DOE/EIS-0119F-SA-01

Supplement Analysis

Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington

U.S. Department of Energy
Richland Operations Office
Richland, Washington 99352

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SUMMARY

In December 1992, the U.S. Department of Energy (DOE) issued the Final Environmental Impact Statement (EIS) on Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington (DOE/EIS-0119F). The Final EIS analyzed alternatives for decommissioning eight water-cooled, graphite-moderated plutonium-production reactors, located along the Columbia River in Washington State. The eight reactors (B, C, D, DR, F, H, KE and KW), operated between the years 1944 and 1971, and have been retired from service. The alternatives analyzed in the EIS included the no-action, immediate one-piece removal, safe storage followed by deferred one-piece removal, safe storage followed by deferred dismantlement, and in situ decommissioning alternatives.

The Record of Decision (ROD) was signed September 10, 1993 (58 FR 48509, September 16, 1993). The ROD documented the DOE decision for safe storage followed by deferred one-piece removal of the eight surplus reactors.

As specifically stated in the ROD:

> "The Department of Energy intends to complete this decommissioning action consistent with the proposed Hanford cleanup schedule for remedial actions included in the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement). Therefore, the safe storage period would be for less than the 75-year time frame outlined in the Final Environmental impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington (DOE/EIS-0119F, December 1992). Also, the Department of Energy intends to evaluate the priority of this decommissioning action relative to Comprehensive Environmental Response, Compensation, and Liability Act and Resource Conservation and Recovery Act remediation of the past practice units in the 100 Area being conducted under the Tri-Party Agreement. Should this decision prove to be inconsistent with subsequent Comprehensive Environmental Response, Compensation, and Liability Act and Resource Conservation and Recovery Act decision, the Department of Energy will re-evaluate the appropriateness of proceeding with this course of action on an Operable Unit-by-Operable Unit basis. Until decommissioning is initiated, the Department of Energy will continue to conduct routine maintenance, surveillance, and radiological monitoring activities to ensure continued protection of the public and the environment during the safe-storage period."

Since the NEPA ROD in 1993, documentation has been prepared and implemented under *Comprehensive Environmental Response, Compensations and Liability Act of 1980* (CERCLA)[1], placing five of the eight surplus reactors (C, D, DR, F, and H), into interim safe storage (ISS)[2]. Of the remaining three reactors,

[1] DOE uses the CERCLA process to decommission and dismantle reactors based on the joint EPA DOE policy on reactor decommissioning signed in 1995 and incorporated into the Hanford Federal Facility and Consent Order (also known as the Tri-Party Agreement).

[2] Interim safe storage (ISS), or "cocooning," is the process of demolishing all but the shield walls surrounding the reactor core, removing or stabilizing all loose contamination within the facility, and placing a new roof on the remaining structure. A single doorway in the structure is installed to provide access for surveillance and maintenance work. This doorway is welded shut, and all other openings in the shield walls are sealed to prevent intrusions and the release of radioactive materials. The facility is inspected every five years and remotely monitored at all times for changes in moisture and temperature. The reactor core will remain in ISS for up to 75 years.

B Reactor is under consideration for preservation as a national historic site. KE and KW Reactors have had CERCLA documentation issued that identified ISS as the preferred alternative; the KE and KW reactors are the next reactors in the queue for completion of ISS.

DOE is reconsidering the decision in the existing ROD which in 1993 selected deferred one-piece removal. DOE now is proposing to broaden the possible decommissioning approach, retaining the one-piece removal option and including the option for immediate dismantlement. The Council on Environmental Quality Regulations for Implementing NEPA (*National Environmental Policy Act of 1969*) [found in 40 Code of Federal Register Part 1502.9(c)] states that agencies shall prepare supplements to a final EIS if (a) the agency makes substantial changes in the proposed action that are relevant to environmental concerns; or (b) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. Further, the DOE regulations for implementing NEPA (10 CFR 314(c)) outline when the Department shall prepare a supplement analysis (SA) - a DOE document used to determine whether a supplemental EIS should be prepared pursuant to 40 CFR 1502.9(c), or to support a decision to prepare a new EIS.

This SA has been prepared to allow a determination by DOE on whether further NEPA review is needed if the Department accelerates reactor decommissioning by implementing dismantlement in the near term and/or continues 'deferred one-piece removal' as selected in the 1993 ROD.

HANFORD DECOMMISSING OF EIGHT SURPLUS PRODUCTION REACTORS ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT ANALYSIS

1.0 INTRODUCTION

This supplement analysis (SA) addresses a proposed action to pursue accelerated dismantlement, removal, and disposal of eight surplus reactor facilities on the Hanford Site. Initially, activities would focus on KE reactor as a demonstration of capabilities to accelerate the dismantlement, removal and disposal of the remaining seven surplus production reactors. The implementation of these activities would be conducted as a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) non-time critical removal action.

