



Public Service

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Public Service
Company of Colorado

April 19, 1996
Fort St. Vrain
P-96031

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

ATTN: Mr. Michael F. Weber, Chief
Decommissioning and
Regulatory Issues Branch

Docket No. 50-267

SUBJECT: Response to NRC Questions Regarding PSCo's Proposed Revisions to Final Survey Plan For Survey of Piping Systems and Suspect Affected Survey Units

REFERENCES:

1. NRC Letter, Pittiglio to Crawford, dated April 11, 1996 (G-96062)
2. PSCo Letter, Fisher to Weber, dated October 12, 1995 (P-95077)
3. PSCo Letter, Borst to Weber, dated March 5, 1996 (P-96009)

Dear Mr. Weber:

This letter submits Public Service Company of Colorado's (PSCo) responses to NRC comments provided in your April 11, 1996 letter (Reference 1), regarding proposed revisions to the Fort St. Vrain (FSV) Final Survey Plan. The propose changes were submitted in a October 12, 1995 letter (Reference 2), and involved survey treatments for piping systems and suspect affected survey units. The NRC's comments requested clarification of proposed survey treatments for embedded piping, particularly regarding information PSCo had provided in a March 5, 1996, letter (Reference 3).

The attachment to this letter provides PSCo's responses to the four comments in the referenced letter. Final surveys of affected FSV piping systems have begun, utilizing survey techniques described in the Reference 2 submittal. In order to minimize the

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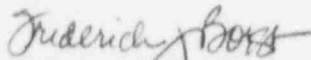
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amount of potential rework and avoid impacting the decommissioning schedule, PSCo requests NRC approval of the proposed treatment methodologies by May 24, 1996.

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

Sincerely,



Frederick J. Borst
Decommissioning Program Director

FJB/SWC

Attachment

cc: with attachment

Regional Administrator, Region IV

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

Attachment to P-96031

Public Service Company of Colorado (PSCo) and the Westinghouse Team (WT) submit the following response to NRC comments in their April 11, 1996 letter, "Response to the Fort St. Vrain Proposed Revisions to Final Survey Plan for Site Release for Survey of Piping Systems and Suspect Affected Survey Units":

NRC Comment No. 1:

The TLDs appear to provide an acceptable estimate of the average contamination in the pipes. However, the uncertainty of measurements made by individual TLDs, and the ability of individual TLD measurements to demonstrate compliance with maximum contamination limits, has not been sufficiently characterized. The analysis provided in Attachment 1 to PSCo's March 5, 1996, response to NRC February 12, 1996, Comment 10, provides only a partial estimate of this uncertainty.

Please provide a full characterization of the uncertainty of individual TLD measurements of localized contamination, i.e., small areas of contamination in geometries that differ from the calibration geometry.

Are TLDs suited for the quantitative assessment of localized contamination, or should TLDs be considered to quantify average contamination levels only, and to provide qualitative estimates of localized contamination?

PSCo/WT Response:

The WT developed the TLD string survey method for surveying small bore embedded piping with bends, because no other technology for this purpose currently exists. The intention was to provide additional information on contamination levels within long runs of embedded pipe in lieu of surveying only the piping ends with commercially available detectors, which is the method deemed adequate in Draft NUREG-5849. The technology has shown the ability to provide good estimates of the average contamination in piping and, provided that contamination is not highly localized, a reasonable representation of the contamination profile in the piping.

