framatome

May 31, 2018
TJT:18:022

Kevin M. Ramsey, Senior Project Manager
Fuel Manufacturing Branch
Division of Fuel Cycle Safety, Safeguards,
and Environmental Review Office of NMSS
United States Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING TRIENNIAL UPDATE TO DECOMMISSIONING FUNDING PLAN (ENTERPRISE PROJECT IDENTIFIER L-2018-DFA-0001)

Dear Mr. Ramsey:

By letter dated May, 16, 2018, the NRC requested additional information regarding Framatome's Decommissioning Funding Plan (DFP) that was submitted on January 17, 2018.

The attachment to this letter provides responses to these requests.

If you have questions, please feel free to contact me at 509-375-8550 or Calvin Manning of my staff at 509-375-8237.

Very truly yours,

T. J. Tate, Manager
Environmental, Health, Safety and Licensing

/mah

NMSS01

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Attachment
DFP RAI Responses

1. Your 2016 DFP submittal included the following key assumption. You need to retain this information (either verbatim or by reference) or explain why it no longer applies:

   Response: FRAMATOME will retain this information verbatim and has included it in the attached DFP.

2. Your 2016 DFP contains the following line item in Table 12. The inventory disposition cost does not appear in the 2018 DFP. What is the basis for removing that cost?

   Table 12 Miscellaneous Costs - Production and Production Support Facilities
   No longer contains line item:
   USEC UF6 Inventory Disposition $756,000

   Response: FRAMATOME will retain this information has included it in the attached DFP. We had 330 USEC Cylinders stored in Nov. 2015, and now have 179.

3. Comparing Table 26 in AREVA's 2016 DFP to Table 26 in AREVA's 2018 DFP, the low-level radiological disposal rate went from to $275.71 in 2016 to $268.53 in 2018. What is the basis for the reduction? Additionally, line item MW- No Disposal Option $300/ft3 totaling $434,558 in the 2016 DFP is removed from the 2018 DFP. What is the basis for removing that cost?

   Response: The low-level radiological disposal rate listed in Table 26 is largely the cost of operating our incinerator (SWUR) for volume reduction. The cost went from 275.71 to 268.53 because the cost associated with operating SWUR has decreased. The line item MW- No Disposal Option was removed because Framatome developed a unique process to separate the uranium from this waste and completed processing this waste, removed sufficient amounts of uranium from this waste so that it could disposed of at Energy Solutions in Clive Utah. This waste has since been shipped offsite.

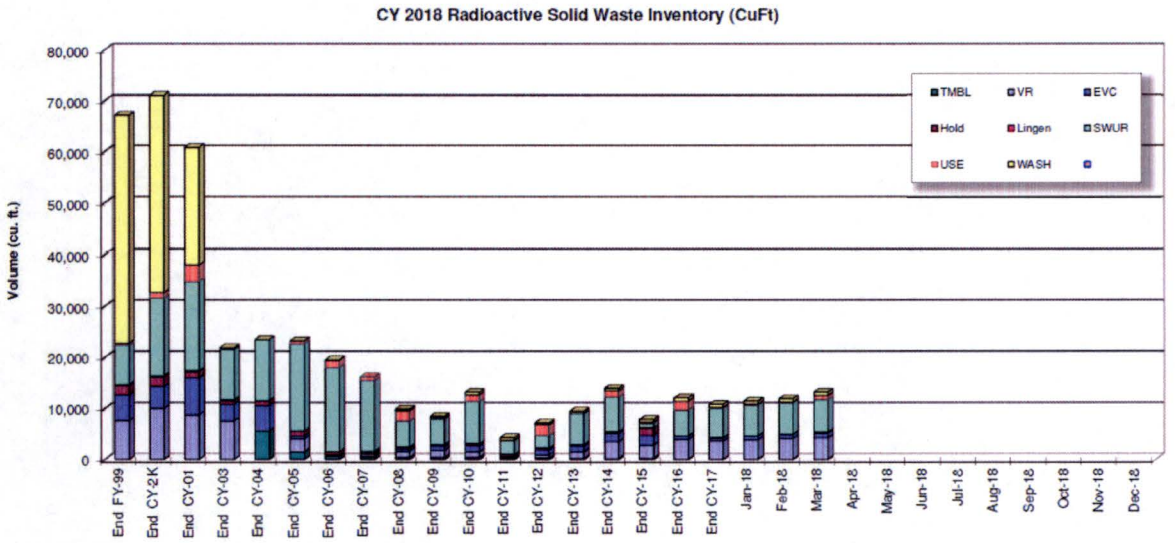
4. Regarding AREVA's e-mail coming in with the 2018 DFP which covered the 8 regulatory factors, the following factors need more basis than what has been provided:

   a. "Spills—no spills that will impact decommissioning costs occurred since the last update." Additional information would help us make a finding. Have you reported any unplanned contamination events since the last update?

      Response: We have had a couple of very minor unplanned contamination events since the last update, but each was cleaned up to release limits and any contaminated soil or asphalt was packaged into waste drums and is accounted for in the DFP. (See section 5.3.2 of the DFP)

   b. Waste inventory increases- the e-mail does not address this factor. A statement is needed regarding changes in the waste inventory since the last update and the reason for the changes (if any).

Response: The waste volume on is shown on the following graph. The current waste inventory as of March 31 is 13,225 ft^3



c. "Increasing waste disposal costs—the estimated cost increases listed in this update of the DFP are primarily due to increased disposal and labor costs." Additional information would help us make a finding. What factors have changed since the last update? Has the waste volume changed (if so, how much)? Have the disposal charges changed (if so, how much)? Have the labor rates changed (if so, how much)?

Response: The estimated disposal costs are primarily due to increased disposal and labor costs. The waste volume estimates for decommissioning is unchanged. Disposal costs estimates have changed as follows:

Waste Category	Disposal Rates, $/ft^3-2015	Disposal Rates, $/ft^3-2017	Comments
LRW-Incinerate in SWUR	275.71	268.53	
LLRW Direct disposal	*	*	*
MW-Disposal at contracted mixed waste disposal site	325.00	370.11	

***No incremental disposal costs above the money already allocated to US Ecology (see Table 9b).**
Most key labor costs have changed. The rates used follow (note that in most cases where we found a lower labor rate in 2017, we retained the 2015 rates):

Labor Category	Labor Rates, $/hr-	Labor Rates,	Comments

	2015	$/hr -2017	
Project Manager	**119.32**	**67.96**	**Retained 2015 rate**
Senior Engineer	**99.84**	**102.40**	
Engineer	**69.78**	**76.80**	
Health & Safety Tech (HST)	**42.00**	**48.00**	
HST Supervisor	**42.00**	**63.00**	**HST Supervisor was not included in 2015 estimate. One HST is now assumed to be a supervisor.**
Crafts (D&D)	**90.10**	**93.47**	
Equipment Operator	**57.91**	**57.66**	**Retained 2015 rate**
Laborer	**49.51**	**53.09**	
Clerical	**36.08**	**38.30**	
Health Physicist	**97.28**	**111.18**	
Technician-Plant Operations Support	**50.00**	**53.15**	

d. "Facility Modifications—no facility modifications were made since the last update that will impact decommissioning costs." Additional information would help us make a finding. Has the footprint of contaminated buildings changed? Has the volume of contaminated piping, duct work, or other equipment changed significantly?

Response: The answer to both questions is no.

EHS&L Document

Decommissioning Funding Plan

Nature of Changes

Item	Paragraph	Description	Justification
1.	Document Rewrite	Editorial/technical revisions and updates	Triennial update
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
List Below any Documents, including Forms & Operator Aids which must be issued concurrently with this document revision:			
Pages 55-66 are place holders until financial documents are signed and received. (THIS WILL BE REMOVED PRIOR TO PROMOTION.)			

This Document contains a total of 73 pages excluding the signature page.

DOCUMENT REVIEW/APPROVAL/DELETION CHECKLIST

All new and/or revised procedures shall be approved by the change author, cognizant manager(s) of areas affected by the changes, and by applicable manager(s) of any function that approved the previous revision of the document unless responsibility for such approval has been transferred to another organization. Also, the procedure shall be approved by manager(s) of functional organizations that provide technical reviews with the exception of the Training Department. Finally, Document Control shall verify that the required approvals have been properly obtained and that any documents that must be issued concurrently are ready to be issued.

Document Reviews			Document Approvals	
Purpose/Function of Review	Specify Reviewer(s) (Optional except for change author)	(Check all that apply)	Title of Approver	(Check all that Apply)
Document Control (Automatic)		☒	Document Control (Automatic)	☒
Change Author	CD Manning	☒	Author	☒
Independent Technical Review	L Kim	☒		
Operability Review(s)			Mgr, Richland Operations[1]	☐
Conversion		☐	Mgr, Uranium Conversion & Recovery Operations[1]	☐
Recovery		☐		
Ceramics		☐	Mgr, Ceramic Operations[1]	☐
Rods		☐	Mgr, Rods & Bundles[1]	☐
Bundles		☐		
Components		☐	Mgr, Component Fabrication[1]	☐
Maintenance Review		☐	Mgr, Maintenance[1]	☒
Lab Review		☐	Mgr, Production Support[1]	☐
Transportation		☐	Mgr, Ops Strategy & Supply Chain	☐
EHS&L Review(s)			Mgr, EHS&L[2]	☒
Criticality		☐	Mgr, Nuclear Safety[2]	☐
Radiation Protection	YR Sakach	☒		
Safety		☐	Mgr, Safety[2]	☐
Security/Emergency Prep.		☐	Mgr, Security & Emergency Preparedness[2]	☐
Fire Safety		☐		
MC&A		☐	Mgr, Licensing & Compliance[2]	☐
Transportation		☐		
Environmental	JB Perryman	☒		
Mechanics Richland Review		☐	Mgr, Mechanics Richland	☐
Mechanics Lynchburg Review		☐		
Thermal-Hydraulics Richland Review		☐	Mgr, Thermal-Hydraulics Richland	☐
Thermal-Mechanics Richland Review		☐	Mgr, Materials & Therm-Mechs	☐
Project & Reliability Review		☐	Mgr, Project & Reliability Eng.	☐
Quality Review		☐	Mgr, Richland Site Quality	☐
Purchasing Review		☐	Mgr, PP&CPC	☐
Others:		☐	Mgr, Richland Site/Other	☒
Document Control		☐	Richland Records Management	☐
Training & Employee Dev.:[3]		☐	Training & Employee Dev.	☐

[1]Note: If approvals include 2 or more product center managers, the Operations manager can be substituted for the applicable product center managers.

[2]Note: If approvals include 2 or more EHS&L functional managers, the EHS&L manager can be substituted for the applicable EHS&L functional managers.

[3]Note: Training department review is required for all procedures that require or affect a Learning Plan and if additional training materials or curriculum must be revised before issuing procedure.

23371 (Rev. 001, 01/09/2018)

EHS&L CHANGE IMPACT EVALUATION FORM

The scope and content of this document have been determined by EHS&L to not impact the safety disciplines checked below. Future revisions do not require review by those EHS&L component(s) unless the scope changes such that a previously excluded safety discipline may be impacted.

