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Confederated Tribes and Bands
of the Yakama Nation

Established by the
Treaty of June 9, 1855

December 15, 2010

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Re: *Engineering Evaluation/Cost Analysis for 105-KE Reactor Decommissioning* (DOE/RL 2009-106, Rev. 0) 0091060

Dear Mr. McCormick, Mr. Faulk and Ms. Hedges:

The Yakama Nation ERWM Program recently submitted comments on the *Engineering Evaluation/Cost Analysis for 105-KE Reactor Decommissioning* (DOE/RL 2009106, Rev. 0) in a letter dated November 17, 2010. Attached herein is a supplement to our previously submitted comment letter. Once again, we appreciate the opportunity to review and provide comments on the document.

Sincerely,

Russell Jim, ER/WM Projects Manager

Attachment

cc: RHW Committee
G. Bohee, NPT
S. Harris, CTUIR
K. Niles, ODOE
J. Beckstrom, ERWM
Administrative Record

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Yakama Nation Comments on the EE/CA for 105-KE Reactor Decommissioning

The following are the Yakama Nation's supplemental comments on the U.S. Department of Energy, Richland Operations Office (DOE/RL) document entitled *Engineering Evaluation / Cost Analysis (EE/CA) for 105-KE Reactor Decommissioning* (DOE/RL 2009-106, Revision 0). General comments on the document are followed by specific comments that reference particular document sections.

1. **It does not appear there has been an objective review of viable removal alternatives.**

Because the ultimate objective of the EE/CA is to identify the most effective approach for implementing reactor removal, it is unclear why there has not been a careful reexamination of the proposed action to determine differences from the analyzed EIS (DOE/EIS-0119F) alternatives. The *Accelerated Dismantlement* alternative added by the amended ROD (75 FR 43158) is nearly identical to the alternative considered in the EIS that was rejected because of its high cost and occupational dose. The EIS analysis indicated that *Immediate One-Piece Removal* would achieve the same result, but with far less impact. Moreover, the cost analysis presented in the EE/CA suggests that, if considered, an *Accelerated One-Piece Removal* alternative could be accomplished at a lower cost than the recommended *Alternative 4, Accelerated Dismantlement*. Because there has not been a careful reexamination of the proposed action, it has not been established that the recommended removal action alternative would provide the level of protection implied by the EE/CA.

2. **It is uncertain if lessons learned from the Brookhaven reactor decommissioning are sufficient to overcome technical challenges associated with remote dismantlement.**

Piece-by-piece removal of the 105-KE Reactor is now apparently viable because of newly available remote dismantlement technologies. However, the specific technical advancements for remote dismantlement are not included or incorporated by reference anywhere in the document. It is critical that the lessons learned from the Brookhaven reactor decommissioning are evaluated in detail and that the evaluation be made public, so that the DOE can overcome technical challenges associated with remote piece-by-piece dismantlement of friable graphite core blocks. It has not been established that advancements in robotics, reactor core sampling, and worker safety technologies would be as reliable as indicated in the subject EE/CA. The reliability of the proposed technologies for Hanford needs to be established.

The technical advances and other information that have come to light since the original EIS (DOE/EIS-0119F) and the original ROD were issued bear directly on the proposed *Accelerated Dismantlement* alternative and its impacts. Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Section 1502.9(c)) require a supplement to the EIS when there are substantial changes, new circumstances, or information bearing on an action such as those cited in the EE/CA. It is uncertain if the recommended removal action would provide

the level of risk reduction implied by the EE/CA because there has not been an evaluation of differences from the original EIS alternatives, which were carefully analyzed for long-term risk, occupational radiation dose, protection of public health, and risk to the environment.

3. Risks to human health and the environment from onsite disposal in the 200 Area are unacceptable and would violate drinking water standards.

The ROD amendment added the *Accelerated Dismantlement* alternative that has been recommended by the EE/CA as the preferred removal action. The ROD amendment was also issued based on a *Supplement Analysis* (DOE/EIS-0119F-SA-01) with fundamental flaws. In particular, the *Supplement Analysis* relies on a cumulative impacts analysis presented in the Draft Tank Closure and Waste Management EIS (DOE/EIS-0391), but these cumulative impacts are based on *Deferred One-Piece Removal*, and are not relevant to the *Accelerated Dismantlement* alternative. It also appears that environmental considerations for the *Supplement Analysis* are based on updated 105-KE Reactor information for comparison with EIS alternatives, which are based on 1985 environmental conditions. The Yakama Nation continues to express the need for a comprehensive risk assessment for the Hanford Site and expects DOE to consider total cumulative risk for evaluation of all cleanup alternatives.

