and media that cannot be evaluated at the $DCGL_W$ using field monitoring techniques. For these cases, field samples will be collected and analyzed and compared to the release DCGLs.

Characterization surveys will be performed of the remediated areas to the rigors of FSS to determine if the area is ready for a FSS (i.e. the area will pass an FSS).

5.2.1.4 *Gross Activity DCGLs*

As a rule, gross activity DCGLs ($DCGL_{GA}$) are developed and applied to structures and plant systems with surface residual radioactivity where multiple radionuclides are present at concentrations that exceed 10 percent of their respective DCGLs. The $DCGL_{GA}$ is determined by taking into account nuclide detectability to enable field

1.76E-07 mrem and 1.82E-07mrem for Residential and Occupancy respectively.

3. I-129 values are entered on certain HBPP radwaste shipment manifests. Certain waste burial sites require that values for all 10 CFR 61 radionuclides be entered on the manifest. Review of values entered determined that the MDC values were used for the I-129 concentrations. I-129 concentrations in 10 CFR 61 analyses have not been observed in the past at HBPP greater than their MDA values.

4. I-129 concentrations have not been observed above the MDA value in characterization sample analyses when analyzed at HBPP.

5. NUREG-4289 lists I-129 residual radionuclide concentrations in HBPP reactor component systems as insignificant (Table C.2.3)

Based upon the above review of I-129 at HBPP, it is appropriate to exclude I-129 from the list of site-specific radionuclides potentially present at the HBPP site.

Based on the previous evaluation, it was determined that individual radionuclides that contributed less than 0.1 percent of the total activity could potentially be discounted, providing that dose contributed by the sum of the those radionuclides does not exceed 1 percent of the total calculated dose. The total percentage of activity attributed to radionuclides that meet these criteria amounts to 0.007 percent

6.2.5. Site-Specific Suite of Radionuclides

Table 6–4 represents a list of radionuclides potentially present at HBPP, based on applying the described screening criteria to the combined list of potential radionuclides from regulatory guidance contained in NUREG/CR-3474 and NUREG/CR-4289 and historical 10 CFR 61 analyses.

Table 6-4 HBPP Site Specific Suite of Nuclides

Radionuclide	Half Life (Years)	Decay Mode
*Cm-243/244	1.81E+01	α, γ
*Cm-245/246	4.75E+03	α, γ
Am-241	4.32E+02	α, γ
C-14	5.73E+03	β-
Co-60	5.27E+00	β-, γ
Cs-137	3.02E+01	β-

Radionuclide	Half Life (Years)	Decay Mode
Eu-152	1.36E+01	β-, γ
Eu-154	8.80E+00	β-, γ
H-3	1.23E+01	β-
Nb-94	2.03E+04	β-, γ
Ni-59	7.50E+04	γ
Ni-63	1.00E+02	β-
Np-237	2.14E+06	α, γ
Pu-238	8.78E+01	α, γ
Pu-239	2.41E+04	α, γ
Pu-240	6.60E+03	α, γ
Pu-241	1.44E+01	β-
Sr-90	2. 86E+01	β-
Tc-99	2.13E+05	β-, γ

*Listed half-life is the shortest half-life for the radionuclides in the pair
α – Alpha Decay
β- – Beta Decay
γ – Gamma Decay

~~Samples will be taken of soils and building surfaces in areas deemed to have the highest activity present in those media.The samples will be analyzed for all the radionuclides in the site-specific suite. If any of the nuclides are not identified in the analyses then they may be deselected from the survey, however, the potential dose from the deselected nuclides will be determined using their MDC values decayed to a license termination date of September 5, 2019, as compared to their respective DCGLs.~~ CR 14-02

6.2.6. Resident Farmer Scenario for Surface and Subsurface Soil Exposure

6.2.6.1 Resident Farmer Scenario Justification

PG&E has no plans to release all or part of the facility for ownership by members of the public. Although the public does have access to portions of the site via the coastal walkway, there is no ready access to the majority of the site. The HBPP switchyard has been in continual use, and the site continues to be an important center of electrical supply from the Humboldt Bay Generating Station (HBGS).