☐ Criticality ☐ Radiation Protection ☐ Safety/Security ☐ Emergency Preparedness ☐ MC&A ☐ Transportation ☐ Environmental

DOCUMENT VERSION:	EHS&L REVIEW COMPONENT:	EVALUATION DATE:	CHANGE EVALUATOR*: 2ND PARTY APPROVAL*:

The scope and content of this document have been determined by EHS&L to not directly impact the safe handling of licensed materials (enriched uranium). Future revisions to this document do not require the 10CFR 70.72 change evaluation unless the scope of the document changes such that it directly impacts the handling of licensed materials. ☐

DOCUMENT / ECN NO**:	EVALUATION DATE:	CHANGE EVALUATOR:
E06-04-007	5/30/18	CD Manning

Does the change potentially impact Criticality Alarm System (CAS) coverage?	☐ YES ☒ No
EVALUATION OF NRC PRE-APPROVAL:	
IS NRC PRE-APPROVAL (LICENSE AMENDMENT) NEEDED? ➢ Based on "**YES**" answer to any of five questions below. ➢ Based on "**NO**" answer to all five questions below.	☐ YES ☒ No
1. Does the change create new types of accident sequences that, unless mitigated or prevented, would exceed the performance requirements of 10 CFR 70.61 (create high or intermediate consequence events) and that have not previously been described in Framatome's ISA Summary?	☐ YES ☒ No
2. Does the change use new processes, technologies, or control systems for which Framatome has no prior experience?	☐ YES ☒ No
3. Does the change remove, without at least an equivalent replacement of the safety function an item relied on for safety **(IROFS)** that is listed in the ISA Summary?	☐ YES ☒ No
4. Does the change alter any item relied on for safety, listed in the ISA Summary, that is the sole item preventing or mitigating an accident sequence of high or intermediate consequences?	☐ YES ☒ No
5. Does the change qualify as a change specifically prohibited by NRC regulation, order or license condition?	☐ YES ☒ No
Evaluation of Actions Required PRIOR TO OR CONCURRENT with Change Implementation:	
6. Modification / Addition to CAS system or system coverage documentation	☐ YES ☒ No
7. Acquire NRC pre-approval (LICENSE AMENDMENT)	☐ YES ☒ No
8. Conduct/modify ISA	☐ YES ☒ No

9. Modify / update the following:	☒ None ☐ Other	☐ ISA Database ☐ Red-Line Drawings/P&ID	☐ NCSA ☐ NCSS	☐ NCSP ☐ PHA	☐ RHA ☐ FHA	☐ ChHA ☐ Procedures
Evaluation of Actions Required SUBSEQUENT TO Change Implementation:						
10. Modify / update the following:	☒ None ☐ Other	☐ ISA Database ☐ AS-Built Drawings/P&ID	☐ NCSA ☐ NCSS	☐ NCSP ☐ PHA	☐ RHA ☐ FHA	☐ ChHA ☐ Procedures

Justification Section for "YES" preceding Questions 1 – 8 or other for 9, 10:

(*) Only required if one or more of the boxes to exclude a particular safety discipline review is checked.

(**) If this form exists as a part of a document, the document number is not required.

Table of Contents

List of Tables

List of Exhibits

1.0 Introduction and Summary

This Decommissioning Funding Plan (DFP) is submitted by Framatome Inc. (Framatome) in compliance with 10 CFR 70.25(c) (2) and contains the information required by 10 CFR 70.25(e). Furthermore it provides the required [10 CFR 70.25(e)] triennial adjustment of the decommissioning cost estimate, last conveyed to the NRC via Version 6.0 of this plan (January 2015). The DFP was developed using the guidance provided in NUREG-1757, Volume 3, Rev. 1, "Consolidated Decommissioning Guidance".

The DFP establishes decommissioning criteria and key assumptions and outlines the major technical approaches in the decommissioning of all facilities on the Framatome Richland site with a potential for radioactive contamination. This includes the major production facilities, production support facilities, containerized waste storage areas, and contaminated environmental media (soil). Certain portions of the containerized waste storage areas manage wastes that are classified as mixed wastes, i.e., wastes that are radiologically contaminated and also contain chemical constituents that cause them to be designated as dangerous wastes under the State of Washington Dangerous Waste Regulations. The decommissioning/closure procedures and provision of financial assurance for these mixed waste areas are, therefore, intended to meet the pertinent requirements of both the NRC and the Washington State Department of Ecology (Ecology).

The DFP also provides associated decommissioning/closure cost estimates, a commitment for periodic (minimum triennial) cost estimate adjustments, and appropriate evidence of financial assurance via a Financial Assurance Instruments section. The total consolidated decommissioning/closure cost estimate addresses all required costs relative to NRC licensed materials for both the NRC and Ecology and is summarized in Table 1. The Table 1 costs are effective as of December 2017.

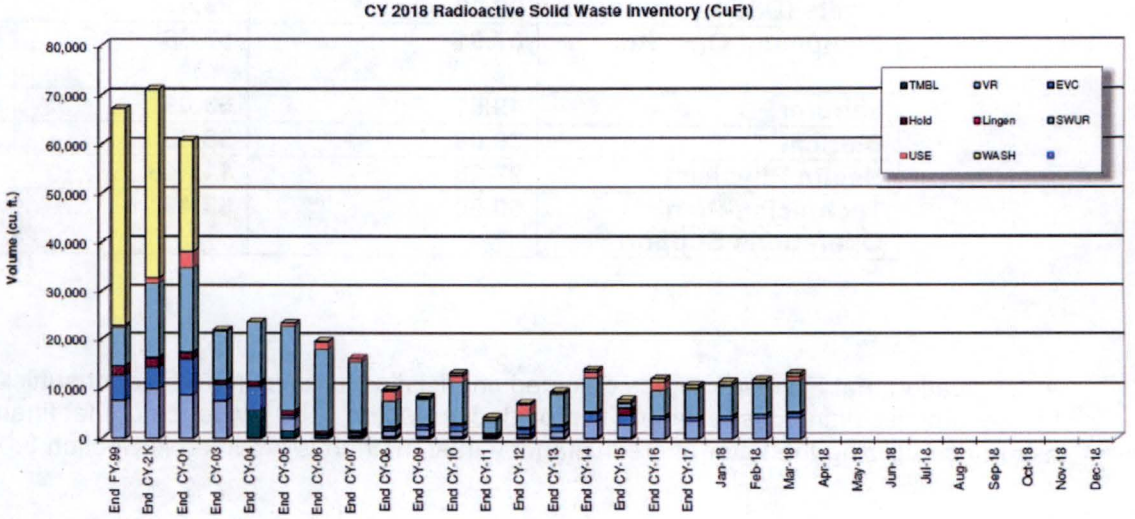
The major components of the cost estimate are described in Sections 5.1, Production and Production Support Facilities; 5.2, Containerized Waste Storage Pads, and 5.3, Environmental Remediation. Section 5.1 is further broken down into the major production facilities and production support (ancillary) facilities. Decommissioning the waste storage pads involves decommissioning the pad structures and disposing of the containerized mixed and low level radioactive wastes stored on the pads. Environmental remediation will entail any activities and associated costs to address any environmental contamination that will require remediation during decommissioning to meet the unrestricted use criteria of 10 CFR 20.1402.

Each of the major cost estimate components is presented via a set of tables, as similar as practicable to those in NUREG-1757, which support the estimates. In some cases, e.g., dispositioning of the containerized waste inventories, the NUREG-1757 tables are not easily applied; in those cases alternate or modified tables better suited to communicate the pertinent cost data have been used.

Some key items to note since the 2015 DFP update are:

- There have not been any changes in the authorized possession limit.
- No spills that will impact decommissioning costs have occurred. The few very minor unplanned contamination events since the last update have been cleaned up to release limits and any contaminated soil or asphalt was packaged into waste drums and is accounted for in section 5.3.2.
- The volume of contaminated piping, duct work and other equipment has not changed significantly since 2015. The foot print of contaminated buildings has not changed.

- No onsite disposal has occurred.
- No use of settling ponds has occurred since the last update.
- No actual remediation costs have occurred since the last update.
- The total estimated cost of decommissioning has increased by $3,845,604 to $66,435,800.
- The inventory of USEC cylinders stored on site has decreased from 330 in November of 2015 to 179 in March of 2018.
- The cost of disposal of low-level radiological waste processed through the Framatome incinerator has been reduced from $276/ft^3 to $269/ft^3. This decrease is largely due to decreased costs in operating the incinerator.
- The $434,558 line item in Table 26 was removed because Framatome developed a unique process to separate most of the uranium from this waste and has completed processing this waste and has disposed of it at a commercial disposal site.
- There has been little change in the inventory of waste volume since 2015 as shown in the following figure.



- The estimated disposal costs are primarily due to increased disposal and labor costs. The waste volume estimates for decommissioning is unchanged. Disposal costs estimates have changed as follows:

Waste Category	Disposal Rates, $/ft^3-2015	Disposal Rates, $/ft^3-2017	Comments
LRW-Incinerate in SWUR	275.71	268.53	
LLRW Direct disposal	*	*	*
MW-Disposal at contracted mixed waste	325.00	370.11	

disposal site			

*No incremental disposal costs above the money already allocated to US Ecology (see Table 9b).

- Most key labor costs have changed. The rates used follow (note that in most cases where we found a lower labor rate in 2017, we retained the 2015 rates):

Labor Category	Labor Rates, $/hr-2015	Labor Rates, $/hr -2017	Comments
Project Manager	**119.32**	**67.96**	**Retained 2015 rate**
Senior Engineer	**99.84**	**102.40**	
Engineer	**69.78**	**76.80**	
Health & Safety Tech (HST)	**42.00**	**48.00**	
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Clerical	**36.08**	**38.30**	
Health Physicist	**97.28**	**111.18**	
Technician-Plant Operations Support	**50.00**	**53.15**	

A certification that Framatome has obtained financial assurance in an amount sufficient to meet the decommissioning cost estimate is provided in Section 7.0. Evidence of that financial assurance utilizing the letter of credit/standby trust method is provided in Section 8.0.

Table 1 Decommissioning Cost Estimate Summary

Category	Cost Estimate, $
1. Production and Production Support Facilities (Table 13)	48,033,688
2. Containerized Waste Storage Pads and Inventories	
A. Storage Area (Pad) Structures (Table 25)	69,757
B. LLRW Inventory Disposal (Table 26)	2,924,292
C. Mixed Waste Inventory Disposal (Table 26)	592,176
3. Environmental Remediation	
A. Legacy Surface Impoundment Area (Table 30)	265,885
B. Historic Spills/Releases (Table 34)	14,110
C. Potential Soil Contamination Areas (Table 42)	1,240,732
Subtotal	53,140,640
25% Contingency	13,285,160
TOTAL	66,425,800

2.0 Decommissioning Criteria

This DFP and associated decommissioning cost estimate for Framatome's Richland Facility, located at 2101 Horn Rapids Road, Richland, Washington (License SNM-1227, Docket 70-1257) have been prepared per the requirements of 10 CFR 70.25 and guidance provided in NUREG-1757, "Consolidated NMSS Decommissioning Guidance, Volume 3", Rev. 1, February 2012.

2.1 *Uncontaminated Facilities*

The disposition of uncontaminated equipment and facilities is not within the scope of this plan, provided that such facilities are verified to be uncontaminated in accordance with approved radiation survey procedures.

2.2 *Residual Radiation Levels*

In accordance with 10 CFR 20.1402, the residual radioactive contamination distinguishable from background radiation for the decontaminated Richland facility shall result in dose levels of less than 25 mrem/yr to the average member of the critical group. Any equipment or facility which cannot be decontaminated to acceptable levels will be demolished, packaged, and disposed of at a licensed low-level radioactive waste (LLRW) or mixed waste disposal site, or alternatively, could be transferred to another licensed facility. Residual environmental contamination will be remediated to levels consistent with the 25 mrem/yr unrestricted use criterion.

2.3 *Records*

Records of the decommissioning procedures and results will be preserved for at least five years, or as required by then-current regulations.