The Hanford Site manufactured nuclear materials for the Nation's defense programs for over 40 years. To assist in this nuclear materials production, nine water-cooled, graphite-moderated plutonium-production reactors were constructed along the Columbia River by the U.S. Government at the Hanford Site near Richland, Washington, between the years 1943 and 1963. Eight of these reactors (B, C., D, DR, F, H, KE and KW), operated between the years 1944 and 1971, have been retired from service. These reactors have been declared surplus by DOE and are available for decommissioning.

In December 1992, the U.S. Department of Energy (DOE) issued the Final Environmental Impact Statement (EIS) on *Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE/EIS-0119F). The Final EIS analyzed alternatives for decommissioning eight water-cooled, graphite-moderated plutonium-production reactors, located along the Columbia River in Washington State. The ROD (58 FR 48509) documented the selection of safe storage followed by deferred one-piece removal for the eight surplus reactors.

A ninth reactor, N Reactor was in transition regarding its defense production mission at the time of the EIS, and was not within the scope of the Final EIS or ROD. Consequently, N Reactor is not within the scope of this SA. For completeness, it is noted that N Reactor has been retired and is undergoing deactivation under CERCLA[3].

2.0 PURPOSE AND NEED FOR AGENCY ACTION

The DOE has an opportunity to identify actions that would support the accelerated disposition of surplus reactor facilities on the Hanford Site. These actions could be accomplished earlier than previously planned, and would be consistent with previous NEPA analyses and decisions.

Technological advances and additional information since the Final EIS and ROD were issued appear to support accelerating the decommissioning of surplus reactor facilities in a safe and environmentally effective manner. New engineering controls (such as development and deployment of robotics in an array of field applications), data collection and validation, worker safety practices, and real-time lessons learned from reactor demolition activities at Brookhaven National Laboratory[4] all could be applied to surplus reactor decommissioning.

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[3] Letter, M. Wilson, Ecology, to K. Klein, DOE-RL, "105-N Reactor Building and 109-N Heat-exchanger Building Action Memorandum," dated February 22, 2005.

[4] "Final Record of Decision for Area of Concern 9, Brookhaven Graphite Research Reactor (BGRR)," U.S. Department of Energy, Brookhaven National Laboratory, CERCLIS Number NY7890008975, dated January 31,

3.0 PROPOSED ACTION

The DOE, Richland Operations Office (RL) proposes to revise its decision in the existing ROD which selected the preferred alternative of safe storage followed by deferred one-piece removal as the method for completing the decommissioning of the eight surplus production reactors located along the Columbia River. DOE proposes to broaden the possible decommissioning approach to include immediate dismantlement as well as continuing with deferred one-piece removal. The implementation of these activities would be conducted as a CERCLA non-time critical removal action. Specific details on unit operations of dismantlement would be addressed in the CERCLA documentation.

4.0 EXISTING EIS ANALYSES

In DOE/EIS-0119F, *Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, DOE analyzed the potential environmental impacts associated with decommissioning of eight surplus reactors. Facilities included within the scope of the proposed action were the eight surplus reactors, their associated nuclear fuel storage basins, and the buildings that house those systems. The purpose of decommissioning was to isolate any remaining radioactive or hazardous wastes in a manner that would minimize environmental impacts, especially potential health and safety impacts on the public. No future long-term use of any of the eight surplus production reactors has been identified by DOE[5]. Because the reactors contain irradiated reactor components and because the buildings that house the reactors are contaminated with low levels of radioactivity, DOE determined that there was a need for action and that some form of decommissioning or continued surveillance and maintenance was necessary.

The alternatives analyzed in the EIS included the no-action, immediate one-piece removal, safe storage followed by deferred one-piece removal, safe storage followed by deferred dismantlement, and in situ decommissioning. Specific details on each alternative are found in DOE/EIS-0119F. The Final EIS identified safe storage followed by deferred one-piece removal as DOE's preferred alternative.

The ROD was signed on September 10, 1993 (58FR 48509, September 16, 1993). DOE's decision was to adopt safe storage followed by deferred one-piece removal of the eight surplus production reactors. DOE's decision was based on environmental impacts, total project cost, and the results of the public review process. Factors considered in selecting a decommissioning alternative were summarized in the ROD; that summary is reproduced in Table 1.

2005; and "Final Record of Decision for Area of Concern 31, High Flux Beam Reactor," U.S. Department of Energy, Brookhaven National Laboratory, CERCLIS Number NY 7890008975, dated February 2009.

