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November 17, 1994
Fort St. Vrain
P-94105

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

ATTN: Mr. John H. Austin, Chief
Decommissioning and
Regulatory Issues Branch

Docket No. 50-267

**SUBJECT: Proposed Modification of Removable Surface Contamination
Release Criteria for Tritium and Iron-55, Supplemental
Information**

REFERENCES:

1. PSC Letter, Warembourg to Austin, dated September 29, 1994 (P-94084)
2. NRC Letter, Pittiglio to Crawford, dated June 15, 1994 (G-94113)

Dear Mr. Austin:

This letter provides additional information in support of Public Service Company of Colorado's (PSC) request to modify the removable surface contamination release criteria for tritium and iron-55, previously submitted via Reference 1. This additional information was requested during a telephone conversation on October 27, 1994, between PSC and Messrs. Dave Fauver and Clayton Pittiglio of your staff.

In the Reference 1 submittal, PSC proposed that the removable surface contamination criteria for hard to detect nuclides tritium and iron-55 be increased from 1000 dpm/100 cm² to 20,000 dpm/100 cm². This request is similar in principle to the modification to fixed surface contamination criteria for tritium and iron-55 approved by the NRC in Reference 2. As discussed in Reference 1, PSC requests an increase to the removable surface contamination criteria for these two nuclides so that the level of cleanup and survey activities during Fort St. Vrain decommissioning will be reasonable and consistent with the levels of detectable β - γ emitters that contribute the majority of dose consequence rather than tritium and iron-55 which have little dose consequence.

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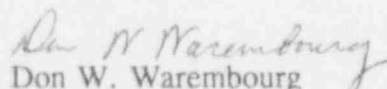
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The attachment to this letter describes the extent of cleanup or housekeeping activities that PSC plans to perform, in addition to the equipment or facility decontamination efforts associated with facility decommissioning, to reasonably clean up removable contamination. The housekeeping protocol described in the attachment ensures that members of the public who may visit the site will not leave with significant amounts of dust, dirt, or contamination on their clothing. Also, a cost/benefit analysis is provided which shows that the extra efforts required to meet a 1000 dpm/100 cm² removable surface contamination limit, as compared to PSC's proposed 20,000 dpm/100 cm² limit for tritium and iron-55, would result in a conservatively calculated dose reduction of only 0.82 person-mRem/year, and would cost approximately \$5.6 million. PSC considers that these efforts are not justified and that this minimal dose reduction is not "reasonably achievable."

PSC requests that the modified removable surface activity limit requested in this letter and in Reference 1 be approved by December 31, 1994. This accelerated approval is required to support current decontamination efforts of plant systems and equipment and to define the Site Specific Guideline Values. In addition, this approval date is requested to support the ongoing efforts of procedure development, training, and planning efforts for the Final Survey.

If you have any questions regarding this information, please contact Mr. M. H. Holmes at (303) 620-1701.

Sincerely,


Don W. Warembourg
Decommissioning Program Director

DWW/SWC

Attachment

cc: w/attachment

Regional Administrator, Region IV

Mr. Robert M. Quillin, Director
Radiation Control Division
Colorado Department of Health

**Supplemental Information to PSC's
Proposed Modification to Removable Surface Contamination
Release Criteria for Tritium and Iron-55**

This attachment provides additional information in support of PSC's proposed modification to removable surface contamination criteria for tritium and iron-55, as discussed with the NRC on October 27, 1994. Included are a clarification of the request, a discussion on PSC's planned cleanup activities or housekeeping protocol, an analysis of the dose consequences from the remaining contamination if our request is approved, an estimate of the costs for a comprehensive plant decontamination and increased final survey efforts that would result if our request is not approved, and a discussion of possible public perceptions of this proposed increase in contamination limits.

Clarification of the Limit Request

In Reference 1, PSC requested that the removable surface contamination release criteria for tritium and iron-55 be adjusted in a manner similar to that previously approved for total surface contamination (Reference 2). The specific limits requested were 20,000 dpm/100 cm² for tritium and for iron-55. The purpose for requesting this adjustment for tritium and iron-55 is to allow PSC to derive a reasonably measurable site specific guideline value for removable activity based on detectable β - γ emitters which contribute the majority of dose consequence rather than tritium and iron-55 which have little dose consequence.