2.4 *Financial Provisions*

Decommissioning of the Framatome Richland facility will be conducted at no cost to the public. Framatome's provisions for funding of the decommissioning activities are provided in Section 7.0 of this plan.

3.0 Key Assumptions

The following key assumptions were used in the preparation of the DFP and cost estimate for the decommissioning of the licensed facilities at Framatome's Richland Facility.

1. This DFP assumes the availability of LLRW and mixed waste disposal facilities at reasonable cost and the application of packaging and transportation requirements consistent with existing regulations.
2. Prior to the start of final site decommissioning, a detailed decommissioning plan consistent with NRC guidance, including a proposed closeout survey plan, will be submitted to the NRC for approval. The results of the closeout survey shall be approved by the NRC prior to release of equipment or grounds to unrestricted use.
3. All work will be performed in compliance with procedures written specifically for the decommissioning activity in conjunction with the detailed decommissioning plan.
4. All work inside contaminated areas will be performed using approved radiation work procedures.

5. The typical costs associated with decontamination of process equipment and ventilation ductwork for free release are expected to be greater than their salvage value, as well as in excess of the cost savings realized by disposal at a non-radioactive waste disposal site. In general, therefore, no attempt at decontamination for this purpose will be made except in special cases when it may be warranted. Contaminated process equipment and ductwork along with other decommissioning-related wastes will typically be disposed of by burial in LLRW disposal sites, and only the facility will be decontaminated.
6. The facilities themselves, i.e., the buildings housing activities utilizing licensed materials, will be decontaminated via a combination of physical processes (steamcleaning, sandblasting, scarification, etc.) such that their demolition will not be required to meet the 25 mrem unrestricted use criteria.
7. All LLRW generated in the decontamination and/or dismantling of site facilities will be containerized and staged to allow shipment to the U.S. Ecology-operated Northwest Compact LLRW Disposal Site over a two calendar year period. The site operator is limited to a maximum allowable total revenue collection from all facility users over a one year period; this limit is currently at $6.230M as set by the Washington Utilities and Transportation Commission. The disposal cost estimate [(see Table 9b)] conservatively assumes application of the entire disposal site fee for the two year period to Framatome.
8. The cost estimate does not take credit for any salvage value that may be realized from the sale of potential assets (e.g., recovered materials or decontaminated equipment) during or after decommissioning.
9. The cost estimate does not take credit for reduced taxes that might result from payment of decommissioning costs or site control and maintenance costs.
10. The site's stored inventory of uranium hexafluoride (UF_6) in Model 30-B cylinders falls into three categories, (1) a relatively small number of cylinders owned by Framatome as working stock, (2) cylinders of UF_6 owned by Framatome's utility customers and staged for utilization in manufacturing customer reactor reload fuel, and (3) UF_6 cylinders stored on a temporary basis in behalf of the United States Enrichment Corporation (USEC). Richland's primary plan assumes that the entire UF_6 inventory will be dispositioned prior to the initiation of the decommissioning process, i.e. either processed into and delivered as product to Framatome's customers or transferred offsite to locations consistent with the ownership of the UF_6. As such, assuming routine facility conditions leading into the decommissioning stage, the site's UF_6 inventory will not constitute a decommissioning liability. UF_6-related assumptions considering an unanticipated non-routine shutdown scenario are as follows:
    - Framatome-owned working stock. This relatively small number of cylinders (typically $\leq$15) will be dispositioned offsite to a European Framatome-affiliate fuel fabricator under an existing long-term NRC export license. If necessary, the costs of this inventory transfer will be borne by the Framatome recipient as an Framatome action to retain full usage of this Framatome-owned asset.
    - Framatome customer-owned UF_6. Under the unlikely scenario of Framatome inability to pay for transfer costs, the primary assumption is that customers will reclaim their UF_6 at their expense as a practical action to retain control and usage of their valuable business asset. However Framatome's business interruption plan and associated property insurance will provide financial coverage for inventory removal/transfer activities if such activities are necessitated by covered events (fire, lightning, aircraft, explosions, earthquake, windstorm, theft, equipment failure, terrorism, etc.)
    - Consistent with contract language, in the event of a unilateral Framatome decision to terminate storage of cylinders stored in behalf of USEC, the cylinders will be transferred

to an alternate location of USEC's choice at Framatome expense. Based on a conservative assumption that the entire transfer cannot be accomplished promptly in the case of a sudden shutdown scenario, these costs are assumed to be covered from decommissioning reserves. In recognition that the stored USEC-related inventory is an extraordinary one-time occurrence related to the shutdown of that facility, the cost estimate uses a cylinder inventory total equal to 50% of the peak inventory (currently being approached as of June 2016). Costs based on currently contracted carrier and labor rates are reflected in Table 12. Miscellaneous Costs, of this DFP.

11. Non-UF_6 inventory of licensed material, i.e. powder pellets, fuel rods, and fuel assemblies, are anticipated to be dispositioned to customers and/or Framatome affiliates prior to initiation of the decommissioning process. In the unlikely event of a sudden plant closure, it is assumed that the material can be rapidly dispositioned within a 30-60 day timeframe.
12. For the sake of this DFP and associated cost estimate, the limit for free release of materials, e.g., soil, in which the radioactive contamination is distributed throughout the material matrix, is assumed to be 30 pCi/gram.
13. The DFP assumes that the site and associated facilities will be decommissioned via decontamination activities and materials removal/disposal in a manner that will not necessitate stabilization and long-term surveillance programs.
14. Increases in plant processing throughput, associated and not associated with increases in site possession limits, are not assumed to increase plant decommissioning liability unless they result in increases in contaminated facilities, equipment, or environmental media. Concurrent increases in generation of operational wastes also are not assumed to necessarily increase decommissioning liability in that estimate waste disposal costs are based on maximum expected waste accumulation (see Sections 5.2.2, 5.2.3, and Table 26). Maximum expected waste accumulations are based on plant history and are updated as appropriate.

4.0 Facility Description Summary

This section provides a facility description as called for in the Facility Description section of Volume 3, Rev. 1, of NUREG-1757. The information supplements the facility description on record (Docket 70-1257) as part of Framatome's NRC special nuclear materials license (SNM-1227) for the Richland site.

4.1 *NRC License*

The Framatome Richland nuclear fuel fabrication facility is operated in accordance with an NRC special materials license issued under 10 CFR Part 70. The license, SNM-1227, is docketed under NRC Docket No. 70-1257 for the Richland site.

4.2 *Authorized Radioactive Materials*

NRC License SNM-1227 authorizes Framatome to possess U-235 present in uranium enriched up to 5 wt. % U-235; and a small amount of U-235 may be possessed in uranium U-235 enrichments exceeding 5 wt. %. In addition to this NRC license, Framatome has a Radioactive Materials license with the State of Washington, WN-I062-1. The disposal costs associated with the material authorized in this license, other than the sealed sources, is included in this Decommissioning Funding Plan.

4.3 *Usage of Licensed Materials*

The Framatome Richland nuclear fuel fabrication facility utilizes enriched uranium (≤5 wt. % U-235) for the production of enriched uranium nuclear fuel for use in commercial light water reactors, both domestically and internationally. Finished fuel assemblies (bundles) are supplied to nuclear utilities for direct usage as fuel in their nuclear power reactors; however intermediate products such as enriched uranium powder or pellets are also produced on behalf of other nuclear fuel cycle facilities.

The typical feed material to the plant is uranium hexafluoride (UF_6) received in 30-inch diameter steel cylinders, each containing approximately 1500 kilograms of enriched uranium. Some feed material is Urania or UN solutions received in licensed shipping packages which are unloaded and eventually processed through the appropriate process stream(s). The UF_6, UN, and Urania are chemically converted to ceramic grade uranium dioxide (UO_2) powder. The resultant powders pressed into fuel pellets, which are then sintered and subsequently loaded into fuel rods. These loaded fuel rods, in conjunction with other supporting hardware (tie plates and grid spacers), are assembled into a variety of fuel bundle designs, depending on customer-specific requirements. The fuel products - powder, pellets, or fuel bundles (assemblies) - are loaded for shipment into specially designed shipping containers licensed by the NRC and/or the U.S. Department of Transportation.

4.4 *Description of Facilities Utilizing Special Nuclear Material*

The Framatome Richland nuclear fuel fabrication plant is located at 2101 Horn Rapids Road just within the northern limits of the City of Richland in Benton County, Washington. More specifically, the facility is located in the approximate center of the more easterly of two adjacent quarter sections (160 acres each) of land owned by Framatome. All facilities storing or processing special nuclear material are located within an approximately 53 acre fenced, secured area; the remainder of the surrounding Framatome property is either devoted to vehicle parking areas, is undeveloped, or is leased for agricultural usage.

The primary production activities involving special nuclear material and state licensed material are conducted in three major facilities - the Dry Conversion Facility; the Uranium Dioxide (UO_2) Building, which includes the Blended Low-Enriched Uranium (BLEU) addition; and the Specialty Fuels (SF) Building. The specific functions of these facilities, the general approach to their decommissioning, and the associated decommissioning cost tables are provided in Section 5.1, Production and Production Support Facilities, of this DFP.

The primary production facilities are supported by a number of ancillary support facilities that also entail the storage or handling of SNM or SNM-containing materials. These facilities are most typically involved with materials storage (feed materials, product intermediates, or finished product) or waste processing functions but also provide a number of other miscellaneous production support functions, e.g., purification of contaminated fuel scrap, laundering of contaminated clothing, and recertification of UF_6 shipping cylinders. A listing of these facilities and their functions, the general assumptions/approach pertinent to their decommissioning, and the associated decommissioning cost tables are also provided in Section 5.1 of this DFP.

The major containerized solid waste storage pads consist of two asphalted areas managing currently generated and legacy containerized (barreled or boxed) wastes. These facilities are distinguished by their large spatial size and the fact that they may manage mixed wastes, i.e., wastes that are both radiologically contaminated and chemically hazardous. These facilities are therefore simultaneously subject to the decommissioning requirements of the NRC and, for those portions managing chemically hazardous wastes, the closure requirements of the

Washington State Department of Ecology. The inventory disposition and closure approach pertinent to the containerized waste pads are addressed in Section 5.2 of this DFP.

In addition to the facilities themselves as discussed above, operation of the site offers the potential for contamination of the land (soil) below and/or around those facilities. That contamination may have resulted from releases from the facilities or from releases/spills associated with the transfer of licensed materials between facilities, e.g., piping leaks, container spills, etc.

The most significant area of known soil contamination on the Framatome Richland site was the area associated with operation of the legacy surface impoundment system. Known liquid releases from at least three of the six impoundments in the 1970s - early 1980s resulted in contamination of the soils underlying these units with uranium as well as certain chemicals (fluorides, nitrates, ammonia). The surface impoundment system has been removed and associated radiological and non-radiological soil contamination remediated to meet Washington Department of Ecology (Ecology) soil cleanup levels for uranium and regulated chemical constituents. Additional soil remediation to meet NRC radiological decommissioning criteria is not anticipated to be necessary.

Less significant instances of soil contamination with licensed materials have occurred from documented spills/releases over the course of the plant's operating history. These contamination incidents have typically been small and remediated at the time of occurrence but in some cases the potential for residual contamination (detected or undetected) remains. These areas are documented in decommissioning records maintained by Framatome in accordance with 10 CFR 70.25(g).

Also addressed are two potential soil contamination areas that have not been characterized but that may, based on operating history, impose soil contamination levels requiring remediation. The two areas are the soil underlying current and historic wet chemical processing areas within the UO_2 Building and soil underlying current and historic underground piping carrying uranium-bearing solutions.

