Comparison of Waste Estimates from Recycling and Fuel Fabrication

Fuel Cycle Research & Development

Prepared for
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SUMMARY

The projected volumes and characteristics of waste generated by a future recycling facility for used nuclear fuel (UNF) in the U.S. can have a large degree of variance depending on the industrial technology deployed, operational approach, and related assumptions. To accurately plan for a future repository for disposition of UNF and high level waste (HLW), other future facilities required for radioactive waste management, and to evaluate impacts of reprocessing and fuel fabrication, an accurate determination of waste generation from recycle of UNF is needed. Such projections have been made by various Department of Energy (DOE) contractors, but the results have exhibited large variability for some wastes.

The goals of this activity are to reduce the variability in waste estimates for reprocessing and fabricating particular fuel types based on industrial experience, and to better understand the cause of any remaining variability in waste estimates. This information may be used later to support the development of waste estimates for future fuel cycle options by the DOE and its laboratories.

To support the activity, DOE contracted with two industrial partners using the advice and assistance contract. Under Task Order 9, AREVA and Energy*Solutions* were tasked to develop volumes, masses, radionuclide concentrations, and other characteristics of both process waste and secondary waste produced during reactor fuel reprocessing and subsequent fuel fabrication facilities. The industrial estimates are compared to estimates developed by the Used Fuel Disposition Campaign (UFDC) within the DOE Office of Nuclear Energy (DOE-NE).

Since the largest source of waste estimate uncertainty is expected to be derived from the different waste management approaches assumed by the organization completing the estimate, a set of key assumptions (see Section 2.3) was provided and used by the industrial teams. These assumptions include items such as the reprocessing method (co-extraction and recovery of uranium and a uranium/plutonium mixture), and recycling facility capacity (800 metric tons heavy metal per year (MTHM/yr)).

When applying the common set of assumptions, the three estimates for the expected volume and mass of process and secondary waste establish a reasonable range for the aqueous reprocessing waste. The range for process waste from aqueous reprocessing is provided in Table ES-1 and for some waste streams the range reflects the potential waste reduction from technological improvements. The range for secondary waste from recycling, MOX fuel fabrication and fast reactor fuel fabrication is shown in Table ES-2. There are no process wastes from MOX fuel fabrication and fast reactor fuel fabrication. The ranges shown in Tables ES-1 and ES-2 for recycling are all representative of 50GWd/MT, 5 year cooled, light water reactor (LWR) used fuel. Values for recycling are shown normalized to one metric ton (MT) of UNF processed from an 800 MTHM/year facility. Values shown for MOX fuel fabrication and fast reactor fuel fabrication are estimated from processing 800 MT of UNF per year.

Table ES-1 Aqueous Reprocessing Process Waste Estimate Range Summary

Waste Stream	Waste Volume (liters/MT)		Observation
	Low Range	High Range	
Fission Product Waste	210	246	When applying the same assumptions to a common waste form, the three unit volume estimates vary by less than 15% and the unit mass estimates vary by less than 7% (see Section 3.1).
Tritium	4	4,000	The three order of magnitude range reflects differences in the tritium management approach selected by the three organizations. The range is established when tritium is allowed to enter the aqueous separations process and must be captured and treated from excess process water. The high range results from the solidification of the excess water into a grouted waste form while the low range is established by using a very energy intensive treatment process to concentrate the tritium in a small volume. Successful development of a voloxidation process to capture and treat the tritium before entering the aqueous system will provide a substantial volume reduction (43 liters/MT) without using a highly energy intensive process and should continue to be pursued.
Krypton -85	1	3.7	Krypton is assumed to be separated from the other off-gas components by cryogenic methods and stored in compressed gas cylinders. The range is established by the assumed allowable storage pressure. A gas storage facility safety basis is required to narrow the range to less than the factor of 4 indicated.
Iodine -129	0.6	11	The final waste form for the captured iodine has not been established and the range includes evaluation of seven potential waste forms.
Carbon-14	1e-6	75	This extremely wide range reflects the impact of normal carbon (12) dioxide has on the capture of C-14. All estimates assume a caustic scrub capture and grouted waste form. The low range is established by use of standard industrial process for the removal of CO_2 from the dissolver sparge air which otherwise becomes the primary carbon source in the final waste form.

Table ES-2 Secondary Waste Estimate Range Summary

Functional Area	Waste Classification	Waste Volume (m^3/MT)		Observation
		Low Range	High Range	
Recycling [1]	Class A	2.96	3.86	• The classification of some waste streams is not consistent for some individual waste streams making some ranges appear large. For instance a waste stream considered Class C waste from one source (e.g. AREVA, Energy*Solutions*, UFD/EAS, UFD 2012) may be considered GTCC waste by another source. • Many individual waste streams are in close agreement among the various sources. The low to high range appears to be primarily driven by assumptions regarding facility design and operating philosophy (e.g. remote operation versus dark cells). • Neither AREVA nor Energy*Solutions* estimated any Mixed Class A/B/C or GTCC waste.
	Class B	0	1.73	
	Class C	0.12	1.45	
	Total Class A/B/C [2]	3.59	7.59	
	GTCC	0.02	1.04	
	Mixed Class A/B/C	0	0.08	
	Mixed GTCC	0	0.06	
MOX Fuel Fabrication [1]	Class A	0.12	0.16	• The range for Total Class A/B/C waste is reasonable. • The wide range for GTCC waste is driven by assumptions regarding facility design and operating philosophy as well as waste disposal requirements. • Assuming a reasonable waste acceptance criteria for disposal, the isotopic distribution of Pu recovered from commercial UNF significantly affects the classification of waste and the volume of waste.
	Class B			
	Class C			
	Total Class A/B/C [2]	0.12	0.64	
	GTCC	0.03	2.79	
	Mixed Class A/B/C	0	0	
	Mixed GTCC	0	0	
Fast Reactor Fuel Fabrication [1]	Class A	0.08	0.09	• The Class A waste volumes are in close agreement. • The reason for the two orders of magnitude difference in GTCC waste is unknown.
	Class B			
	Class C			
	Total Class A/B/C [2]	0.08	0.09	
	GTCC	0.006	0.17	
	Mixed Class A/B/C			
	Mixed GTCC	0	0.006	

1. The values for recycling are normalized to units of m^3/MT based on a recycling facility capacity of 800 MT/year. The values for MOX fuel fabrication and fast reactor fuel fabrication are normalized to the same recycling capacity of 800 MT/year. Actual capacity of the fuel fabrication plants are lower and are based on the processing the quantity of Pu recovered from 800 MT of UNF (see Section 3.2.11 and 3.2.12).
2. The individual values shown for Class A, B and C waste volumes do not total to the value shown for Total Class A/B/C waste since the minimum and maximum for each waste classification are chosen to represent the low and high range values. The low and high range values are not obtained consistently from one particular source (e.g. AREVA, Energy*Solutions*, UFD/EAS, UFD 2012).

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ACRONYMS

BWR	Boiling Water Reactor
CFR	Code of Federal Regulations
COCA	Cobroyage Cadarache
CFTC	Consolidated Fuel Treatment Center
DOE	Department of Energy
DOE-NE	Department of Energy - Office of Nuclear Energy
EAS	Engineering Alternative Studies
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FGE	Fissile Gram Equivalent
FOEAS	Follow-On Engineering Alternative Studies
GFI	Government Furnished Information
GNEP	Global Nuclear Energy Partnership
GTCC	Greater Than Class C
GW	Giga-watt
GW/d	Giga-watt days
HEPA	High Efficiency Particulate Air
HLW	High Level Waste
HT	High Tritium
LLW	Low Level Waste
LT	Low Tritium
LWR	Light Water Reactor
MC&A	Material Control and Accountability
MFFF	MOX Fuel Fabrication Facility
MOX	Mixed Oxide fuel
MPC	Multi-Purpose Canister
MT	Metric Ton
MTHM	Metric Ton Heavy Metal
MTIHM	Metric Ton Initial Heavy Metal
NWTRB	Nuclear Waste Technical Review Board
PA	Performance Assessment
PE-Ci	Plutonium Equivalent Curie
PWR	Pressurized Water Reactor
SFR	Sodium Fast Reactor
SRS	Savannah River Site
TRU	Transuranic
UC-C	Universal Canister – for Compacted waste
UC-V	Universal Canister – for Vitrified waste
U.S.	United States
UFD	Used Fuel Disposition
UFDC	Used Fuel Disposition Campaign
UNF	Used Nuclear Fuel
UOX	Uranium Oxide fuel
UREX	Uranium Extraction
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant

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1. Introduction

The projected volumes and characteristics of waste generated by a future recycling facility for used nuclear fuel (UNF) in the U.S. can have a large degree of variance depending on the industrial technology deployed, operational approach, and related assumptions. To accurately plan for a future repository for disposition of UNF and high level waste (HLW), and other facilities required for radioactive waste management, and to evaluate impacts of reprocessing and fuel fabrication, an accurate determination of waste generation from recycle of UNF is needed. Such projections have been made by various Department of Energy (DOE) contractors, but the results have exhibited large variability for some wastes.

The goals of this activity are to reduce the variability in waste estimates for reprocessing and fabricating particular fuel types based on industrial experience, and to better understand the cause of any remaining variability in waste estimates. This information may be used later to support the development of waste estimates for future fuel cycle options by the DOE and its laboratories.

To support the activity, DOE contracted with two industrial partners using an advisory and assistance contract. Under Task Order 9, AREVA and Energy*Solutions* were tasked to develop volumes, masses, radionuclide concentrations, and other characteristics of both process waste and secondary waste produced during reactor fuel reprocessing and subsequent fuel fabrication facilities [DOE-NE]. The industrial estimates are compared to estimates developed by the Used Fuel Disposition Campaign (UFDC) within the DOE Office of Nuclear Energy (DOE-NE).

2. Background

Prior estimates of process and secondary waste from recycling and fuel fabrication have been developed by the UFDC and several industrial partners including AREVA and Energy*Solutions*. The UFDC waste estimates are based largely on work conducted for the Global Nuclear Energy Partnership (GNEP) program. In the past, these UFDC waste estimates have been compared primarily to data also developed by industrial partners for the GNEP program. Details of the GNEP waste estimates produced by the industrial partners are protected as proprietary information; however, summary data is available publicly in documents such as presentations made to the Nuclear Waste Technology Review Board (NWTRB) [Davidson 2009, Energy*Solutions* 2009]. The lack of access to the details of this work has inhibited the comparison of waste estimates prepared by the industrial partners to each other and to the waste estimates prepared by the UFDC.

The following sections provide background on the development of the GNEP, UFDC and Task Order 9 waste estimates.

2.1 Global Nuclear Energy Partnership

The GNEP program was a comprehensive program to increase national and global energy security, reduce the risk of nuclear proliferation, encourage clean energy development around the world, and improve the management of nuclear waste. As part of the GNEP program, several industrial teams were engaged to develop proposals for a Consolidated Fuel Treatment Center (CFTC) incorporating recycle of UNF and transmutation of actinides in advanced burner reactors with the goal of reducing the amount of wastes requiring geologic disposal. DOE also requested the Savannah River Site (SRS) to conduct studies, the Engineering Alternative Studies (EAS), to provide a comprehensive assessment of a commercial-scale UNF separations facility in support of the GNEP program.

The EAS was based on processing 3,000 MTHM/year of light water reactor (LWR) UNF using the Uranium Extraction (UREX)+1a flowsheet at a greenfield site. Although a 3,000 MTHM/year plant supports the current domestic fuel recycling needs, it is unprecedented in size and complexity and a formidable challenge for a first of a kind facility. Accordingly, subsequent studies, the Follow-On Engineering Alternative Studies (FOEAS), were conducted to provide revised cost, schedule and technical data for an 800 MTHM/year plant using the UREX+1b process as the technical basis.

Identification of unit operations and detailed development of process flow diagrams and material balances provided the basis for estimating process wastes for both the EAS and FOEAS processes. This work in turn supported development of equipment lists and general building and equipment arrangements, which along with other inputs such as facility staffing estimates provided the basis for a bottoms-up estimate of secondary waste.

The EAS and FOEAS provided DOE with a better understanding of the separations process and the unresolved technology issues associated with construction and operation of a separation facility. The waste estimates developed as part of the FOEAS ultimately provided input to the Environment Impact Statement (EIS) for the GNEP program.

2.2 Used Fuel Disposition Campaign

In 2010, after the GNEP program was suspended, the UFDC was established to evaluate alternative fuel cycles, including those involving recycling. Under the UFDC two work packages were created, (1) to estimate process waste inventories from recycling and (2) to estimate secondary waste inventories from recycling and mixed oxide (MOX) fuel fabrication. In subsequent years the two work packages were combined into a single "Inventory" work package.

The UFDC developed process and secondary waste estimates for a variety of recycling processes involving a variety of process waste forms. The processes evaluated include UREX+1b, co-extraction, new-extraction and electrochemical. Alternate process waste forms evaluated for HLW include borosilicate glass, phosphate glass, glass ceramic and bentonite clay (Cs and Sr only). The prior GNEP work was used as a basis to develop material balances for these processes which were in turn used to estimate process wastes. The process waste estimates are documented in a report along with current and projected used fuel inventory estimates [Carter 2012b].

The secondary waste estimates for recycling used the GNEP/FOEAS data developed for the UREX+1b process as a basis for developing waste estimates for other aqueous recycling processes, i.e. co-extraction and new-extraction. The estimates were modified by deleting waste streams associated with functional areas not applicable to the process being evaluated. For instance, the UREX+1b process involves an operation to separate Cs and Sr from other HLW constituents. This operation is not part of co-extraction or new-extraction; therefore, the waste streams associated with this functional area are deleted to derive the waste estimate for co-extraction and new-extraction. On the other hand, all of the processes evaluated involve HLW vitrification operations; accordingly, the waste streams associated with these operations are included in the waste estimates for co-extraction and new-extraction. The results are documented in a report which also includes a variation of the waste estimates for recycling sodium fast reactor (SFR) UNF [Jones 2011].

Secondary waste estimates for MOX fuel fabrication were also developed by the UFDC in 2011 [Jones 2011b]. These estimates are based on the waste balance data for the MOX Fuel Fabrication Facility (MFFF) under construction at SRS. The MFFF is designed to receive, handle and process weapons grade Pu to produce MOX fuel for use in commercial LWRs. The MFFF data was adjusted to delete waste streams from operations not considered applicable to a commercial MOX fuel fabrication facility such as the Aqueous Polishing operations. The MFFF data was also adjusted to account for impacts associated with processing Pu recovered from commercial LWR UNF on repository waste acceptance criteria. In particular, Pu equivalent Curie (PE-Ci) limits on individual waste packages significantly affect the volume of final packaged waste. In the absence of a commercial GTCC disposal facility in the U.S., the Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC) PE-Ci limit of 80 PE-Ci/55 gallon drum (^{239}Pu basis) is used to set allowable waste concentrations for final packaged waste for the UFDC MOX fabrication facility waste estimate.

In 2010, a separate UFDC work package was also established to investigate disposal options for low level waste (LLW) from alternative fuel cycles. To support this work a task was initiated to determine the radionuclide content of the waste streams identified by the UFDC waste inventory estimates to support waste treatment studies being conducted by the Separations and Waste Forms Campaign and the Fuel Cycle Options Campaign [Jones 2012]. As a result of the radionuclide inventory work, the waste streams from the UFDC waste estimates could be more definitively classified. The prior UFDC waste estimates did not consider the radionuclide content of the waste streams and waste classifications were determined arbitrarily based on the source of the waste stream (i.e. functional area).

2.3 Task Order 9

One of the objectives for Task Order 9 was to ensure that waste estimates were based on actual data from operations and present day technology capabilities to the extent possible and the contractors selected have extensive experience in aqueous reprocessing technologies.

Since the largest source of waste estimate uncertainty is expected to be derived from the different waste management approaches assumed by the organization completing the estimate, Task Order 9 defined key assumptions used by all participants:

- Assume the LWR UNF reprocessing capacity is 800 MTIHM/yr using aqueous reprocessing techniques.
- Only uranium and a uranium/plutonium mixture are assumed to be recovered (assume an initial product material of 35 percent Pu and 65 percent U). Recovered uranium should be sufficiently clean for chemical conversion and storage for possible future use in reactor fuel. Other transuranic (TRU) elements were not to be recovered and were combined into a single fission product waste form.
- Fission product wastes (e.g., vitrified wastes) are assumed to be packaged in 2' diameter x 15' tall canisters with an internal volume of $1.2m^3$. Heat generating waste cannot exceed 14,000 watts per canister at the time of production. Waste loading assumptions were identified by the individual study participants. The study team also considered the impact of using the Universal Canister – Vitrification (UC-V) containers used at current reprocessing facilities.
- Metal wastes are assumed to be packaged in 2' diameter x 10' tall canisters with a waste weight limit of 3,600 kg of waste. Compaction factors and waste loading assumptions were identified by the individual participants. The study team also considered the impact of using the Universal Canister – Compacted (UC-C) containers used at current reprocessing facilities.
- Off-gas is assumed to have H-3, C-14, Kr-85, Ru-99 and I-129 captured and treated for disposal in accordance with U.S. regulations. Capture technology, waste form, and waste packaging were identified and capture efficiency was provided by individual participants. Waste treatment technology (including decay storage requirements if any) was identified and waste loading/density assumptions were provided by the individual participants.
- Waste estimates are based on normal operations. Off-normal and/or accident conditions and decommissioning wastes are not part of this activity.
- Water management is a key consideration for accurate waste estimates. Liquid effluent discharge is an accepted practice by DOE and nuclear utility operations and is assumed to continue. Wastewater from reprocessing and refabrication should be assumed to be decontaminated and recovered for reuse and excess water discharged. For estimate consistency, liquid effluent discharges should be assumed to meet U.S. Environmental Protection Agency (EPA) drinking water standards. Secondary wastes resulting from treatment processes required to yield acceptable effluents should be included in the secondary waste estimates.

- Secondary waste should be classified as either Class A/B/C LLW or Greater than Class C LLW. For this study, routine operations and maintenance activities which do not breach process confinement are assumed to result in Class A/B/C LLW. Activities which breach confinement and become contaminated with process materials are assumed to result in waste characteristics similar to the process materials. GTCC waste will result from operations and maintenance activities associated with processing material with high fission product or TRU concentrations. Class A/B/C LLW will result from other operations and maintenance activities.
- Secondary waste volumes should be reported "as-generated" and "as-packaged" to illustrate the volume reductions expected. Packaging for GTCC waste will assume packages similar to WIPP approved containers for contact handled waste. Class A/B/C LLW containers are assumed to use 4 cubic meter steel boxes.
- Intentional waste blending solely to change the classification of waste (e.g. blending greater than Class C (GTCC) with class A/B/C LLW) is prohibited.

The waste estimates used the UNF composition data associated with reprocessing two reference LWR uranium oxide (UOX) fuels and a LWR MOX fuel which were labeled Used Nuclear Fuel (UNF) 1, 2 and 3 respectively:

UNF-1: 50 GWd/MT burnup, 5 year cooled

UNF-2: 50 GWd/MT burnup, 50 year cooled

UNF-3: 50 GWd/MT burnup, 5 year cooled

The isotopic composition of these fuels was provided to the industrial contractors as government furnished information (GFI) [Carter 2012].

During the course of conducting Task Order 9, the industrial participants identified concerns with reprocessing UNF-3. The Task Order 9 team agreed to reprocess a blend of UNF-1 and UNF-3 designated as UNF-4:

UNF-4: A blend of 90MT/yr of UNF-3 and 710 MT/yr of UNF-1

The isotopic content of the blend was calculated by the individual participants.

The participants also developed waste estimates associated with fabricating reactor fuel from the U/Pu mixture recovered from UNF-1 into LWR MOX fuel consistent with the provided GFI composition data. The industrial participants also developed waste estimates associated with fabricating fast reactor fuel from the U/Pu mixture recovered from UNF-1 and UNF-3.

The waste estimate for reprocessing included a description of the as-generated and as-packaged waste form and its associated volume and mass, radionuclide mass composition, and volumetric and/or mass flow rate per MTIHM of UNF processed for each LLW and HLW stream (including separately identified mixed waste) generated by the following functions/ activities (i.e. functional areas):

1. Receipt and Storage
2. Head End (shearing and dissolution including any dissolver solution adjustment and solids removal)
3. Separations (including solvent cleanup)
4. Product Solidification
5. Acid Recovery
6. Liquid Effluent Processing
7. Vitrification
8. Offgas treatment and stabilization of retained materials (Volume and characteristics of each waste were identified individually (e.g. C-14, H-3, Kr-85, I-129). A management strategy for tritium and Kr separation for each reference fuel type was developed by each participant.)
9. MOX Fuel Fabrication
10. Fast Reactor Fuel Fabrication
11. Balance of Plant

Each of the industrial teams prepared final reports documenting their waste estimates [AREVA 2013, Willis 2013].

3. Comparison of Waste Estimates

This study provides a comparison of the waste estimates provided by the two industrial teams under Task Order 9 and the UFDC for reprocessing UNF-1, 2, and 4 and the fabrication of MOX and fast reactor fuels. The estimates include both process and secondary waste. Process waste, for this study, is defined as wastes that contain a portion of the UNF assembly being reprocessed without consideration for the waste classification (e.g. High-Level or Low-Level Waste) as defined by current U.S. regulations. Examples of process waste include: fission products, captured volatile isotopes, hulls and hardware.

Secondary wastes are those resulting from the act of handling radioactive materials. Examples of secondary waste include: operations, maintenance, and job control waste.