The TLD string method does not provide a high level of certainty for quantifying the maximum contamination level at a given localized area in a pipe (unless the location is specifically known and TLDs are positioned at that location). For example, contamination may be at a location where TLDs are not located or in a different

geometry (e.g., a small spot at the edge of a TLD) than assumed by the calibration process. Despite this limitation, using TLDs strings to survey embedded piping is considered appropriate for the following reasons:

1. The bounding value of 100,000 dpm/100 cm² for individual contamination measurements was proposed by PSCo as the point at which we would notify the NRC, not as an absolute limit on the maximum contamination level in piping to be grouted. This level was included to provide an upper limit on individual measurements, which is especially appropriate in view of the fact that specialized detectors capable of surveying small bore embedded piping with bends would necessarily be less precise than standard detectors. Because the bounding dose calculation presented in the October 12, 1995, submittal assumed that average contamination is at 100,000 dpm/100 cm², this level is appropriate as an average contamination limit.
2. If embedded piping does not meet the SGLVs after completing an aggressive decontamination effort, it will be filled with grout, which fixes any residual contamination in the piping. Therefore, reasonable exposure scenarios are dominated more by the total amount of contamination in the pipe (i.e., average) and less by the precise distribution of contamination within the pipe.
3. Embedded piping is not accessible and poses a much lower radiological risk to personnel compared to localized contamination on accessible floors or walls. Accessible ends of surveyed embedded pipes, which present the most likely exposure pathway, will be surveyed with gas flow pipe probes to the first elbow, so elevated contamination levels in these areas are more accurately characterized.
4. Additional analysis indicates that localized contamination as high as 1,000,000 dpm/100 cm² does not significantly increase the previously estimated exposures.

This 1,000,000 dpm/100 cm² contamination level is conservative for the following reasons:

- 1,000,000 dpm/100 cm² is a factor of 10 higher than the measurement upper limit of 100,000 dpm/100 cm², which accounts for the TLD uncertainties identified in Section 5 below
- PSCo/WT's embedded pipe survey data for pipes to be surveyed with TLDs, taken before decontamination efforts, indicate that all measurements were much less than 1,000,000 dpm/100 cm²

The exposure analysis includes the following conservative assumptions:

- The previously evaluated dismantlement and disposal scenario is used
- Elevated contamination is assumed to remain in one-half of the dismantled 1-inch pipe sections; it is highly unlikely that this many areas of elevated contamination would go undetected
- In each of these pipe sections with elevated contamination, there are three 100 cm² spots of contamination at 1,000,000 dpm/100 cm² (i.e., a total of 300 cm²). Since TLDs are spaced at 20" with each TLD calibrated with a 100 cm² source which is 5" of pipe length, the maximum unmonitored area between TLDs is 15" or 300 cm². Therefore, the exposure analysis also accounts for 1,000,000 dpm/100 cm² of contamination over the area between two TLD locations.
- No credit is taken for the shielding effects of grout
- The rest of the pipes are contaminated to an average level of 100,000 dpm/100 cm²

The resulting dose is 3.1 mRem per year. This represents a modest increase above the 2.4 mRem dose previously evaluated; however, it is still small compared to the 10 mRem per year criteria provided by the NRC for soil and water pathways, as identified in the Final Survey Plan, and the limits being considered in the NRC Proposed Decommissioning Rulemaking.

5. If individual measurements are greater than 50,000 dpm/100 cm², investigations are performed with GM detector assemblies where possible. 50,000 dpm/100 cm² is considered an appropriate investigation level for the following reasons:
 - a. Uncertainty analysis presented in Attachment 1 of PSCo's March 5, 1996, response to NRC February 12, 1996, Comment 10, indicates that TLD uncertainty for a point source within the TLD's defined field of view is less than a factor of 6 (areas of larger size would be detected with lower uncertainty). Although this analysis did not include all possible sources of uncertainty, investigations at 50,000 dpm/100 cm² are a factor of 20 below the localized contamination level analyzed above, which provides reasonable conservatism.
 - b. Uncertainty analysis presented in Attachment 2 of PSCo's March 5, 1996, response to NRC February 12, 1996, Comment 10, indicates that TLD uncertainty for measuring maximum levels of actual contamination distributions is less than 25%. 50,000 dpm/100 cm² allows uncertainty up to 100% prior to exceeding the individual measurement bounding value of 100,000 dpm/100 cm² proposed by PSCo, providing added conservatism.