Decommissioning obligations and associated costs relative to environmental remediation are discussed in Section 5.3. These include residual decommissioning-related final survey costs associated with the remediated surface impoundment area, potential characterization/ remediation costs associated with certain spills/releases documented in required decommissioning records, and estimated characterization/remediation costs postulated for the two uncharacterized potential soil contamination areas discussed above.

4.5 *Pre-Shipment/Disposal Waste Accumulations*

With the elimination of the site's historic surface impoundment system, current liquid waste processing is very closely coupled to production, using relatively small volume tanks. Temporary accumulation of liquid SNM-containing wastes from production activities is very limited with respect to time and volume and an insignificant contributor to the overall plant decommissioning liability.

Current inventories of containerized solid wastes (low-level radioactive and mixed) and their associated disposition costs are provided in Table 26. Based on the site's continued progress in working down its legacy backlog of stored wastes, current inventories are no longer necessarily higher than possible maximum foreseeable inventories in the future. Therefore in addition to current inventories, Table 26 provides estimates of maximum anticipated volumes in each solid waste category. These higher inventory volumes have been conservatively utilized to estimate disposal cost liabilities.

Accumulated volumes of low-level radioactive waste (LLRW) generated by the actual decommissioning activities will be dispositioned to LLRW disposal and/or recycle facilities. These waste volumes are presented in Table 9. Disposal volumes related to postulated environmental remediation activities are included in Table 40. As noted in Section 3.0, Key Assumptions, No. 7, the waste volumes set forth in Tables 9 and 40 will be containerized and staged over the course of the decommissioning/remediation activities and then all shipped to the LLRW disposal site over a two year period.

5.0 Closure Procedures and Cost Estimates

This section outlines the major technical approaches involved in the decontamination and decommissioning of each major facility with a significant potential for radiological contamination. In the case of the containerized waste storage areas, the DFP also extends to the onsite waste inventory associated with these units. Minor ancillary facilities such as external docks, grounds, and warehouses, where contamination is not anticipated but may be found, will be decontaminated in a similar fashion as the known-contaminated facilities described herein.

Certain portions of the containerized waste storage areas may manage mixed wastes, i.e., wastes that are radiologically contaminated and also contain chemical constituents that cause them to be designated as dangerous wastes under the State of Washington Dangerous Waste Regulations. These wastes are dually regulated by the NRC and Ecology and the units are subject to the decommissioning requirements of the NRC (10 CFR 70.25) and the closure requirements of Ecology (WAC 173-303-610 and 650). Detailed decommissioning procedures written pursuant to this DFP and closure plans/procedures developed pursuant to Ecology's regulations will jointly address the requirements of both regulatory agencies with respect to the mixed waste areas.

Environmental remediation costs apart from costs associated with the decommissioning of site structures are not anticipated to be significant by comparison. Environmental remediation-related approaches and costs are discussed in Section 5.3.

5.1 *Production and Production Support Facilities*

The production activities at the Framatome Richland facility encompass the full scale of nuclear fuel fabrication, i.e., chemical conversion of UF_6 to UO_2 powder, UO_2 pellet production, rod loading, and fuel bundle assembly. These activities occur in three major production facilities, namely the Dry Conversion Facility; the UO_2 Building, including the Blended Low Enriched Uranium (BLEU) addition; and the Specialty Fuels Building. The major production activities are supported by a number of production support, or ancillary, facilities. The general approach to decommissioning these facilities, along with the associated costs, is described below. The associated cost estimates are shown in Tables 2 through 13.

5.1.1 Dry Conversion Facility

The Dry Conversion Facility (DCF) houses the head-end processes for the Richland plant's nuclear fuel fabrication activities, namely the vaporization of UF_6 out of Model 30-B cylinders using electrically-heated autoclaves, the conversion of the UF_6 vapor to dry UO_2 powder in fluidized bed reactors, final defluoridation of the powder in calciners, and the physical preparation (milling, compacting, etc.) of the powder for subsequent pellet pressing. Major aspects of the decommissioning of the DCF are as follows:

1. All process equipment in the various contaminated areas of the building will be surveyed to determine the degree of contamination. Equipment with contamination which is below acceptable release levels can be disposed of on a commercial basis at non-radiological

disposal facilities. Equipment which is contaminated to levels above such release levels will be decontaminated if warranted, and packaged for shipment. Such equipment contaminated above free release levels will be shipped to an appropriate low-level radioactive waste disposal site or alternatively, could be transferred to another licensed facility.

Liquid effluent systems exiting radiation zones will be treated in the same manner as process equipment in the contaminated areas.

Sufficient radiation surveys of process equipment outside the contaminated areas will be made to assure that unacceptable levels of contamination have not spread outside the contaminated operating areas. Non-contaminated process equipment outside the contaminated areas can be disposed of on a commercial basis at non-radiological disposal facilities or can be left in place to support the mission of associated decontaminated facilities.

2. All contaminated exhaust ductwork will be treated in a manner similar to the contaminated process equipment as described in item 1 above. The final filter bank of the ventilation system will also be disposed of by burial.
3. After removal of all process equipment, ancillary equipment, and exhaust ducting, the facility ceiling and walls will be cleaned as necessary. The cost estimate for this work is based on sandblasting. The typical wall materials (painted concrete and painted cement block) and ceiling materials (metal panels) are amenable to coating removal and decontamination via sandblasting. Porous, non-durable wall coverings such as gypsum wallboard are uncommon and are present in noteworthy quantities only within two production facilities (UO_2 and Specialty Fuels Buildings) and a single production support facility (ELO Building). The total packed disposal volume for the potentially radioactively contaminated portion of this material is relatively small (≈2,500 ft^3) and is included in the packed disposal volumes provided in Table 2.
4. The floors of the controlled areas will be stripped of all protective coatings and appropriately cleaned. Solvents, if used, will be selected such that they will not cause materials to be designated as dangerous wastes under the State of Washington Dangerous Waste Regulations. The cost estimates for floor decontamination assume the utilization of mechanical scarification. Due to the fact that the floors are in most cases coated with some type of sealant, less aggressive surface decontamination techniques may suffice for large areas of the facility, making scarification a conservative assumption.
5. A radiation survey described in the decommissioning plan will be completed to verify that areas are successfully decontaminated.
6. After NRC approval of the radiation survey results, the entire affected area may be resurfaced as appropriate.

5.1.2 UO_2 Building

The UO_2 Building houses the majority of Framatome's nuclear fuel fabrication process downstream of the Dry Conversion Facility, i.e., pellet pressing to final fuel bundle assembly. The building also houses the Richland plant's one remaining "wet" chemical conversion (ammonium diuranate) production line, now utilized strictly for uranium scrap recovery. The activities (excluding the ADU conversion-related activities) are broadly grouped into two categories as follows:

- Ceramics, including additive blending, pellet pressing, pellet sintering, pellet grinding and pellet inspection; and

- Rod Fabrication/Bundle Assembly, including rod loading; rod welding, leak checking, assaying, and x-raying; rod inspection; bundle assembly; and bundle inspection, cleaning, and packaging.

These ceramics and rod fabrication/bundle assembly activities include those performed in the traditional portions of the UO_2 Building as well as those more recently added (2004) to accommodate processing of BLEU material.

Other miscellaneous support facilities located within the UO_2 Building include the U_3O_8 Facility, Powder Storage Facility, Powder Dissolution Facility, Pellet Dissolution Facility, Miscellaneous Uranium Recovery (MURS) Facility, Powder Characterization Facility, UF_6 cylinder wash facility, , Quality Control Analytical/Testing Laboratories, Waste Volume Reduction Facility (VRF), and "hot" maintenance facilities.

Decontamination and decommissioning of the UO_2 Building will be accomplished via an approach consistent with that described for the Dry Conversion Facility with one exception. The cost estimate includes enhanced approaches to address potential floor contamination in historic and current wet chemical processing areas, including deeper floor scarification or concrete removal.

5.1.3 Specialty Fuels Building

The Specialty Fuels (SF) Building houses fuel fabrication activities related to the production of fuel containing gadolinia (Gd_2O_3) as a neutron poison. The activities include the blending of UO_2 powder, produced in the Dry Conversion Facility or UO_2 Building, with purchased Gd_2O_3; powder preparation and additive blending; pellet pressing; pellet sintering; and pellet grinding. Loading of gadolinia-containing pellets into rods occurs in the UO_2 Building. Also located in the SF Building is the Solid Waste Uranium Recovery (SWUR) Incinerator Facility.

Decontamination and decommissioning of the SF Building will be accomplished via an approach consistent with that described for the Dry Conversion Facility and UO_2 Building.

5.1.4 Production Support (Ancillary) Facilities

In addition to the Dry Conversion Facility and the UO_2 and SF Buildings, a number of other facilities are involved with enriched uranium handling and processing in varying degrees, and will, therefore, require decontamination/decommissioning efforts commensurate with those activities. The facilities, along with a brief summary of their associated enriched uranium/ radionuclide-handling activities, are as follows:

1. Engineering Laboratory Operations (ELO) Building - process development laboratories, Gadolinia Scrap Uranium Recovery (GSUR) Facility (fuel scrap dissolution and solvent extraction activities), decontamination area, and hot maintenance area.
2. Contaminated Clothing Laundry - laundering of contaminated protective clothing.
3. Fuels Storage Warehouse (Warehouse 4) - storage of packaged special nuclear material in various compounds and forms.
4. UNH Drum Storage Warehouse - storage of closed drums of uranyl nitrate liquid awaiting processing.
5. Uranium Storage Warehouse (Warehouse 6) – past storage of packaged special nuclear material in various compounds and forms; currently devoted to non-SNM processing/storage activities.
6. Operations Scrap Warehouse (Warehouse 7) - storage of closed containers of uranium-containing feed materials, product, or scrap awaiting processing.

7. Product Development Test Facility (PDTF) - LOCA heat transfer, seismic, and coolant flow testing of nuclear fuel assemblies.
8. UF_6 Receiving and Storage Facility - receipt and storage of UF_6 cylinders.
9. Lagoon Uranium Recovery (LUR) Facility - past recovery of uranium from liquid process wastes; no current SNM-related activities.
10. Solids Processing Facility (SPF) - an addition to LUR containing equipment for recovery of uranium from contaminated sludges.
11. Silicon Removal Process (SRP) - equipment housed at LUR/SPF to remove silicon from low-U liquid effluents before treatment in the Ammonia Recovery Facility.
12. Modular Extraction Recovery Facility (MERF) - recovery of uranium from certain solid phase low-level radioactive and mixed wastes.
13. Wastewater Treatment Facility - includes the traditional Ammonia Recovery Facility (ARF) for the recovery of ammonium hydroxide from high-ammonia-content liquid process wastes; the filtration and ion exchange (IX) systems for removal of trace levels of uranium from the plant's final sewered effluent, including equipment to flush and regenerate these systems; and wastewater tanks for interim management of the site's contaminated liquid effluents.
14. Fuel Services Facility (Building 9) - disassembly of contaminated fuel bundles; waste handling/packaging activities; miscellaneous production-support activities.
15. Cylinder Recertification Facility (CRF) - testing and recertification of UF_6 cylinders.
16. Warehouse 2 - storage/loading of packaged special nuclear material in various compounds and forms.
17. Uranyl Nitrate Building (UNB) – receipt of uranyl nitrate (UN) solution from offsite sources (download from shipping containers) and onsite sources (pipeline transfer) with subsequent storage of the UN in tanks while awaiting transfer to the UO_2 Building for conversion to UO_2.