Moreover, the EIS itself states that the maximum annual dose from disposal in the 200 Area would be 0.04 rem per year, which is 40 millirem per year, "for the removal and dismantlement alternatives" (DOE/EIS-119F p. 1.25). This is ten times greater than the drinking water standard of 4 millirem per year. In situ disposal would also exceed drinking water doses, and "no action" doses are estimated to be the highest. Hence, none of the alternatives considered meet drinking water standards. It is imperative that the DOE consider alternatives that would meet ARARs, including drinking water standards. This includes offsite disposal. Among offsite disposal alternatives, deep disposal in a geologic repository should be considered. We recognize that offsite disposal would likely require piece-by-piece dismantlement. This makes it all the more important that the DOE demonstrate the safety and reliability of Brookhaven decommissioning experience for Hanford.

4. The reactor block waste would not meet ERDF Waste Acceptance Criteria.

The reactor graphite contains significant quantities of the long-lived radionuclides carbon-14 (C-14) and chlorine-36 (Cl-36), as well as trace amounts of transuranic and fission product radionuclides. The DOE has projected ERDF disposal to peak at 1.3 million picocuries per liter (DOE/RL-93-99), which is hundreds of time more than the drinking water standard by itself. Onsite disposal of reactor graphite would by itself cause the exceedance of drinking water limits according to the DOE's own assessment cited above, in violation of CERCLA ARARs. Disposal and decommissioning of ERDF should be planned in a way that would enable drinking water standards to be met throughout the Central Plateau. Disposal of the reactor blocks in ERDF does not appear to be compatible with this goal. As an alternative, the DOE should develop an interim retrievable storage plan for the decommissioned graphite that is compatible with offsite deep geologic disposal.

Based on the radionuclide inventory cited as a basis for waste characterization (UNI-3714, Rev. 1), graphite waste generated from reactor removal would not meet *ERDF Waste Acceptance Criteria* (WHC-191, Rev. 2) due to elevated levels of C-14 and Cl-36. There are no recent analytical results provided in the EE/CA or incorporated by reference to support characterization of the waste that would be generated. In addition, the cited "*100-K Area Interim Safe Storage and D4 Project Waste Sampling and Analysis Plan*" (DEO/RL-2005-33, Rev. 1) is not designed for characterization of waste from removal or dismantlement of the K reactor blocks. A well designed waste characterization process is needed, which should include a Sampling and Analysis Plan specifically intended for characterization of waste generated from reactor block removal.

Specific Comments

5. Section 1, Introduction

There is no mention in this section of the Final EIS (DOE/EIS-119F) statement, "the safe storage period would be less than 30 years versus the 75 years assumed in the Draft EIS for the *Deferred One-Piece Removal* alterative." It is also not mentioned that the Record of Decision (58 FR 48509) states the safe storage period would be less than 75 year to be consistent with the Tri-Party Agreement cleanup schedule. This reduction in time period for reactor cooling represents a potentially significant change to the alternatives evaluated in the original EIS.

6. Section 1.1, Purpose and Scope

Soil contamination identified adjacent to, and possibly underlying, the 105-KE Reactor that has come to light since the EIS (DOE/EIS-119F) and the ROD (58 FR 48509) represents a new circumstance bearing on the proposed action and its impacts.

7. Section 1.2, Regulatory Overview

It is indicated that the NEPA values presented in the EE/CA are based on the *Supplement Analysis* (DOE/EIS-0119F-SA-01). The *Supplement Analysis* relies on a cumulative impacts analysis based on *Deferred One-Piece Removal*, and not relevant to the *Accelerated Dismantlement* alternative. It also appears that environmental considerations for the *Supplement Analysis* are based on updated 105-KE Reactor information for comparison with EIS alternatives, which are based on 1985 environmental conditions. As previously mentioned, CEQ regulations (40 CFR Section 1502.9(c)) require an EIS supplement when there are these types of substantive changes bearing on an action.

8. Section 2, Site Characterization

The EIS (DOE/EIS-0119F) and original ROD (58 FR 48509) are cited, but there is no mention of the *Supplement Analysis* (DOE/EIS-0119F-SA-01) or the amended ROD (75 FR

43158) on which the EE/CA is based. Although the *Deferred One-Piece Removal* was selected as the preferred alternative, it was just one of the three alternatives determined to be environmentally favorable by the EIS and ROD.