The wastes were identified by the functional areas defined above. In many cases, a waste stream is generated in one functional area but is then transferred to another functional area for treatment. In these cases only the final waste form is discussed in this report. Additional waste stream information by functional areas is contained in the reference reports.

3.1 Process Waste

Table 3.1-1 summarizes each participant's results for process waste in the study. For each of the three fuels used in this study, Table 3.1-1 provides the bulk density, unit mass (kg/MT of UNF), volume (liters/MT) of each final process waste stream. The container selected and the number of containers produced annually for an 800MT/yr reprocessing facility is also provided. A short description of the basis or other notes is contained in the far right column. Data in the table is coded for each participant, information in red was supplied by Energy*Solutions*, data in black was supplied by AREVA, and data in tan was supplied by the UFDC.

Table 3.1-1 uses the UNF-1 reprocessing waste as a reference case. If the waste estimate does not vary with UNF composition the corresponding quantities for UNF-2 and 4 are marked "n/c" for no change with respect to the reference fuel. Missing data is marked with an "--".

None of the participants identified any process waste from the fuel fabrication facilities. Therefore all the process wastes in Table 3.1-1 are aqueous reprocessing waste.

Observations on each waste stream are provided in the following sections.

3.1.1 Fission Product Waste

All participants selected borosilicate glass as the final waste form for the combined fission product and minor actinide waste stream. The task order specified a 2 ft diameter x 15 ft canister with a decay heat limit of 14,000 watts per canister. Using these parameters, participant's estimates agree to within 7%. For example for the reprocessing UNF-1 the estimates were 567, 572, and 535 kg of glass per MT of fuel reprocessed. For UNF-1 the fission product waste loading is limited by the total decay heat.

For UNF-2 which is 50 year cooled fuel, the decay heat limit is not reached and other factors limit the maximum waste loading. Energy*Solutions* and AREVA used total waste loadings of 19 and 18.5 weight percent oxide loading respectively. The UFDC used a total MoO_3 loading of 2.5%. While the limits applied are slightly different, the waste estimates are almost identical at 302, 305, and 305 kg/MT respectively.

The study also examined the potential impact of the 2 ft diameter canister, which limits the amount of decay heat that can be transferred to an air cooled storage vault when maintaining the glass canister centerline temperature below the glass transition temperature (510°C or 950°F). The participants used the smaller diameter universal canister – vitrification (UC-V) deployed at commercial reprocessing facilities as an alternative canister. The waste stream mass from reprocessing UNF-1 is decreased between 45 and 65% by using this smaller canister; however, the canisters produced are increased by a factor of between 4 and 5.6 since the volume of each canister is considerably smaller. Each participant determined their own basis for the waste loading limitation when using the UC-V container. Energy*Solutions* used a maximum decay heat of approximately 2,500 watts per UC-V or the maximum loading of 19 wt%, whichever was most limiting. AREVA continued to use the 18.5 % waste loading which allowed the decay heat for a UC-V to reach a maximum of about 3,450 watts per UC-V. Using the methods established for the UFDC, the decay heat limit for a UC-V canister was determined to be approximately 2,500 to 3,300 watts per UC-V. The values range based on the storage design assumptions being used. The lower value results from only natural convection while the higher value can be obtained by using heat transfer coefficients associated with forced convection during storage or higher canister centerline temperatures. Should the UC-V be selected as a canister for reprocessing waste, additional investigation into the decay heat or maximum waste loading should be conducted to reduce this uncertainty.

Table 3.1-1 also provides UFDC information on two alternative fission product waste forms. The table indicates little incentive to pursue a phosphate glass where the unit mass and volume is similar to the borosilicate glass. The glass ceramic waste form does offer some incentive as the unit mass and volume is a little less than 50% of the borosilicate glass waste form.

3.1.2 Compacted Metal

The hulls and hardware are washed and compressed into 2 ft diameter x 10 ft tall canisters and participants used a similar process although the final density varies among the participants. The mass of this waste stream was specified in the task order supplied information and does not vary for the fuels investigated. However the number of canisters varies as result of the bulk density differences.

3.1.3 Tritium

The approach to tritium management selected by the individual participants results in a 3 order of magnitude variation in this waste stream. Energy*Solutions* and AREVA followed the current reprocessing practice of allowing the tritium to enter the aqueous separations process. AREVA separated the liquid effluents into high and low tritium bearing streams. AREVA assumed the low tritium liquid effluent would meet applicable drinking water standards and could be released to the environment. AREVA grouted the high tritium liquid effluent stream resulting in the bounding waste form estimate. Energy*Solutions* allowed the tritium to accumulate in a single liquid effluent which they treated with an energy intensive process to concentrate the tritium into a considerable smaller volume. This waste stream was then grouted for disposal.

The UFDC estimate is based on a head-end voloxidation process prior to aqueous processing of the UNF. Tritium is captured in a small liquid volume for grouting as a final waste form. This estimate is 2 orders of magnitude less than the high estimate without employing an energy intensive process. The benefit for continued development of a voloxidation and tritium capture process is illustrated in this estimate.

3.1.4 Carbon-14

All participants used a caustic scrub solution to capture the C-14 and other carbon compounds from the head-end processes and all participants grouted the caustic solution for a final waste form, yet the waste estimates vary by 8 orders of magnitude. This difference illustrates the effect that a commercially available technology can have on the waste estimate. The UFDC assumed that dissolver sparge air is treated by molecular sieves for the removal of naturally occurring carbon dioxide. The resulting waste volume is essentially the C-14 from the fuel. Without this pretreatment process the waste estimate increases by 6 orders of magnitude.

It should also be noted that the participants used various C-14 release assumptions depending upon fuel dissolver residence time with longer residence time resulting in higher release efficiency. If C-14 capture is selected to be a part of the head-end off-gas system the dissolver designs must consider the release of the volatile radionuclides of interest.

3.1.5 Iodine-129

All participants used a silver mordenite as the capture media for I-129 but recognized that the final waste form is still under active investigation. Table 3.1-1 provides seven alternative waste forms which vary by less than 2 orders of magnitude.

3.1.6 Krypton-85

All participants used a cryogenic separations process for recovery of the Kr-85 which is subsequently stored in high pressure gas cylinders awaiting final disposition. The container count estimates vary by a factor of 5 due to varying assumptions regarding the storage pressure which ranged from 2,400 psi (163 atm) to 35 atm. A storage facility safety analysis is necessary to determine the maximum storage pressure and to reduce the uncertainty for this waste stream.

Table 3.1-1 Process Waste Comparison Summary

		UNF-1 50 GWd/MT 5yr					UNF-2 50 GWd/MT 50yr				UNF-4 UOX/MOX Blend				
Waste	Description	Bulk Density	Mass (kg/MT)	Volume (Liters/MT)	Container Description	Container / yr	Bulk Density	Mass (kg/MT)	Volume (Liters/MT)	Container / yr	Bulk Density	Mass (kg/MT)	Volume (Liters/MT)	Container / yr	Basis Decription and other notes
Borosilicate Glass	Fission Products including minor actinides	2.70	567	210	2' dia 15' tall	144	2.70	302	112	77.3	2.70	639	237	163	UNF-1 is limited to 14,000 watts per can ~10 to 12 wt % Waste Loading UNF-2 is limited to 19 wt% waste loading
		2.70	294	108	UC-V (180 liters)	806	2.70	302	112	597	2.70	298	109	922	UC-V cans limited to 2,500 watts per canister or 19% WL
		2.60	572	220	2' dia 15' tall	147	2.60	296	114	76	2.60	637	245	163	14,000 watts per can ~10 to 12 wt % Waste Loading
		2.60	298	112	UC-V (180 liters)	595	2.60	305	114	610	2.60	356	135	714	UC-V limited to 18.5 wt% oxide waste loading = 3,450 watts per can for UNF-1 and 2 UNF-4 limited to 15.7 wt % to limit the alpha radiation dose
		2.75	535	246	2' dia 15' tall	148	2.75	305	140	84	2.75	593	272	164	14,000 watts per can ~10 to 12 wt % Waste Loading, UNF-2 limited to 2.5 wt% MoO_3 loading
		2.75	354	139	UC-V (180 liters)	616	2.75	305	113	531	2.75	392	145	683	UNF-1 and 3 limited to 3,500 watts/canister, UNF-4 limited to 2.5 wt% MoO_3
		2.75	553	211	2' dia 15' tall	126	--	424	160	96	--	622	236	142	UNF-1 and 4 Phosphate Glass limited to 16,300 watts/canister, UNF-2 limited to 4 wt% Noble metals
		2.75	249	105	2' dia 15' tall	64	--	192	81	48	--	282	120	72	glass ceramic limited to 24,700 watts/can (K=1.2, *ρ=3.2)*
Compacted Metal	Hulls and Hardware - compacted	1.80	302	168	26" dia 10' tall	158	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	
		4.50	300	98	24"dia 10' tall	98	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	
		4.50	300	98	UC-C (180 liters)	520	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	
		4.00	300	74	24" dia 10' tall	67	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	60% of the base metal density
Grouted H-3	Tritiated water - grouted	2.00	4	4	55 gal drum	18.4	n/c	--	n/c	n/c	n/c	--	n/c	n/c	44 wt% waste , 56 wt% grout
		2.00	--	4,000	4 m^3 boxes	1,000	n/c	--	n/c	n/c	n/c	--	n/c	n/c	
		2.30	35	43	10 liter bottle in 1 ft^3 (28.3 liter)	1,200	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	
Grouted C-14	Caustic captured C - grouted	2.30	11	9.7	55 gal drum	43	n/c	--	n/c	n/c	n/c	--	n/c	n/c	44 wt% slurry
		2.00	150	75	4 m^3 boxes	15	n/c	--	n/c	n/c	n/c	--	n/c	n/c	
		2.30	2E-06	1E-06	55 gal drum	4E-06	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	UFD assumed CO_2 free process air
Compressed Gas	Cryogenic separated Kr	0.57	0.54	0.95	type A Cylinder	15.5	0.57	0.52	0.91	14.8	0.57	0.52	0.9	14.7	2400 psi, containing 680 watts per cylinder
		--	--	--	type A Cylinder	77	--	--	--	0					35 Bar
		--	0.70	3.7	type A Cylinder	67	--	n/c	n/c	n/c	--	n/c	n/c	n/c	50 atm
I-129	I-129 on Mordenite	0.94	4.3	4.6	55 gal drum	18.5	n/c	--	n/c	n/c	4.4	--	4.7	19.1	142mg I/g mordenite 57.4% loading but no waste form identified
		1.80	20.0	11	55 gal drum	43	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	grouted mordenite
		7.00	17.5	2.6	2' dia x 15' tall	2	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	BiPBO glass
		4.00	2.5	0.625	55 gal drum	3	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	Synroc HIP
		2.30	9.0	4	55 gal drum	15.4	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	grouted mordenite
		--	44.0	10	55 gal drum	38.6	--	n/c	n/c	n/c	--	n/c	n/c	n/c	Bi Phospahte glass encapsulating mordenite
		--	1.8	0.85	55 gal drum	3.3	--	n/c	n/c	n/c	--	n/c	n/c	n/c	functional aerogels
		--	0.7	0.23	55 gal drum	0.9	--	n/c	n/c	n/c	--	n/c	n/c	n/c	Chalcogenids

Table 3.1-1 (continued)

Legend				
Red	Energy solutions			
Black	Areva			
Tan	UFD			
n/c	No Change from the UFD-1 Fuel Waste			
--	No Information found in report			

3.2 Secondary Waste

Secondary waste estimates for recycling and fuel fabrication from four sources are compared in this section. The four sources are identified as follows:

- AREVA - estimates of secondary waste from recycling and fabrication of MOX and fast reactor fuel provided by AREVA for Task Order 9.
- Energy*Solutions* - estimates of secondary waste from recycling and fabrication of MOX and fast reactor fuel provided by Energy*Solutions* for Task Order 9.
- UFD/EAS - estimates of secondary waste from recycling and fabrication of MOX reactor fuel provided by the UFDC. Recycling wastes are based on the EAS/FOEAS information developed for the GNEP program (see Section 2.1); hence, the "UFD/EAS" designation. MOX fuel fabrication waste estimates are not based on EAS or FOEAS data; therefore, a designation of simply "UFD" is used for MOX fuel fabrication waste estimates. There are no UFD waste estimates for fast reactor fuel fabrication.
- UFD 2012 - estimates of waste from recycling based on work conducted by the UFDC in FY 2012. The as-generated waste volumes are identical to the as-generated waste volumes from the UFD/EAS waste estimates; however, final waste volumes differ due to the reclassification of waste based on radionuclide content derived from representative fuel types and process material balances. There are no UFD-2012 waste estimates for MOX fuel fabrication or fast reactor fuel fabrication.

Although the intent of Task Order 9 was to provide a common basis for the waste estimates provided by AREVA and Energy*Solutions* and to allow comparison to the prior UFD secondary waste estimates, several differences still exist that complicate a direct comparison to the UFD estimates. These differences are discussed below.

Used nuclear fuel type/characteristics

As requested in Task Order 9, estimates of secondary waste are provided by AREVA and Energy*Solutions* for recycling UNF1, UNF2 and UNF4 used nuclear fuel. Energy*Solutions* also provided estimates of waste for recycling UNF3 fuel even though UNF3 fuel was replaced by UNF4 fuel as work on the task order progressed. Energy*Solutions*' waste estimates based on UNF4 are not included in this report.

The UFD/EAS secondary waste estimates for recycling [Jones 2011] were not based on any particular used fuel; however, work conducted in FY 2012 [Jones 2012] reclassified the waste streams identified by the UFD/EAS estimates based on specific fuel characteristics (i.e. burnup and cooling time) and similar waste treatment assumptions (e.g. compaction). Unfortunately, the fuel types used for the UFD 2012 work are not the same as the fuel types specified in Task Order 9 (e.g. UNF1, UNF2, etc.). Two used fuel types were chosen to correspond to the UNF1, UNF2 and UNF4 used fuel types specified in Task Order 9. The used fuel chosen to correspond to UNF1 and UNF4 is a fuel with a burnup of 60 GWd/MT and a cooling time of 5 years (versus 50 GWd/MT and 5 years for UNF1 and UNF4). The used fuel chosen to correspond to UNF2 is a fuel with a burnup of 60 GWd/MT and a cooling time of 30 years (versus 50 GWd/MT and 50 years for UNF1).

Waste packaging

The type of final waste packages specified by AREVA, Energy*Solutions* and UFD are not all the same, making a comparison of the waste estimates based on waste package quantity difficult. Because of the different waste packages assumed for each waste estimate, the waste package quantity is converted to volume (m^3) to provide a common basis for comparison. Table 3.2-1 shows the various waste packages used in the waste estimates.

Table 3.2-1 Secondary Waste Packages

Waste Classification	**Waste Characteristic**	**AREVA**	**Energy*Solutions***	**UFD/EAS and UFD 2012**
Class A	Non-compactable	4 m^3 box		
	Compactable	4 m^3 box	3 compacted 55 gallon drums in one 110 gallon drum	
	Resins		High integrity container	
Class C	Non-compactable	4 m^3 box		
	Compactable	4 m^3 box		
	Encapsulated		55 gallon drum	
	Grouted		High integrity container	
Class A/B/C [1]	Non-compactable			2.5 m^3 box
	Compactable			2.5 m^3 box
	Grouted			1.2 m^3 box
	Resins			High integrity container
	Large items			Engineered container
GTCC	Unspecified			55 gallon drum or WIPP standard waste box
	Non-TRU	High integrity container		
	TRU	55 gallon drum		
	Contact handled compactable		3 compacted 55 gallon drums in one 110 gallon drum	
	Remote handled		Special overpack	
	Large items			Engineered container

1. The original UFD waste estimates for recycling do not distinguish between Class A, B and C waste. The original UFD waste estimates combine these waste classifications together, i.e. Class A/B/C. The UFD 2012 waste estimates do distinguish between Class A, B and C waste; however, in general the same waste package is used regardless of whether the waste is classified a Class A, B or C.

Receipt of short cooled versus long cooled fuel

As work progressed on Task Order 9, the assumptions regarding receipt of used fuel at the recycling facility were clarified. Short cooled fuel (e.g. UNF1) is assumed to be received in reusable, bolted-lid casks; therefore, no waste resulting from opening multi-purpose canisters (MPCs) is generated. Long cooled fuel is assumed to be received in MPCs. One hundred percent of the MPCs opened are assumed to be unsuitable for reuse; therefore, all MPCs are regarded as waste. Both AREVA's and Energy*Solutions*' waste estimates reflect these assumptions.

The original UFD/EAS and UFD 2012 estimates assumed that all used fuel was received in MPCs and that only 10% of the MPCs were disposed (i.e. 90% were reusable). For consistency with Task Order 9, the UFD/EAS and UFD 2012 estimates were modified to reflect the Task Order 9 assumptions regarding receipt of used fuel in MPCs. The UFD/EAS waste estimate is not based on any specific used fuel type; however, two separate UFD/EAS waste estimates are presented. The only difference between the two UFD/EAS estimates of waste volume is the volume associated with MPCs. In other words, if the waste volume for UNF1 is subtracted from the waste volume for UNF2, the difference is entirely attributable to MPCs. This is not the case for the UFD 2012 waste estimates. Although the as-generated waste volumes for the UFD/EAS and UFD 2012 waste estimates are identical, other assumptions regarding waste classification and waste treatment methods affect the volumes of other waste streams. For this reason, one cannot simply subtract the UFD 2012 UNF1 waste estimate from the UFD 2012 UNF2 estimate to determine the volume of waste attributable to the disposal of MPCs. Nevertheless, the UFD 2012 waste estimates were also modified to reflect the Task Order 9 assumptions regarding receipt of used fuel in MPCs [Jones 2013b].

Classification of waste

The classification of wastes identified by AREVA and Energy*Solutions* is based on their experience and interpretation of the regulatory requirements contained in 10 CFR 61. AREVA and Energy*Solutions* both identify waste as either Class A, Class B, Class C or GTCC (Note: Neither AREVA nor Energy*Solutions* identified any Class B secondary waste streams).

The UFD/EAS waste estimates did not distinguish between Class A, Class B and Class C waste. The UFD/EAS waste estimates combine these wastes into a single Class A/B/C waste classification. The UFD/EAS waste estimates quantify GTCC waste separately. The UFD/EAS waste classifications are arbitrarily assigned based on the source of the waste (i.e. functional area).

The UFD 2012 waste estimates provide separate Class A, Class B, Class C and GTCC waste estimates. The UFD 2012 waste classifications are based on the content of specific radionuclides as defined in 10 CFR 61.

UFD waste volume

During the course of preparing this report comparing estimates of secondary waste from recycling, it was realized that the original UFD/EAS waste estimate [Jones 2011] and consequently the UFD 2012 secondary waste estimate [Jones 2012] contained several oversights that produced an overly conservative estimate. These oversights were corrected and are documented in a revision to the original UFD report [Jones 2013]. The UFD/EAS and UFD 2012 waste estimates presented in this report reflect these corrections.

In Sections 3.2.1 through 3.2.9 that follow, the AREVA, Energy*Solutions*, UFD/EAS and UFD 2012 estimates of waste from recycling are compared by process function. The first table in each section compares the waste estimates by waste classification (i.e. Class A, Class B, Class C, Class A/B/C, GTCC, Mixed Class A/B/C and Mixed GTCC). The next three tables in each section compare the waste estimates by waste type (e.g. operational waste streams, job control waste, maintenance waste, etc.) for UNF1, UNF2 and UNF3 used fuel. Observations are provided after the tables. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

An overall summary of wastes from all process functions related to recycling is provided in Section 3.2.10. The first table compares the waste estimates by waste classification similar to the first table in Sections 3.2.1 through 3.2.9. The second table summarizes the comparison by functional area. The next three tables compare the waste estimates by waste type similar to the tables in Sections 3.2.1 through 3.2.9. Observations are provided after the tables.

Appendices A through I provide greater detail regarding the waste streams from recycling for each of the four sources (i.e. AREVA, Energy*Solutions*, UFD/EAS and UFD 2012). The UFD waste estimates were originally developed based on a "bottoms up" approach; therefore, a great amount of detail is inherent in the UFD waste estimates. The UFD estimates group the waste streams into sub categories: operational waste, job control waste and maintenance waste. The AREVA and Energy*Solutions* waste estimates are based on their operational experience; however, the method of data collection and record keeping relevant to individual waste streams and their source does not allow for a level of detail consistent with the UFD data. AREVA does, however, distinguish a combined job control and maintenance waste stream by functional area. With a couple of exceptions, Energy*Solutions* combines all job control and maintenance waste ("ad hoc" waste in their terminology) and reports this waste in the Balance of Plant functional area. Both AREVA and Energy*Solutions* provide estimates of individual operational waste streams (e.g. MPCs, solvent residue, ion exchange resins, etc.).

Sections 3.2.11 and 3.2.12 compare the estimates of waste from MOX fuel fabrication and fast reactor fuel fabrication respectively. Unlike the waste estimates for recycling, there is only one UFD estimate for MOX fuel fabrication. There is no UFD waste estimate for fast reactor fuel fabrication. Similar to the waste estimates for recycling, all volumes shown are final packaged waste volumes in cubic meters. Appendices J and K provide greater detail regarding the waste streams from MOX Fuel Fabrication and Fast Reactor Fuel Fabrication respectively.

3.2.1 Receipt and Storage

The Receipt and Storage functional area receives used fuel in either reusable, bolted-lid casks (short cooled fuel) or MPCs (long cooled fuel). Operations conducted in the Receipt and Storage functional area include unloading of casks, fuel transfer, interim storage, decontamination of casks, and cask maintenance.