[5]B Reactor is under consideration for preservation as a national historic site.

Table 1. Factors Considered in Selecting a Decommissioning Alternative[a]

Decommissioning Alternative	Occupational radiation dose (person-rem)	Occupational cancer fatalities	Total cost (millions of 1990 dollars)	Population dose over 10,000 years[b] (person-rem)	Population cancer fatalities over 10,000 years	Maximum well dose[c] (rem/year)
No Action	24	0	44	50,000	20	1.2
Immediate one-piece removal	159	0	228	1,900	1	0.04
Safe storage followed by deferred one-piece removal	51	0	235	1,900	1	0.04
Safe storage followed by deferred dismantlement	532	0	311	1,900		10.04
In situ decommissioning	33	0	193	4,700	2	0.03

a Quantities are for all eight reactors. Costs are for 100 years.
b Conversion factor of 400 cancer deaths per one million person-rem.
c This is the maximum dose rate to a person drinking water from a well drilled near the waste disposal site at any time up to 10,000 years.

Because the environmental impacts of the alternatives did not offer a strong basis for selection, DOE considered the selected alternative to be one of three environmentally preferable alternatives (i.e., immediate one-piece removal; safe storage followed by deferred one-piece removal; and safe storage followed by deferred dismantlement alternatives were equally favorable based solely on the evaluation of environmental impacts). This selection was consistent with both DOE's preferred alternative in the Final EIS and with the Tri-Party Agreement. In the ROD, DOE noted (a) its proposal to complete the decommissioning of the eight surplus production reactors, consistent with related activities scheduled under the Hanford Tri-Party Agreement, and (b) its intent to integrate and prioritize this decision with the related CERCLA or RCRA remediation activities scheduled under the Tri-Party Agreement.

Further, DOE acknowledged in the ROD that although there are apparent differences in occupational radiation dose among the alternatives, all of the estimated doses (based on a radionuclide inventory as of March 1, 1985) are small and no occupational cancer fatalities would be expected for any of the alternatives. The action alternatives would result in very similar environmental impacts. Estimated radiation doses and impacts from drinking water from a hypothetical well drilled near a waste disposal site were low for all of the action alternatives. Estimated radiation doses and impacts from potential accidents were also low for all action alternatives. Impacts associated with long-term population dose estimates for the action alternatives would be essentially the same and small.

Since the NEPA ROD was issued in 1993, documentation has been prepared and implemented under CERCLA placing five of the eight surplus reactors (C, D, DR, F, and H) into Interim Safe Storage (ISS)[6]. The implementing documents are identified in Table 2. Additionally, implementation documentation has been prepared for the KE and KW Reactors (also shown in Table 2).

Further, since the Final EIS and ROD were issued, other documents describing the Hanford Site environs have been prepared, including PNNL-6415, *Hanford Site National Environmental Policy Act (NEPA) Characterization* (Revision 18, September 2007), and DOE/EIS-0391, *Draft Tank Closure and Waste Management Environmental Impact Statement,* (TC&WM Draft EIS, October 2009). The TC&WM Draft EIS also provides updated, comprehensive Hanford Site analyses of potential groundwater impacts associated with DOE's proposal to close the single-shell tanks, determine an end state for the FFTF facility, and enhance ongoing waste management activities. Cumulative impacts associated with ongoing Hanford Site cleanup and decommissioning activities also are evaluated in combination with the impacts from the proposed actions and alternatives.

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[6] DOE uses the CERCLA process to decommission and dismantle reactors based on the joint EPA DOE policy on reactor decommissioning signed in 1995 and incorporated into the Hanford Federal Facility and Consent Order (also known as the Tri-Party Agreement).

Table 2. CERCLA Implementation Documents for ISS for Surplus Reactors

C Reactor	DOE/RL-2005-45, Revision 0, *Surplus Reactor Final Disposition Engineering Evaluation*, August 2005
D Reactor	*Action Memorandum for the 105-D and 105-H Reactor Facilities and Ancillary Facilities (*October 2000)
DR Reactor	*Action Memorandum for the 105-F and 105-DR Reactor Facilities and Ancillary Facilities (* July 1998)
F Reactor	*Action Memorandum for the 105-F and 105-DR Reactor Facilities and Ancillary Facilities (* July 1998)
H Reactor	*Action Memorandum for the 105-D and 105-H Reactor Facilities and Ancillary Facilities (* October 2000)
KE/KW Reactors	DOE-RL-2005, Revision 0, *Engineering Evaluation/Cost Analysis for the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities*, May 2006 and *Action Memorandum for the Non-Time Critical Removal Action of the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities*, January 2007)