- c. Investigation of highly localized contamination above 50% of the individual measurement bounding value is sufficiently conservative to ensure potential doses from the grouted piping are within the 3.1 mRem/year value identified above. Should an elevated area be larger in size (as indicated by multiple consecutive TLD readings), the TLD results can be expected to provide a reasonable estimation of contamination levels in the region. If there are many single TLD readings that are elevated, the average contamination in the pipe as determined by TLDs becomes more accurate.
6. Even if investigations are not possible with GM detector assemblies, the large number of measurements taken when TLDs surveys are performed provide reasonable assurance that good estimates of average contamination are obtained which provides assurance that potential doses will not exceed those presented above. Also, additional decontamination may be performed at a reduced action level where investigations are not possible, as discussed in PSCo's response to Comment No. 3 below.

NRC Comment No. 2:

Based on the uncertainty analysis requested above, please provide justification for the investigation levels provided in PSCo's March 5, 1996, response to NRC February 12, 1996, Comment 1. Because of the uncertainty in individual measurement results, it may be appropriate to base investigation levels, and decisions to perform additional decontamination, on lower maximum measurements than proposed by PSCo.

PSCo/WT Response:

In the March 5, 1996, response, PSCo proposed to investigate any individual measurement in embedded pipes of 50,000 dpm/100 cm² or greater, and any individual pipe with average contamination greater than 25,000 dpm/100 cm², provided this individual pipe is significantly more contaminated than the rest of the pipes in the survey unit.

The proposed individual measurement investigation level of 50,000 dpm/100 cm² is considered appropriate based on the following considerations:

1. 50,000 dpm/100 cm² is 50% of the measurement bounding value proposed in the submittal (i.e., 100,000 dpm/100 cm²) which is appropriate as an average contamination level limit. This is conservatively lower than the normal 75% investigation action level associated with affected plant system survey units.
2. The 50% investigation level is reasonable based on the analysis of past TLD survey data as presented in Attachment 2 to PSCo's March 5, 1996, response to NRC's February 12, 1996, Comment 10. This data indicated that areas of elevated contamination are typically observed over several adjacent TLDs, so that areas of contamination near the 100,000 dpm/100 cm² level are highly likely to be detected at a level that would initiate an investigation, so that they can be adequately characterized.
3. A highly localized "spot" of contamination that is measured below 50% of the measurement bounding value, such that an investigation is not required, would result in very small dose consequences, as discussed in PSCo's response to Comment No. 1 above.

Investigation of pipes with an average contamination level of 25,000 dpm/100 cm² and that are significantly more contaminated than the rest of the pipes in the survey unit is addressed in response to Comment No. 4, below.

NRC Comment No. 3:

What percentage of the 1 inch pipes are accessible for survey with the GM detectors if an investigation is required? What actions are proposed if the GM detectors cannot be used? Will additional decontamination be performed?

PSCo/WT Response:

When initially proposed, investigation of individual TLD measurements by GM detector assemblies was thought to be possible for most 1" piping survey units. However, our subsequent experience has shown that, for some survey units, investigations by GM detector assemblies will be possible for only some of the pipes. Some 1" pipes are restricted to GM probes due to butt welded joints, or radical bends as piping appears to be bent around rebar. This condition precludes the use of GM detector assemblies for initial survey or investigations where use of TLDs may be possible.

The 1" piping survey units that will be surveyed with TLDs are listed below with an estimated percentage that is expected to be accessible by GM detector assemblies.

System 13 - Equipment Storage Well Vent and Drain Piping	90 - 100% accessible by GMs
System 14 - Fuel Storage Well Vent Piping	90 - 100% accessible by GMs
Core Support Floor Column Piping	25% accessible by GMs
PCRIV Cooling Tubes	50% accessible by GMs

For the Core Support Floor Column Piping and PCRIV Cooling Tube survey units which have the most limited investigation potential, PSCo expects contamination levels well below the 100,000 dpm/100 cm² upper measurement limit. Survey measurements in both of these survey units were less than 100,000 dpm/100 cm² before decontamination efforts, and all pipes in these survey units have been aggressively decontaminated as described in our April 12, 1996, letter (P-96028).