AREVA based their waste volumes from this functional area on wet storage of used fuel. The storage pool is assumed to have a capacity of 660 baskets to contain a 3 year supply of used fuel; split between 65% PWR used fuel assemblies and 35% BWR assemblies. The water in the pool is cooled, treated and continuously filtered.

Energy*Solutions* assumes dry storage of used fuel in casks on outdoor dry storage pads. A used fuel pool is provided primarily for cask unloading and fuel transfer operations. The pool size is minimized to limit water processing operations.

The UFD waste estimates assume two fuel storage pools and interconnecting canals with a total capacity equivalent to one year supply of used fuel. An additional one year supply of used fuel is assumed to be stored dry.

Table 3.2.1-1 below compares the secondary waste estimates for the Receipt and Storage functional area of recycling by waste classification. Tables 3.2.1-2 through 3.2.1-4 compare the secondary waste estimates for the Receipt and Storage functional area by waste type. Observations are provided after the tables.

Table 3.2.1-1 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Classification

Receipt and Storage - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		198.73	102.2			200.73	762.2	872.0		102.2	
Class B		2.63				0.00					
Class C		16.29	5.7			16.29	5.7			5.7	
Class A/B/C	277.2	217.7	107.9		877.2	217.0	767.9	872.0	277.2	107.9	
GTCC		13.5				613.5					
Mixed Class A/B/C	0.4	0.5			0.4	0.5			0.4		
Mixed GTCC		0.0				0.0					
Total All Wastes	277.5	231.6	107.9		877.5	831.0	767.9	872.0	277.5	107.9	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.1-2 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF1

Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF1								
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Used Multi-Purpose Canisters (MPCs)			0.0			0.0		0.0
Machining chips from MPCs			0.1	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste	
Fuel cask and canister decontamination wipes			36.0					
Fuel cask and canister decontamination filters			14.1					
Filtered solids			6.3					
Pool sludge			18.6					
Dewatered resin			12.8			7.2		See Note 1
Other Class A/B/C Secondary Waste	Job Control	173.3	189.4	Class A	95.0	100.7		See Balance of Plant
	Maintenance	16.1		Class C	5.7			
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0		
	Maintenance	0.0						
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.4			0.0		
	Maintenance	0.4						
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0		
	Maintenance	0.0						
Total			277.5			107.9		

1. Energy*Solutions* reports all resins in the Liquid Effluent Processing functional area as Spent Ion Exchange Resins.
2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.1-3 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF2

Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF2								
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Used Multi-Purpose Canisters (MPCs)			600.0			660.0		872.0
Machining chips from MPCs			0.1	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste	
Fuel cask and canister decontamination wipes			36.0					
Fuel cask and canister decontamination filters			14.1					
Filtered solids			6.3					
Pool sludge			18.6					
Dewatered resin			12.8			7.2		See Note 1
Other Class A/B/C Secondary Waste	Job Control	173.3	189.4	Class A	95.0	100.7		See Balance of Plant
	Maintenance	16.1		Class C	5.7			
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0		
	Maintenance	0.0						
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.4			0.0		
	Maintenance	0.4						
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0		
	Maintenance	0.0						
Total			877.5			767.9		872.0

1. Energy*Solutions* reports all resins in the Liquid Effluent Processing functional area as Spent Ion Exchange Resins.
2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.1-4 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF4

Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Used Multi-Purpose Canisters (MPCs)			0.0			0.0	0.0
Machining chips from MPCs			0.1	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste
Fuel cask and canister decontamination wipes			36.0				
Fuel cask and canister decontamination filters			14.1				
Filtered solids			6.3				
Pool sludge			18.6				
Dewatered resin			12.8			7.2	See Note 1
Other Class A/B/C Secondary Waste	Job Control	173.3	189.4	Class A	95.0	100.7	See Balance of Plant
	Maintenance	16.1		Class C	5.7		
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.4			0.0	
	Maintenance	0.4					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			277.5			107.9	

1. Energy*Solutions* reports all resins in the Liquid Effluent Processing functional area as Spent Ion Exchange Resins.
2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- The differences between the Class A waste estimates (Class A/B/C for UFD/EAS) for the UNF1/UNF4 and UNF2 scenarios for AREVA, Energy*Solutions* and UFD/EAS are primarily attributable to the assumptions regarding receipt of short cooled fuel in reusable, bolted-lid casks and long cooled fuel in MPCs. AREVA provides a packaged waste volume of 660 m^3 for MPCs. Energy*Solutions* provides a waste volume of 872 m^3. UFD/EAS provides a volume of 600 m^3. The difference in waste volume is probably attributable to the specific MPC assumed, the ratio of PWR fuel to BWR fuel received and the final disposal configuration.
- The UFD 2012 waste estimate also provides an MPC waste volume of 600 m^3 as expected (same as UFD/EAS); however, the classification provided by UFD 2012 is GTCC instead of Class A for all others (Class A/B/C for UFD/EAS). The difference in classification is explained by the assumption in the UFD 2012 waste estimates that the MPCs are contaminated with the full distribution of radionuclides present in the used fuel. AREVA on the other hand only assumes the presence of ^{60}Co and ^{63}Ni from the corrosion of fuel cladding. It is planned to revise the UFD 2012 waste estimates to incorporate AREVA's approach; however, this was not done prior to the completion of this report.
- The UFD and AREVA waste estimates are fairly close. A functional area comparison to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy*Solutions* terminology) from the Receipt and Storage functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any GTCC or Mixed Class A/B/C waste.

3.2.2 Head End

The Head End functional area receives used fuel from the Receipt and Storage functional area. The used fuel is cut into segments and transferred to the dissolver. The used fuel is dissolved leaving behind the cladding and other fuel hardware which is washed, compacted and disposed as process waste. The undissolved solids are removed from the dissolved used fuel solution and are ultimately combined in the vitrified high level waste. The dissolved used fuel is transferred to the Separations functional area for further processing.

Basic process operations assumed by AREVA, Energy*Solutions* and UFD are essentially the same. The only major difference is that AREVA assumes the use of continuous dissolvers; whereas, Energy*Solutions* and UFD assume the use of batch dissolvers.

Table 3.2.2-1 below compares the secondary waste estimates for the Head End functional area of recycling by waste classification. Tables 3.2.2-2 through 3.2.2-4 compare the secondary waste estimates for the Head End functional area by waste type. Observations are provided after the tables.

Table 3.2.2-1 Head End - Summary of Secondary Waste Estimates by Waste Classification

Head End - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		66.20	103.0			66.20	103.0			103.0	
Class B		0.00				0.00					
Class C		24.50	17.2	2.8		32.69	17.2	2.8		22.9	2.8
Class A/B/C	154.9	90.7	120.2	2.8	154.9	98.9	120.2	2.8	154.9	125.9	2.8
GTCC	0.4	124.5	16.6		0.4	118.3	16.6		0.4	16.6	
Mixed Class A/B/C	8.7	1.6			8.7	1.6			8.7		
Mixed GTCC		0.0				0.0					
Total All Wastes	164.0	216.7	136.7	2.8	164.0	218.7	136.7	2.8	164.0	142.4	2.8

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.2-2 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF1

Head End - Summary of Secondary Waste Estimates by Waste Type for UNF1							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Other Class A/B/C Secondary Waste	Job Control	120.3	154.9	Class A	103.0	120.2	See Balance of Plant
	Maintenance	34.6		Class C	17.2		
Other GTCC Secondary Waste	Job Control	0.0	0.4			16.6	
	Maintenance	0.4					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	8.7			0.0	
	Maintenance	8.7					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			164.0			136.7	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.2-3 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF2

Head End - Summary of Secondary Waste Estimates by Waste Type for UNF2							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Other Class A/B/C Secondary Waste	Job Control	120.3	154.9	Class A	103.0	120.2	See Balance of Plant
	Maintenance	34.6		Class C	17.2		
Other GTCC Secondary Waste	Job Control	0.0	0.4			16.6	
	Maintenance	0.4					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	8.7			0.0	
	Maintenance	8.7					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			164.0			136.7	0.0

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.2-4 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF4

Head End - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Other Class A/B/C Secondary Waste	Job Control	120.3	154.9	Class A	103.0	125.9	See Balance of Plant
	Maintenance	34.6		Class C	22.9		
Other GTCC Secondary Waste	Job Control	0.0	0.4			16.6	
	Maintenance	0.4					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	8.7			0.0	
	Maintenance	8.7					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			164.0			142.4	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- No specific operational waste streams are identified by AREVA, Energy*Solutions*, UFD/EAS or UFD 2012.
- Energy*Solutions* identifies shear blades as a specific maintenance waste (not specifically indicated in the tables above, see Appendix B).
- AREVA, UFD/EAS and UFD 2012 Class A/B/C waste estimates are fairly close. The UFD 2012 GTCC waste volume is substantially greater than the UFD/EAS and AREVA waste estimates. Total waste for AREVA, UFD/EAS and UFD 2012 is comparable even with the large discrepancy in GTCC waste between the UFD 2012 estimate and the AREVA and UFD /EAS estimates.
- A functional area comparison to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e “ad hoc” waste in Energy*Solutions* terminology) except shear blades from the Head End functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

3.2.3 Separations

The Separations functional area separates fission products and actinides from U and Pu, partially separates U from Pu and purifies the U and U/Pu streams to comply with product specifications. The Separations functional area encompasses the solvent recovery operations and high activity waste handling operations.

Basic process operations assumed by AREVA, Energy*Solutions* and UFD are essentially the same; however, one major difference is in how tritium contamination is managed in the process. AREVA segregates the separation process into high tritium (HT) and low tritium (LT) zones to control the concentration of tritium in liquid effluents. Energy*Solutions* allows the tritium to pass through to the liquid waste stream where it is concentrated using a combined electrolysis and catalytic process (see the Liquid Effluent Processing functional area, Section 3.2.6). The UFD waste estimates minimize the presence of tritium by using voloxidation in the Head End functional area to drive off and capture tritium before aqueous processing is initiated. See Section 3.1.3 for more information regarding tritium management.

Table 3.2.3-1 below compares the secondary waste estimates for the Separations functional area of recycling by waste classification. Tables 3.2.3-2 through 3.2.3-4 compare the secondary waste estimates for the Separations functional area by waste type. Observations are provided after the tables.

Table 3.2.3-1 Separations - Summary of Secondary Waste Estimates by Waste Classification

Separations - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		88.16	78.9	85.6		145.79	78.9	85.6		78.9	86.1
Class B		66.58				22.97					
Class C		250.65	12.8			289.88	12.8			17.7	
Class A/B/C	571.5	405.4	91.7	85.6	571.5	458.6	91.7	85.6	571.5	96.6	86.1
GTCC		226.0	1.7			160.8	1.7			1.7	
Mixed Class A/B/C	2.4	2.0			2.4	2.0			2.4		
Mixed GTCC		0.0				0.0					
Total All Wastes	573.9	633.4	93.4	85.6	573.9	621.5	93.4	85.6	573.9	98.3	86.1

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.3-2 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF1

Separations - Summary of Secondary Waste Estimates by Waste Type for UNF1							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Solvent residue						12.0	85.6
Other Class A/B/C Secondary Waste	Job Control	321.3	571.5	Class A	66.9	79.7	See Balance of Plant
	Maintenance	250.3		Class C	12.8		
Other GTCC Secondary Waste	Job Control	0.0	0.0			1.7	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	2.4			0.0	
	Maintenance	2.4					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			573.9			93.4	85.6

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.3-3 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF2

Separations - Summary of Secondary Waste Estimates by Waste Type for UNF2							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Solvent residue						12.0	85.6
Other Class A/B/C Secondary Waste	Job Control	321.3	571.5	Class A	66.9	79.7	See Balance of Plant
	Maintenance	250.3		Class C	12.8		
Other GTCC Secondary Waste	Job Control	0.0	0.0			1.7	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	2.4			0.0	
	Maintenance	2.4					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			573.9			93.4	85.6

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.3-4 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF4

Separations - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Solvent residue						12.0	86.1
Other Class A/B/C Secondary Waste	Job Control	321.3	571.5	Class A	66.9	84.6	See Balance of Plant
	Maintenance	250.3		Class C	17.7		
Other GTCC Secondary Waste	Job Control	0.0	0.0			1.7	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	2.4			0.0	
	Maintenance	2.4					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			573.9			98.3	86.1

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- The only operational waste stream identified is solvent residue. Both AREVA and Energy*Solutions* utilize pyrolysis to treat a solvent purge waste stream; however, the final waste form for this waste stream differs. AREVA uses cementation of the resulting ash to stabilize the waste for disposal. Energy*Solutions* uses compaction to produce the final waste form. There is no solvent residue waste stream identified for the UFD waste estimates. The UFD estimates assume that solvent is reconditioned and fresh solvent additions replenish normal solvent losses to the aqueous streams.
- AREVA and UFD 2012 Class A waste estimates are fairly close (even without consideration of the solvent residue waste stream reported by AREVA); however, the UFD/EAS and UFD 2012 waste estimates differ significantly from a total Class A/B/C and overall total waste perspective. probable explanation for these significant differences is the basis for operations inherent in the UFD waste estimates which assumes remote operation and maintenance of high maintenance solvent extraction equipment (e.g. centrifugal contactors - rotating machinery) versus AREVA and Energy*Solutions* use of highly reliable equipment (e.g. pulse columns - no moving parts).
- A functional area comparison of job control and maintenance waste to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e “ad hoc” waste in Energy*Solutions* terminology) from the Separations functional area in the Balance of Plant functional area.
- The UFD 2012 waste estimate allocates a substantial portion of the waste streams considered Class A/B/C waste in the UFD/EAS waste estimates to GTCC waste.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

3.2.4 Solidification

The Solidification functional area converts the aqueous U and U/Pu product streams to a solid phase for fuel fabrication or interim storage.

Basic process operations assumed by AREVA, Energy*Solutions* and UFD are essentially the same. The U product solution is converted to UO_3 by thermal denitration. The U/Pu product solution is converted to an oxide by oxalate precipitation and calcination.

Table 3.2.4-1 below compares the secondary waste estimates for the Solidification functional area of recycling by waste classification. Tables 3.2.4-2 through 3.2.4-4 compare the secondary waste estimates for the Solidification functional area by waste type. Observations are provided after the tables.

Table 3.2.4-1 Solidification - Summary of Secondary Waste Estimates by Waste Classification

Solidification - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		142.96	61.6			142.96	61.6			61.6	
Class B		0.00				0.00					
Class C		65.29	49.3			65.29	49.3			76.2	
Class A/B/C	189.5	208.2	110.9		189.5	208.2	110.9		189.5	137.8	
GTCC	252.1	73.8	23.0		252.1	73.8	23.0		252.1	40.0	
Mixed Class A/B/C	0.8	1.0			0.8	1.0			0.8		
Mixed GTCC		0.1				0.1					
Total All Waste	442.4	283.2	133.9		442.4	283.2	133.9		442.4	177.8	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.4-2 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF1

Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF1							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Inner containers (bagless transfer stub pieces)			0.6	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste
Inner containers (bagless transfer stub pieces)			9.8				
Outer containers			0.01				
Inner containers (including convenience cans)			0.04				
Other Class A/B/C Secondary Waste	Job Control	148.6	188.9	Class A	61.6	110.9	See Balance of Plant
	Maintenance	40.3		Class C	49.3		
Other GTCC Secondary Waste	Job Control	224.7	242.3			23.0	
	Maintenance	17.5					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.8			0.0	
	Maintenance	0.8					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			442.4			133.9	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.4-3 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF2

Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF2							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Inner containers (bagless transfer stub pieces)			0.6	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste
Inner containers (bagless transfer stub pieces)			9.8				
Outer containers			0.01				
Inner containers (including convenience cans)			0.04				
Other Class A/B/C Secondary Waste	Job Control	148.6	188.9	Class A	61.6	110.9	See Balance of Plant
	Maintenance	40.3		Class C	49.3		
Other GTCC Secondary Waste	Job Control	224.7	242.3			23.0	
	Maintenance	17.5					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.8			0.0	
	Maintenance	0.8					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			442.4			133.9	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.4-4 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF4

Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Inner containers (bagless transfer stub pieces)			0.6	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste
Inner containers (bagless transfer stub pieces)			9.8				
Outer containers			0.01				
Inner containers (including convenience cans)			0.04				
Other Class A/B/C Secondary Waste	Job Control	148.6	188.9	Class A	61.6	137.8	See Balance of Plant
	Maintenance	40.3		Class C	76.2		
Other GTCC Secondary Waste	Job Control	224.7	242.3			40.0	
	Maintenance	17.5					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.8			0.0	
	Maintenance	0.8					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			442.4			177.8	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- Operational waste streams identified pertain to canning of U/Pu product oxide. Only the UFD estimates specifically identify waste from canning operations. AREVA assumes the use of reusable product cans. Presumably, Energy*Solutions* assumes the use of reusable cans or either includes canning waste in their "ad hoc" operational waste reported in the Balance of Plant functional area. The canning waste reported by the UFD estimates is relatively minor.
- AREVA and UFD Class A/B/C waste estimates are fairly close; however, the UFD/EAS and UFD 2012 waste estimates differ somewhat in regards to GTCC waste (UFD/EAS more so than UFD 2012). The UFD 2012 estimates for GTCC waste are in closer agreement with AREVA's; however, the UFD/EAS estimates differ by an order of magnitude. The UFD/EAS waste estimate does not consider compaction of GTCC waste; however, the UFD 2012 waste estimate does incorporate compaction of GTCC waste. This along with some reclassification of waste in the UFD 2012 estimate (relative to the UFD/EAS estimate) is a likely explanation for the difference in GTCC waste volumes identified by the UFD/EAS and UFD 2012 estimates.
- The UFD/EAS waste estimate arbitrarily assumes a high fraction of the waste streams from the Solidification functional area is GTCC waste. This assumption is not supported by the UFD 2012 waste estimate which uses actual fuel radionuclide distributions and material balance data to characterize the waste streams.
- A functional area comparison of job control and maintenance waste to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy*Solutions* terminology) from the Solidification functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste. The UFD 2012 waste estimate reclassifies some of the Mixed Class A/B/C waste as Mixed GTCC waste.

3.2.5 Acid Recovery

The Acid Recovery functional area recovers nitric acid from liquid waste streams from the Separations and Solidification functional areas.

Basic process operations assumed by AREVA, Energy*Solutions* and UFD are essentially the same. AREVA does divide their liquid waste streams into high tritium and low tritium streams as part of their tritium management plan.

Table 3.2.5-1 below compares the secondary waste estimates for the Acid Recovery functional area of recycling by waste classification. Tables 3.2.5-2 through 3.2.5-4 compare the secondary waste estimates for the Solidification functional area by waste type. Observations are provided after the tables.

Table 3.2.5-1 Acid Recovery - Summary of Secondary Waste Estimates by Waste Classification

Acid Recovery - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		55.26	1060.4			55.26	1060.4			1060.4	
Class B		12.00				12.00					
Class C		0.00				0.00					
Class A/B/C	56.0	67.3	1060.4		56.0	67.3	1060.4		56.0	1060.4	
GTCC		0.0				0.0					
Mixed Class A/B/C	0.6	0.5			0.6	0.5			0.6		
Mixed GTCC		0.0				0.0					
Total All Wastes	56.6	67.8	1060.4		56.6	67.8	1060.4		56.6	1060.4	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.5-2 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF1

Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF1							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Excess nitrates	See Note 1					1060.4	
Other Class A/B/C Secondary Waste	Job Control	26.5	56.0	Class A	0.0	0.0	See Balance of Plant
	Maintenance	29.5		Class C	0.0		
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.6			0.0	
	Maintenance	0.6					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			56.6			1060.4	

1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream reported in the Liquid Effluent Processing functional area.
2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.5-3 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF2

Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF2							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Excess nitrates	See Note 1					1060.4	
Other Class A/B/C Secondary Waste	Job Control	26.5	56.0	Class A	0.0	0.0	See Balance of Plant
	Maintenance	29.5		Class C	0.0		
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.6			0.0	
	Maintenance	0.6					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			56.6			1060.4	

1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream reported in the Liquid Effluent Processing functional area.
2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.5-4 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF4

Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Excess nitrates	See Note 1					1060.4	
Other Class A/B/C Secondary Waste	Job Control	26.5	56.0	Class A	0.0	0.0	See Balance of Plant
	Maintenance	29.5		Class C	0.0		
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.6			0.0	
	Maintenance	0.6					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			56.6			1060.4	

1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream reported in the Liquid Effluent Processing functional area.
2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- The UFD waste estimates identify a solidified waste water stream (in the Liquid Effluent Processing functional area) that includes the equivalent of the excess nitrate waste stream reported here by AREVA. AREVA also identifies a separate salt bearing waste stream (1,232.0 m^3) in the Liquid Effluent Processing functional area. AREVA's total solidified waste water stream is, therefore, 2,292.4 m^3 (1,060.4 + 1,232.0 = 2,292.4) compared to the UFD/EAS (and UFD 2012) total of 1,200 m^3.
- AREVA does not identify any job control or maintenance waste associated with the Acid Recovery functional area. The volume of job control and maintenance wastes identified in the UFD/EAS and UFD 2012 waste estimates are minimal relative to other functional areas.
- A functional area comparison of job control and maintenance waste to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy*Solutions* terminology) from the Acid Recovery functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

3.2.6 Liquid Effluent Processing

The Liquid Effluent Processing functional area decontaminates waste streams primarily from the Acid Recovery functional area prior to release to the environment. Concentrated active wastes are immobilized for disposal as solid waste.