5.0 CURRENT PROPOSAL

DOE is now considering accelerating reactor decommissioning by dismantling the reactor instead of removing it in one-piece (referred to as the "one-piece removal" alternative in the EIS). The alternative being considered is the same as DOE's "safe storage followed by deferred dismantlement" alternative described in the EIS except that it accelerates the safe storage period from 75 years as suggested in the EIS to about 20 years. However, accelerating the safe storage period to less than 75 years was also expressly addressed in the 1993 ROD based on the analysis in the Final EIS. Specifically, the ROD states in the summary that "[t]he Department of Energy intends to complete this decommissioning action consistent with the proposed Hanford cleanup schedule for remedial actions included in the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement). Therefore, th*e safe storage period would be for less than the 75-year time frame* outlined in the Final Environmental Impact Statement . . ." [Emphasis added].

The current Tri-Party Agreement schedule for remedial actions supports accelerating reactor removal in less than 75 years. The Hanford surplus production reactors are all located along the Columbia River; this area is commonly referred to as the River Corridor. Consistent with DOE's 2015 Vision for the Hanford Site, the River Corridor is scheduled to be cleaned up by 2015 (DOE/RL-10, Draft B, *Hanford Site Cleanup Completion Framework*, August 2009). Most of the current Tri-Party Agreement milestones in effect for the River Corridor support the 2015 date.

The EIS ROD describes "safe storage followed by deferred dismantlement" as each reactor block being disassembled piece-by-piece, and all contaminated equipment and components being packed and transported to the 200 West Area for disposal." This is the same action that currently is being considered in this Supplement Analysis. Safe storage followed by deferred dismantlement was considered an environmentally preferred alternative (as were safe storage followed by one-piece removal and immediate one-piece removal).

Safe storage followed by deferred dismantlement includes three distinct operational phases: preparation for safe storage, the safe-storage period, and deferred dismantlement. The following summarizes those phases as described in the Final EIS.

> "During preparation for safe storage, building components and structures are repaired as needed to ensure that radioactive materials are contained during the safe-storage period. Building security, radiation monitoring, and fire detection systems would be upgraded to provide safety and security controls and regulated surveillance during the safe-storage period.
>
> The safe-storage period assumed for these analyses is 75 years. Routine surveillance operations during this time include periodic patrol inspections; radiological and environmental surveys; site maintenance; fence repairs; and operational testing of security, monitoring, and fire-detection systems. Major building maintenance should be performed at 5-year and 20-year intervals to preserve the confinement capability of the reactor buildings.
>
> At the conclusion of the safe-storage period, the reactor block would undergo piece-by-piece dismantlement. The contaminated material would be packaged and transported to the 200 West Area for disposal as low-level waste. Contaminated equipment and contaminated structural surfaces would also be removed, packaged as low-level waste, and transported to the 200 West Area for disposal. Noncontaminated equipment would be released for salvage or disposed of onsite as ordinary demolition waste. Remaining noncontaminated structures would be demolished, and the site would be backfilled, graded, seeded, and released for other use.
>
> Safe storage has the advantage of allowing time for the decay of short and intermediate-half-life radionuclides, thus reducing the occupational dose rate to workers during deferred dismantlement (relative to immediate dismantlement). For the surplus production reactors, the decay of cobalt-60 during the safe storage period would make piece-by-piece dismantlement of the reactor block possible without the need for extensive remote-handling techniques to remove the reactor block components. This would reduce the time, cost, and complexity of piece-by-piece dismantlement operations. However, this alternative would result in the highest occupational exposure and largest cost of any alternative. The highest occupational exposure results from the necessity to work within the reactor block where initial dose rates are high. The largest cost results from piece-by-piece dismantlement, instead of one-piece removal."

The current concept of dismantlement would rely on remote handling of highly-radioactive components, substantially reducing exposure. Planning has been initiated for the KE Reactor. The 105-KE Reactor block would be disassembled piece by piece remotely (Figure 1), and all contaminated equipment and components would be packaged and transported to the Hanford Site's Environmental Restoration Disposal Facility (ERDF[7]) for disposal. Contaminated structural surfaces, including contaminated surfaces of the fuel storage basin, would also be removed, packaged, and transported to the ERDF for disposal. Noncontaminated material and equipment could be released for salvage, in compliance with applicable policies and procedures, or disposed of in place or in an ordinary landfill. The site would be

[7]ERDF is located in the 200 West Area of the Hanford site, and accepts low-level radioactive, hazardous, and mixed wastes that are generated during the cleanup activities at Hanford.

backfilled, graded, seeded, and released for other DOE use. An estimated 3 years would be required for dismantlement of the 105-KE Reactor.