PSC understands and has actively pursued the ALARA philosophy throughout the decommissioning process. The decommissioning team has spent considerable effort examining the issues impacting various cleanup and housekeeping options as they relate to ALARA and to the proposed modified limit of 20,000 dpm/100 cm², such as the following:

- Dose consequences of removable activity;
- The relative activities of nuclides expected to be present at the time of license termination (i.e., the source term), radionuclide half lives and the variability of the source term in various plant areas/systems;
- The current radiological conditions of the facility;

- The derived guideline value and its associated action level (50%) for investigation surveys;
- The potential for beta attenuation caused by the presence of dirt and debris;
- Safety concerns associated with an extensive housekeeping effort (i.e. scaffolding, asbestos cable trays, electrical panels and wiring, high work, confined spaces, additional dose consequences, etc.) in the absence of any direct correlation between surface dust and removable contamination except in affected-suspect areas; and
- Cost and schedule impacts due to extensive plant decontamination required to demonstrate compliance with very low removable surface contamination guideline values (e.g., 305 dpm/100 cm² as identified in Reference 1).

Facility Housekeeping

Although PSC's housekeeping practices are not actually considered part of decontamination efforts, they are and will be generally effective in cleaning up removable contamination and in preventing workers or other individuals in the facility from carrying contamination away from the site. General housekeeping activities have been a part of facility dismantlement and decommissioning activities to this point and we intend to continue these efforts throughout the physical decommissioning process.

Routine housekeeping is normally limited to areas and surfaces routinely accessed. Facility housekeeping is a recognized responsibility of the licensee and is important for the general health and safety of workers as well as proper facility maintenance. The need to remove dust and debris which might otherwise impact the ability to survey surfaces during the termination surveys is also recognized. In all cases, surfaces in excess of the site specific guideline criteria will be decontaminated or remediated. PSC intends to use the following housekeeping protocol:

Affected Areas (> 50% of Guideline Value)

- Horizontal surfaces will be swept, vacuumed or wiped down using a wet wipe and mild detergent, as appropriate. Exceptions to this requirement may be taken where concern for the safety of personnel is determined to be significant as a result of cleanup activities.

Affected Areas ($\leq 50\%$ of Guideline Value)

- Readily accessible horizontal surfaces will be swept, vacuumed or wiped down using a wet wipe and mild detergent, as appropriate. Exceptions to this requirement may be taken where concern for the safety of personnel is determined to be significant as a result of cleanup activities. Readily accessible will be considered 1 meter horizontally and 2 meters vertically from catwalks, walkways, stairways, landings, or other locations designed for routine personnel access.

Unaffected areas

- Dust or debris which prevents the ability to assess the underlying surface will be removed from the survey point.

PSC believes the housekeeping protocol outlined above is appropriate based on:

- The execution of a well defined housekeeping program by the licensee which meets the ALARA requirement of "reasonably achievable".
- The need to minimize health and safety risks to decommissioning personnel.

Dose Consequences of Proposed Limit Adjustment

Revising the removable surface contamination limit from 1000 dpm/100 cm² to 20,000 dpm/100 cm² for tritium and iron-55 will have somewhat higher dose consequences for individuals in the Reactor Building after license termination. This limit change will generally not result in accessible surfaces being released with 20,000 dpm/100 cm² of removable tritium or iron-55, as shown in the calculations in Attachment A, due to the mix of isotopes found in the facility. It should be pointed out that if tritium is identified in the absence of other radionuclides, it would most likely be internal to system piping or components and would not be accessible. In such a case, however, the full guideline value of 20,000 dpm/100 cm² will be applied and this contamination level could remain.

The dose consequences of removable activities at the values under consideration are summarized in the following table. The calculated Total Effective Dose Equivalent (TEDE) values report the annual TEDE which would be attributable to the removable activity component of the total residual using the methodology and dose factors contained in NUREG-5512 (Volume 1, October 1992). Although PSC has no current plans for use of the reactor building after license termination, the "Occupancy Scenario" and associated default values were used for this estimate of the potential dose consequences. This is a conservative scenario assumption and assumes a total of 2000 person-hours per year spent

in the reactor building. Our decommissioning workers currently have far greater access to the facility than is envisioned after license termination, and our experience has been that reactor building access and routine maintenance activities have been made generally without picking up contamination; in fact, most reactor building activities can be performed in street clothes, unlike conditions at most water reactors. The removable surface contamination value used in the dose calculations was conservatively assumed to be uniformly distributed over all surfaces. This is conservative in that it does not take credit for cleaned surfaces, as described in the housekeeping protocol discussion above.

DOSE CONSEQUENCES OF REMOVABLE ACTIVITIES		
Scenario	Derived Limit Value	Calculated TEDE *
1. Removable Guideline (No H-3 or Fe-55)	1000 dpm/100cm ² detectable $\beta - \gamma$	1.84E+0 person-mRem/yr.
2. Removable Guideline (H-3, Fe-55 @ 1000dpm/100cm ²)	305 dpm/100cm ² detectable $\beta - \gamma$ (1000 dpm/100cm ² all isotopes)	5.69E-1 person-mRem/yr.
3. Removable Guideline (H-3, Fe-55 @ 20,000dpm/100cm ²)	750 dpm/100cm ² detectable $\beta - \gamma$ (2443 dpm/100cm ² all isotopes)	1.39E+0 person-mRem/yr.
4. H-3 @ 20,000dpm/100cm ²	20,000 dpm/100cm ² Tritium Only	1.13E-2 person-mRem/yr.
5. Fe-55 @ 20,000dpm/100cm ²	20,000 dpm/100cm ² Fe-55 Only	1.02E-1 person-mRem/yr.