Basic process operations assumed by AREVA, Energy*Solutions* and UFD are essentially the same (e.g. evaporation, filtration, etc.); however, operations regarding tritium management are substantially different (see Section 3.1.3 for further discussion of tritium management approaches).

Table 3.2.6-1 below compares the secondary waste estimates for the Liquid Effluent Processing functional area of recycling by waste classification. Tables 3.2.6-2 through 3.2.6-4 compare the secondary waste estimates for the Liquid Effluent Processing functional area by waste type. Observations are provided after the tables.

Table 3.2.6-1 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Classification

Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		76.12	1293.6	1880.1		76.12	1293.6	1880.1		1293.6	1880.1
Class B		1,200.00				1,200.00					
Class C		0.00	1.3	1709.7		0.00	1.3	1709.7		1.3	1692.6
Class A/B/C	1271.8	1276.1	1294.9	3589.8	1271.8	1276.1	1294.9	3589.8	1271.8	1294.9	3572.7
GTCC		0.0				0.0					
Mixed Class A/B/C		0.0				0.0					
Mixed GTCC		0.0				0.0					
Total All Wastes	1271.8	1276.1	1294.9	3589.8	1271.8	1276.1	1294.9	3589.8	1271.8	1294.9	3572.7

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.6-2 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF1

Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF1							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Solidified waste water			1200.0	See Note 2			See Note 4
Spent Ion Exchange Resins (including from Fuel Receipt)	See Note 1			See Note 3			1880.1
Salt-bearing waste						1232.0	1709.7
Other Class A/B/C Secondary Waste	Job Control	Note 5	71.8	Class A	61.6	62.9	See Balance of Plant
	Maintenance	71.8		Class C	1.3		
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			1271.8			1294.9	3589.8

1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes spent ion exchange resins in Maintenance waste.
2. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream. AREVA includes excess nitrates in the Acid Recovery functional area (see Section 3.2.5).
3. No specific resin waste streams were identified by AREVA for the Liquid Effluent Processing functional area.
4. Other than the salt bearing waste stream identified by Energy*Solutions*, the only other solidified liquid waste stream identified by Energy*Solutions* is tritium waste. Tritium waste is a process waste and not included here as a secondary waste (see Section 3.1.3).
5. Job control waste for the Liquid Effluent Processing functional area is included in the job control waste for the Balance of Plant functional area.
6. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.6-3 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF2

Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF2							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Solidified waste water			1200.0	See Note 2			See Note 4
Spent Ion Exchange Resins (including from Fuel Receipt)	See Note 1			See Note 3			1880.1
Salt-bearing waste						1232.0	1709.7
Other Class A/B/C Secondary Waste	Job Control	Note 5	71.8	Class A	61.6	62.9	See Balance of Plant
	Maintenance	71.8		Class C	1.3		
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			1271.8			1294.9	3589.8

1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes spent ion exchange resins in Maintenance waste.
2. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream. AREVA includes excess nitrates in the Acid Recovery functional area (see Section 3.2.5).
3. No specific resin waste streams were identified by AREVA for the Liquid Effluent Processing functional area.
4. Other than the salt bearing waste stream identified by Energy*Solutions*, the only other solidified liquid waste stream identified by Energy*Solutions* is tritium waste. Tritium waste is a process waste and not included here as a secondary waste (see Section 3.1.3).
5. Job control waste for the Liquid Effluent Processing functional area is included in the job control waste for the Balance of Plant functional area.
6. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.6-4 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF4

Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Solidified waste water			1200.0	See Note 2			See Note 4
Spent Ion Exchange Resins (including from Fuel Receipt)	See Note 1			See Note 3			1880.1
Salt-bearing waste						1232.0	1692.6
Other Class A/B/C Secondary Waste	Job Control	Note 5	71.8	Class A	61.6	62.9	See Balance of Plant
	Maintenance	71.8		Class C	1.3		
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			1271.8			1294.9	3572.7

1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes spent ion exchange resins in Maintenance waste.
2. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream. AREVA includes excess nitrates in the Acid Recovery functional area (see Section 3.2.5).
3. No specific resin waste streams were identified by AREVA for the Liquid Effluent Processing functional area.
4. Other than the salt bearing waste stream identified by Energy*Solutions*, the only other solidified liquid waste stream identified by Energy*Solutions* is tritium waste. Tritium waste is a process waste and not included here as a secondary waste (see Section 3.1.3).
5. Job control waste for the Liquid Effluent Processing functional area is included in the job control waste for the Balance of Plant functional area.
6. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- Given that different tritium management approaches are taken by AREVA, Energy*Solutions* and the UFD waste estimates, the total solidified liquid waste streams are in close agreement.
- A comparison of the job control and maintenance waste between the AREVA and the UFD/EAS waste estimates is not possible since job control waste for UFD/EAS is not reported here but in the Balance of Plant functional area.
- A functional area comparison of job control and maintenance waste to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e “ad hoc” waste in Energy*Solutions* terminology) from the Liquid Effluent Processing functional area in the Balance of Plant functional area.

3.2.7 Vitrification

The Vitrification functional area immobilizes the majority of the radioactivity processed through the facility (e.g. undissolved fines from the Head End functional area, concentrated fission product raffinates from the Separations functional area, etc.).

Basic process operations assumed by AREVA, Energy*Solutions* and UFD are essentially the same, i.e. production of a borosilicate glass waste form.

Table 3.2.7-1 below compares the secondary waste estimates for the Vitrification functional area of recycling by waste classification. Tables 3.2.7-2 through 3.2.7-4 compare the secondary waste estimates for the Vitrification functional area by waste type. Observations are provided after the tables.

Table 3.2.7-1 Vitrification - Summary of Secondary Waste Estimates by Waste Classification

Vitrification - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		16.20	67.8			62.08	67.8			67.8	
Class B		87.50				38.00					
Class C		173.92	6.7			163.02	6.7			9.2	
Class A/B/C	219.3	277.6	74.5		219.3	263.1	74.5		219.3	77.0	
GTCC		0.0	28.2	9.8		0.0	28.2	9.8		28.2	9.8
Mixed Class A/B/C	0.8	43.3			0.8	43.3			0.8		
Mixed GTCC	44.8	0.0			44.8	0.0			44.8		
Total All Wastes	264.9	320.9	102.7	9.8	264.9	306.4	102.7	9.8	264.9	105.2	9.8

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.7-2 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF1

Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF1							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Other Class A/B/C Secondary Waste	Job Control	145.0	219.3	Class A	67.8	74.5	See Balance of Plant
	Maintenance	74.3		Class C	6.7		
Other GTCC Secondary Waste	Job Control	0.0	0.0			28.2	9.8
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.8			0.0	
	Maintenance	0.8					
Other Mixed GTCC Secondary Waste	Job Control	0.0	44.8			0.0	
	Maintenance	44.8					
Total			264.9			102.7	9.8

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.7-3 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF2

Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF2							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Other Class A/B/C Secondary Waste	Job Control	145.0	219.3	Class A	67.8	74.5	See Balance of Plant
	Maintenance	74.3		Class C	6.7		
Other GTCC Secondary Waste	Job Control	0.0	0.0			28.2	9.8
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.8			0.0	
	Maintenance	0.8					
Other Mixed GTCC Secondary Waste	Job Control	0.0	44.8			0.0	
	Maintenance	44.8					
Total			264.9			102.7	9.8

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.7-4 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF4

Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)							
Waste Type	UFD/EAS			AREVA			Energy*Solutions*
Other Class A/B/C Secondary Waste	Job Control	145.0	219.3	Class A	67.8	77.0	See Balance of Plant
	Maintenance	74.3		Class C	9.2		
Other GTCC Secondary Waste	Job Control	0.0	0.0			28.2	9.8
	Maintenance	0.0					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.8			0.0	
	Maintenance	0.8					
Other Mixed GTCC Secondary Waste	Job Control	0.0	44.8			0.0	
	Maintenance	44.8					
Total			264.9			105.2	9.8

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- AREVA and UFD Class A/B/C waste estimates differ by a factor of approximately 3 (UFD/EAS) and 3.7 (UFD 2012).
- AREVA identifies GTCC waste (28.2 m^3); however, the UFD waste estimates do not identify any GTCC waste. The UFD waste estimates do, however, identify 43.3 m^3 of Mixed Class A/B/C waste (UFD 2012) and 44.8 m^3 of Mixed GTCC waste (UFD/EAS). The composition of all these waste streams is probably similar (i.e. failed equipment) and from a volume perspective are in close agreement. The difference, obviously, is in the classification of the waste, particularly in regards to hazardous content. The UFD waste estimates assume that certain failed equipment, particularly equipment incorporating refractory material (e.g. melters), has the potential to contain hazardous constituents, resulting in the mixed waste classifications.
- Energy*Solutions* identified failed melters as a specific item of failed equipment. The volume reported (9.8 m^3 - see Appendix G) is substantially less than that reported in the UFD/EAS waste estimate (41.1 m^3 - see Appendix G).
- Further comparison of job control and maintenance waste to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy*Solutions* terminology) from the Vitrification functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste. Only the UFD/EAS waste estimate identifies any Mixed GTCC waste.

3.2.8 Offgas

The Offgas functional area captures and immobilizes volatile gases from various functional areas such as the Head End and Separations functional areas.

Some of the process operations assumed by AREVA, Energy*Solutions* and UFD differ substantially in the approach to capture and immobilize the relevant process gases. See Section 3.1 for more discussion on the capture and immobilization of the relevant process gases. The immobilized process gas waste forms are considered process wastes and are not reported here as secondary wastes (see Section 3.1).

Table 3.2.8-1 below compares the secondary waste estimates for the Offgas functional area of recycling by waste classification. Tables 3.2.8-2 through 3.2.8-4 compare the secondary waste estimates for the Offgas functional area by waste type. Observations are provided after the tables.

Table 3.2.8-1 Offgas - Summary of Secondary Waste Estimates by Waste Classification

Offgas - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD	AREVA	Energy*Solutions*
Class A		10.97				10.97					
Class B		0.00				0.00					
Class C		0.68				0.68					
Class A/B/C	11.0	11.6			11.0	11.6			11.0		
GTCC	0.3	0.0			0.3	0.0			0.3		
Mixed Class A/B/C	0.5	0.5			0.5	0.5			0.5		
Mixed GTCC		0.0				0.0					
Total All Wastes	11.8	12.1			11.8	12.1			11.8		

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.8-2 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF1

Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF1							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Other Class A/B/C Secondary Waste	Job Control	8.4	11.0	Class A	0.0	0.0	See Balance of Plant
	Maintenance	2.6		Class C	0.0		
Other GTCC Secondary Waste	Job Control	0.0	0.3			0.0	
	Maintenance	0.3					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.5			0.0	
	Maintenance	0.5					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			11.8			0.0	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.8-3 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF2

Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF2							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Other Class A/B/C Secondary Waste	Job Control	8.4	11.0	Class A	0.0	0.0	See Balance of Plant
	Maintenance	2.6		Class C	0.0		
Other GTCC Secondary Waste	Job Control	0.0	0.3			0.0	
	Maintenance	0.3					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.5			0.0	
	Maintenance	0.5					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			11.8			0.0	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.8-4 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF4

Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)							
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***
Other Class A/B/C Secondary Waste	Job Control	8.4	11.0	Class A	0.0	0.0	See Balance of Plant
	Maintenance	2.6		Class C	0.0		
Other GTCC Secondary Waste	Job Control	0.0	0.3			0.0	
	Maintenance	0.3					
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.5			0.0	
	Maintenance	0.5					
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0	
	Maintenance	0.0					
Total			11.8			0.0	

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- AREVA does not identify any job control or maintenance waste for the Offgas functional area.
- A comparison of job control and maintenance waste to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy*Solutions* terminology) from the Offgas functional area in the Balance of Plant functional area.
- The volume of job control and maintenance wastes identified in the UFD waste estimates is minor relative to other functional areas.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

3.2.9 Balance of Plant

The Balance of Plant functional area includes operations that support the main process operations such as analytical laboratories, waste handling, maintenance shops and other facility infrastructure services.

Basic process operations assumed by AREVA, Energy*Solutions* and UFD are essentially the same. Where possible, compaction is used to reduce the volume of wastes processed through the waste handling facilities. Filtration of facility ventilation air is accomplished with HEPA filters prior to discharge to the atmosphere. The UFD waste estimates probably incorporate a greater number of radiologically controlled maintenance shops due to the operating approach inherent in the UFD waste estimates (i.e. remote operation and maintenance of mechanical process equipment in a canyon-like environment versus a dark cell approach to equipment operation and maintenance).

Table 3.2.9-1 below compares the secondary waste estimates for the Balance of Plant functional area of recycling by waste classification. Tables 3.2.9-2 through 3.2.9-4 compare the secondary waste estimates for the Balance of Plant functional area by waste type. Observations are provided after the tables.

Table 3.2.9-1 Balance of Plant - Summary of Secondary Waste Estimates by Waste Classification

Balance of Plant - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		2,436.45	11.9	406.0		2,912.93	11.9	406.0		11.9	406.0
Class B		17.00				0.00					
Class C		625.39	2.2	0.8		173.64	2.2	0.8		3.1	0.8
Class A/B/C	3317.0	3078.8	14.1	406.8	3317.0	3086.6	14.1	406.8	3317.0	15.0	406.8
GTCC	6.4	394.3		8.4	6.4	266.3		8.4	6.4		8.4
Mixed Class A/B/C	13.8	11.7			13.8	11.7			13.8		
Mixed GTCC		0.0				0.0					
Total All Wastes	3337.2	3484.9	14.1	415.2	3337.2	3364.6	14.1	415.2	3337.2	15.0	415.2

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.9-2 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF1

Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF1									
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***		
Packaging waste (low activity)			33.9	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste		
Packaging waste (high activity)			6.4						
Other Class A/B/C Secondary Waste	Job Control	1923.6	3283.2	Class A	11.9	14.1	Class A	406.0	406.8
	Maintenance	1359.6		Class C	2.2		Class C	0.8	
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0			8.4
	Maintenance	0.0							
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	13.8			0.0			0
	Maintenance	13.8							
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0			0
	Maintenance	0.0							
Total			3337.2			14.1			415.2

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.9-3 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF2

Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF2									
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***		
Packaging waste (low activity)			33.9	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste		
Packaging waste (high activity)			6.4						
Other Class A/B/C Secondary Waste	Job Control	1923.6	3283.2	Class A	11.9	14.1	Class A	406.0	406.8
	Maintenance	1359.6		Class C	2.2		Class C	0.8	
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0			8.4
	Maintenance	0.0							
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	13.8			0.0			0
	Maintenance	13.8							
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0			0
	Maintenance	0.0							
Total			3337.2			14.1			415.2

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.9-4 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF4

Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF)									
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***		
Packaging waste (low activity)			33.9	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste			Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste		
Packaging waste (high activity)			6.4						
Other Class A/B/C Secondary Waste	Job Control	1923.6	3283.2	Class A	11.9	15.0	Class A	406.0	406.8
	Maintenance	1359.6		Class C	3.1		Class C	0.8	
Other GTCC Secondary Waste	Job Control	0.0	0.0			0.0			8.4
	Maintenance	0.0							
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	13.8			0.0			0
	Maintenance	13.8							
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0			0.0			0
	Maintenance	0.0							
Total			3337.2			15.0			415.2

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- The volume of waste identified by the UFD/EAS and UFD 2012 waste estimates far exceeds the volume identified by AREVA. The volume of waste identified by the UFD waste estimates even exceeds the volume identified by Energy*Solutions* even though the Energy*Solutions* waste estimate is a rollup of job control and maintenance waste from all other functional areas. The majority of the difference, over 3,000 m^3 of job control and maintenance waste, is comprised of job control waste from radiologically controlled maintenance shops and filters from facility ventilation systems. A likely explanation for the difference in job control waste may be the operating and facility design approach inherent in the UFD waste estimates, i.e. remote operation and maintenance of mechanical process equipment in a canyon-like environment versus a dark cell approach to equipment operation and maintenance. This same operating and facility design approach could also account for some of the difference in facility ventilation filter waste; however, it doesn't seem likely that such a large difference could be expected from the two different approaches. Without actually knowing whether AREVA and Energy*Solutions* included facility ventilation filter waste and knowing the assumptions pertaining to the generation of filter waste (e.g. facility air flow, filter operational life, filter configuration, etc.), it is impossible to compare the waste estimates.
- The volume of waste associated with job control waste from radiologically controlled maintenance shops and facility ventilation filters (over 3,000 m^3 - see above) accounts for the majority of the difference between the UFD total waste estimates and the AREVA and Energy*Solutions* total waste estimates (see Section 3.2.10).
- A comparison of job control and maintenance waste to Energy*Solutions* is not possible since Energy*Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy*Solutions* terminology) from all other functional areas in the Balance of Plant functional area. A comparison of job control and maintenance waste to the Energy*Solutions* waste estimates can only be compared on a total basis, see Section 3.2.10.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

3.2.10 Summary of Secondary Wastes from Recycling

Table 3.2.10-1 below compares the total secondary waste estimates for recycling by waste classification similar to the first table in Sections 3.2.1 through 3.2.9. Table 3.2.10-2 compares the total secondary waste estimates for recycling by functional area. Tables 3.2.10-3 through 3.2.10-5 compare the total secondary waste estimates for recycling by waste type similar to the tables in Sections 3.2.1 through 3.2.9. Observations are provided after the tables.

Table 3.2.10-1 Overall Summary of Secondary Waste Estimates from Recycling by Waste Classification

Overall Summary of Secondary Waste Estimates from Recycling by Waste Classification											
	UNF1				UNF2				UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Class A		3091.0	2779.4	2371.7		3673.0	3439.4	3243.7		2779.4	2372.2
Class B		1385.7	0.0	0.0		1273.0	0.0	0.0		0.0	0.0
Class C		1156.7	95.2	1713.3		741.5	95.2	1713.3		136.1	1696.2
Class A/B/C	6068.3	5633.5	2874.6	4085.0	6668.3	5687.5	3534.6	4957.0	6068.3	2915.5	4068.4
GTCC	259.1	832.1	69.5	18.2	259.1	1232.7	69.5	18.2	259.1	86.5	18.2
Mixed Class A/B/C	27.9	61.1	0.0	0.0	27.9	61.1	0.0	0.0	27.9	0.0	0.0
Mixed GTCC	44.8	0.1	0.0	0.0	44.8	0.1	0.0	0.0	44.8	0.0	0.0
Total All Wastes	6400.1	6526.8	2944.0	4103.2	7000.1	6981.4	3604.0	4975.2	6400.1	3002.0	4086.6

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.10-2 Overall Summary of Secondary Waste Estimates from Recycling by Functional Area

Overall Summary of Secondary Waste Estimates by Functional Area											
	UNF1				UNF2				UNF4 (Blended UNF)		
Functional Area	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	UFD 2012	AREVA	Energy*Solutions*	UFD/EAS	AREVA	Energy*Solutions*
Receipt and Storage	277.5	231.6	107.9		877.5	831.0	767.9	872.0	277.5	107.9	
Head End	164.0	216.7	136.7	2.8	164.0	218.7	136.7	2.8	164.0	142.4	2.8
Separations	573.9	633.4	93.4	85.6	573.9	621.5	93.4	85.6	573.9	98.3	86.1
Solidification	442.4	283.2	133.9		442.4	283.2	133.9		442.4	177.8	
Acid Recovery	56.6	67.8	1060.4		56.6	67.8	1060.4		56.6	1060.4	
Liquid Effluent Processing	1271.8	1276.1	1294.9	3589.8	1271.8	1276.1	1294.9	3589.8	1271.8	1294.9	3572.7
Vitrification	264.9	320.9	102.7	9.8	264.9	306.4	102.7	9.8	264.9	105.2	9.8
Offgas	11.8	12.1			11.8	12.1			11.8		
Balance of Plant	3337.2	3484.9	14.1	415.2	3337.2	3364.6	14.1	415.2	3337.2	15.0	415.2
Total	6400.1	6526.8	2944.0	4103.2	7000.1	6981.4	3604.0	4975.2	6400.1	3002.0	4086.6

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.10-3 Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF1

Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF1									
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***		
Used Multi-Purpose Canisters (MPCs)			0.0			0.0			0.0
Machining chips from MPCs			0.1						
Fuel cask and canister decontamination wipes			36.0						
Fuel cask and canister decontamination filters			14.1						
Filtered solids			6.3						
Pool sludge			18.6						
Dewatered resin			12.8			7.2			
Solvent residue						12.0			85.6
Inner containers (bagless transfer stub pieces)			0.6						
Inner containers (bagless transfer stub pieces)			9.8						
Outer containers			0.01						
Inner containers (including convenience cans)			0.04						
Excess nitrates						1060.4			
Solidified waste water			1200.0						
Salt-bearing waste						1232.0			1709.7
Spent Ion Exchange Resins (including from Fuel Receipt)									1880.1
Packaging waste (low activity)			33.9						
Packaging waste (high activity)			6.4						
Subtotal			1338.5			2311.6			3675.4
Other Class A/B/C Secondary Waste	Job Control	2866.8	4746.0	Class A	467.8	563.0	Class A	406.0	409.6
	Maintenance	1879.1		Class C	95.2		Class C	3.6	
Other GTCC Secondary Waste	Job Control	224.7	242.9			69.5			18.2
	Maintenance	18.2							
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	27.9			0.0			0.0
	Maintenance	27.9							
Other Mixed GTCC Secondary Waste	Job Control	0.0	44.8			0.0			0.0
	Maintenance	44.8							
Total			6400.1			2944.0			4103.2