It is unlikely that the HBPP site will be used for any purpose other than an industrial site; however, HBPP has chosen the conservative approach of remediating and surveying to the resident farmer scenario at license termination to allow

Proposed License Termination Plan Changes (retyped sections)

5.2.1.3 *Surrogate Ratio DCGLs and Deselection Process*

It has been determined that due to the time since reactor shutdown, surrogate ratios are not appropriate due to decay of shorter half-life gamma emitters. In lieu of surrogate ratios, a deselection of specific radionuclides will be implemented. The deselection process for radionuclides that were not specifically statistically evaluated in each specific survey area shall be performed. The sum-of-fractions for the deselected radionuclides shall be no more than 10% of the limit. The input for the Hard-to-Detect (HTD) isotopes for the sum-of-fractions calculation may be based on actual analytical characterization data or Minimum Detectable Concentration (MDC) values. The basis for input parameters chosen should be included with the area's deselection documentation. CR 14-02 CR 14-04

Post-remediation surveying will be accomplished utilizing instrumentation and methodologies consistent with FSS surveying: CR 14-03

- Field screening will be performed using 2350-1 instruments with NaI detectors. Scanning rates will be determined so that activity at the $DCGL_W$ will be detected. Scanning may be performed using the ISOCS provided the assay sensitivity allows for the detection of activity at the $DCGL_W$.
- Field sampling analysis will be performed to the MDC criteria addressed in Section 5.5.3.

The remedial action support survey relies on a simple radiological parameter, such as direct radiation near the surface (i.e. surface scans using a 44-10 detector), as an indicator of effectiveness. The investigation level (the level below which there is an acceptable level of assurance that the established DCGLs have been attained) is determined and used for immediate, in-field decisions. There will be radionuclides and media that cannot be evaluated at the $DCGL_W$ using field monitoring techniques. For these cases, field samples will be collected and analyzed and compared to the release DCGLs.

Characterization surveys will be performed of the remediated areas to the rigors of FSS to determine if the area is ready for a FSS (i.e. the area will pass an FSS).

4. I-129 concentrations have not been observed above the MDA value in characterization sample analyses when analyzed at HBPP.

5. NUREG-4289 lists I-129 residual radionuclide concentrations in HBPP reactor component systems as insignificant (Table C.2.3)

Based upon the above review of I-129 at HBPP, it is appropriate to exclude I-129 from the list of site-specific radionuclides potentially present at the HBPP site.

Based on the previous evaluation, it was determined that individual radionuclides that contributed less than 0.1 percent of the total activity could potentially be discounted, providing that dose contributed by the sum of the those radionuclides does not exceed 1 percent of the total calculated dose. The total percentage of activity attributed to radionuclides that meet these criteria amounts to 0.007 percent

6.2.5. Site-Specific Suite of Radionuclides

Table 6–4 represents a list of radionuclides potentially present at HBPP, based on applying the described screening criteria to the combined list of potential radionuclides from regulatory guidance contained in NUREG/CR-3474 and NUREG/CR-4289 and historical 10 CFR 61 analyses.

Table 6-4 HBPP Site Specific Suite of Nuclides

Radionuclide	Half Life (Years)	Decay Mode
*Cm-243/244	1.81E+01	α, γ
*Cm-245/246	4.75E+03	α, γ
Am-241	4.32E+02	α, γ
C-14	5.73E+03	β-
Co-60	5.27E+00	β-, γ
Cs-137	3.02E+01	β-
Eu-152	1.36E+01	β-, γ
Eu-154	8.80E+00	β-, γ
H-3	1.23E+01	β-
Nb-94	2.03E+04	β-, γ
Ni-59	7.50E+04	γ
Ni-63	1.00E+02	β-
Np-237	2.14E+06	α, γ
Pu-238	8.78E+01	α, γ
Pu-239	2.41E+04	α, γ
Pu-240	6.60E+03	α, γ
Pu-241	1.44E+01	β-

Radionuclide	Half Life (Years)	Decay Mode
Sr-90	2. 86E+01	β-
Tc-99	2.13E+05	β-, γ

*Listed half-life is the shortest half-life for the radionuclides in the pair
α – Alpha Decay
β- – Beta Decay
γ – Gamma Decay

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6.2.6. Resident Farmer Scenario for Surface and Subsurface Soil Exposure

6.2.6.1 Resident Farmer Scenario Justification

PG&E has no plans to release all or part of the facility for ownership by members of the public. Although the public does have access to portions of the site via the coastal walkway, there is no ready access to the majority of the site. The HBPP switchyard has been in continual use, and the site continues to be an important center of electrical supply from the Humboldt Bay Generating Station (HBGS).

It is unlikely that the HBPP site will be used for any purpose other than an industrial site; however, HBPP has chosen the conservative approach of remediating and surveying to the resident farmer scenario at license termination to allow for other uses following the expected 30-year life of the HBGS, which would be in 2040.

6.2.6.2 Critical Group for Surface Exposure

The average member of the critical group was determined to be the resident farmer who lives on the Humboldt Bay site following decommissioning, grows all or a portion of his/her diet onsite, and uses the water from a groundwater source on the site for drinking water and irrigation. The dose from residual radioactivity in soil is evaluated for the critical receptor as required by 10 CFR 20, Subpart E, and described in Appendix I to NUREG -1757.

6.2.6.3 Conceptual Model and Site-Specific Exposure Pathways

The conceptual model for this scenario is a residential farming family that lives onsite, raises crops and livestock