The same basic plan as outlined above for the major production facilities will be implemented, as necessary, in the decontamination and decommissioning of these ancillary facilities.

Assumptions specific to ancillary facilities are as follows:

1. The following facilities contain contaminated equipment to be disposed of and, based on the nature of their operations, will likely require decontamination of the facility and supporting structures prior to release.
   - ELO (process areas)
   - LUR/SPF/SRP
   - MERF
   - Fuel Services Building (Building 9) process area
   - WWTF (ARF process sump areas only)
   - Laundry
2. The following facilities contain contaminated equipment to be disposed of, but no significant contamination of the facilities themselves is anticipated because the radioactive material was well contained in equipment or in closed containers:
   - WWTF (exclusive of ARF process sump areas)

- Cylinder Recertification Facility
- Uranyl Nitrate Building

3. The following facilities contain neither contaminated equipment requiring disposal nor significant levels of structural contamination because they contain, or previously contained, radioactive material exclusively in closed containers.
   - Operations Scrap Warehouse (Warehouse 7)
   - UNH Drum Storage Warehouse
   - Boron Pellet Production Facility (a.k.a. Warehouse 6, this building was formerly used for Uranium Oxide Storage in inner shipping packages, 5-gallon buckets and 45-gallon powder storage drums.)
   - PDTF
   - Fuels Storage Warehouse (Warehouse 4)
   - UF_6 Receiving and Storage Facility
   - Warehouse 2

Table 2 Total Dimensions of Facility Components - Production and Production Support Facilities

Level of Contamination: <2000 dpm/100 cm^2

Production Facilities	Components	Total Dimensions
Dry Conversion Facility	• Floors • Walls • Ceilings • Equipment/Components/Wallboard (packaged for disposal)	17,818 ft^2 46,179 ft^2 20,611 ft^2 4,301 ft^3
UO_2 Building, including BLEU	• Floors • Walls • Ceilings • Equipment/Components/Wallboard (packaged for disposal)	116,269 ft^2 268,606 ft^2 135,355 ft^2 20,786 ft^3
Specialty Fuels Building	• Floors • Walls • Ceilings • Equipment/Components/Wallboard (packaged for disposal)	13,540 ft^2 52,804 ft^2 15,825 ft^2 6,929 ft^3
Production Support Facilities	**Components**	**Total Dimensions**
WWTF (ARF Sumps Only)	• Floors	527 ft^2
LUR/SPF/SRP Building	• Floors • Walls • Ceilings	6,165 ft^2 25,823 ft^2 6,673 ft^2
ELO Building (process areas)	• Floors • Walls • Ceilings	8,772 ft^2 19,743 ft^2 8,770 ft^2
MERF	• Floors • Walls • Ceilings	2,045 ft^2 5,091 ft^2 2,045 ft^2
Fuel Services Building (Building 9) (process area)	• Floors • Walls • Ceilings	5,305 ft^2 10,361 ft^2 5,455 ft^2
Laundry	• Floors • Walls • Ceilings	299 ft^2 690 ft^2 299 ft^2
All Production Support Facilities	• Equipment/components/wallboard from all production support facilities (packaged for disposal)	10,323 ft^3

Table 3 Planning and Preparation - Production and Production Support Facilities (Work Days)

Estimate of the number of work days, by specific labor category, that will be required to complete planning and preparation activities.

Activity	Safety Engineer Work Days	Engineer Work Days	Health and Safety Technician Work Days	NRC Work Days	Crafts Work Days	Laborer - Work Days
Preparation of Documentation for Regulatory Agencies	181					
Submittal of Decommissioning Plan to NRC when required by 10 CFR 30.36(g)(1), 40.42(g)(1), or 70.38(g)(1)	27			25		
Development of Work Plans		44				
Procurement of Special Equipment/Services		44				
Staff Training	10		20		40	40
Characterization of Radiological Condition of the Facility (including sampling, soil and tailings analysis, or groundwater analysis if applicable)			482			
TOTALS	218	88	502	25	40	40

Table 4 Decontamination or Dismantling of Radioactive Facility Components - Production and Production Support Facilities (Work Days)

Estimate of the number of workdays, by specified labor category that will be required to complete the specified decontamination and/or dismantling activities.

Name of room, laboratory, or area: Dry Conversion Facility
Level of Contamination: <2000 dpm/100 cm^2

Component	Decon. Method	Engineer Work Days	Crafts Work Days	Laborer Work Days	Health and Safety Technician Work Days
Preparation/ Mobilization				56	
Equipment/ Component Removal			478	478	
Floors	Scarification	$47,330 (See Table 12)			
Walls/ Ceilings	Sandblast	Estimated @ $4.16/$ft^2$ (See Table 12) = $277,847			
Remedial Radiation Surveys					208
QA/QC		25			
TOTALS		25	478	534	208

Table 4 Decontamination or Dismantling of Radioactive Facility Components - Production and Production Support Facilities (Work Days) (cont.)

Estimate of the number of workdays, by specified labor category that will be required to complete the specified decontamination and/or dismantling activities.

Name of room, laboratory, or area: UO_2 Building, including BLEU
Level of Contamination: <2000 dpm/100 cm^2

Component	Decon. Method	Engineer Work Days	Crafts Work Days	Laborer Work Days	Health and Safety Technician Work Days
Preparation/ Mobilization				276	
Equipment/ Component Removal			1,766	1,766	
Floors	Scarification*	$485,090 (See Table 12)			
Walls/ Ceilings	Sandblast**	Estimated @ $4.16/$ft^2$ (See Table 12) = $1,680,479			
Remedial Radiation Surveys					1,098
QA/QC		129			
TOTALS		129	1,766	2,042	1,098

*Based on commercial rates for a scarification vendor.
**Based on commercially-available environmental meditation cost estimation manual (R.S. Means)

Table 4 Decontamination or Dismantling of Radioactive Facility Components - Production and Production Support Facilities (Work Days) (cont.)

Estimate of the number of workdays, by specified labor category that will be required to complete the specified decontamination and/or dismantling activities.

Name of room, laboratory, or area: Specialty Fuels Building
Level of Contamination: <2000 dpm/100 cm^2

Component	Decon. Method	Engineer Work Days	Crafts Work Days	Laborer Work Days	Health and Safety Technician Work Days
Preparation/ Mobilization				103	
Equipment/ Component Removal			873	873	
Floors	Scarification*	$35,966 (See Table 12)			
Walls/ Ceilings	Sandblast**	Estimated @ $4.16/$ft^2$ (See Table 12) = $285,497			
Remedial Radiation Surveys					510
QA/QC		30			
TOTALS		30	873	976	510

*Based on commercial rates for a scarification vendor.
**Based on commercially-available environmental meditation cost estimation manual (R.S. Means)

Table 4 Decontamination or Dismantling of Radioactive Facility Components - Production and Production Support Facilities (Work Days) (cont.)

Estimate of the number of workdays, by specified labor category that will be required to complete the specified decontamination and/or dismantling activities.

Name of room, laboratory, or area: Production Support (Ancillary) Facilities
Level of Contamination: <2000 dpm/100 cm^2

Component	Decon. Method	Engineer Work Days	Crafts Work Days	Laborer Work Days	Health and Safety Technician Work Days
Preparation/ Mobilization				157	
Equipment/ Component Removal			927	927	
Floors	Scarification*	$105,422 (See Table 12)			
Walls/ Ceilings	Sandblast**	Estimated @ $4.16/$ft^2$ (See Table 12) = $353,394			
Remedial Radiation Surveys					276
QA/QC		43			
TOTALS		43	927	1,084	276

*Based on commercial rates for a scarification vendor.
**Based on commercially-available environmental meditation cost estimation manual (R.S. Means)

Table 5 Final Radiation Survey - Production and Production Support Facilities (Work Days)

Estimate of the number of work days, by specific labor category that will be required to conduct a final radiation survey.

Activity	Health and Safety Technician Work Days
Final Survey	628
TOTAL	628

Table 6 Total Work Days by Labor Category - Production and Production Support Facilities

Total work days estimated for each specific labor category from the applicable tables above (i.e., from Tables 3 through 5) plus total work days associated with overall project support functions (non-task-specific).

Activity	Project Manager	Safety Engineer Work Days	Senior Engineer Work Days	Engineer Work Days	Health and Safety Technician Work Days	Clerical Work Days	Crafts Work Days	Laborer Work Days	NRC Work Days	Support Technician Work Days	Health Physicist Work Days
Planning and Preparation (TOTALS from Table 3)		218		88	502		40	40	25		
Decontamination and/or Dismantling of Radioactive Facility Components (Sum of TOTALS from Table 4)				227	2,092		4,044	4,636			
Operation of Waste Volume Reduction Facility								4,680			
Final Radiation Survey (TOTAL from Table 5)					628						
Project Administration (6 FTE)	1,040	1,040	1,040	1,040		1,040					1,040
Craft Support – Plant Operations (3 FTE)							2,340				
Technician Support – Plant Operations (4 FTE)										3,120	

Table 7 Worker Unit Cost Schedule

Fully burdened billing rates (wages, benefits, overheads, and profits) from State of Washington-based third party contractors (with exception of NRC).

Labor Category	Labor Rate, $/hr.	Labor Rate, $/day*
Project Manager	119.32	955
Senior Engineer	102.40	819
Engineer	76.80	614
Health and Safety Technician (HST)	48.00	384
Health Physicist	111.18	889
Safety Engineer	72.40	580
Crafts (D&D)	93.47	748
Crafts – Plant Operations Support	88.92	711
Equipment Operator	57.91	463
Laborer	53.09	425
Technician – Plant Operations Support	53.15	425
Clerical	38.30	306
NRC	279.00	2,232

* Eight hour day; rounded to the nearest dollar.

Table 8 Total Labor Costs by Major Decommissioning Task - Production and Production Support Facilities

Estimated work days for each specific labor category (from Table 6) multiplied by the total cost per work day for the corresponding labor category (from Table 7). Costs for Craft Support – Plant Operations and Technician Support – Plant Operations based on full time equivalent staffing (FTE) as indicated and composite labor rates reflecting staffing mix.

Task	Project Manager Cost, $	Safety Engineer Cost, $	Senior Engineer Cost, $	Engineer Cost, $	Health and Safety Tech. Cost, $	Health Physicist Cost, $	Clerical Cost, $	Crafts (Avg.) Cost, $	Laborer Cost, $	Technician Plant Support, Cost $	NRC Cost, $	Total Labor Cost, $
Planning and Preparation		126,222		54,067	192,768			29,910	16,989		55,860	475,816
Decontamination or Dismantling of Radioactive Facility Components				139,468	803,328			3,023,941	1,970,300			5,937,037
Operation of Waste Volume Reduction Facility									1,989,000			1,989,000
Final Radiation Survey					241,152							241,152
Project Administration (6 FTE)	993,200	602,160	851,760	638,560		925,018	318,656					4,329,3564
Craft Support – Plant Operations (3 FTE)								1,664,582				1,664,582
Technician Support – Plant Operations (4 FTE)										1,451,424		1,451,424

Table 9 Shipping and Disposal of Radioactive Wastes - Production and Production Support Facilities (Excluding Labor Costs)

Note: Labor costs for waste packaging included in Table 8 under Operation of Waste Volume Reduction Facility. Labor costs for shipping activities are included in Table 12 under Logistics/ Shipping Support.

(a) Packing Material Costs

Estimate of the types and volumes of waste expected to be generated, along with the number and types of containers required for packing the waste.