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.10-4 Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF2

Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF2									
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***		
Used Multi-Purpose Canisters (MPCs)			600.0			660.0			872.0
Machining chips from MPCs			0.1						
Fuel cask and canister decontamination wipes			36.0						
Fuel cask and canister decontamination filters			14.1						
Filtered solids			6.3						
Pool sludge			18.6						
Dewatered resin			12.8			7.2			
Solvent residue						12.0			85.6
Inner containers (bagless transfer stub pieces)			0.6						
Inner containers (bagless transfer stub pieces)			9.8						
Outer containers			0.01						
Inner containers (including convenience cans)			0.04						
Excess nitrates						1060.4			
Solidified waste water			1200.0						
Salt-bearing waste						1232.0			1709.7
Spent Ion Exchange Resins (including from Fuel Receipt)									1880.1
Packaging waste (low activity)			33.9						
Packaging waste (high activity)			6.4						
Subtotal			1938.5			2971.6			4547.4
Other Class A/B/C Secondary Waste	Job Control	2866.8	4746.0	Class A	467.8	563.0	Class A	406.0	409.6
	Maintenance	1879.1		Class C	95.2		Class C	3.6	
Other GTCC Secondary Waste	Job Control	224.7	242.9			69.5			18.2
	Maintenance	18.2							
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	27.9			0.0			0.0
	Maintenance	27.9							
Other Mixed GTCC Secondary Waste	Job Control	0.0	44.8			0.0			0.0
	Maintenance	44.8							
Total			7000.1			3604.0			4975.2

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.10-5 Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF4

Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF4 (Blended UNF)									
Waste Type	**UFD/EAS**			**AREVA**			**Energy*Solutions***		
Used Multi-Purpose Canisters (MPCs)			0.0			0.0			0.0
Machining chips from MPCs			0.1						
Fuel cask and canister decontamination wipes			36.0						
Fuel cask and canister decontamination filters			14.1						
Filtered solids			6.3						
Pool sludge			18.6						
Dewatered resin			12.8			7.2			
Solvent residue						12.0			86.1
Inner containers (bagless transfer stub pieces)			0.6						
Inner containers (bagless transfer stub pieces)			9.8						
Outer containers			0.01						
Inner containers (including convenience cans)			0.04						
Excess nitrates						1060.4			
Solidified waste water			1200.0						
Salt-bearing waste						1232.0			1692.6
Spent Ion Exchange Resins (including from Fuel Receipt)									1880.1
Packaging waste (low activity)			33.9						
Packaging waste (high activity)			6.4						
Subtotal			1338.5			2311.6			3658.8
Other Class A/B/C Secondary Waste	Job Control	2866.8	4746.0	Class A	467.8	603.9	Class A	406.0	409.6
	Maintenance	1879.1		Class C	136.1		Class C	3.6	
Other GTCC Secondary Waste	Job Control	224.7	242.9			86.46			18.2
	Maintenance	18.2							
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	27.9			0.0			0.0
	Maintenance	27.9							
Other Mixed GTCC Secondary Waste	Job Control	0.0	44.8			0.0			0.0
	Maintenance	44.8							
Total			6400.1			3002.0			4086.6

1. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- Specific observations are provided in Sections 3.2.1 through 3.2.9.
- The volume of waste associated with job control waste from radiologically controlled maintenance shops and facility ventilation filters (over 3,000 m^3) accounts for the majority of the difference between the UFD total waste estimates and the AREVA and Energy*Solutions* total waste estimates (see Section 3.2.9).
- Excluding the waste volume associated with job control waste from radiologically controlled maintenance shops and facility ventilation filters from the UFD waste estimates (see prior observation), the "Other Class A/B/C Secondary Waste" volumes plus the specific waste streams listed are in close agreement.
- "Other GTCC Secondary Waste" volumes vary by an order of magnitude with the UFD waste estimate the highest, the Energy*Solutions* estimate the lowest and AREVA in between.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C or Mixed GTCC waste.

3.2.11 MOX Fuel Fabrication

The MOX Fuel Fabrication functional area produces mixed oxide (MOX) fuel assemblies from the products of the recycling facility.

Basic process operations assumed by AREVA, Energy*Solutions* and UFD are essentially the same. The process blends the U/Pu oxide product from recycling with additional uranium oxide to produce MOX fuel pellets. The pellets are then loaded into fuel rods and assembled into a MOX fuel assembly. The AREVA waste estimates are based on operating experience at the MELOX plant. The Energy*Solutions* waste estimate is based on the Sellafield plant. The UFD waste estimate is based on the waste balance data for the MOX Fuel Fabrication Facility (MFFF) under construction at the Savannah River Site. The MFFF waste balance data is itself based on the MELOX plant but adjusted for the unique operating, design and regulatory requirements of the MFFF.

Table 3.2.11-1 below compares the secondary waste estimates for the MOX Fuel Fabrication functional area by waste classification. Observations are provided after the tables.

Table 3.2.11-1 MOX Fuel Fabrication - Summary of Secondary Waste Estimates by Waste Classification

MOX Fuel Fabrication - Summary of Secondary Waste Estimates by Waste Classification			
Waste Classification	**UFD**	**AREVA**	**Energy*Solutions***
Class A		99.0	130.0
Class B			
Class C			
Class A/B/C	510.0	99.0	130.0
GTCC	2229.1	237.8	23.7
Mixed Class A/B/C			
Mixed GTCC			
Total All Wastes	2739.1	435.8	283.7

1. All volumes shown represent final packaged waste volumes in cubic meters for MOX fuel fabrication facilities with the following capacities:
   - AREVA - 9.3 MT Pu/year, 77.8 MT U/year
   - Energy*Solutions* - 100 MTHM/year
   - UFD - 5.25 MT Pu/year

Observations

- Credible estimates of GTCC waste appears to be problematic. AREVA's estimate of GTCC waste is an order of magnitude higher than Energy*Solutions*' estimate of GTCC waste. The UFD estimate of GTCC waste is even an order of magnitude higher than AREVA's estimate of GTCC waste.
- An explanation for the order of magnitude difference in the AREVA and Energy*Solutions* estimates of GTCC waste is unclear. Both estimates are based on operating experience; however, the Sellafield plant never operated at its design capacity. Nevertheless, Energy*Solutions* used actual waste data from Sellafield from the period which Sellafield operated. Energy*Solutions* stated during the review of their estimates that no adjustments were made to the actual waste volumes to account for the less than full capacity of the plant during the period of operation. Instead, Energy*Solutions* stated that the Sellafield plant operated with a significant amount of recycle (above design rates) during that time and that they felt that the volume of waste generated from plant operations during the time of high recycle bounded the volume of waste that could be expected from a plant operating at design capacity with normal recycle rates. This assumption by Energy*Solutions* appears to be reasonable for Class A/B/C waste since there is relatively close agreement with AREVA; however, the order of magnitude difference in GTCC waste (relative to AREVA) raises doubts about the validity of this assumption for GTCC waste.
- The order of magnitude difference between the AREVA and UFD estimates of GTCC waste and the significant difference in Class A/B/C waste are probably due to a variety of reasons including:
  - The MFFF waste balance data reflects MELOX's experience approximately 15 years ago. The AREVA waste estimates are based on the most recent data from the MELOX plant. The AREVA data reflects improvements to the fuel fabrication processes which have resulted in significant reductions to the quantities of LLW produced since the MFFF waste balance report was produced.
  - AREVA's estimate does not reflect the use of disposable containers (e.g. DOE Standard 3013 containers) for transferring product material from the recycling facility to the fuel fabrication facility as currently practiced for La Hague and MELOX. AREVA assumes that the recycling facility and the fuel fabrication facility are co-located and that reusable containers can be used for product transfer. The MFFF waste data, and hence the UFD waste estimates, include convenience cans, inner cans, and outer cans associated with receipt of the PuO_2 product.
  - The MFFF does not employ significant, if any, compaction of secondary wastes. This ensures the WIPP-WAC are not exceeded; therefore, a larger volume of secondary waste streams can be expected.
  - The secondary waste from the MFFF laboratories, which are for both the aqueous polishing and the fuel fabrication processes, will be performing a proportionally (relative to throughput) larger number of analyses than performed at MELOX (due to feedstock verification, inclusion of aqueous polishing sampling activities, material control and accountability (MC&A), etc.); hence, a larger volume and mass of secondary wastes can be attributed to the MFFF laboratories relative to the MELOX laboratories.

    Note: The MFFF includes an aqueous polishing process that is not relevant to the UFD MOX fuel fabrication waste estimate. The UFD waste estimate deleted waste streams specifically associated with aqueous polishing; however, adjustments were not made to the analytical laboratory waste streams to account for the deletion of aqueous polishing.

- The MELOX facility is designed with a filter recovery glovebox to reduce the material loading in filters prior to disposal. The design of the MFFF deleted this capability; therefore, filter waste from the MFFF can have a significant quantity of Pu contamination present. The amount of Pu present can significantly affect the final volume of packaged GTCC waste due to the need to meet waste acceptance criteria at the disposal site. In the absence of a commercial GTCC waste disposal facility in the United States, the UFD waste estimate assumes that the Waste Acceptance Criteria for the Waste Isolation Pilot Plant (WIPP-WAC) is relevant to GTCC waste. The WIPP-WAC establishes acceptance criteria that waste packages must meet to be disposed at WIPP. Some of these criteria limit the amount of Pu that can be contained in each waste package. The UFD waste estimate considered both fissile gram equivalent (FGE) and plutonium equivalent Curie (PE-Ci) limits in determining the quantity of waste packages. The UFD waste estimate determined that FGE limits would not increase the volume of packaged GTCC waste; however, the PE-Ci limits could significantly impact the final packaged volume. This is especially true for Pu recovered from commercial reactor used fuel which is significantly more active than the weapons grade Pu that the MFFF is designed to process. The activity of Pu recovered from commercial used fuel is dependent on fuel burnup (and cooling time) and readily challenges the PE-Ci limits for any heavily contaminated waste stream, especially waste items such as filters with a heavy material loading.
- The MFFF waste data conservatively assumes each glovebox will require filter change outs and fails to credit gloveboxes which are connected to one another and share filters, thereby, reducing the actual number of filters requiring disposal. In addition, the MFFF secondary waste stream estimate includes the gloveboxes in the aqueous process units in this total count of gloveboxes; hence, this conservative assumption results in additional (volume and mass) secondary wastes relative to the MELOX plant.
- The MFFF waste data includes spent cartridge filters from the aqueous polishing process which is not included in the secondary wastes from the MELOX plant. These cartridge filters were deleted from the UFD waste estimates.
- The MELOX plant uses waste drums approximately 30 gallons in size for GTCC waste disposal. The MFFF waste data converts the quantity of 30 gallon drums to equivalent 55-gallon drums. Since the drums are usually not completely filled, a larger volume of secondary waste can be expected with the larger air gaps potentially found in the 55 gallon drums. The final waste volumes reflected in the MFFF waste data do reflect a slightly larger value than would be obtained by simply multiplying the reference MELOX drum quantity by drum volume (i.e. 30 gallons).
- If a simple proportional increase in the MFFF waste stream volumes/masses relative to capacity is utilized to scale up the MFFF to a commercial size reprocessing facility, then an overestimation of the size of the secondary waste streams for a MOX fuel fabrication facility may occur because many of the values are not proportional and the MFFF is over-sized for its given Pu input capacity (e.g. it is difficult to proportionally downsize the fuel fabrication process). For instance, there is not a proportional increase in the number of spent filters because there is not a proportional increase in the number of gloveboxes for a larger facility as the core gloveboxes (e.g., primary dosing, secondary dosing, grinding, etc.) are required for any fuel fabrication facility. The change in filters is likely a step factor after a certain throughput increase as opposed to a proportional increase (i.e., by adding another fuel fabrication line).

Note: The UFD waste estimate provides an estimate of waste from facility capacities other than the design capacity of the MFFF. The waste volumes were not scaled up directly proportional to capacity. A step wise approach was used for some waste streams to derive the waste volumes for other plant capacities; however, the exact approach that AREVA would recommend was probably not taken. Although some waste streams were scaled proportionally to capacity, the scaling philosophy advocated by AREVA was considered in producing the UFD waste estimates. The UFD waste estimates did not extrapolate waste volume estimates for facility capacities greater than ±50% from the nominal MFFF plant capacity. Extrapolation beyond this range was not deemed appropriate.

3.2.12 Fast Reactor Fuel Fabrication

The Fast Reactor Fuel Fabrication functional area produces fuel assemblies from the products of UNF4 recycling.

Basic process operations assumed by AREVA and Energy*Solutions* are essentially the same. The processes produce oxide fuel pellets loaded into fuel rods and assembled into fuel assemblies similar to the MOX fuel fabrication process. The AREVA waste estimates are based on the Cobroyage Cadarache (COCA) process. The Energy*Solutions* waste estimate is based on the fuel fabrication process that was developed in the U.S. during the 1980s and 1990s for supporting the needs of the Fast Reactor Development Program. Fast reactor fuel fabrication waste estimates have not been developed by the UFD Campaign.

Table 3.2.12-1 below compares the secondary waste estimates for the Fast Reactor Fuel Fabrication functional area by waste classification. Observations are provided after the tables.

Table 3.2.12-1 Fast Reactor Fuel Fabrication - Summary of Secondary Waste Estimates by Waste Classification

Fast Reactor Fuel Fabrication - Summary of Secondary Waste Estimates by Waste Classification		
Waste Classification	**AREVA**	**Energy*Solutions***
Class A	70.4	66.0
Class B		
Class C		
Class A/B/C	70.4	66.0
GTCC	132.9	4.4
Mixed Class A/B/C		
Mixed GTCC		4.7
Total All Wastes	203.3	75.2

1. All volumes shown represent final packaged waste volumes in cubic meters for fast reactor fuel fabrication facilities with the following capacities:
   - AREVA - 7.0 MT Pu/year, 21.0 MT U/year
   - Energy*Solutions* - 40 MTHM/year

Observations

- The Class A low level waste estimates for AREVA and Energy*Solutions* are in very close agreement.
- As with MOX Fuel Fabrication, there is a significant difference (two orders of magnitude difference) in GTCC waste volume estimates for AREVA and Energy*Solutions*. The reason for this difference is unclear.
- Energy*Solutions* designated operational waste streams from Process Enclosures (i.e. Gloves and Transfer Bags and Decontamination Wipes and Smears) as Mixed GTCC waste in Table 4-13 of their final report. These waste streams appear to be included in the GTCC total shown in Table 5-8 of the Energy*Solutions* final report. The Mixed GTCC waste streams are shown separately in Table 3.2.12-1 above.
- Energy*Solutions* designated the waste streams from Pin Welding, Auto Sampling, Auto Sending and Fuel Assembly as LLW (i.e. Class A, B or C) in Table 4-13 of their final report. It appears that Energy*Solutions* included these waste streams in their GTCC total presented in Table 5-8 of their final report. These waste streams are designated as GTCC waste in Table 3.2.12-1 above. The total waste volume for these waste streams is relatively low and would not have a significant impact regardless of the waste classification.

4. References

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10. Jones, Robert H. June 2013b. *Low Level Waste Disposition - LLW Treatment/Management Data Input*. FCRD-UFD-2012-000195
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12. Willis, W.; Phillips, C.; Carter, R.; Baker, S. Bowen, W.; and Grygiel, M. March 21, 2013. *DOE Advisory and Assistance Contract (Contract No. DE-NE0000293), Task Order 9: Improving the Estimates of Waste from Recycling, Task 5 - Final Report, Revision 1, LWR UOX and MOX Fuel Recycle and LWR MOX and Fast Reactor Fuel Fabrication Waste Estimates*. Energy*Solutions* Federal EPC, UK National Nuclear Laboratory, Columbia Basin Consulting Group LLC

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Appendix A
Receipt and Storage Functional Area
Detailed Waste Comparison

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Receipt and Storage - Detailed Summary of Secondary Waste Estimates for UNF1

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Used Multi-Purpose Canisters (MPCs)	Not Applicable to UNF1						Not Applicable to UNF1						Not Applicable to UNF1					
Machining chips from MPCs	0.3	Compaction	LLW box	0.03	0.1	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Fuel cask and canister decontamination wipes	144.0	Compaction	LLW box	14.4	36.0	Class A/B/C												
Fuel cask and canister decontamination filters	9.0	None	HIC	56.3	14.1	Class A/B/C												
Filtered solids	4.0	None	HIC	25.0	6.3	Class A/B/C												
Pool sludge	11.9	None	HIC	74.4	18.6	Class A/B/C												
Dewatered resin	8.2	None	HIC	51.3	12.8	Class A/B/C	3.1	Cementation	55 gallon drum	31	7.2	Class A	Resins are included in "Spent Ion Exchange Resins" in Liquid Effluent Processing					
Operational Waste Subtotal Class A							3.1				7.2							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	177.4				87.8		3.1				7.2							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	122.6	Compaction	LLW box	12.3	30.7	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	122.6	Compaction	LLW box	12.3	30.7	Class A/B/C												
Laundered protective clothing	10.3	Compaction	LLW box	1.0	2.6	Class A/B/C												
Step-off pads	2.6	Compaction	LLW box	0.3	0.7	Class A/B/C												
Disposable protective clothing	172.8	Compaction	LLW box	17.3	43.2	Class A/B/C												
Plastic suits	247.7	Compaction	LLW box	24.8	61.9	Class A/B/C												
Containment hut material	14.4	Compaction	LLW box	1.4	3.6	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	693.0				173.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	55 gallon drum	1.8	0.4	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Filter cartridges	8.0	None	HIC	50.0	12.5	Class A/B/C												
Ultraviolet lights	4.5	Compaction	LLW box	0.5	1.1	Class A/B/C												
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	22.5				16.1													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.4													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A							148.1	Compacted	4 m3 box	20.6	90.6	Class A	See Balance of Plant					
Non-compactable Class A							4.0	None	4 m3 box	1.0	4.4	Class A						
Compactable Class C							5.1	Compacted	4 m3 box	1.0	4.4	Class C						
Non-compactable Class C							0.5	None	4 m3 box	0.3	1.3	Class C						
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							152.1				95.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							5.6				5.7							
Other Secondary Waste Subtotal Class A/B/C							157.7				100.7							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							155.2				102.2		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							5.6				5.7		0.0				0.0	
Total Class A/B/C	892.9				277.2		160.8				107.9		0.0				0.0	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.4		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Receipt and Storage - Detailed Summary of Secondary Waste Estimates for UNF2

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Used Multi-Purpose Canisters (MPCs)	480	None	LLW Engineered	Unknown	600	Class A/B/C	575	None	4 m3 box	150	660	Class A	872	None	Direct	80	872	Class A
Machining chips from MPCs	0.3	Compaction	LLW box	0.03	0.1	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Fuel cask and canister decontamination wipes	144.0	Compaction	LLW box	14.4	36.0	Class A/B/C												
Fuel cask and canister decontamination filters	9.0	None	HIC	56.3	14.1	Class A/B/C												
Filtered solids	4.0	None	HIC	25.0	6.3	Class A/B/C												
Pool sludge	11.9	None	HIC	74.4	18.6	Class A/B/C												
Dewatered resin	8.2	None	HIC	51.3	12.8	Class A/B/C	3.1	Cementation	55 gallon drum	31	7.2	Class A	Resins are included in "Spent Ion Exchange Resins" in Liquid Effluent Processing					
Operational Waste Subtotal Class A							578.1				667.2		872				872	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	657.4				687.8		578.1				667.2		872				872	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	122.6	Compaction	LLW box	12.3	30.7	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	122.6	Compaction	LLW box	12.3	30.7	Class A/B/C												
Laundered protective clothing	10.3	Compaction	LLW box	1.0	2.6	Class A/B/C												
Step-off pads	2.6	Compaction	LLW box	0.3	0.7	Class A/B/C												
Disposable protective clothing	172.8	Compaction	LLW box	17.3	43.2	Class A/B/C												
Plastic suits	247.7	Compaction	LLW box	24.8	61.9	Class A/B/C												
Containment hut material	14.4	Compaction	LLW box	1.4	3.6	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	693.0				173.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	55 gallon drum	1.8	0.4	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Filter cartridges	8.0	None	HIC	50.0	12.5	Class A/B/C												
Ultraviolet lights	4.5	Compaction	LLW box	0.5	1.1	Class A/B/C												
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	22.5				16.1													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.4													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A							148.1	Compacted	4 m3 box	20.6	90.6	Class A	See Balance of Plant					
Non-compactable Class A							4.0	None	4 m3 box	1.0	4.4	Class A						
Compactable Class C							5.1	Compacted	4 m3 box	1.0	4.4	Class C						
Non-compactable Class C							0.5	None	4 m3 box	0.3	1.3	Class C						
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							152.1				95.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							5.6				5.7							
Other Secondary Waste Subtotal Class A/B/C							157.7				100.7							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							730.2				762.2		872.0				872.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							5.6				5.7		0.0				0.0	
Total Class A/B/C	1372.9				877.2		735.8				767.9		872.0				872.0	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.4		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Receipt and Storage - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)