9. Section 2.3, Source, Nature, and Extent of Contamination

This document section does not, but should, discuss the 105-KE Reactor block, the single most significant source of radioactive contamination, which includes the graphite core, thermal and biological shields, and the supporting concrete pad.

10. Section 2.4, Analytical Data

Based on the estimated radiological inventory for the 105-KE Reactor created by PNNL in March 1985 (*Radionuclide Inventory and Source Terms for the Surplus Production Reactors at Hanford* [UNI-3714, Rev. 1]), graphite waste generated from reactor removal would not meet *ERDF Waste Acceptance Criteria* (WHC-191, Rev. 2) due to significant levels of radioactivity from C-14 and Cl-36, and determined as follows:

- Table 7 of the radionuclide inventory indicates 105-KE Reactor graphite radioactivity of 7,000 curies from C-14, and 54 curies from Cl-36 (UNI-3714, Rev. 1, page 28).
- Table 3 of the radionuclide inventory indicates the 105-KE Reactor graphite stack volume is 1,595 cubic meters (UNI-3714, Rev. 1, page 14).
- Given total C-14 and Cl-36 radionuclides, and the graphite stack volume, the radioactivity of C-14 and Cl-36 is 4.39 and 0.039 curies per cubic meter, respectively.
- Table 2 of the *ERDF Waste Acceptance Criteria* shows limits of 5.1 and 0.034 curies per cubic meter for C-14 and Cl-36, respectively (WHC-191, Rev. 2, page 10).
- When two or more radionuclides are present in a waste, the "sum of fractions" method is used as acceptance criteria. Each constituent radioactivity is divided by its limit with the sum being less than or equal to 1.0 for acceptance (WHC-191, Rev. 2, page 9).
- As shown in Table 1, the sum of fraction limits for radionuclides is 1.88, which is greater than the 1.0 acceptance limit.

Table 1. Estimated 105-KE Reactor Graphite Radionuclide Inventory as of March 1, 1985[1]

Radionuclide	Curies[1]	Ci/m^3*	ERDF Limit[2] (Ci/m^3)	Limit Fraction[3] (Ci/m^3 / Limit)
^{3}H	30,000	1.88E+1	Unlimited	—
^{14}C	7,000	4.39E+0	5.1e+0	8.61E-1
^{60}Co	5	3.13E-3	Unlimited	—
^{63}Ni	11	6.90E-3	7.0e+2	9.85E-6
^{59}Ni	—	—	2.1e+2	—
^{36}Cl	54	3.39E-2	3.4e-2	9.96E-1
^{239}Pu	1	6.27E-4	2.9e-2	2.16E-2
^{241}Am	0.3	1.88E-4	5.4e-2	3.48E-3
^{90}Sr	10	6.27E-3	7.0e+3	8.96E-7
^{137}Cs	30	1.88E-2	3.2e+1	5.88E-4
^{152}Eu	40	2.51E-2	2.1e+7	1.19E-9
^{154}Eu	20	1.25E-2	Unlimited	—
			Sum of the Fractions[3]	1.88E+0

[1]UNI-3714, Rev. 1, page 28, Table 7
[2]ERDF Waste Acceptance Criteria (WHC-191, Rev. 2), Table 2, pages 10-12
[3]ERDF Waste Acceptance Criteria (WHC-191, Rev. 2), Section 4.2.2, page 9
*Ci/m^3 activity for each constituent based on reactor stack volume of 1,595 m^3 (UNI-3714, Rev. 1, page 14, Table 3)
— Radionuclide was evaluated, but is not present at significant levels.

The cited "*100-K Area Interim Safe Storage and D4 Project Waste Sampling and Analysis Plan*" (DEO/RL-2005-33, Rev. 1), provides rationale to support waste characterization activities for interim safe storage (ISS) of the 100-K Area reactor buildings, but is not designed for characterization of waste from removal or dismantlement of the K reactor blocks. Furthermore, the cited *Sampling and Analysis Plan* objectives and requirements are based on the *DQO Summary Report for 105-KE and 105-KW Reactors and Ancillary Facilities Interim Safe Storage and D4 Project Waste Characterization* (WCH -103, Rev. 0), and also are not designed for reactor removal.