Waste Type	Volume (ft^3)	Number of Containers	Type of Container	Unit Cost of Container, $	Total Packaging Costs, $
Bldg. Waste	42,338	455	93 ft^3 Box	1,810*	823,550
Boron spider drums	1,418 (compacted)	16			28,960
Contaminated shipping container components	400 (compacted)	5			9,050
TOTAL	44,156	476			861,560

*Catalog price from commercial container supplier including shipping costs to the HRR site.

(b) Shipping and Disposition Costs

Estimate of the volume of waste to be disposed and the shipping and disposal costs.

Waste Type	Disposition Volume or Weight (as indicated)	Disposition Costs, $	Shipping Cost, $
Containerized Waste for Burial	44,156 ft^3	12,460,000*	568,000**
30-B Cylinders (melt, reuse)	478,800 lbs.	1,661,436	186,000**
TOTAL		14,121,436	754,000

* Assumes all wastes accumulated/staged for disposal over two calendar year period at maximum allowed waste site revenue collection of $6,230,000/yr. (see Section 3.0, Key Assumptions)
**This is for total cost, actual transport plus TN labor of about $6,500 per truck to support the shipments.

Table 10 Equipment/Supply Costs - Production and Production Support Facilities
(Excluding Containers)

Estimate of the quantity of equipment and supplies required for decommissioning.

Equipment/Supplies	Total Equipment/Supply Cost, $
Miscellaneous Decommissioning-Related Tools/Equipment/Consumable Supplies	420,200
TOTAL	420,200

Table 11 Laboratory Costs - Production and Production Support Facilities

Estimate of costs for analyses to be performed by an independent third-party laboratory.

Activity	Total Cost, $
Lab analysis costs	180,960
TOTAL	180,960

Table 12 Miscellaneous Costs - Production and Production Support Facilities

Estimate of any other applicable costs.

Cost Item	Total Cost, $
State/Local Regulatory Fees	77,000/yr x 3 yr. = 231,000
Insurance	1,144,000/yr x 3 yr. = 3,432,000
Taxes	1,994,000
NRC Inspections	90,000/yr x 3 yr. = 270,000
Sandblasting Walls/Ceilings	2,597,216*
Scarifying Floors	673,808*
Certification Survey	115,000
Logistics/Shipping Support	298,200
USEC UF_6 Inventory Disposition**	778,680
Security	965,120/yr. x 3 yr. = 2,895,360
Utilities (electricity, water, sewer)	975,000 x 3 yr. = 2,925,000
IT Support	175,581
TOTAL	16,385845

* Totals from Table 4.
** See Section 3.0, Key Assumptions No. 10, $778.68K cost based on 42 transports at $18,540/transport. Transport costs made up of $12,360 commercial carrier charges and $6,180 logistics/shipping documentation charges.

Table 13 Total Decommissioning Costs - Production and Production Support Facilities

Total of the reported costs in Tables 8, 9, 10, 11 and 12.

Task/Component	Cost, $
Planning and Preparation (TOTAL from Table 8)	475,816
Decontamination and/or Dismantling of Radioactive Facility Components (TOTAL from Table 8)	5,937,037
Operation of Waste Volume Reduction Facility (TOTAL from Table 8)	1,989,000
Final Radiation Survey (TOTAL from Table 8)	241,152
Project Administration Costs (TOTAL from Table 8)	4,329,356
Craft Support – Plant Operations Costs (TOTAL from Table 8)	1,664,582
Technician Support – Plant Operations Costs (TOTAL from Table 8)	1,451,424
Packing Material Costs (TOTAL from Table 9a)	861,560
Shipping 754,000and Disposition Costs (14,121,436) (TOTAL from Table 9b)	14,875,436
Equipment/Supply Costs (TOTAL from Table 10)	420,200
Laboratory Costs (TOTAL from Table 11)	180,960
Miscellaneous Costs (TOTAL from Table 12)	16,385845
TOTAL - Production and Production Support Facilities	48,812,368

5.2 *Containerized Waste Storage Pads and Inventories*

Containerized (barreled or boxed) operational wastes are managed on an ongoing basis at two significant container storage areas at the Richland facility - an uncovered asphalt pad located in the central portion of the site, often referred to as the "old" or "historic" dangerous waste storage pad; and a newer, partially covered asphalt pad, located in the southeast corner of the site, and referred to as the Dangerous Waste Storage Facility (DWSF). Both pads manage containerized low-level radioactive waste (LLRW) and also manage, or have managed, LLRW that also designates as chemically dangerous per Ecology's Dangerous Waste Regulations (WAC 173-303), i.e., mixed wastes. As such, these waste management units, all or in part, are subject to both the NRC's decommissioning requirements and Ecology's closure requirements, as well as the financial assurance requirements of both agencies.

The decommissioning/closure of the containerized waste storage pads will involve disposition of the containerized inventories followed by decommissioning/closure of the physical structures. Current plans call for utilization of both pads for the management of LLRW until time of plant closure, meaning that NRC decommissioning will not occur before then. With respect to mixed waste management, nearly all of the historic dangerous waste pad has been closed per Ecology regulations now that Framatome has completed its disposition of the large volume of legacy containerized mixed wastes once stored on the historic pad. Management of LLRW and mixed wastes on the newer DWSF will continue until time of plant closure, at which time Framatome will pursue Ecology closure of the DWSF plus the small unclosed portion of the historic pad. At that time, decommissioning of both pads will also be pursued per NRC requirements.

5.2.1 Container Storage Pad Structures

Physical structures associated with the container storage pads (historic pad and DWSF) consist of the blacktop pads at both locations, a limited number of double containment storage pallets, and the roofed three-sided storage building at the DWSF. Contamination levels (radiological or chemical) are expected to be minimal at both locations based on the fact that the pads manage for the most part solid phase wastes in securely closed strong-tight containers. Outside surfaces of the containers have undergone appropriate radiological release surveys. Furthermore, the containers are subject to routine operational inspections. The need for remediation of surrounding or underlying soil to any significant extent is also not anticipated but soil status will be verified via appropriate screening/sampling protocols. Prior (September 2004) closure of a significant portion of the historic waste pad under Ecology regulations confirmed the lack of surface and soil contamination associated with this longstanding operation.

Major aspects of the decommissioning/closure of the container storage pads and associated equipment/facilities are as follows:

- radiological surface screening measurements at a detection sensitivity sufficient to detect past releases from containers to the blacktop or surrounding peripheral soils;
- removal of any asphalt with evidence of radiological contamination to allow similar screening of underlying soil;
- chemical constituent sampling of any underlying or peripheral soils found to be radiologically contaminated;
- removal/disposal of contaminated blacktop and/or soils in accordance with NRC/Ecology cleanup criteria;
- surveying/decontamination/release of double containment pallets, and;
- replacement of removed asphalt with non-contaminated material.

Final release of the pad structures will be subject to the final release survey requirements of both the NRC and Ecology. Costs associated with closure/decommissioning of the waste storage pad structures are summarized in Tables 14-25.

Table 14 Number and Dimensions of Facility Components - Storage Areas

Name of room, laboratory, or area: Outdoor Containerized Waste Storage Areas

Component	Number of Components	Dimensions of Components	Total Dimensions, ft^2
Asphalt Pad - Old	1	72' x 133 ' + 45' x 169'	17,181
Asphalt Pad - DWSF	1	120' x 170'	20,400
Double Containment Pallets	20	4' x 4'	320

Table 15 Planning and Preparation - Storage Areas (Work Days)

Estimate of the number of work days, by specific labor category, that will be required to complete planning and preparation activities.

Activity	Safety Engineer Work Days	Engineer Work Days	Health and Safety Technician Work Days	Laborer Work Days
Preparation and Submittal of Documentation for Regulatory Agencies	*			
Submittal of Decommissioning Plan to NRC when required by 10 CFR 30.36(g)(1), 40.42(g)(1), or 70.38(g)(1)	*			
Development of Work Plans/Safety Plans	2			
Procurement of Special Equipment		2		
Staff Training	1		1	1
Characterization of Radiological Condition of the Facility (including sampling, soil and tailings analysis, or groundwater analysis if applicable)		4	10	4
Other (specify)				
TOTALS	3	6	11	5

* Labor costs relative to NRC licensed materials included in Decommissioning Plan for Production and Production Support Facilities (Table 3). Closure plan for Ecology-regulated areas already on file with Ecology.

Table 16 Decontamination or Dismantling of Radioactive Facility Components - Storage Areas (Work Days)

Estimate of the number of workdays, by specified labor category that will be required to complete decontamination and/or dismantling activities for each facility component.

Name of room, laboratory, or area: Waste Storage Areas

Component	Health and Safety Technician Work Days	Laborer Work Days
Asphalt Pads	1	2
Double Containment Pallets	5	
TOTALS	6	2

Table 17 Restoration of Contaminated Areas on Facility Grounds - Storage Areas (Work Days)

Estimate of the number of work days, by specific labor category that will be required to restore contaminated areas on facility grounds.

Activity	Laborer Work Days
Waste Storage Areas	3
TOTAL	3

Table 18 Final Radiation Survey - Storage Areas (Work Days)

Estimate of the number of work days, by specific labor category that will be required to conduct a final radiation survey.

Activity	Engineer Work Days	Health and Safety Technician Work Days	Laborer Work Days
Survey		30	
Sampling Labor	2		2
TOTALS	2	30	2

Table 19 Total Work Days by Labor Category - Storage Areas

Total work days estimated for each specific labor category from the applicable tables above (i.e., from Tables 15 through 18).

Activity	Safety Engineer Work Days	Engineer Work Days	Health and Safety Technician Work Days	Laborer Work Days
Planning and Preparation (TOTALS from Table 15)	3	6	11	5
Decontamination and/or Dismantling of Radioactive Facility Components (Sum of TOTALS from Table 16)			6	2
Restoration of Contaminated Areas on Facility Grounds (TOTAL from Table 17)				3
Final Radiation Survey (TOTALS from Table 18)		2	30	2

Table 20 Total Labor Costs by Major Decommissioning Task - Storage Areas

Estimated work days for each specific labor category (from Table 19) multiplied by the total cost per work day for the corresponding labor category (from Table 7).

Task	Safety Engineer Cost, $	Engineer Cost, $	Health and Safety Technician Cost, $	Laborer Cost, $	Total Labor Cost, $
Planning and Preparation	1,737	3,684	4,224	2,125	11,770
Decontamination or Dismantling of Radioactive Facility Components			2,304	850	3,154
Restoration of Contaminated Areas on Facility Grounds				1,275	1,275
Final Radiation Survey		1,228	11,520	850	13,598

Table 21 Packaging, Shipping, and Disposal of Radioactive Wastes - Storage Areas (Excluding Labor Costs)

(a) Packing Material Costs

Estimate of the types and volumes of waste expected to be generated, along with the number and types of containers required for packing the waste.

Waste Type	Volume (ft^3)	Number of Containers	Type of Container	Unit Cost of Container, $	Total Packaging Costs, $
Asphalt/Soil	40	*	93 ft^3 box	*	*

(b) Processing, Packing, Shipping, Disposal Cost

Estimate of the volume of waste to be disposed and the packing, shipping, and disposal costs.

Waste Type	Disposal Volume (ft^3)	Unit Cost ($/$ft^3$)	Total Disposal Costs, $
Asphalt/Soil	40	*	*

* No incremental costs for containers or disposal for this small waste volume. Can be accommodated in void spaces of equipment disposal boxes (see Table 9).

Table 22 Equipment/Supply Costs - Storage Areas (Excluding Containers)

Estimate of the quantity of equipment and supplies required for decommissioning.

Equipment/Supplies	Total Equipment/Supply Cost, $
Radiation Screening Instruments	13,400
TOTAL	13,400

Table 23 Laboratory Costs - Storage Areas

Estimate of costs for analyses to be performed by an independent third-party laboratory.