Waste Stream	UFD/EAS As Generated Volume (m^3)	UFD/EAS Treatment	UFD/EAS Container	UFD/EAS Container Quantity	UFD/EAS Packaged Volume (m^3)	UFD/EAS Waste Classification	AREVA As Generated Volume (m^3)	AREVA Treatment	AREVA Container	AREVA Container Quantity	AREVA Packaged Volume (m^3)	AREVA Waste Classification	Energy*Solutions* As Generated Volume (m^3)	Energy*Solutions* Treatment	Energy*Solutions* Container	Energy*Solutions* Container Quantity	Energy*Solutions* Packaged Volume (m^3)	Energy*Solutions* Waste Classification
Operational Waste																		
Used Multi-Purpose Canisters (MPCs)	Not Applicable to UNF1						Not Applicable to UNF1						Not Applicable to UNF1					
Machining chips from MPCs	0.3	Compaction	LLW box	0.03	0.1	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Fuel cask and canister decontamination wipes	144.0	Compaction	LLW box	14.4	36.0	Class A/B/C												
Fuel cask and canister decontamination filters	9.0	None	HIC	56.3	14.1	Class A/B/C												
Filtered solids	4.0	None	HIC	25.0	6.3	Class A/B/C												
Pool sludge	11.9	None	HIC	74.4	18.6	Class A/B/C												
Dewatered resin	8.2	None	HIC	51.3	12.8	Class A/B/C	3.1	Cementation	55 gallon drum	31	7.2	Class A	Resins are included in "Spent Ion Exchange Resins" in Liquid Effluent Processing					
Operational Waste Subtotal Class A							3.1				7.2							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	177.4				87.8		3.1				7.2							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	122.6	Compaction	LLW box	12.3	30.7	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	122.6	Compaction	LLW box	12.3	30.7	Class A/B/C												
Laundered protective clothing	10.3	Compaction	LLW box	1.0	2.6	Class A/B/C												
Step-off pads	2.6	Compaction	LLW box	0.3	0.7	Class A/B/C												
Disposable protective clothing	172.8	Compaction	LLW box	17.3	43.2	Class A/B/C												
Plastic suits	247.7	Compaction	LLW box	24.8	61.9	Class A/B/C												
Containment hut material	14.4	Compaction	LLW box	1.4	3.6	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	693.0				173.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	55 gallon drum	1.8	0.4	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Filter cartridges	8.0	None	HIC	50.0	12.5	Class A/B/C												
Ultraviolet lights	4.5	Compaction	LLW box	0.5	1.1	Class A/B/C												
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	22.5				16.1													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.4													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A							148.1	Compacted	4 m3 box	20.6	90.6	Class A	See Balance of Plant					
Non-compactable Class A							4.0	None	4 m3 box	1.0	4.4	Class A						
Compactable Class C							5.1	Compacted	4 m3 box	1.0	4.4	Class C						
Non-compactable Class C							0.5	None	4 m3 box	0.3	1.3	Class C						
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							152.1				95.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							5.6				5.7							
Other Secondary Waste Subtotal Class A/B/C							157.7				100.7							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							155.2				102.2		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							5.6				5.7		0.0				0.0	
Total Class A/B/C	892.9				277.2		160.8				107.9		0.0				0.0	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.4		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

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Appendix B

Head End Functional Area

Detailed Waste Comparison

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Head End - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	91.1	Compaction	LLW box	9.1	22.8	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	91.1	Compaction	LLW box	9.1	22.8	Class A/B/C												
Laundered protective clothing	7.5	Compaction	LLW box	0.8	1.9	Class A/B/C												
Step-off pads	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
Disposable protective clothing	115.2	Compaction	LLW box	11.5	28.8	Class A/B/C												
Plastic suits	165.1	Compaction	LLW box	16.5	41.3	Class A/B/C												
Containment hut material	9.6	Compaction	LLW box	1.0	2.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	481.3				120.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.8	None	Mixed drum	7.7	1.6	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste											
Shear Blades	0.3	None	GTCC box	0.2	0.4	GTCC							2.7	Encapsulate	55 gallon drum	13.4	2.8	Class C
Manipulator counterweights	0.0	None	Mixed drum	0.3	0.1	Mixed A/B/C							Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Manipulator boots	0.6	Compaction	LLW box	0.1	0.2	Class A/B/C												
Manipulator arms	2.0	Compaction	LLW box	0.2	0.5	Class A/B/C												
Glovebox gloves	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Glovebox filters	0.2	Compaction	LLW box	0.0	0.1	Class A/B/C												
Shear assembly	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Voloxidizer	3.5	None	Mixed engineered	Unknown	7.0	Mixed A/B/C												
Voloxidizer heaters	7.3	None	LLW Engineered	Unknown	9.1	Class A/B/C												
Dissolver vessel	1.8	None	LLW Engineered	Unknown	2.3	Class A/B/C												
Dissolver condenser	0.7	None	LLW Engineered	Unknown	0.9	Class A/B/C												
Dissolver heating coils	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Process vessel (various sizes)	0.4	None	LLW Engineered	Unknown	0.5	Class A/B/C												
Vessel cooling coils	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Pump - Transfer (remote)	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Centrifuge	1.3	None	LLW Engineered	Unknown	1.6	Class A/B/C												
Jumper - Piping	7.6	None	LLW Engineered	Unknown	9.5	Class A/B/C												
Jumper - Electrical and Instrument	6.7	None	LLW Engineered	Unknown	8.4	Class A/B/C												
Agitator	0.3	None	LLW Engineered	Unknown	0.4	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A													0				0	
Maintenance Waste Subtotal Class B													0				0	
Maintenance Waste Subtotal Class C													2.7				2.8	
Maintenance Waste Subtotal Class A/B/C	30.0				34.6								2.7				2.8	
Maintenance Waste Subtotal GTCC	0.3				0.4								0				0	
Maintenance Waste Subtotal Mixed Class A/B/C	4.3				8.7								0				0	
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0								0				0	

Head End - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							127.1	Compacted	4 m3 box	17.7	77.9	Class A	See Balance of Plant					
Non-compactable Class A							22.7	None	4 m3 box	5.7	25.1	Class A						
Compactable Class C							7.3	Compacted	4 m3 box	1.0	4.4	Class C						
Non-compactable Class C							5.7	None	4 m3 box	2.9	12.8	Class C						
GTCC-NT (non-TRU)							3.0	None	55 gallon drum	13.8	16.6	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							149.8				103.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							13.0				17.2							
Other Secondary Waste Subtotal Class A/B/C							162.8				120.2							
Other Secondary Waste Subtotal GTCC							3.0				16.6							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							149.8				103.0		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							13.0				17.2		2.7				2.8	
Total Class A/B/C	511.3				154.9		162.8				120.2		2.7				2.8	
Total GTCC	0.3				0.4		3.0				16.6		0.0				0.0	
Total Mixed Class A/B/C	4.3				8.7		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Head End - Detailed Summary of Secondary Waste Estimates for UNF2

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Operational Waste Subtotal Class A							0				0		0				0	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	91.1	Compaction	LLW box	9.1	22.8	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	91.1	Compaction	LLW box	9.1	22.8	Class A/B/C												
Laundered protective clothing	7.5	Compaction	LLW box	0.8	1.9	Class A/B/C												
Step-off pads	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
Disposable protective clothing	115.2	Compaction	LLW box	11.5	28.8	Class A/B/C												
Plastic suits	165.1	Compaction	LLW box	16.5	41.3	Class A/B/C												
Containment hut material	9.6	Compaction	LLW box	1.0	2.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	481.3				120.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.8	None	Mixed drum	7.7	1.6	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste											
Shear Blades	0.3	None	GTCC box	0.2	0.4	GTCC							2.7	Encapsulate	55 gallon drum	13.4	2.8	Class C
Manipulator counterweights	0.0	None	Mixed drum	0.3	0.1	Mixed A/B/C							Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Manipulator boots	0.6	Compaction	LLW box	0.1	0.2	Class A/B/C												
Manipulator arms	2.0	Compaction	LLW box	0.2	0.5	Class A/B/C												
Glovebox gloves	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Glovebox filters	0.2	Compaction	LLW box	0.0	0.1	Class A/B/C												
Shear assembly	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Voloxidizer	3.5	None	Mixed engineered	Unknown	7.0	Mixed A/B/C												
Voloxidizer heaters	7.3	None	LLW Engineered	Unknown	9.1	Class A/B/C												
Dissolver vessel	1.8	None	LLW Engineered	Unknown	2.3	Class A/B/C												
Dissolver condenser	0.7	None	LLW Engineered	Unknown	0.9	Class A/B/C												
Dissolver heating coils	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Process vessel (various sizes)	0.4	None	LLW Engineered	Unknown	0.5	Class A/B/C												
Vessel cooling coils	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Pump - Transfer (remote)	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Centrifuge	1.3	None	LLW Engineered	Unknown	1.6	Class A/B/C												
Jumper - Piping	7.6	None	LLW Engineered	Unknown	9.5	Class A/B/C												
Jumper - Electrical and Instrument	6.7	None	LLW Engineered	Unknown	8.4	Class A/B/C												
Agitator	0.3	None	LLW Engineered	Unknown	0.4	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A													0				0	
Maintenance Waste Subtotal Class B													0				0	
Maintenance Waste Subtotal Class C													2.7				2.8	
Maintenance Waste Subtotal Class A/B/C	30.0				34.6								2.7				2.8	
Maintenance Waste Subtotal GTCC	0.3				0.4								0				0	
Maintenance Waste Subtotal Mixed Class A/B/C	4.3				8.7								0				0	
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0								0				0	

Head End - Detailed Summary of Secondary Waste Estimates for UNF2																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							127.1	Compacted	4 m3 box	17.7	77.9	Class A	See Balance of Plant					
Non-compactable Class A							22.7	None	4 m3 box	5.7	25.1	Class A						
Compactable Class C							7.3	Compacted	4 m3 box	1.0	4.4	Class C						
Non-compactable Class C							5.7	None	4 m3 box	2.9	12.8	Class C						
GTCC-NT (non-TRU)							3.0	None	55 gallon drum	13.8	16.6	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							149.8				103.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							13.0				17.2							
Other Secondary Waste Subtotal Class A/B/C							162.8				120.2							
Other Secondary Waste Subtotal GTCC							3.0				16.6							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							149.8				103.0		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							13.0				17.2		2.7				2.8	
Total Class A/B/C	511.3				154.9		162.8				120.2		2.7				2.8	
Total GTCC	0.3				0.4		3.0				16.6		0.0				0.0	
Total Mixed Class A/B/C	4.3				8.7		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Head End - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	91.1	Compaction	LLW box	9.1	22.8	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	91.1	Compaction	LLW box	9.1	22.8	Class A/B/C												
Laundered protective clothing	7.5	Compaction	LLW box	0.8	1.9	Class A/B/C												
Step-off pads	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
Disposable protective clothing	115.2	Compaction	LLW box	11.5	28.8	Class A/B/C												
Plastic suits	165.1	Compaction	LLW box	16.5	41.3	Class A/B/C												
Containment hut material	9.6	Compaction	LLW box	1.0	2.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	481.3				120.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.8	None	Mixed drum	7.7	1.6	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste											
Shear Blades	0.3	None	GTCC box	0.2	0.4	GTCC							2.7	Encapsulate	55 gallon drum	13.4	2.8	Class C
Manipulator counterweights	0.0	None	Mixed drum	0.3	0.1	Mixed A/B/C							Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Manipulator boots	0.6	Compaction	LLW box	0.1	0.2	Class A/B/C												
Manipulator arms	2.0	Compaction	LLW box	0.2	0.5	Class A/B/C												
Glovebox gloves	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Glovebox filters	0.2	Compaction	LLW box	0.0	0.1	Class A/B/C												
Shear assembly	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Voloxidizer	3.5	None	Mixed engineered	Unknown	7.0	Mixed A/B/C												
Voloxidizer heaters	7.3	None	LLW Engineered	Unknown	9.1	Class A/B/C												
Dissolver vessel	1.8	None	LLW Engineered	Unknown	2.3	Class A/B/C												
Dissolver condenser	0.7	None	LLW Engineered	Unknown	0.9	Class A/B/C												
Dissolver heating coils	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Process vessel (various sizes)	0.4	None	LLW Engineered	Unknown	0.5	Class A/B/C												
Vessel cooling coils	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Pump - Transfer (remote)	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Centrifuge	1.3	None	LLW Engineered	Unknown	1.6	Class A/B/C												
Jumper - Piping	7.6	None	LLW Engineered	Unknown	9.5	Class A/B/C												
Jumper - Electrical and Instrument	6.7	None	LLW Engineered	Unknown	8.4	Class A/B/C												
Agitator	0.3	None	LLW Engineered	Unknown	0.4	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A													0				0	
Maintenance Waste Subtotal Class B													0				0	
Maintenance Waste Subtotal Class C													2.7				2.8	
Maintenance Waste Subtotal Class A/B/C	30.0				34.6								2.7				2.8	
Maintenance Waste Subtotal GTCC	0.3				0.4								0				0	
Maintenance Waste Subtotal Mixed Class A/B/C	4.3				8.7								0				0	
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0								0				0	

Head End - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							127.1	Compacted	4 m3 box	17.7	77.9	Class A	See Balance of Plant					
Non-compactable Class A							22.7	None	4 m3 box	5.7	25.1	Class A						
Compactable Class C							7.3	Compacted	4 m3 box	1.4	6.2	Class C						
Non-compactable Class C							5.7	None	4 m3 box	3.8	16.7	Class C						
GTCC-NT (non-TRU)							3.0	None	55 gallon drum	13.8	16.6	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							149.8				103.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							13.0				22.9							
Other Secondary Waste Subtotal Class A/B/C							162.8				125.9							
Other Secondary Waste Subtotal GTCC							3.0				16.6							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							149.8				103.0		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							13.0				22.9		2.7				2.8	
Total Class A/B/C	511.3				154.9		162.8				125.9		2.7				2.8	
Total GTCC	0.3				0.4		3.0				16.6		0.0				0.0	
Total Mixed Class A/B/C	4.3				8.7		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Appendix C
Separations Functional Area
Detailed Waste Comparison

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Separations - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Solvent residue							12.8	Distillation/ Pyrolysis/ Cementation	55 gallon drum	52	12	Class A	122.1	Pyrolysis/ Compaction	3 compacted 55 gallon drums/110 gallon drum	206	85.6	Class A
Operational Waste Subtotal Class A							12.8				12		122.1				85.6	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	0.0				0.0		12.8				12		122.1				85.6	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	124.7	Compaction	LLW box	12.5	31.2	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	124.7	Compaction	LLW box	12.5	31.2	Class A/B/C												
Laundered protective clothing	14.7	Compaction	LLW box	1.5	3.7	Class A/B/C												
Step-off pads	6.1	Compaction	LLW box	0.6	1.5	Class A/B/C												
Disposable protective clothing	403.2	Compaction	LLW box	40.3	100.8	Class A/B/C												
Plastic suits	578.0	Compaction	LLW box	57.8	144.5	Class A/B/C												
Containment hut material	33.6	Compaction	LLW box	3.4	8.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	1285.0				321.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	1.2	None	Mixed drum	11.5	2.4	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Process vessel (various sizes)	41.8	None	LLW Engineered	Unknown	52.3	Class A/B/C												
Vessel cooling coils	3.0	None	LLW Engineered	Unknown	3.8	Class A/B/C												
Vessel heating coils	1.9	None	LLW Engineered	Unknown	2.4	Class A/B/C												
Pump - Transfer (remote)	11.7	None	LLW Engineered	Unknown	14.6	Class A/B/C												
Jumper - Piping	95.1	None	LLW Engineered	Unknown	118.9	Class A/B/C												
Jumper - Electrical and Instrument	29.7	None	LLW Engineered	Unknown	37.1	Class A/B/C												
Centrifugal contactor	4.8	None	LLW Engineered	Unknown	6.0	Class A/B/C												
Centrifugal contactor/diluant washer bank	1.9	None	LLW Engineered	Unknown	2.4	Class A/B/C												
Evaporator vessel	1.2	None	LLW Engineered	Unknown	1.5	Class A/B/C												
Evaporator condenser	3.3	None	LLW Engineered	Unknown	4.1	Class A/B/C												
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Agitator	5.2	None	LLW Engineered	Unknown	6.5	Class A/B/C												
Decanter	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Mixer settler	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	200.2				250.3													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	1.2				2.4													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Separations - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							107.0	Compacted	4 m3 box	14.9	65.6	Class A	See Balance of Plant					
Non-compactable Class A							1.0	None	4 m3 box	0.3	1.3	Class A						
Compactable Class C							13.4	Compacted	4 m3 box	1.9	8.4	Class C						
Non-compactable Class C							2.1	None	4 m3 box	1.0	4.4	Class C						
GTCC-NT (non-TRU)							0.3	None	55 gallon drum	1.4	1.7	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							108.0				66.9							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							15.5				12.8							
Other Secondary Waste Subtotal Class A/B/C							123.5				79.7							
Other Secondary Waste Subtotal GTCC							0.3				1.7							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							120.8				78.9		122.1				85.6	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							15.5				12.8		0.0				0.0	
Total Class A/B/C	1485.2				571.5		136.3				91.7		122.1				85.6	
Total GTCC	0.0				0.0		0.3				1.7		0.0				0.0	
Total Mixed Class A/B/C	1.2				2.4		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Separations - Detailed Summary of Secondary Waste Estimates for UNF2																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Solvent residue							12.8	Distillation/ Pyrolysis/ Cementation	55 gallon drum	1.9	12	Class A	122.1	Pyrolysis/ Compaction	3 compacted 55 gallon drums/110 gallon drum	206	85.6	Class A
Operational Waste Subtotal Class A							12.8				12		122.1				85.6	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	0.0				0.0		12.8				12		122.1				85.6	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	124.7	Compaction	LLW box	12.5	31.2	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	124.7	Compaction	LLW box	12.5	31.2	Class A/B/C												
Laundered protective clothing	14.7	Compaction	LLW box	1.5	3.7	Class A/B/C												
Step-off pads	6.1	Compaction	LLW box	0.6	1.5	Class A/B/C												
Disposable protective clothing	403.2	Compaction	LLW box	40.3	100.8	Class A/B/C												
Plastic suits	578.0	Compaction	LLW box	57.8	144.5	Class A/B/C												
Containment hut material	33.6	Compaction	LLW box	3.4	8.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	1285.0				321.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	1.2	None	Mixed drum	11.5	2.4	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Process vessel (various sizes)	41.8	None	LLW Engineered	Unknown	52.3	Class A/B/C												
Vessel cooling coils	3.0	None	LLW Engineered	Unknown	3.8	Class A/B/C												
Vessel heating coils	1.9	None	LLW Engineered	Unknown	2.4	Class A/B/C												
Pump - Transfer (remote)	11.7	None	LLW Engineered	Unknown	14.6	Class A/B/C												
Jumper - Piping	95.1	None	LLW Engineered	Unknown	118.9	Class A/B/C												
Jumper - Electrical and Instrument	29.7	None	LLW Engineered	Unknown	37.1	Class A/B/C												
Centrifugal contactor	4.8	None	LLW Engineered	Unknown	6.0	Class A/B/C												
Centrifugal contactor/diluant washer bank	1.9	None	LLW Engineered	Unknown	2.4	Class A/B/C												
Evaporator vessel	1.2	None	LLW Engineered	Unknown	1.5	Class A/B/C												
Evaporator condenser	3.3	None	LLW Engineered	Unknown	4.1	Class A/B/C												
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Agitator	5.2	None	LLW Engineered	Unknown	6.5	Class A/B/C												
Decanter	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Mixer settler	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	200.2				250.3													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	1.2				2.4													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Separations - Detailed Summary of Secondary Waste Estimates for UNF2																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							107.0	Compacted	4 m3 box	14.9	65.6	Class A	See Balance of Plant					
Non-compactable Class A							1.0	None	4 m3 box	0.3	1.3	Class A						
Compactable Class C							13.4	Compacted	4 m3 box	1.9	8.4	Class C						
Non-compactable Class C							2.1	None	4 m3 box	1.0	4.4	Class C						
GTCC-NT (non-TRU)							0.3	None	55 gallon drum	1.4	1.7	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							108.0				66.9							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							15.5				12.8							
Other Secondary Waste Subtotal Class A/B/C							123.5				79.7							
Other Secondary Waste Subtotal GTCC							0.3				1.7							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							120.8				78.9		122.1				85.6	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							15.5				12.8		0.0				0.0	
Total Class A/B/C	1485.2				571.5		136.3				91.7		122.1				85.6	
Total GTCC	0.0				0.0		0.3				1.7		0.0				0.0	
Total Mixed Class A/B/C	1.2				2.4		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Separations - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Solvent residue							12.8	Distillation/ Pyrolysis/ Cementation	55 gallon drum	0	12	Class A	122.7	Pyrolysis/ Compaction	3 compacted 55 gallon drums/110 gallon drum	207	86.1	Class A
Operational Waste Subtotal Class A							12.8				12		122.7				86.1	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	0.0				0.0		12.8				12		122.7				86.1	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	124.7	Compaction	LLW box	12.5	31.2	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	124.7	Compaction	LLW box	12.5	31.2	Class A/B/C												
Laundered protective clothing	14.7	Compaction	LLW box	1.5	3.7	Class A/B/C												
Step-off pads	6.1	Compaction	LLW box	0.6	1.5	Class A/B/C												
Disposable protective clothing	403.2	Compaction	LLW box	40.3	100.8	Class A/B/C												
Plastic suits	578.0	Compaction	LLW box	57.8	144.5	Class A/B/C												
Containment hut material	33.6	Compaction	LLW box	3.4	8.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	1285.0				321.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	1.2	None	Mixed drum	11.5	2.4	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Process vessel (various sizes)	41.8	None	LLW Engineered	Unknown	52.3	Class A/B/C												
Vessel cooling coils	3.0	None	LLW Engineered	Unknown	3.8	Class A/B/C												
Vessel heating coils	1.9	None	LLW Engineered	Unknown	2.4	Class A/B/C												
Pump - Transfer (remote)	11.7	None	LLW Engineered	Unknown	14.6	Class A/B/C												
Jumper - Piping	95.1	None	LLW Engineered	Unknown	118.9	Class A/B/C												
Jumper - Electrical and Instrument	29.7	None	LLW Engineered	Unknown	37.1	Class A/B/C												
Centrifugal contactor	4.8	None	LLW Engineered	Unknown	6.0	Class A/B/C												
Centrifugal contactor/diluant washer bank	1.9	None	LLW Engineered	Unknown	2.4	Class A/B/C												
Evaporator vessel	1.2	None	LLW Engineered	Unknown	1.5	Class A/B/C												
Evaporator condenser	3.3	None	LLW Engineered	Unknown	4.1	Class A/B/C												
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Agitator	5.2	None	LLW Engineered	Unknown	6.5	Class A/B/C												
Decanter	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Mixer settler	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	200.2				250.3													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	1.2				2.4													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Separations - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							107.0	Compacted	4 m3 box	14.9	65.6	Class A	See Balance of Plant					
Non-compactable Class A							1.0	None	4 m3 box	0.3	1.3	Class A						
Compactable Class C							13.4	Compacted	4 m3 box	2.6	11.5	Class C						
Non-compactable Class C							2.1	None	4 m3 box	1.4	6.2	Class C						
GTCC-NT (non-TRU)							0.3	None	55 gallon drum	1.4	1.7	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							108.0				66.9							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							15.5				17.7							
Other Secondary Waste Subtotal Class A/B/C							123.5				84.6							
Other Secondary Waste Subtotal GTCC							0.3				1.7							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							120.8				78.9		122.7				86.1	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							15.5				17.7		0.0				0.0	
Total Class A/B/C	1485.2				571.5		136.3				96.6		122.7				86.1	
Total GTCC	0.0				0.0		0.3				1.7		0.0				0.0	
Total Mixed Class A/B/C	1.2				2.4		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Appendix D