* Based on the relative nuclide activities present in the Fort St. Vrain waste streams, and based on 2000 person-hours access per year.

Five calculated dose scenarios are presented above. The first scenario assumes that 1000 dpm/100 cm² detectable $\beta - \gamma$ removable contamination remains with no dose contribution due to tritium or iron-55. The second scenario assumes that the removable contamination limit for all isotopes, including tritium and iron-55, remains at 1000 dpm/100 cm². This scenario results in a FSV site specific guideline value of 305 dpm/100 cm² detectable $\beta - \gamma$. The third scenario assumes that the removable contamination limit for tritium and iron-55 is raised to 20,000 dpm/100 cm², as requested in this letter, which results in a FSV site specific guideline value of 750 dpm/100 cm² detectable $\beta - \gamma$. The dose consequence associated with the difference between scenarios two and three, i.e., the additional dose resulting from approval of PSC's request, is approximately 0.82 person-mRem/yr. Scenarios four and five are presented to portray

the dose associated with the potential presence of only tritium or iron-55 at the requested removable contamination limit of 20,000 dpm/100 cm².

As can be seen from this table, the 0.82 person-mRem dose consequence of the limit adjustment is below the 1.84 person-mRem dose based on 1000 dpm/100 cm² detectable $\beta - \gamma$ (Scenario One) which would be allowable per Regulatory Guide 1.86, and is a small fraction of the 10 mRem/yr basis for total residual contamination (Reference 2).

Note that NUREG-5512 does not differentiate between removable and fixed surface activity and that the FSV site-specific guideline value for total residual surface contamination will not change with approval of this limit adjustment for removable activity. Hence, the calculated TEDE value for total residual (fixed plus removable) activity will not change with approval of the limit adjustment for tritium and iron-55.

Cost Analysis for Compliance with the 305 dpm/100 cm² Site Specific Guideline Value

In Reference 1, PSC stated that the reduction of the removable contamination beta-gamma activity guideline value from 1000 dpm/100 cm² to 305 dpm/100 cm², along with action levels set at an appropriate fraction of the guideline value (as low as 50% or 153 dpm/100 cm²), would result in significantly more investigation surveys, more extensive decontamination activities, and would also result in greater need for laboratory counting equipment for routine surveys to monitor the effectiveness of decontamination. We estimate that the costs associated with the additional efforts could be as much as \$5,600,000 and that the decommissioning could be extended three months. Attachment B contains a breakdown of this cost estimate.

Based on biased surveys performed prior to and during decommissioning, most of the Reactor Building greater than 2 meters above floors or deck grating surfaces was initially classified as affected non-suspect. This classification was based on a removable contamination limit of 1000 dpm/100 cm² detectable beta-gamma and action levels set at 50% of the limit. Without an adjustment in the tritium and iron-55 limits, these areas would require reclassification as affected suspect if samples indicate readily detectable beta-gamma removable activity greater than 153 dpm/100 cm². Given this lower limit and current plant survey data, the cost assessment assumed that the majority of the Reactor Building must be classified as affected suspect and that a thorough decontamination would be required to achieve unconditional release. The cost estimate in Attachment B includes costs for:

- Decontamination of the entire Reactor Building. The costs shown are those above and beyond the housekeeping activities described previously in this letter.

- Additional survey requirements required by the change in classification from affected non-suspect to affected suspect.
- Additional laboratory equipment (e.g. liquid scintillation, gamma spectrometry) and laboratory technician support to count the additional smears.
- Additional radwaste generated by the decontamination efforts.
- Miscellaneous support for decontamination and additional surveys. This includes scaffold erections, temporary lighting and ventilation, extended operation of mobile laundry facilities and safety engineering support.
- Overhead staff and facility costs to support the additional three month effort.

Public Perception

PSC understands that increasing the limit for removable surface contamination from 1000 to 20,000 dpm/100 cm² for tritium and iron-55 could be perceived as an undesirable increase in the amount of contamination that could be carried away from the Fort St. Vrain site, as for example, by brushing against facility surfaces. We consider that the housekeeping protocol described above will reasonably remove contamination from normally accessible areas so that members of the public who may visit the site do not leave with significant amounts of dust, dirt, or contamination on their clothing.