Activity	Total Cost, $
Testing and analysis - 48 samples @ $120 ea.	5,760
TOTAL	5,760

Table 24 Miscellaneous Costs - Storage Areas

Estimate of any other applicable costs.

Cost Item	Total Cost, $
Certification Survey (ORISE)	20,800
TOTAL	20,800

Table 25 Total Decommissioning Costs - Storage Areas

Total of the reported costs in Tables 20, 21, 22, 23 and 24.

Task/Component	Cost, $
Planning and Preparation (From Table 20)	11,770
Decontamination and/or Dismantling of Radioactive Facility Components (From Table 20)	3,154
Restoration of Contaminated Areas on Facility Grounds (From Table 20)	1,275
Final Radiation Survey (From Table 20)	13,598
Packing Material Costs (TOTAL from Table 21)	-
Processing, Packing, Shipping, Disposal Costs (TOTAL from Table 21)	-
Equipment/Supply Costs (TOTAL from Table 22)	13,400
Laboratory Costs (TOTAL from Table 23)	5,760
Miscellaneous Costs (TOTAL from Table 24)	20,800
TOTAL - Storage Areas	69,757

5.2.2 Containerized LLRW Inventory

The LLRW inventory consists of drummed or boxed waste materials that are radioactively contaminated but that do not designate as chemically dangerous per Ecology regulations. They are essentially all solid-phase materials; all of the relatively few drums containing liquids, e.g., radioactively contaminated oils, are stored on double containment pallets or in drums within drums. Treatment and/or disposal options are available for each of the major containerized LLRW categories; disposition pathways vary primarily based on combustible versus non-combustible classification of the waste. Primary disposition pathways include:

- for combustible wastes, incineration in Framatome's SWUR facility, followed by uranium recovery processing of the resultant ash; and
- for non-combustible LLRW, disposal at the U.S. Ecology-operated Hanford LLRW disposal site.

Table 26 summarizes the volumes and associated disposition costs for the containerized LLRW inventory. As noted in the table, current inventories are now somewhat lower than reasonably assumed maximum inventories, due in large part to the site's ongoing efforts to minimize its backlog of stored wastes. The maximum expected volumes have been conservatively utilized to estimate disposal cost liabilities.

5.2.3 Containerized Mixed Waste Inventory

The containerized mixed waste inventory consists of wastes that are both radioactively contaminated and chemically dangerous (per Ecology criteria). Like the LLRW inventory, they are essentially all solid-phase; the few remaining liquid-containing drums are stored on containment pallets. Treatment and/or disposal options are available and being utilized for all of the major currently generated containerized mixed waste categories. Viable options for the final disposition of a relatively small volume of legacy mixed wastes and very small volume of currently generated mixed wastes have not been identified but continue to be pursued in the commercial sector.

Disposition pathways for the containerized mixed wastes depend primarily on the specific acceptance criteria of the available commercial mixed waste disposal vendors. Primary disposition pathways, depending on the specific waste stream, include:

- direct shipment to the contracted mixed waste disposal site for treatment and/or disposal with or without pre-compaction; and
- offsite treatment via a permitted commercial mixed waste treatment facility followed by disposal of the treated residues at the contracted mixed waste disposal facility.

Table 26 also summarizes the volumes and associated disposition costs for the containerized mixed waste inventory. As in the case of the non-mixed LLRW, the current inventory of containerized mixed wastes is smaller than currently assumed maximum inventories. As such, the maximum expected inventories have been utilized to estimate disposal cost liabilities.

Table 26 Containerized Waste Inventory Costs

	Disposal Rate $/ft[3]	Current[4] Volume ft[3]	Max Expected Volume ft[3]	Max Total Cost, $[1]
LLRW[2] - Incinerate in SWUR	$268.53	4,479	10,890	$2,924,292
LLRW - Direct disposal at LLRW burial site	*	3,720	5,000	*
LLRW - On hold for further processing	*	3,928	5,000	*
LLRW - Total		**12,127**	**20,390**	**$2,924,292**
MW[3] - Disposal at contracted mixed waste disposal site	$370.11	1,510	1,600	$592,176
MW - Total		**1,510**	**1,600**	**$592,176**
Logistics/Shipping Support				**N/A****
Shipping Costs				**N/A*****

* No incremental disposal costs above $12.460M already allocated to US Ecology (see Table 9 b.)

** Logistics/shipping support included in Table 12.

*** Disposal rates include shipping costs, as applicable.

[1] Because this waste is already containerized, the cost of containers is not included.

[2] Low-level radioactive waste

[3] Mixed waste

[4] As of October 1st 2017

5.3 *Environmental Remediation*

Decommissioning financial liability can be associated with environmental contamination with licensed materials to the extent that the contamination requires remediation during decommissioning to meet the unrestricted use criteria of 10 CFR 20.1402. At the Richland facility the most significant area of known soil contamination was the area associated with the legacy surface impoundment system. This historically contaminated area and its residual decommissioning liability are discussed below in Section 5.3.1. Similar discussion relative to other historic site spills/releases of licensed materials to the environment is provided in Section 5.3.2. Lastly, Section 5.3.3 addresses potential investigation/remediation costs associated with two potential soil contamination areas, namely soil underlying certain areas of the UO_2 Building and soil potentially impacted by underground piping.

5.3.1 Legacy Surface Impoundment System

The Richland site maintained and operated a surface impoundment system over the time period of 1971-2004 for the management of the plant's radioactively-contaminated (low-level uranium) liquid effluents. Certain of those impoundments initially installed with single liner systems developed leaks, resulting in contamination of the underlying soil. The leaks also resulted in uranium contamination within the shallow unconfined groundwater aquifer underlying the site. From 1983 until their last usage in 2004, all of the impoundments were operated with multi-linered containment systems with inter-liner leak detection/leachate collection; no additional leaks were documented over that period.

The surface impoundment system has been removed from service in accordance with a consent decree and formal closure plan under Washington State Department of Ecology (Ecology) Dangerous Waste Regulations. The work involved processing of the stored waste inventory, removal/disposal of lagoon structural components, characterization of contamination levels in underlying soil, and remediation (removal and offsite disposal) of contaminated soil to meet Ecology cleanup levels for uranium and regulated non-radiological chemicals. Certification of completion of the work in accordance with the approved closure plan and associated soil cleanup levels was submitted to Ecology in September 2006; Ecology concurrence was received on November 14, 2006.

Framatome believes that the surface impoundment area now conservatively meets NRC requirements for unrestricted release and that no additional remediation will be required at the time of final plant decommissioning. The Ecology-imposed uranium cleanup level of 12.1 mg/kg translates to an activity level of 29 pCi/g for uranium at a U-235 enrichment of 3.5%. In reality the residual soil uranium concentrations present upon completion of the Ecology-mandated closure work were generally well below the 29 pCi/g limit in that cleanup to a very conservative fluoride soil cleanup limit typically drove soil removal/disposal to an extent well beyond that required to meet the uranium cleanup limit. Framatome has calculated Derived Concentration Guideline Levels (DCGLs) of 63 pCi/g for U-234 and 66 pCi/g for U-235, U-236, and U-238 based on RESRAD 6.3 and ICRP 30 (using more up-to-date ICRP models would yield even higher DCGLs). While realizing the final NRC release of the former surface impoundment area will be based on NRC-approved DCGLs and final status and confirmatory surveys, it is not anticipated that such DCGLs will necessitate cleanup beyond that already conducted.

In accordance with its NRC license (SNM-1227) and Ecology Groundwater Compliance Monitoring Plan, Framatome continues its semi-annual monitoring of downgradient wells for gross alpha and uranium. Groundwater levels of gross alpha and uranium have continued their decline over the last three years and are expected to continue to decline via natural attenuation

in that the Ecology uranium soil cleanup level was calculated to be protective of groundwater at the 30 ppb Ecology groundwater cleanup limit, which also corresponds to the current federal (EPA) drinking water limit for uranium. In the first-half 2017 groundwater sampling event, none of the site's six groundwater monitoring wells downgradient of the legacy surface impoundment area still exceeded 30 ppb uranium. The highest measurement during this most recent sampling event was 28.4 ppb uranium. It should be noted that there is no domestic or agricultural usage of groundwater on the Framatome site or on the hydrologically-downgradient US Department of Energy Hanford Site.

Residual decommissioning cost liabilities related to the legacy surface impoundment area are limited to the costs associated with the planning for, and the conduct of, a technically compliant final survey, including anticipated NRC regulatory oversight and the conduct of an NRC-required third party certification survey. These residual costs are addressed in Tables 27-30. The costs will be incurred at the time of final plant decommissioning in that the NRC has granted Framatome an alternate schedule for official decommissioning of the remediated surface impoundment area in accordance with 10 CFR 70.38(f) (November 15, 2006; TAC L31973).

5.3.2 Historic Spills and Releases (Documented)

As required by 10 CFR 70.25(g)(3), Framatome maintains records of information important to the decommissioning of the Richland site, which includes areas of known or suspect environmental contamination that will require additional characterization and, if needs be, remediation at the time of plant decommissioning. These potential environmental remediation areas are a subset of the areas listed per 10 CFR 70.25(g)(3)(ii), i.e., records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. Information in this regard has been derived from two major sources, namely (1) a major site-wide remedial investigation/feasibility study (RI/FS) conducted in the early 1990s which included a formal hazardous substance source review (the RI/FS was in response to surface impoundment-related issues and included both radiological and non-radiological constituents), and (2) the site's ongoing hazardous spill/release reporting procedure and associated spill reports/log.

Records of these past spills/releases typically reveal residual contamination levels below 30 pCi/g uranium-based activity; furthermore most of the areas are highly localized and typically were remediated at the time of occurrence. Extensive environmental remediation efforts are not anticipated for these areas to meet decommissioning radiological release criteria. Costs will primarily be related to characterization (investigation, sampling, analysis) with the potential for limited soil removal costs. Any limited soil removal required will not result in incremental disposal costs in that the soil can be easily accommodated within the void spaces in the approximately 450 93 ft^3 burial boxes that will be utilized to contain removed facility equipment (see Table 9). A review of site spill logs for 2012 through October 2017 indicated no additional radiological environmental releases requiring evaluation at time of decommissioning beyond those previously accounted for. Estimated decommissioning costs related to environmental remediation of documented historic spills/releases (unrelated to the surface impoundments) are provided in Tables 31-34.

5.3.3 Potential Soil Contamination Areas

Beyond the legacy surface impoundment area and the pertinent historic spill/release sites discussed in Sections 5.3.1 and 5.3.2, respectively, two other environmental areas of potential soil contamination will need to be accessed and evaluated at the time of plant decommissioning. The first area is the soil underlying the historic and current wet chemical processing areas

[primarily ammonium diuranate (ADU) chemical conversion] within the Uranium Dioxide (UO_2) Building. The long-term processing of uranium-bearing solutions in conjunction with concrete flooring challenged by the harsh chemical environment have created the possibility for the release of uranium to the soil column below those areas. Access to this soil for characterization and possible removal will necessitate concrete removal, soil characterization, soil excavation, and possible offsite soil disposal.

The second area of potential soil contamination is the soil underlying underground piping, historically or currently conveying uranium-bearing solutions. It is estimated that approximately 3,000 feet of trenching will be required to gain access for removal of the approximately 6,000 lineal feet of underground piping that has conveyed uranium-bearing solutions, past or present.