Solidification Functional Area

Detailed Waste Comparison

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Solidification - Detailed Summary of Secondary Waste Estimates for UNF1

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Inner containers (bagless transfer stub pieces)	2.5	Compaction	LLW box	0.25	0.6	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Inner containers (bagless transfer stub pieces)	7.4	None	GTCC box	5.78	9.8	GTCC												
Outer containers	0.03	Compaction	LLW box	0.003	0.01	Class A/B/C												
Inner containers (including convenience cans)	0.03	None	GTCC box	0.02	0.04	GTCC												
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	2.5				0.6		0				0							
Operational Waste Subtotal GTCC	7.4				9.9		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	153.7	Compaction	LLW box	15.4	38.4	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Gloves	3.1	None	GTCC box	2.4	4.1	GTCC												
Shoe covers	153.7	Compaction	LLW box	15.4	38.4	Class A/B/C												
Shoe covers	3.1	None	GTCC box	2.4	4.1	GTCC												
Laundered protective clothing	12.4	Compaction	LLW box	1.2	3.1	Class A/B/C												
Step-off pads	2.6	Compaction	LLW box	0.3	0.7	Class A/B/C												
Disposable protective clothing	108.0	Compaction	LLW box	10.8	27.0	Class A/B/C												
Disposable protective clothing	64.8	None	GTCC box	50.6	86.1	GTCC												
Plastic suits	154.8	Compaction	LLW box	15.5	38.7	Class A/B/C												
Plastic suits	92.9	None	GTCC box	72.5	123.3	GTCC												
Containment hut material	9.0	Compaction	LLW box	0.9	2.3	Class A/B/C												
Containment hut material	5.4	None	GTCC box	4.2	7.2	GTCC												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	594.2				148.6													
Job Control Waste Subtotal GTCC	169.2				224.7													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.6	None	55 gallon drum	3.6	0.8	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5	Class A/B/C												
Manipulator counterweights	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Manipulator boots	1.5	Compaction	LLW box	0.2	0.4	Class A/B/C												
Manipulator arms	4.8	Compaction	LLW box	0.5	1.2	Class A/B/C												
Glovebox gloves	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Glovebox filters	0.2	Compaction	LLW box	0.0	0.1	Class A/B/C												
HEPA filters	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
HEPA filters	10.0	None	GTCC box	7.8	13.3	GTCC												
Dust collection bags	1.0	Compaction	LLW box	0.1	0.3	Class A/B/C												
Process vessel (various sizes)	11.0	None	LLW Engineered	Unknown	13.8	Class A/B/C												
Process vessel (various sizes)	2.4	None	GTCC engineered	Unknown	3.0	GTCC												
Pump - Process	1.0	None	LLW Engineered	Unknown	1.3	Class A/B/C												
Pump - Process	0.3	None	GTCC engineered	Unknown	0.4	GTCC												
Evaporator vessel	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator vessel	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Evaporator condenser	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator condenser	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Evaporator reboiler	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Evaporator cooler	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Hydrate evaporator	1.4	None	LLW Engineered	Unknown	1.8	Class A/B/C												
Hydrate evaporator condenser	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Denitrator	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Scrubber	10.4	None	LLW Engineered	Unknown	13.0	Class A/B/C												
Process vacuum unit	1.7	None	LLW Engineered	Unknown	2.1	Class A/B/C												
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Heat exchanger	0.3	None	GTCC engineered	Unknown	0.4	GTCC												
Agitator	0.8	None	LLW Engineered	Unknown	1.0	Class A/B/C												
Oxidizer	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Oxidizer	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Scrubber (critically safe)	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Scrubber (critically safe)	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	47.8				40.3													
Maintenance Waste Subtotal GTCC	13.4				17.5													
Maintenance Waste Subtotal Mixed Class A/B/C	0.6				0.8													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Solidification - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							105.0	Compacted	4 m3 box	14.0	61.6	Class A	See Balance of Plant					
Non-compactable Class A							0.0											
Compactable Class C							66.4	Compacted	4 m3 box	9.2	40.5	Class C						
Non-compactable Class C							3.9	None	4 m3 box	2.0	8.8	Class C						
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							20.6	None	55 gallon drum	100.0	23.0	GTCC						
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							105.0				61.6							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							70.3				49.3							
Other Secondary Waste Subtotal Class A/B/C							175.3				110.9							
Other Secondary Waste Subtotal GTCC							20.6				23.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							105.0				61.6		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							70.3				49.3		0.0				0.0	
Total Class A/B/C	644.5				189.5		175.3				110.9		0.0				0.0	
Total GTCC	190.0				252.1		20.6				23.0		0.0				0.0	
Total Mixed Class A/B/C	0.6				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Solidification - Detailed Summary of Secondary Waste Estimates for UNF2

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Inner containers (bagless transfer stub pieces)	2.5	Compaction	LLW box	0.25	0.6	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Inner containers (bagless transfer stub pieces)	7.4	None	GTCC box	5.78	9.8	GTCC												
Outer containers	0.03	Compaction	LLW box	0.003	0.01	Class A/B/C												
Inner containers (including convenience cans)	0.03	None	GTCC box	0.02	0.04	GTCC												
Operational Waste Subtotal Class A							0				0		0				0	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	2.5				0.6		0				0		0				0	
Operational Waste Subtotal GTCC	7.4				9.9		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	153.7	Compaction	LLW box	15.4	38.4	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Gloves	3.1	None	GTCC box	2.4	4.1	GTCC												
Shoe covers	153.7	Compaction	LLW box	15.4	38.4	Class A/B/C												
Shoe covers	3.1	None	GTCC box	2.4	4.1	GTCC												
Laundered protective clothing	12.4	Compaction	LLW box	1.2	3.1	Class A/B/C												
Step-off pads	2.6	Compaction	LLW box	0.3	0.7	Class A/B/C												
Disposable protective clothing	108.0	Compaction	LLW box	10.8	27.0	Class A/B/C												
Disposable protective clothing	64.8	None	GTCC box	50.6	86.1	GTCC												
Plastic suits	154.8	Compaction	LLW box	15.5	38.7	Class A/B/C												
Plastic suits	92.9	None	GTCC box	72.5	123.3	GTCC												
Containment hut material	9.0	Compaction	LLW box	0.9	2.3	Class A/B/C												
Containment hut material	5.4	None	GTCC box	4.2	7.2	GTCC												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	594.2				148.6													
Job Control Waste Subtotal GTCC	169.2				224.7													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.6	None	55 gallon drum	3.6	0.8	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5	Class A/B/C												
Manipulator counterweights	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Manipulator boots	1.5	Compaction	LLW box	0.2	0.4	Class A/B/C												
Manipulator arms	4.8	Compaction	LLW box	0.5	1.2	Class A/B/C												
Glovebox gloves	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Glovebox filters	0.2	Compaction	LLW box	0.0	0.1	Class A/B/C												
HEPA filters	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
HEPA filters	10.0	None	GTCC box	7.8	13.3	GTCC												
Dust collection bags	1.0	Compaction	LLW box	0.1	0.3	Class A/B/C												
Process vessel (various sizes)	11.0	None	LLW Engineered	Unknown	13.8	Class A/B/C												
Process vessel (various sizes)	2.4	None	GTCC engineered	Unknown	3.0	GTCC												
Pump - Process	1.0	None	LLW Engineered	Unknown	1.3	Class A/B/C												
Pump - Process	0.3	None	GTCC engineered	Unknown	0.4	GTCC												
Evaporator vessel	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator vessel	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Evaporator condenser	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator condenser	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Evaporator reboiler	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Evaporator cooler	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Hydrate evaporator	1.4	None	LLW Engineered	Unknown	1.8	Class A/B/C												
Hydrate evaporator condenser	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Denitrator	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Scrubber	10.4	None	LLW Engineered	Unknown	13.0	Class A/B/C												
Process vacuum unit	1.7	None	LLW Engineered	Unknown	2.1	Class A/B/C												
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Heat exchanger	0.3	None	GTCC engineered	Unknown	0.4	GTCC												
Agitator	0.8	None	LLW Engineered	Unknown	1.0	Class A/B/C												
Oxidizer	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Oxidizer	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Scrubber (critically safe)	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Scrubber (critically safe)	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	47.8				40.3													
Maintenance Waste Subtotal GTCC	13.4				17.5													
Maintenance Waste Subtotal Mixed Class A/B/C	0.6				0.8													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Solidification - Detailed Summary of Secondary Waste Estimates for UNF2																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							105.0	Compacted	4 m3 box	14.0	61.6	Class A	See Balance of Plant					
Non-compactable Class A							0.0											
Compactable Class C							66.4	Compacted	4 m3 box	9.2	40.5	Class C						
Non-compactable Class C							3.9	None	4 m3 box	2.0	8.8	Class C						
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							20.6	None	55 gallon drum	100.0	23.0	GTCC						
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							105.0				61.6							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							70.3				49.3							
Other Secondary Waste Subtotal Class A/B/C							175.3				110.9							
Other Secondary Waste Subtotal GTCC							20.6				23.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							105.0				61.6		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							70.3				49.3		0.0				0.0	
Total Class A/B/C	644.5				189.5		175.3				110.9		0.0				0.0	
Total GTCC	190.0				252.1		20.6				23.0		0.0				0.0	
Total Mixed Class A/B/C	0.6				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Solidification - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Inner containers (bagless transfer stub pieces)	2.5	Compaction	LLW box	0.25	0.6	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Inner containers (bagless transfer stub pieces)	7.4	None	GTCC box	5.78	9.8	GTCC												
Outer containers	0.03	Compaction	LLW box	0.003	0.01	Class A/B/C												
Inner containers (including convenience cans)	0.03	None	GTCC box	0.02	0.04	GTCC												
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	2.5				0.6		0				0							
Operational Waste Subtotal GTCC	7.4				9.9		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	153.7	Compaction	LLW box	15.4	38.4	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Gloves	3.1	None	GTCC box	2.4	4.1	GTCC												
Shoe covers	153.7	Compaction	LLW box	15.4	38.4	Class A/B/C												
Shoe covers	3.1	None	GTCC box	2.4	4.1	GTCC												
Laundered protective clothing	12.4	Compaction	LLW box	1.2	3.1	Class A/B/C												
Step-off pads	2.6	Compaction	LLW box	0.3	0.7	Class A/B/C												
Disposable protective clothing	108.0	Compaction	LLW box	10.8	27.0	Class A/B/C												
Disposable protective clothing	64.8	None	GTCC box	50.6	86.1	GTCC												
Plastic suits	154.8	Compaction	LLW box	15.5	38.7	Class A/B/C												
Plastic suits	92.9	None	GTCC box	72.5	123.3	GTCC												
Containment hut material	9.0	Compaction	LLW box	0.9	2.3	Class A/B/C												
Containment hut material	5.4	None	GTCC box	4.2	7.2	GTCC												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	594.2				148.6													
Job Control Waste Subtotal GTCC	169.2				224.7													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.6	None	55 gallon drum	3.6	0.8	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5	Class A/B/C												
Manipulator counterweights	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Manipulator boots	1.5	Compaction	LLW box	0.2	0.4	Class A/B/C												
Manipulator arms	4.8	Compaction	LLW box	0.5	1.2	Class A/B/C												
Glovebox gloves	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Glovebox filters	0.2	Compaction	LLW box	0.0	0.1	Class A/B/C												
HEPA filters	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
HEPA filters	10.0	None	GTCC box	7.8	13.3	GTCC												
Dust collection bags	1.0	Compaction	LLW box	0.1	0.3	Class A/B/C												
Process vessel (various sizes)	11.0	None	LLW Engineered	Unknown	13.8	Class A/B/C												
Process vessel (various sizes)	2.4	None	GTCC engineered	Unknown	3.0	GTCC												
Pump - Process	1.0	None	LLW Engineered	Unknown	1.3	Class A/B/C												
Pump - Process	0.3	None	GTCC engineered	Unknown	0.4	GTCC												
Evaporator vessel	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator vessel	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Evaporator condenser	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator condenser	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Evaporator reboiler	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Evaporator cooler	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Hydrate evaporator	1.4	None	LLW Engineered	Unknown	1.8	Class A/B/C												
Hydrate evaporator condenser	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Denitrator	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Scrubber	10.4	None	LLW Engineered	Unknown	13.0	Class A/B/C												
Process vacuum unit	1.7	None	LLW Engineered	Unknown	2.1	Class A/B/C												
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Heat exchanger	0.3	None	GTCC engineered	Unknown	0.4	GTCC												
Agitator	0.8	None	LLW Engineered	Unknown	1.0	Class A/B/C												
Oxidizer	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Oxidizer	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Scrubber (critically safe)	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Scrubber (critically safe)	0.1	None	GTCC engineered	Unknown	0.1	GTCC												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	47.8				40.3													
Maintenance Waste Subtotal GTCC	13.4				17.5													
Maintenance Waste Subtotal Mixed Class A/B/C	0.6				0.8													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Solidification - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							105.0	Compacted	4 m3 box	14.0	61.6	Class A	See Balance of Plant					
Non-compactable Class A							0.0											
Compactable Class C							66.4	Compacted	4 m3 box	12.9	56.8	Class C						
Non-compactable Class C							6.6	None	4 m3 box	4.4	19.4	Class C						
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							36.0	None	55 gallon drum	174.0	40.0	GTCC						
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							105.0				61.6							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							73.0				76.2							
Other Secondary Waste Subtotal Class A/B/C							178.0				137.8							
Other Secondary Waste Subtotal GTCC							36.0				40.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							105.0				61.6		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							73.0				76.2		0.0				0.0	
Total Class A/B/C	644.5				189.5		178.0				137.8		0.0				0.0	
Total GTCC	190.0				252.1		36.0				40.0		0.0				0.0	
Total Mixed Class A/B/C	0.6				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Appendix E

Acid Recovery Functional Area

Detailed Waste Comparison

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Acid Recovery - Detailed Summary of Secondary Waste Estimates for UNF1

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Excess nitrates	See Liquid Effluent Processing - Solidified Waste Water						481	Cementation	4 m3 box	241	1060.4	Class A						
Operational Waste Subtotal Class A							481				1060.4							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		481				1060.4							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C												
Laundered protective clothing	1.4	Compaction	LLW box	0.1	0.4	Class A/B/C												
Step-off pads	0.4	Compaction	LLW box	0.0	0.1	Class A/B/C												
Disposable protective clothing	28.8	Compaction	LLW box	2.9	7.2	Class A/B/C												
Plastic suits	41.3	Compaction	LLW box	4.1	10.3	Class A/B/C												
Containment hut material	2.4	Compaction	LLW box	0.2	0.6	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	105.9				26.5													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	Mixed drum	2.9	0.6	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5	Class A/B/C												
Process vessel (various sizes)	10.4	None	LLW Engineered	Unknown	13.0	Class A/B/C												
Pump - Process	1.1	None	LLW Engineered	Unknown	1.4	Class A/B/C												
Evaporator condenser	0.3	None	LLW Engineered	Unknown	0.4	Class A/B/C												
Evaporator reboiler	1.1	None	LLW Engineered	Unknown	1.4	Class A/B/C												
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Agitator	0.4	None	LLW Engineered	Unknown	0.5	Class A/B/C												
Preheater	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Distillation column	8.0	None	LLW Engineered	Unknown	10.0	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	31.6				29.5													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.6													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Acid Recovery - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A													See Balance of Plant					
Non-compactable Class A																		
Compactable Class C																		
Non-compactable Class C																		
GTCC-NT (non-TRU)																		
Non-compactable GTCC-T (TRU)																		
Compactable GTCC-T (TRU)																		
Other Secondary Waste Subtotal Class A																		
Other Secondary Waste Subtotal Class B																		
Other Secondary Waste Subtotal Class C																		
Other Secondary Waste Subtotal Class A/B/C																		
Other Secondary Waste Subtotal GTCC																		
Other Secondary Waste Subtotal Mixed Class A/B/C																		
Other Secondary Waste Subtotal Mixed GTCC																		
Total Class A							481.0				1060.4		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							0.0				0.0		0.0				0.0	
Total Class A/B/C	137.5				56.0		481.0				1060.4		0.0				0.0	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.6		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Acid Recovery - Detailed Summary of Secondary Waste Estimates for UNF2

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Excess nitrates							481	Cementation	4 m3 box	0	1060.4	Class A						
Operational Waste Subtotal Class A							481				1060.4		0				0	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	0.0				0.0		481				1060.4		0				0	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C												
Laundered protective clothing	1.4	Compaction	LLW box	0.1	0.4	Class A/B/C												
Step-off pads	0.4	Compaction	LLW box	0.0	0.1	Class A/B/C												
Disposable protective clothing	28.8	Compaction	LLW box	2.9	7.2	Class A/B/C												
Plastic suits	41.3	Compaction	LLW box	4.1	10.3	Class A/B/C												
Containment hut material	2.4	Compaction	LLW box	0.2	0.6	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	105.9				26.5													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
0	0.0	None	0	0.0	0.0	0	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Process vessel (various sizes)	10.4	None	LLW Engineered	Unknown	13.0	Class A/B/C												
Pump - Process	1.1	None	LLW Engineered	Unknown	1.4	Class A/B/C												
Evaporator condenser	0.3	None	LLW Engineered	Unknown	0.4	Class A/B/C												
Evaporator reboiler	1.1	None	LLW Engineered	Unknown	1.4	Class A/B/C												
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	31.6				29.5													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.6													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Acid Recovery - Detailed Summary of Secondary Waste Estimates for UNF2																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A													See Balance of Plant					
Non-compactable Class A																		
Compactable Class C																		
Non-compactable Class C																		
GTCC-NT (non-TRU)																		
Non-compactable GTCC-T (TRU)																		
Compactable GTCC-T (TRU)																		
Other Secondary Waste Subtotal Class A																		
Other Secondary Waste Subtotal Class B																		
Other Secondary Waste Subtotal Class C																		
Other Secondary Waste Subtotal Class A/B/C																		
Other Secondary Waste Subtotal GTCC																		
Other Secondary Waste Subtotal Mixed Class A/B/C																		
Other Secondary Waste Subtotal Mixed GTCC																		
Total Class A							481.0				1060.4		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							0.0				0.0		0.0				0.0	
Total Class A/B/C	137.5				56.0		481.0				1060.4		0.0				0.0	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.6		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Acid Recovery - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)

Waste Stream	UFD/EAS As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	AREVA As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	Energy*Solutions* As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Excess nitrates							481	Cementation	4 m3 box	0	1060.4	Class A						
Operational Waste Subtotal Class A							481				1060.4							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		481				1060.4							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C												
Laundered protective clothing	1.4	Compaction	LLW box	0.1	0.4	Class A/B/C												
Step-off pads	0.4	Compaction	LLW box	0.0	0.1	Class A/B/C												
Disposable protective clothing	28.8	Compaction	LLW box	2.9	7.2	Class A/B/C												
Plastic suits	41.3	Compaction	LLW box	4.1	10.3	Class A/B/C												
Containment hut material	2.4	Compaction	LLW box	0.2	0.6	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	105.9				26.5													
0	0.0	None	0	0.0	0.0	0	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Process vessel (various sizes)	10.4	None	LLW Engineered	Unknown	13.0	Class A/B/C												
Pump - Process	1.1	None	LLW Engineered	Unknown	1.4	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	31.6				29.5													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.6													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Acid Recovery - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A													See Balance of Plant					
Non-compactable Class A																		
Compactable Class C																		
Non-compactable Class C																		
GTCC-NT (non-TRU)																		
Non-compactable GTCC-T (TRU)																		
Compactable GTCC-T (TRU)																		
Other Secondary Waste Subtotal Class A																		
Other Secondary Waste Subtotal Class B																		
Other Secondary Waste Subtotal Class C																		
Other Secondary Waste Subtotal Class A/B/C																		
Other Secondary Waste Subtotal GTCC																		
Other Secondary Waste Subtotal Mixed Class A/B/C																		
Other Secondary Waste Subtotal Mixed GTCC																		
Total Class A							481.0				1060.4		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							0.0				0.0		0.0				0.0	
Total Class A/B/C	137.5				56.0		481.0				1060.4		0.0				0.0	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.6		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Appendix F