For piping accessible by only TLD strings, additional investigation surveys will not be practical. Due to the long exposure periods required for TLD measurements (typically 2 to 3 months), a significant schedule impact would occur if re-survey with TLD strings was required. The additional minimal benefit provided by obtaining additional measurements does not justify the added survey costs and schedule delays.

For pipe sections that cannot be investigated, PSCo proposes to minimize associated dose by performing additional decontamination, followed by grouting. For pipes with readings greater than 50,000 dpm/100 cm² that cannot be investigated, additional decontamination will be performed for all pipes in the survey unit if the average contamination in the pipe is greater than 50,000 dpm/100 cm². This is a factor of 2 less than the 100,000 dpm/100 cm² upper measurement limit for pipes that can be investigated, and is conservative because it would not be reasonable to expect that investigation surveys (if they could have been performed) would identify elevated contamination significant enough to raise the average contamination level by a factor of 2.

If individual contamination measurements are observed greater than 100,000 dpm/100 cm², PSCo/WT will perform an engineering evaluation of additional decontamination and subsequent grouting actions. If average contamination measurements are observed greater than 100,000 dpm/100 cm² or if individual measurements are greater than 200,000 dpm/100 cm², PSCo/WT will perform additional decontamination and subsequent grouting. PSCo will notify the NRC of any individual measurement in excess of 100,000 dpm/100 cm², prior to grouting.

NRC Comment No. 4:

PSCo indicates that an investigation will be conducted if the average contamination in a given pipe exceeds 25,000 dpm/100 cm² and is twice the average for the survey unit. This investigation level appears high. The objective of the comment (NRC February 12, 1996, Comment 2) was to ensure that the measurement results from selected pipes are representative of the entire survey unit. The results from individual pipes could indicate a non-representative sample at average contamination levels below 25,000 dpm/100 cm².

Please provide additional justification for the selection of the 25,000 dpm/100 cm² value at the "two times survey unit average" value, and why investigation at lower values are not necessary to demonstrate that the survey results in a given pipe are representative of the entire survey unit.

PSCo/WT Response:

Pipes selected for final survey are conservatively biased toward higher contamination potentials to the extent practical. For example, Core Support Floor Column tubes selected for survey include a higher percentage of vent and grout tubes than regular tubes. The vent and grout tubes are considered to possibly have a higher contamination potential due to possible exposure to primary coolant during plant operation. Additionally, removable surface activity measurements are taken with each pipe (as the final step in decontamination); therefore, those pipes that contained higher removable surface activity (based on removable activity measurements or number of passes required to meet removable criteria) are selectively targeted for survey. By selecting biased pipes for survey, the survey approach is conservative and will reasonably bound contamination remaining in the pipes.

25,000 dpm/100 cm² was selected as an investigation level for the average contamination in a given pipe because this corresponds to 25% of the individual measurement bounding level. This investigation level (i.e., 25%) is consistent with the lowest action levels used with final survey measurement results (i.e., the action level associated unaffected survey units). The factor of two above survey unit average was included in the event (although not expected) that a given survey unit's average pipe measurements are consistent but at a level near or above 25,000 dpm/100 cm². In this example, a representative survey could be performed with measurements above 25,000 dpm/100 cm² but still significantly below the individual measurement bounding level and further investigation would provide very little benefit.

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These investigation criteria are considered to provide reasonable assurance that contamination levels are low enough to ensure potential doses from grouted piping are well within the values identified above. These investigation levels will also help minimize unnecessary investigations which provide very little benefit in maintaining doses ALARA but require a high cost in additional survey time and schedule delay.