A well designed waste characterization process is needed. If reactor block removal is implemented, the process should include a Sampling and Analysis Plan (SAP) specifically intended for characterization of waste generated from reactor block removal. The SAP should consider reactor design details for developing an approach to estimate the amounts of all radionuclides and hazardous constituents in waste that would be generated. The contamination of any additional reactor materials (that may not be listed in the material specification used to build the reactor) should also be identified and added to the material considered for analysis of radioactive and hazardous materials. It may also be appropriate to measure the complete spectrum of reactor materials considered for disposal.

11. Section 2.5, Risk Evaluation Results

This section does not discuss management or disposal of the significant levels of contamination contained in the reactor block graphite, thermal and biologic shields, and concrete base. Moreover, the EIS itself states that the maximum annual dose from disposal in the 200 Area would be 0.04 rem per year, which is 40 millirem per year, "for the removal and dismantlement alternatives" (DOE/EIS-119F p. 1.25). This is ten times greater than the drinking water standard of 4 millirem per year.

12. Section 4.4, Alternative 4 – Accelerated Dismantlement

Accelerated Dismantlement was initially considered for analysis in the EIS (DOE/EIS-119), but was rejected due to its high occupational radiation dose and high cost. Piece-by-piece removal of the 105-KE Reactor is now apparently viable because of newly available remote dismantlement technologies, but because specific technical advancements are not discussed, it is unclear if these advancements are reliable.

13. Section 5.4, Other Considerations – NEPA Values

This section references the *Supplement Analysis* (DOE/EIS-0119F-SA-01) for a discussion of potential impacts of the proposed action. As previously mentioned, it appears environmental considerations for the *Supplement Analysis* are based on updated information from the 105-KE Reactor for comparison with EIS alternatives, which are based on 1985 environmental conditions. The *Supplement Analysis* also relies on the cumulative impacts analysis from the Draft Tank Closure and Waste Management EIS, which are based on the *Deferred One-Piece Removal* alternative, and not relevant to *Accelerated Dismantlement.* Significant soil contamination has been identified adjacent to, and possibly underlying, the 105-KE Reactor. These environmental conditions, in addition to technological advances and other additional information that have come to light since the EIS (DOE/EIS-0119F), and the ROD (58 FR 48509), represent new circumstances bearing on the proposed action and its impacts. There has not been careful reexamination of the EIS for the proposed action changes to determine differences in the analyzed alternatives, or if there are any new circumstances bearing on the proposed action.

14. Section 5.4, Table 2 – NEPA Values Evaluation, page 22, Environmental Justice

As previously mentioned, DOE has projected ERDF disposal to peak at 1.3 million picocuries per liter (DOE/RL-93-99). Significant levels of radioactivity would be present in onsite disposal of reactor graphite, which contains elevated quantities C-14 and Cl-36, in addition to trace amounts of transuranic and fission product radionuclides. Onsite disposal would aggravate the projected exceedance of drinking water limits in violation of CERCLA ARARs, with high disproportional impacts on the Yakama Nation. Onsite disposal of reactor graphite would by itself cause the exceedance of drinking water limits in violation of the ARARs. Disposal and decommissioning of ERDF should include evaluation of an alternative that would enable drinking water standards to be met throughout the Central Plateau. Disposal of the reactor blocks in ERDF does not appear to be compatible with this

goal. The DOE should develop an interim retrievable storage option for the decommissioned graphite that is compatible with offsite deep geologic disposal.

15. Section 5.4, Table 2 – NEPA Values Evaluation, page 22, Cumulative Impacts

Based on the *Radionuclide Inventory and Source Terms for the Surplus Production Reactors at Hanford* (UNI-3714, Rev. 1), graphite waste generated from reactor removal would not meet *ERDF Waste Acceptance Criteria* (WHC-191, Rev. 2). There are no recent analytical results provided in document or incorporated by reference to support characterization of the waste that would be generated.

16. Section 6, Comparative Analysis of Removal Action Results

Because it is unclear if reactor block waste can be disposed at the ERDF, it is also unclear if any of the proposed alternatives would meet Removal Action Objectives (RAOs) for compliance with ARARs and waste disposal.

17. Section 7, Recommended Removal Action Alternative

There has not been a careful reexamination of the proposed action to determine differences from EIS alternatives analyzed for long-term risk, occupational radiation dose, protection of public health, and risk to the environment. Therefore, it has not been established that *Alternative 4, Accelerated Dismantlement*, would provide the level of risk reduction implied.