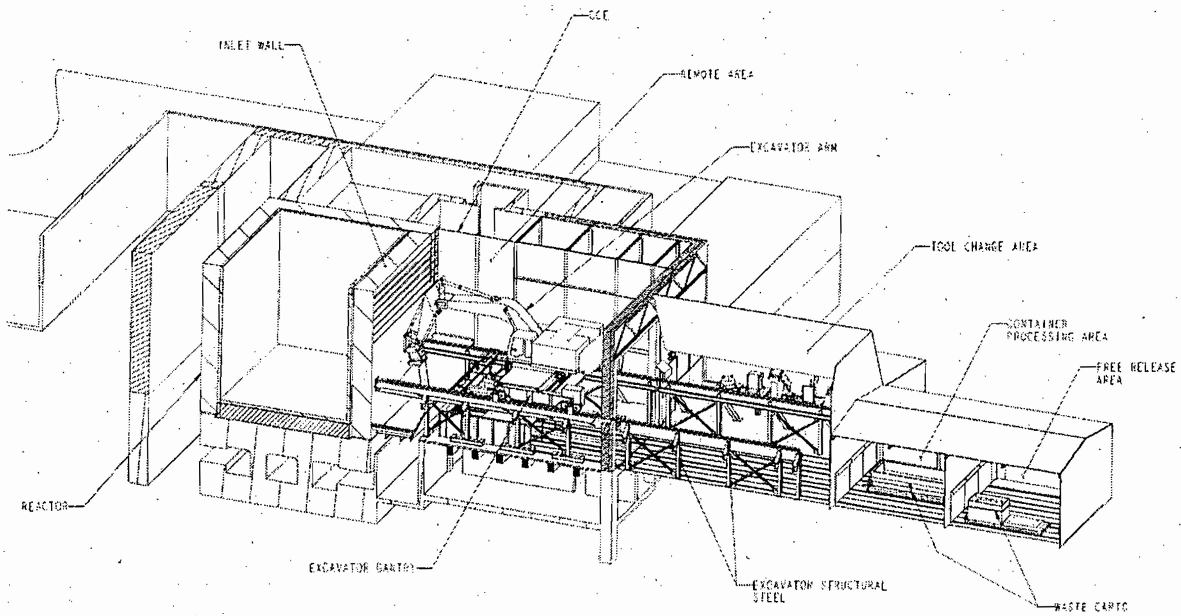

Figure 1. Depiction of Reactor Block Dismantlement Setup

6.0 ENVIRONMENTAL IMPACTS

This section addresses the potential environmental impacts associated with decommissioning, via deferred dismantlement or one-piece removal, of all eight surplus reactors, which were both alternatives evaluated in the Final EIS. Quantification of projected dismantlement activities is based, in part, on extrapolation of preliminary calculations based on demolition of KE Reactor; it is expected that the calculated values are conservative, and that experience gained from activities at each reactor would be applied to the next reactor in sequence, further reducing/mitigating overall consequences.

The TC&WM DRAFT EIS discussions and analyses of resource areas discussed in the following sections were also reviewed and compared to what was previously presented in the Final EIS to identify potential changes or differences that might be important from an environmental impact standpoint.

6.1 Transportation Impacts

6.1.1 Transportation from Reactor Areas to the Environmental Restoration Disposal Facility (ERDF)

Under the current proposed action, less than 3,600 shipments of waste would be transported from Reactor Areas to ERDF. Transportation impacts are compared with estimates from the EIS in Table 3. While the overall volume of waste to be transported for disposal is higher than projected in the EIS, it is expected that the actual volumes (and attendant required number of shipments) would be less through waste minimization, waste packaging, and engineering practices.

It is noted that a total of 64,000 m^3 of waste (for all eight surplus reactors) represents a fraction of the total volume of waste disposed of in ERDF in Calendar Year 2008 (approximately 400,000 m^3).

Table 3. Transportation Impacts

Alternative	Waste Volume (m3)	Shipments (trucks)	Shipments (railcar)	Shipments (tractor-transporter)
Deferred One-Piece Removal	33,350	1,112	0	8
Deferred Dismantlement	42,360	1,800	532	0
Current Proposal[a]	64,000	< 3,600	0	0

[a]Extrapolated (i.e., multiplied by 8) from conservative, preliminary data for KE Reactor; an upper bound of 8,000 m^3 of waste and <450 individual shipments.