In addition, the dose consequences associated with the proposed guideline values are consistent with the concept that remaining contamination levels should be "indistinguishable from natural background", as was championed by members of the public during the enhanced rulemaking process for decommissioning. The increased dose represents less than 24 hours worth (less than 0.2%) of the approximately 450 mRem/year (including Radon) natural background level in Colorado. Discussions with the State of Colorado have indicated that analyses of proposed actions based on pathways analyses, such as has been done in this case, generally are acceptable to the public.

Summary

The above discussion shows that PSC's planned housekeeping protocol for facility cleanup will ensure that the amount of removable surface contamination accessible to members of the public during normal activities will be insignificant.

A pathways analysis using the methodology provided in NUREG-5512 conservatively determined that the additional public dose resulting from approval of the 20,000 dpm/100 cm² removable surface contamination limit (or conversely, the dose savings associated

with the 1000 dpm/100 cm² limit) is only 0.82 person-mRem/year. This analysis is conservative in that: it is based on a conservative building occupancy scenario whereas PSC has no plans for use of the reactor building after license termination; it does not take credit for cleaned surfaces, but rather assumes that remaining contamination is uniformly distributed over all surfaces; and it does not take into account the additional dose that would be received by workers performing additional cleanup activities.

This requested change in the limit for removable surface contamination will have no impact on the calculated TEDE value for total residual activity, determined in accordance with NUREG-5512.

The cost to implement the 1000 dpm/100 cm² limit is estimated at \$5.6 million, and the associated cleanup and survey tasks are estimated to require an additional three months. PSC does not consider that an expenditure of \$5.6 million to save a conservatively estimated 0.82 person-mRem is reasonable nor justified. In addition, this level of expenditure would not be warranted using the industry standard cost/benefit guidance in 10 CFR 50, Appendix I, of \$1000 per total body person-Rem.

PSC believes that the proposed 20,000 dpm/100cm² guideline value for H-3 and Fe-55, combined with the cleaning and housekeeping protocol outlined above represents a programmatic and reasonable effort to reduce contamination levels to "As Low As Reasonably Achievable" during Fort St. Vrain decommissioning.

Attachment A

FSV Site Specific Guideline Value for Removable Activity Based on a 20,000 dpm/100cm² Limit for Fe-55 and H-3

The site-specific guideline value for detectable β - γ removable activity was calculated to be 750 dpm/100cm² using a derivation of equation A-2 in Draft NUREG/CR-5849, Appendix A.

$$\text{Site-Specific Guideline Value} = \frac{F}{\left[\frac{f_1}{G_1} + \frac{f_2}{G_2} + \dots + \frac{f_n}{G_n} \right]}$$

Where:

Site-Specific Guideline Value = The limit for surface contamination for nuclides normally detected during field measurement, adjusted for H-3, Fe-55 and other radionuclides not readily detectable.

F = Detectable nuclide fraction.

f_i = Fraction of the total activity contributed by each nuclide,

G_i = Guideline value for each nuclide. (From Regulatory Guide 1.86 or as specified by the NRC),

As discussed in Reference 1, eight samples were taken in the years 1993 and 1994 for the purposes of characterizing FSV waste streams. The samples were analyzed in accordance with 10 CFR 61 and were decay corrected through December 1995. A site-specific guideline of 750 dpm/100 cm² was calculated using the above formula and average isotopic values from the eight samples. The isotopic fractions for H-3, Fe-55 and detectable β - γ emitters are listed below:

- .518 = Fraction of total removable activity attributable to Fe-55
- .146 = Fraction of total removable activity attributable to H-3
- .307 = Fraction of total removable activity attributable to detectable beta-gamma emitters

Attachment A

(Continued)

FSV Site Specific Guideline Value for Removable Activity Based on a 20,000 dpm/100cm² Limit for Fe-55 and H-3

Although approval of the 20,000 dpm/100 cm² limit for H-3 and Fe-55 could hypothetically result in release of accessible surfaces with these contamination levels, this will not typically be the case. Based on the isotopic fractions presented above, approval of the 20,000 dpm/100 cm² for H-3 and Fe-55 would more realistically result in the release of surfaces with the removable H-3 and Fe-55 levels as calculated below:

$$(750) \times \frac{(.518)}{(.307)} = 1265 \text{ dpm/100cm}^2 \text{ Fe-55}$$

$$(750) \times \frac{(.146)}{(.307)} = 357 \text{ dpm/100cm}^2 \text{ H-3}$$

Attachment B

Breakdown of the \$5.6 Million Cost to Comply
with 305 dpm/100 cm² Site Specific Guideline Value

• Additional analytical equipment and analyses	\$250K
• Extensive decontamination of Reactor Building	\$1,200K
• Area reclassification and additional surveys	\$1,896K
• Additional radwaste	\$140K
• Miscellaneous support	\$465K
• Staff support	\$750K
• PSC staff, facility costs during additional 3 months	\$900K
Total	\$5,601K