Estimated decommissioning costs for these two areas of potential soil contamination are provided in Tables 35-42. Conservatisms relative to the UO_2 wet chemical processing area estimate include removal of 1400 ft^2 of concrete to allow backhoe access versus an implicated floor area of 500 ft^2, and removal of all soil to a depth of ten feet over a total surface area of 1000 ft^2 (twice the implicated floor area). Relative to the underground piping removal/ remediation, the estimate conservatively assumes soil removal/disposal to a depth of ten feet below ten percent of the 3000 feet of trenching.

Table 27 Residual Labor Requirements for Final Release of Former Surface Impoundment Area (Work Days)

Estimated number of work days by specific labor category that will be required to complete the planning and preparation for, and the conduct of, a final release survey for the former surface impoundment area.

Activity	Senior Engineer Work Days	Engineer Work Days	NRC Work Days	Health and Safety Technicians
Planning and Preparation				
Preparation of Documentation for Regulatory Agencies	10			
Submittal of Decommissioning Plan to NRC when Required by 70.38(g)(1)	5		15	
Development of Work Plans		5		
Procurement of Special Equipment		4		
Staff Training		4		2
Conduct of Survey				
Final Radiation Survey (gridding, sampling, sample preparation)		12		12
TOTALS	15	25	15	14

Table 28 Total Labor Costs for Final Release of Former Surface Impoundment Area

Estimated work days for each specific labor category (from Table 27) multiplied by the total cost per work day for the corresponding labor category (from Table 7).

Task	Senior Engineer Cost, $	Engineer Cost, $	Health and Safety Technician Cost, $	NRC Cost, $	Total Labor Cost, $
Planning and Preparation	12,285	7,982	768	33,480	54,515
Conduct of Final Radiation Survey		7,368	4,608		11,976

Table 29 Laboratory and Miscellaneous Costs - Final Release of Former Surface Impoundment Area

Estimate of costs for analyses to be performed by an independent third-party laboratory as well as other third party support costs.

Activity/Item	Total Cost, $
Testing and analysis: 480 samples @ $120 ea.	57,600
40 sampling excavations (backhoe)	18,980
NRC Inspections	36,000
Certification Survey	86,814
TOTAL	199,394

Table 30 Total Decommissioning Costs - Final Release of Former Surface Impoundment Area

Total of the reported costs in Tables 28 and 29.

Task/Component	Cost, $
Planning and Preparation (From Table 28)	54,515
Conduct of Final Radiation Survey (From Table 28)	11,976
Laboratory and Miscellaneous Costs (TOTAL from Table 29)	199,394
TOTAL – Former Surface Impoundment Area	265,885

Table 31 Labor Requirements – Historic Spills/Releases (Work Days)

Estimated number of work days by specific labor category that will be required to investigate, characterize and remediate pertinent environmental releases/spills recorded in accordance with 10 CFR 70.25(g)(3)

Activity	Engineer Work days	Equipment Operator Work Days	Laborer Work Days
Work plans/procedures	3		
Pre-characterization dismantlement and/or excavation		2	2
Soil sample collection (characterization and confirmation)	2		
Soil removal/packaging (if required)		3	3

Table 32 Total Labor Costs for Historic Spills/Releases

Estimated number of work days for each specific labor category (from Table 31) multiplied by the total cost per work day for the corresponding labor category (from Table 7)

Activity	Engineer Cost, $	Equipment Operator Cost, $	Laborer Cost, $	Total Labor Cost, $
Work plans/procedures	1,842			1,842
Pre-characterization dismantlement and/or excavation		926	850	1,776
Soil sample collection (characterization and confirmation)	1,228			1,228
Soil removal/packaging (if required)		1,389	1,275	2,664

Table 33 Laboratory and Miscellaneous Costs – Historic Spills/Releases

Estimate of costs for analyses to be performed by an independent third-party laboratory.

Activity/Item*	Total Cost, $
Testing and analysis: 55 samples @ $120 ea.	6,600
NRC Inspections, certification survey	Covered in Table 12 and 29 costs

* No incremental soil disposal costs. Anticipated soil volumes accommodated in void spaces of equipment disposal boxes (see discussion in Section 5.3.2).

Table 34 Total Costs - Environmental Remediation for Historic Spills/Releases

Total of reported costs in Tables 32 and 33.

Task/Component	Cost, $
Work plans/procedures (from Table 32)	1,842
Pre-characterization dismantlement and/or excavation (from Table 32)	1,776
Soil sample collection (from Table 32)	1,228
Soil removal/packaging (from Table 32)	2,664
Laboratory testing and analysis (from Table 33)	6,600
TOTAL - Environmental Remediation	14,110

Table 35 Dimensional/Volume Assumptions for Remediation of Specific Potential Soil Contamination Areas – Soil Below UO_2 Building Wet Processing Area; Soil Underlying Underground Piping

a) Soil Below UO_2 Building			
Parameter	Impacted Area, ft^2	Area Removed, ft^2	Disposal Vol., ft^3
Concrete (floor)	500	1,400	700
Soil	-	1,000	10,000

b) Soil Below Underground Piping		
Parameter	Length, ft.	Disposal Vol., ft^3
Trenching	3,000	-
Piping	6,000	1,116
Soil	-	8,400

Table 36 Planning and Preparation – Remediation of Specific Potential Soil Contamination Areas – Soil Below UO_2 Building Wet Processing Area; Soil Underlying Underground Piping

Estimate the number of work days, by specific labor category, that will be required to complete planning and preparation activities.

Activity	Safety Engineer, Work Days	Engineer, Work Days	Health and Safety Technician, Work Days	Laborer, Work Days	Operator, Work Days
Preparation and Submittal of Documentation for Regulatory Agencies	*				
Submittal of Decommissioning Plan to NRC	*				
Development of Work Plans/Safety Plans	10	10			
Staff Training	4		2	4	2

* Included in labor costs for this activity in Table 3 for Production and Production Support Facilities.

Table 37 Environmental Investigation/Remediation of Specific Potential Soil Contamination Areas – Soil Below UO_2 Building Wet Processing Area; Soil Underlying Underground Piping

Estimate the number of work days, by specific labor category, for environmental investigation/ remediation activities.

Location	Operator, Work Days	Laborer, Work Days	Health and Safety Technician, Work Days*	Engineer, Work Days
Below UO_2 Building	18	23	13	2
Below Underground Piping	79	533	17	2

* Health and Safety Technician labor includes radiation protection oversight of work plus collection of soil samples for pre-characterization and final confirmation.

Table 38 Total Work Days by Labor Category – Potential Soil Contamination Areas – Soil Below UO_2 Building Wet Processing Area; Soil Underlying Underground Piping

Total work days estimated for each specific labor category from Tables 36 and 37.

Activity	Engineer, Work Days	Safety Engineer, Work Days	Operator, Work Days	Laborer, Work Days	Health and Safety Technician, Work Days
Development of Work Plans/Safety Plans	10	10			
Staff Training	*	4	2	4	2
Environmental Investigation/ Remediation	4		97	556	30

Table 39 Total Labor Costs by Major Decommissioning Task – Potential Soil Contamination Areas – Soil Below UO_2 Building Wet Processing Area; Soil Underlying Underground Piping

Estimated work days for each specific labor category (from Table 38) multiplied by the total cost per work day for the corresponding labor category (from Table 7)

Activity	Engineer, Work Days	Safety Engineer, Work Days	Operator, Work Days	Laborer, Work Days	Health and Safety Technician, Work Days	Total Labor Cost, $
Development of Work Plans/Safety Plans	6,140	5,790				11,930
Staff Training		2,316	926	1,700	768	5,710
Environmental Investigation/ Remediation	2,456		44,911	236,300	11,520	295,187

Table 40 Packaging, Shipping and Disposal of Radioactive Wastes – Potential Soil Contamination Areas – Soil Below UO_2 Building Wet Processing Area; Soil Underlying Underground Piping

a) Packing Material Costs

Waste Type	Volume, ft^3	Number of Containers	Type of Container	Container Unit Cost, $	Total Packaging Costs
Soil/Concrete	19,100				
Piping	1,000				
Total	20,100	223	93 ft^3 box	1,800	401,400

b) Shipping and Disposal Costs

Waste Type	Disposal Volume, ft^3	Disposal Cost, $	Shipping Cost, $
Containerized Waste for Burial	20,100	*	262,700**

* Catalog price from commercial container supplier.
** No incremental disposal costs above $12.460M already allocated to US Ecology (see Table 9b).
*** Assumes 37 shipments at $7,100/shipment based on current TN rates.

Table 41 Laboratory and Miscellaneous Costs – Potential Soil Contamination Areas – Soil Below UO_2 Building Wet Processing Area; Soil Underlying Underground Piping

Activity/Item*	Cost, $
Equipment (Backhoe) Charges	215,641
Materials	2,784
Analytical Uranium in soil (364 @ $120 ea.) Nitrate/fluoride in soil (57 @ $30 ea.)	 43,680 1,710
TOTAL	263,815

* Does not include miscellaneous expenses that apply for the site-wide decommissioning effort, e.g., insurance, NRC inspections, logistics support, etc. (see Table 12).

Table 42 Total Decommissioning Costs – Potential Soil Contamination Areas – Soil Below UO_2 Building Wet Processing Area; Soil Underlying Underground Piping

Total of reported costs in Tables 39, 40 and 41.

Task/Component	Cost, $
Development of Work Plans/Safety Plans (from Table 39)	11,920
Staff Training (from Table 39)	5,710
Environmental Investigation/Remediation (from Table 39)	295,187
Packing Material Costs (TOTAL from Table 40a)	401,400
Shipping and Disposal Costs (from Table 40b)	262,700**
Laboratory and Miscellaneous Costs (TOTAL from Table 41)	263,815
TOTAL – Potential Soil Contamination Areas	1,240,732

6.0 Adjustment of Cost Estimates and Funding Level

As required in 10 CFR 70.25(e), Framatome will adjust these cost estimates at intervals not to exceed three years. Associated funding levels will be adjusted as needed. Consistent with guidance in NUREG-1757, the review will consider changes in costs of goods and services, including inflation; changes in facility conditions or operations; and changes in expected decommissioning procedures.

7.0 Certification of Financial Assurance

Principal: Framatome Inc., 2101 Horn Rapids Road, Richland, WA 99354

NRC License Number SNM-1227 for Framatome Inc. (same address)

Issued to: U.S. Nuclear Regulatory Commission

I certify that Framatome Inc. is licensed to possess the following types of unsealed special nuclear material licensed under 10 CFR Part 70 in the following amounts:

Type of Material	Amount of Material
Uranium compounds in any chemical/physical form enriched up to 5.00 wt. % U-235 (uranium compounds)	120,000 kg U-235
Uranium enriched in U-235 (any enrichment or chemical/physical form)	350 g U-235

I also certify that financial assurance in the amount of $66,425,800 has been obtained for the purpose of decommissioning as prescribed by 10 CFR Part 70.

Katherine Williams, Chief Financial Officer

Date

8.0 Financial Assurance Instruments

This section provides copies of financial assurance instruments (Exhibits 1 and 2) to demonstrate financial assurance for all of the estimated decommissioning costs. The mechanism utilized by Framatome is the letter of credit/standby trust agreement provided for in 10 CFR 70.25 (f)(2).

Exhibit 1 - Irrevocable Standby Letter of Credit

Exhibit 2 - Standby Trust Agreement

Decommissioning Funding Plan

Date (GMT)	Signed by
2018/05/30 22:24:07	Tate, Timothy
Authorization/Title	Richland EHS&L Manager

2018/05/30 22:49:56	Land, Ron
Authorization/Title	Richland Site Manager

2018/06/01 14:17:08	Powers, Steve
Authorization/Title	Maintenance Manager