6.1.2 Transportation Accidents

As stated in the EIS, a bounding transportation accident for deferred dismantlement involved a railcar accident between the 100 Areas and the 200 West Area of the Hanford Site. The accident scenario analyzed was where there is a postulated collision at a railroad crossing between a railcar containing reactor graphite and a vehicle carrying a flammable liquid (e.g., gasoline) followed by a 30-minute fire. The projected 50-year population radiation dose to the public was estimated to be 800 person-rem (less than one health effect). For perspective, this was compared to 90,000 person-rem that the same population would receive annually from naturally occurring background radiation. No new bounding transportation accident has been identified; such an unlikely event would be expected to have very small consequences.

6.2 Potential Environmental Impacts

In accordance with DOE's "sliding scale" guidance [8]the description of potential environmental impacts in this section emphasizes the resource areas and considerations most likely to be affected by the proposed action and highlights information that is necessary to assess or understand the potential environmental impacts. The areas addressed herein are worker radiological dose (routine operations and accident consequences), land use, historical/cultural resources, ecological resources, and cumulative impacts.

Examples of resource areas not addressed specifically in this section include air quality and aesthetic resources. No new information pertaining to these areas of environmental interest has been identified as a result of the proposed action when considering the information presented in the EIS compared to more recent Hanford Site data in the TC&WM DRAFT EIS and PNNL-6415. Further, water quality is not addressed, as impacts to groundwater from disposal of reactor materials in ERDF would be the same regardless of the alternative; i.e., deferred one-piece removal or immediate dismantlement would result in the same radiological/chemical inventory being disposed. Cost data are included in this section for information.

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[8] *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, 2nd edition, U.S. Department of Energy, Washington, D. C.,* 2004. Online at http://gc.energy.gov/NEPA/nepa_documents/TOOLS/GUIDANCE/Volume2/2-10-greenbook-recommendations.pdf.

6.2.1 Worker Dose, Routine Operations

As noted in Section 4.0, 532 person rem was the estimated dose to workers for deferred dismantlement of eight surplus reactors. The dose estimate was calculated based on radionuclide source term as of March 1, 1985. As noted in the Final EIS, radionuclides of primary interest (described in terms of their half-lives and total curie amounts in all eight reactors as of March 1985) included tritium (12.3 years, 98,100 curies), carbon-14 (5,730 years, 37,400 curies), chlorine-36 (300,000 years, 270 curies), cobalt-60 (5.3 years, 74,400 curies), cesium-137 (30.2 years, 267 curies), and uranium-238 (4.5 billion years, 0.013 curies). Cobalt-60 and cesium-137 are of importance because they contribute to the dose received by decommissioning workers. Carbon-14, chlorine-36, and uranium-238 are of importance because of their long half-lives and because of their contribution to long-term individual and population public doses. After 25 years (1985 to 2010), the total inventory of cobalt-60 would be reduced to approximately 2,300 curies; cesium-137 would be reduced to approximately 110 curies. There would be no expected substantial change in the contribution of long-lived isotopes.

Initial calculations pertaining to near-term dismantlement of the KE Reactor core have been developed. These preliminary calculations (assuming a conservative radionuclide inventory; remote handling techniques for demolition and packaging of wastes; and transportation to ERDF), indicate that a worker dose of less than 10 person-rem could be expected to result[9]. An extrapolation to all eight reactors (80 person-rem) indicates that worker dose under a dismantlement scenario would be expected to be substantially less than that projected in the EIS (the aforementioned 532 person-rem), and slightly higher than that for deferred one-piece removal (51 person-rem in the safe storage/deferred one-piece removal scenario). The actual dose rates to which workers would be exposed would be controlled by such means as remote handling, use of robotics, and the use of shielding. Worker radiation exposure would be controlled to stay within administrative and regulatory limits. Regardless, using the current conversion factor of 6×10^{-4} latent cancer fatalities (LCF) per person-rem, less than one LCF would be expected as a result of the proposed action.

6.2.2 Accident Consequences

In the EIS, radiological accidents were analyzed for all alternatives considered. Radionuclide source terms were modified by appropriate decay times and release fractions for the specific accident scenario. Impacts of accidents involving hazardous materials were not addressed because (it was assumed) all hazardous materials (such as friable asbestos, mercury, cadmium, and contaminated and noncontaminated lead) except irradiated lead would have been removed from the decommissioning site and would have either been recycled, stored, or disposed of. Table 4 shows the bounding accident consequences presented in the EIS associated both with one-piece removal and deferred dismantlement.

No new bounding accident scenarios associated with reactor decommissioning have been developed (see Section 6.1.2). While some hazardous materials may be present (unlike the assumption in the EIS), nonradiological accident consequences associated with decommissioning activities would be expected to be similar to those present in any industrial setting, and small when compared to radiological consequences. The scenarios presented in Table 3 reflect the maximum reasonably foreseeable consequences; using a conversion factor of 6 x 10-4 LCF per person-rem, less than one LCF would be expected as a result of any postulated bounding accident.

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[9] Ongoing characterization activities of KE Reactor will refine projected radiological consequence analysis and verify the relatively low potential doses before implementation of demolition activities under CERCLA.

Table 4. Radiation Doses to the Public from Accident Scenarios.

Alternative	Bounding Accident Scenario	Maximally exposed individual (millirem)	Maximum population dose (person-rem)
Immediate One-piece removal[10]	Reactor block falls off the tractor-transporter	80	300
Deferred dismantlement	Severe weather blowing roof off of reactor building while core is uncovered during dismantling	8	30
Deferred dismantlement	Onsite transportation accident with fire involving a railcar full of reactor parts	200	800

6.2.3 Land Use

Since the Final EIS was issued, on June 9, 2000, the Hanford Reach National Monument (Monument) was established by Presidential Proclamation (http://clinton5 .nara.gov/CEQ/hanford-reach proclamation.html.). The reactor areas are located along the Monument boundary, adjacent to the Columbia River.

Land use management at the Hanford Site is governed by the Hanford Comprehensive Land-Use Plan (CLUP) that was established by the Record of Decision (ROD) issued in November 1999, and is based on the analyses presented in the associated Hanford Comprehensive Land-Use Plan (HCP) Environmental Impact Statement (EIS) (DOE/EIS-0222-F). The HCP EIS analyzed the impacts of alternatives for implementing a land-use plan for the DOE's Hanford Site for at least the next 50-year planning period and lasting for as long as DOE retains legal control of some portion of the real estate. DOE prepared a supplement analysis to the HCP EIS in June 2008 (DOE/EIS-0222-SA-01, *Supplement Analysis, Hanford Comprehensive Land-Use Plan Environmental Impact Statement*) and issued an amended ROD in September 2008 (73 FR 55824).

The EIS addressed, as part of one-piece transport of the reactor blocks, the consideration of specially constructed haul roads. It would be expected that dismantlement would not require such roads, reducing the potential impacts to biological resources.

Neither of the aforementioned issues would be expected to impact near-term decommissioning activities; specific impacts for each reactor would be addressed in the attendant CERCLA documentation which, under DOE Policy[11] includes a discussion of NEPA values. Section 3.2.1 of the TC&WM DRAFT EIS provides the most current overview of land resources on the Hanford Site.

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[10] Deferred one-piece removal would be bounded by immediate one-piece removal. Any delay would allow for radioactive decay of short- and intermediate-half-life radionuclides such as cobalt-60, mitigating radiological impacts to the general public resulting from potential accident scenarios.

[11] In accordance with DOE Order 451.1B Change 1, DOE CERCLA documents are required to incorporate NEPA values (e.g., analysis of cumulative, offsite, ecological, and socioeconomic impacts) to the extent practicable.

6.2.4 Historical/Cultural Resources

As stated in Section 4.6.3 of the Final EIS ("Historic, Archaeological, and Cultural Resources")

> ..."The decommissioning of surplus production reactors may have an impact on archaeological or cultural properties that may be found within the 100 Areas, and/or the 100-B reactor. Whenever earth-disturbing activities or decommissioning of structures is contemplated, a review is carried out by the Hanford Cultural Resources Laboratory. This includes literature and records search and field inspection components."

No new historical/cultural issues have been identified to date for seven of the eight surplus production reactors since the Final EIS (i.e., C, D, DR, F, H, KE, and KW). These reactors have been designated as non-contributing properties within the Hanford Site Manhattan project and Cold War Era Historic District[12]. Appropriate cultural resource reviews will be conducted prior to reactor decommissioning under CERCLA. DOE would continue to use the *Hanford Cultural Resources Management Plan* (HCRMP) and other management plans developed under the CLUP to implement environmental controls consistently across the Hanford Site. Also, as stated in the EIS, B Reactor was eligible for listing in the National Register as an historic site. A draft National Park Service study on preserving Hanford's historic B Reactor looks at several options but dismisses the possibility of making the reactor directly part of the national park system[13]. Only Los Alamos, N.M., is being considered to be named a Manhattan Project National Historical Park. However, most of the five options being considered for Hanford would offer some possible park service role to provide technical assistance or educational programs for B Reactor. Most of the options for B Reactor would rely heavily on local groups or other nonprofit agencies to preserve the reactor as a museum, develop and maintain exhibits and coordinate public visits. All options likely would require fundraising to keep the reactor open to the public. The draft study did not reach a conclusion on the best option for B Reactor's future or other Manhattan Project sites.

Additionally, as noted in Section 6.2.3, the EIS addressed, as part of one-piece transport of the reactor blocks, the consideration of specially constructed haul roads. It would be expected that dismantlement would not require such roads, reducing the potential impacts to historical/cultural resources.

Neither of the aforementioned issues would be expected to impact near-term decommissioning activities; specific impacts for each reactor would be addressed in the attendant CERCLA documentation which, under DOE Policy, includes a discussion of NEPA values. Section 3.2.8 of the TC&WM DRAFT EIS provides the most current overview of cultural resources on the Hanford Site.

6.2.5 Ecological Resources

No new substantial ecological issues have been identified for the eight surplus production reactors since the EIS (i.e., B, C, D, DR, F, H, KE, and KW). Appropriate ecological resource reviews will be conducted prior to reactor decommissioning under CERCLA. Section 3.2.7 of the TC&WM DRAFT EIS provides the most current overview of ecological resources on the Hanford Site. Ecological resources include terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. As stated in the aforementioned CLUP, DOE would continue to use the *Hanford Site Biological Resources Management Plan* (BRMaP) the *Hanford Site Biological Resources Mitigation Strategy* (BRMiS), and other management plans developed under the CLUP to implement environmental controls consistently across the Hanford Site.

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[12] DOE/RL-97-56, Revision 1, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan*, January 1998.

[13] (http://parkplanning.nps.gov/document.cfm?parkId=482&projectId=14946&documentID=30977)

Additionally, as noted in Section 6.2.3, the EIS addressed, as part of one-piece transport of the reactor blocks, the consideration of specially constructed haul roads. It would be expected that dismantlement would not require such roads, reducing the potential impacts to ecological resources.

6.2.6 Cumulative Impacts

The cumulative impacts associated with the transport and disposal of waste generated by decommissioning of eight surplus production reactors at the Hanford Site more recently have been addressed in Chapter 6 of the TC&WM Draft EIS. No short-term or long-term cumulative impacts based on the analyses therein have been identified that would affect near-term surplus production reactors decommissioning activities under one-piece removal or dismantlement. For example, the cumulative impacts analysis in the TC&WM Draft EIS concludes the collective dose to the Hanford involved workers would be 14.1 person-rem, equating to no latent-cancer-fatalities (0.008 LCFs). Additionally, there would be little or no radiation exposure to the public.

Analyses of cumulative impacts in the TC&WM Draft EIS (Chapter 6) relied on a range of analytical methods based on the significance of the short-term and long-term cumulative impacts on a given resource area. Cumulative impacts data were gathered from across the Hanford Site for ongoing and reasonably foreseeable activities and validated against existing decision documents or other referenceable sources. Wastes expected to be generated on the Hanford Site that were destined for onsite disposal, including those from the decommissioning of the eight surplus production reactors, were included in the TC&WM Draft EIS analysis. Resource areas selected for short-term cumulative impacts analysis included land resources (land use and visual resources); ecological resources; cultural and paleontological resources; public and occupational health and safety-normal operations; public and occupational health and safety-transportation; waste management; and industrial safety. Resource areas selected for long-term cumulative impacts analysis included groundwater quality, public health, ecological risk, and environmental justice.

6.2.7 Costs

As shown previously in Table 1, costs were estimated for each disposal alternative for all eight reactors (1990 dollars). Therein, deferred dismantlement ($311,000,000) was approximately 80 million dollars more than deferred one-piece removal ($235,000,000). Table 5 shows current cost estimates for all eight reactors, based on preliminary cost estimate data for KE Reactor (in 2010 dollars).

Table 5. Cost Estimates for Alternatives

Alternative	Cost (EIS, millions of 1990 dollars)	Cost (EIS, millions of 2010 dollars)a	Cost (millions of 2010 dollars- based on KE Reactor estimates)b
Deferred one-piece removal	235	298	590
Deferred dismantlement	311	395	610

a EIS 1990 dollars times escalation factor of 1.27.

b KE Reactor 2010 dollars times 8 (for all eight reactors).

7.0 CONCLUSION

The potential environmental impacts of the current proposal are comparable to, or less than, those predicted by DOE/EIS-0119F.

8.0 DETERMINATION

Based on the analyses of the potential impacts of the current proposed action as discussed in this SA, DOE concludes that the current proposed action is not a substantial change to the proposal analyzed in prior NEPA documents that are relevant to environmental concerns. Further, there are no significant new circumstances or information relevant to environmental concerns and bearing on the current proposed action or its impacts identified in the Surplus Production Reactor EIS or the TC&WM Draft EIS. Therefore a supplement to DOE/EIS-0119F or a new EIS is not needed.

Approval Date 7/16/10

HQ Program Signature