Liquid Effluent Processing Functional Area

Detailed Waste Comparison

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Liquid Effluent Processing - Detailed Summary of Secondary Waste Estimates for UNF1

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Solidified waste water	1200.0	Cementation	Solid LLW box	1000.00	1200.0	Class A/B/C	See Acid Recovery - Excess Nitrates						See Process Waste - Tritium Waste (Not considered secondary waste)					
Spent Ion Exchange Resins (including from Fuel Receipt)	Included in Ion Exchange Vessel below						No resin waste identified specifically for Liquid Effluent Processing (See Receipt and Storage - Dewatered Resin)						1696	None	HIC 210-Liner	331	1880.1	Class A
Salt-bearing waste							560	Cementation	4 m3 box	280	1232	Class A	1251.2	Cementation	HIC 210-Liner	301	1709.7	Class C
Operational Waste Subtotal Class A							560				1232		1696				1880.1	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		1251.2				1709.7	
Operational Waste Subtotal Class A/B/C	1200.0				1200.0		560				1232		2947.2				3589.8	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves Shoe covers Laundered protective clothing Step-off pads Disposable protective clothing Plastic suits Containment hut material	Included in Balance of Plant						Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C																		
Job Control Waste Subtotal GTCC																		
Job Control Waste Subtotal Mixed Class A/B/C																		
Job Control Waste Subtotal Mixed GTCC																		
Maintenance Waste																		
Ion exchange vessel	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Micro-filtration housing	0.0	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Carbon bed filter vessels	0.7	None	LLW Engineered	Unknown	0.9	Class A/B/C												
Reverse osmosis housing	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator	0.4	None	LLW Engineered	Unknown	0.5	Class A/B/C												
Condenser	4.5	None	LLW Engineered	Unknown	5.6	Class A/B/C												
Heat exchanger	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Process vessels	47.5	None	LLW Engineered	Unknown	59.4	Class A/B/C												
Agitator	1.5	None	LLW Engineered	Unknown	1.9	Class A/B/C												
Pump	2.3	None	LLW Engineered	Unknown	2.9	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	57.4				71.8													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Liquid Effluent Processing - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							100.5	Compacted	4 m3 box	14.0	61.6	Class A	See Balance of Plant					
Non-compactable Class A							0.0											
Compactable Class C							1.7	Compacted	4 m3 box	0.3	1.3	Class C						
Non-compactable Class C							0.0											
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							100.5				61.6							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							1.7				1.3							
Other Secondary Waste Subtotal Class A/B/C							102.2				62.9							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							660.5				1293.6		1696.0				1880.1	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							1.7				1.3		1251.2				1709.7	
Total Class A/B/C	1257.4				1271.8		662.2				1294.9		2947.2				3589.8	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Liquid Effluent Processing - Detailed Summary of Secondary Waste Estimates for UNF2

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Solidified waste water	1200.0	Cementation	Solid LLW box	1000.00	1200.0	Class A/B/C	See Acid Recovery - Excess Nitrates						See Process Waste - Tritium Waste (Not considered secondary waste)					
Spent Ion Exchange Resins (including from Fuel Receipt)	Included in Ion Exchange Vessel below						No resin waste identified specifically for Liquid Effluent Processing						1696	None	HIC 210-Liner	331	1880.1	Class A
Salt-bearing waste							560	Cementation	4 m3 box	280	1232	Class A	1251.2	Cementation	HIC 210-Liner	301	1709.7	Class C
Operational Waste Subtotal Class A							560				1232		1696				1880.1	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		1251.2				1709.7	
Operational Waste Subtotal Class A/B/C	1200.0				1200.0		560				1232		2947.2				3589.8	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	0.0	None	0	0.0	0.0	0	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	0.0	None	0	0.0	0.0	0												
Laundered protective clothing	0.0	None	0	0.0	0.0	0												
Step-off pads	0.0	None	0	0.0	0.0	0												
Disposable protective clothing	0.0	None	0	0.0	0.0	0												
Plastic suits	0.0	None	0	0.0	0.0	0												
Containment hut material	0.0	None	0	0.0	0.0	0												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	0.0				0.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Ion exchange vessel	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Micro-filtration housing	0.0	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Carbon bed filter vessels	0.7	None	LLW Engineered	Unknown	0.9	Class A/B/C												
Reverse osmosis housing	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator	0.4	None	LLW Engineered	Unknown	0.5	Class A/B/C												
Condenser	4.5	None	LLW Engineered	Unknown	5.6	Class A/B/C												
Heat exchanger	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Process vessels	47.5	None	LLW Engineered	Unknown	59.4	Class A/B/C												
Agitator	1.5	None	LLW Engineered	Unknown	1.9	Class A/B/C												
Pump	2.3	None	LLW Engineered	Unknown	2.9	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	57.4				71.8													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Liquid Effluent Processing - Detailed Summary of Secondary Waste Estimates for UNF2																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							100.5	Compacted	4 m3 box	14.0	61.6	Class A	See Balance of Plant					
Non-compactable Class A							0.0											
Compactable Class C							1.7	Compacted	4 m3 box	0.3	1.3	Class C						
Non-compactable Class C							0.0											
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							100.5				61.6							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							1.7				1.3							
Other Secondary Waste Subtotal Class A/B/C							102.2				62.9							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							660.5				1293.6		1696.0				1880.1	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							1.7				1.3		1251.2				1709.7	
Total Class A/B/C	1257.4				1271.8		662.2				1294.9		2947.2				3589.8	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Liquid Effluent Processing - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Solidified waste water	1200.0	Cementation	Solid LLW box	1000.00	1200.0	Class A/B/C	See Acid Recovery - Excess Nitrates						See Process Waste - Tritium Waste (Not considered secondary waste)					
Spent Ion Exchange Resins (including from Fuel Receipt)	Included in Ion Exchange Vessel below						No resin waste identified specifically for Liquid Effluent Processing (See Recycle and Storage - Dewatered Resin)						1696	None	HIC 210-Liner	331	1880.1	Class A
Salt-bearing waste							560	Cementation	4 m3 box	280	1232	Class A	1240	Cementation	HIC 210-Liner	298	1692.6	Class C
Operational Waste Subtotal Class A							560				1232		1696				1880.1	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		1240				1692.6	
Operational Waste Subtotal Class A/B/C	1200.0				1200.0		560				1232		2936				3572.7	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	0.0	None	0	0.0	0.0	0	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	0.0	None	0	0.0	0.0	0												
Laundered protective clothing	0.0	None	0	0.0	0.0	0												
Step-off pads	0.0	None	0	0.0	0.0	0												
Disposable protective clothing	0.0	None	0	0.0	0.0	0												
Plastic suits	0.0	None	0	0.0	0.0	0												
Containment hut material	0.0	None	0	0.0	0.0	0												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	0.0				0.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Ion exchange vessel	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Micro-filtration housing	0.0	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Carbon bed filter vessels	0.7	None	LLW Engineered	Unknown	0.9	Class A/B/C												
Reverse osmosis housing	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Evaporator	0.4	None	LLW Engineered	Unknown	0.5	Class A/B/C												
Condenser	4.5	None	LLW Engineered	Unknown	5.6	Class A/B/C												
Heat exchanger	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Process vessels	47.5	None	LLW Engineered	Unknown	59.4	Class A/B/C												
Agitator	1.5	None	LLW Engineered	Unknown	1.9	Class A/B/C												
Pump	2.3	None	LLW Engineered	Unknown	2.9	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	57.4				71.8													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Liquid Effluent Processing - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							100.5	Compacted	4 m3 box	14.0	61.6	Class A	See Balance of Plant					
Non-compactable Class A							0.0											
Compactable Class C							1.7	Compacted	4 m3 box	0.3	1.3	Class C						
Non-compactable Class C							0.0											
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							100.5				61.6							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							1.7				1.3							
Other Secondary Waste Subtotal Class A/B/C							102.2				62.9							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							660.5				1293.6		1696.0				1880.1	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							1.7				1.3		1240.0				1692.6	
Total Class A/B/C	1257.4				1271.8		662.2				1294.9		2936.0				3572.7	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Appendix G

Vitrification Functional Area

Detailed Waste Comparison

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Vitrification - Detailed Summary of Secondary Waste Estimates for UNF1

Waste Stream	UFD/EAS						AREVA						Energy*Solutions*					
	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C												
Laundered protective clothing	8.7	Compaction	LLW box	0.9	2.2	Class A/B/C												
Step-off pads	2.2	Compaction	LLW box	0.2	0.6	Class A/B/C												
Disposable protective clothing	144.0	Compaction	LLW box	14.4	36.0	Class A/B/C												
Plastic suits	206.4	Compaction	LLW box	20.6	51.6	Class A/B/C												
Containment hut material	12.0	Compaction	LLW box	1.2	3.0	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	580.1				145.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	Mixed drum	2.9	0.6	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Manipulator counterweights	0.1	None	Mixed drum	1.0	0.2	Mixed A/B/C												
Manipulator boots	2.4	Compaction	LLW box	0.2	0.6	Class A/B/C												
Manipulator arms	8.0	Compaction	LLW box	0.8	2.0	Class A/B/C												
Glovebox gloves	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Glovebox filters	0.2	Compaction	LLW box	0.0	0.1	Class A/B/C												
Process vessel (various sizes)	6.3	None	LLW Engineered	Unknown	7.9	Class A/B/C												
Vessel cooling coils	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
vessel heating coils	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Pump - Transfer	7.2	None	LLW Engineered	Unknown	9.0	Class A/B/C												
Jumper - Piping	23.7	None	LLW Engineered	Unknown	29.6	Class A/B/C												
Jumper - Electrical and Instrument	14.5	None	LLW Engineered	Unknown	18.1	Class A/B/C												
Agitator	1.5	None	LLW Engineered	Unknown	1.9	Class A/B/C												
Cooler	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Condesner	1.1	None	LLW Engineered	Unknown	1.4	Class A/B/C												
Calciner	2.8	None	Mixed engineered	Unknown	3.7	Mixed GTCC												
Scrubber	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Melter	31.3	None	Mixed engineered	Unknown	41.1	Mixed GTCC							2.90	None	Overpack	0.2	9.8	GTCC
Absorber	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Maintenance Waste Subtotal Class A													0				0	
Maintenance Waste Subtotal Class B													0				0	
Maintenance Waste Subtotal Class C													0				0	
Maintenance Waste Subtotal Class A/B/C	68.0				74.3								0				0	
Maintenance Waste Subtotal GTCC	0.0				0.0								2.9				9.8	
Maintenance Waste Subtotal Mixed Class A/B/C	0.4				0.8								0				0	
Maintenance Waste Subtotal Mixed GTCC	34.1				44.8								0				0	

Vitrification - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							83.0	Compacted	4 m3 box	11.5	50.6	Class A	See Balance of Plant					
Non-compactable Class A							15.6	None	4 m3 box	3.9	17.2	Class A						
Compactable Class C							9.5	Compacted	4 m3 box	1.3	5.8	Class C						
Non-compactable Class C							0.5	None	4 m3 box	0.2	0.9	Class C						
GTCC-NT (non-TRU)							5.2	None	55 gallon drum	23.5	28.2	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							98.6				67.8							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							10.0				6.7							
Other Secondary Waste Subtotal Class A/B/C							108.6				74.5							
Other Secondary Waste Subtotal GTCC							5.2				28.2							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							98.6				67.8		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							10.0				6.7		0.0				0.0	
Total Class A/B/C	648.1				219.3		108.6				74.5		0.0				0.0	
Total GTCC	0.0				0.0		5.2				28.2		2.9				9.8	
Total Mixed Class A/B/C	0.4				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	34.1				44.8		0.0				0.0		0.0				0.0	

Vitrification - Detailed Summary of Secondary Waste Estimates for UNF2

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Operational Waste Subtotal Class A							0				0		0				0	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C												
Laundered protective clothing	8.7	Compaction	LLW box	0.9	2.2	Class A/B/C												
Step-off pads	2.2	Compaction	LLW box	0.2	0.6	Class A/B/C												
Disposable protective clothing	144.0	Compaction	LLW box	14.4	36.0	Class A/B/C												
Plastic suits	206.4	Compaction	LLW box	20.6	51.6	Class A/B/C												
Containment hut material	12.0	Compaction	LLW box	1.2	3.0	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	580.1				145.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	Mixed drum	2.9	0.6	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Manipulator counterweights	0.1	None	Mixed drum	1.0	0.2	Mixed A/B/C												
Manipulator boots	2.4	Compaction	LLW box	0.2	0.6	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Process vessel (various sizes)	6.3	None	LLW Engineered	Unknown	7.9	Class A/B/C												
Vessel cooling coils	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
vessel heating coils	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Pump - Transfer	7.2	None	LLW Engineered	Unknown	9.0	Class A/B/C												
Jumper - Piping	23.7	None	LLW Engineered	Unknown	29.6	Class A/B/C												
Jumper - Electrical and Instrument	14.5	None	LLW Engineered	Unknown	18.1	Class A/B/C												
Agitator	1.5	None	LLW Engineered	Unknown	1.9	Class A/B/C												
Cooler	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Condesner	1.1	None	LLW Engineered	Unknown	1.4	Class A/B/C												
Calciner	2.8	None	Mixed engineered	Unknown	3.7	Mixed GTCC												
Absorber	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A													0				0	
Maintenance Waste Subtotal Class B													0				0	
Maintenance Waste Subtotal Class C													0				0	
Maintenance Waste Subtotal Class A/B/C	68.0				74.3								0				0	
Maintenance Waste Subtotal GTCC	0.0				0.0								2.9				9.8	
Maintenance Waste Subtotal Mixed Class A/B/C	0.4				0.8								0				0	
Maintenance Waste Subtotal Mixed GTCC	34.1				44.8								0				0	

Vitrification - Detailed Summary of Secondary Waste Estimates for UNF2																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							83.0	Compacted	4 m3 box	11.5	50.6	Class A	See Balance of Plant					
Non-compactable Class A							15.6	None	4 m3 box	3.9	17.2	Class A						
Compactable Class C							9.5	Compacted	4 m3 box	1.3	5.8	Class C						
Non-compactable Class C							0.5	None	4 m3 box	0.2	0.9	Class C						
GTCC-NT (non-TRU)							5.2	None	55 gallon drum	23.5	28.2	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							98.6				67.8							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							10.0				6.7							
Other Secondary Waste Subtotal Class A/B/C							108.6				74.5							
Other Secondary Waste Subtotal GTCC							5.2				28.2							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							98.6				67.8		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							10.0				6.7		0.0				0.0	
Total Class A/B/C	648.1				219.3		108.6				74.5		0.0				0.0	
Total GTCC	0.0				0.0		5.2				28.2		2.9				9.8	
Total Mixed Class A/B/C	0.4				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	34.1				44.8		0.0				0.0		0.0				0.0	

Vitrification - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C												
Laundered protective clothing	8.7	Compaction	LLW box	0.9	2.2	Class A/B/C												
Step-off pads	2.2	Compaction	LLW box	0.2	0.6	Class A/B/C												
Disposable protective clothing	144.0	Compaction	LLW box	14.4	36.0	Class A/B/C												
Plastic suits	206.4	Compaction	LLW box	20.6	51.6	Class A/B/C												
Containment hut material	12.0	Compaction	LLW box	1.2	3.0	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	580.1				145.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
0	0.0	None	0	0.0	0.0	0	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Process vessel (various sizes)	6.3	None	LLW Engineered	Unknown	7.9	Class A/B/C												
Vessel cooling coils	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
vessel heating coils	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Pump - Transfer	7.2	None	LLW Engineered	Unknown	9.0	Class A/B/C												
Jumper - Piping	23.7	None	LLW Engineered	Unknown	29.6	Class A/B/C												
Jumper - Electrical and Instrument	14.5	None	LLW Engineered	Unknown	18.1	Class A/B/C												
Agitator	1.5	None	LLW Engineered	Unknown	1.9	Class A/B/C												
Calciner	2.8	None	Mixed engineered	Unknown	3.7	Mixed GTCC												
Scrubber	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
Melter	31.3	None	Mixed engineered	Unknown	41.1	Mixed GTCC							2.9	None	Overpack	0.2	9.8	GTCC
Absorber	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A													0				0	
Maintenance Waste Subtotal Class B													0				0	
Maintenance Waste Subtotal Class C													0				0	
Maintenance Waste Subtotal Class A/B/C	68.0				74.3								0				0	
Maintenance Waste Subtotal GTCC	0.0				0.0								2.9				9.8	
Maintenance Waste Subtotal Mixed Class A/B/C	0.4				0.8								0				0	
Maintenance Waste Subtotal Mixed GTCC	34.1				44.8								0				0	

Vitrification - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							83.0	Compacted	4 m3 box	11.5	50.6	Class A	See Balance of Plant					
Non-compactable Class A							15.6	None	4 m3 box	3.9	17.2	Class A						
Compactable Class C							9.5	Compacted	4 m3 box	1.8	7.9	Class C						
Non-compactable Class C							0.5	None	4 m3 box	0.3	1.3	Class C						
GTCC-NT (non-TRU)							5.2	None	55 gallon drum	23.5	28.2	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							98.6				67.8							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							10.0				9.2							
Other Secondary Waste Subtotal Class A/B/C							108.6				77.0							
Other Secondary Waste Subtotal GTCC							5.2				28.2							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							98.6				67.8		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							10.0				9.2		0.0				0.0	
Total Class A/B/C	648.1				219.3		108.6				77.0		0.0				0.0	
Total GTCC	0.0				0.0		5.2				28.2		2.9				9.8	
Total Mixed Class A/B/C	0.4				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	34.1				44.8		0.0				0.0		0.0				0.0	

Appendix H

Offgas Functional Area

Detailed Waste Comparison

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Offgas - Detailed Summary of Secondary Waste Estimates for UNF1

Waste Stream	UFD/EAS						AREVA						Energy*Solutions*					
	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	15.3	Compaction	LLW box	1.5	3.8	Class A/B/C							Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	15.3	Compaction	LLW box	1.5	3.8	Class A/B/C												
Laundered protective clothing	2.1	Compaction	LLW box	0.2	0.5	Class A/B/C												
Step-off pads	0.9	Compaction	LLW box	0.1	0.2	Class A/B/C												
Disposable protective clothing	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Plastic suits	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Containment hut material	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	33.6				8.4													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	Mixed drum	2.4	0.5	Mixed A/B/C							Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Jumper - Piping	1.4	None	LLW Engineered	Unknown	1.8	Class A/B/C												
Jumper - Electrical and Instrument	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Offgas filter vessel	0.2	None	GTCC engineered	Unknown	0.3	GTCC												
Iodine reactor vessel	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Ruthenium filter vessel	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	2.1				2.6													
Maintenance Waste Subtotal GTCC	0.2				0.3													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.5													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A							None Identified						See Balance of Plant					
Non-compactable Class A																		
Compactable Class C																		
Non-compactable Class C																		
GTCC-NT (non-TRU)																		
Non-compactable GTCC-T (TRU)																		
Compactable GTCC-T (TRU)																		
Other Secondary Waste Subtotal Class A							0.0				0.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							0.0				0.0							
Other Secondary Waste Subtotal Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							0.0				0.0		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							0.0				0.0		0.0				0.0	
Total Class A/B/C	35.7				11.0		0.0				0.0		0.0				0.0	
Total GTCC	0.2				0.3		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.5		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Offgas - Detailed Summary of Secondary Waste Estimates for UNF2

Waste Stream	UFD/EAS						AREVA						EnergySolutions					
	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Operational Waste Subtotal Class A							0				0		0				0	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	15.3	Compaction	LLW box	1.5	3.8	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	15.3	Compaction	LLW box	1.5	3.8	Class A/B/C												
Laundered protective clothing	2.1	Compaction	LLW box	0.2	0.5	Class A/B/C												
Step-off pads	0.9	Compaction	LLW box	0.1	0.2	Class A/B/C												
Disposable protective clothing	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Plastic suits	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Containment hut material	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	33.6				8.4													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	Mixed drum	2.4	0.5	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Jumper - Piping	1.4	None	LLW Engineered	Unknown	1.8	Class A/B/C												
Jumper - Electrical and Instrument	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Offgas filter vessel	0.2	None	GTCC engineered	Unknown	0.3	GTCC												
Iodine reactor vessel	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Ruthenium filter vessel	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	2.1				2.6													
Maintenance Waste Subtotal GTCC	0.2				0.3													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.5													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A							0.0						See Balance of Plant					
Non-compactable Class A							0.0											
Compactable Class C							0.0											
Non-compactable Class C							0.0											
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							0.0				0.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							0.0				0.0							
Other Secondary Waste Subtotal Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							0.0				0.0		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							0.0				0.0		0.0				0.0	
Total Class A/B/C	35.7				11.0		0.0				0.0		0.0				0.0	
Total GTCC	0.2				0.3		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.5		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Offgas - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)

Waste Stream	UFD/EAS						AREVA						Energy*Solutions*					
	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	15.3	Compaction	LLW box	1.5	3.8	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	15.3	Compaction	LLW box	1.5	3.8	Class A/B/C												
Laundered protective clothing	2.1	Compaction	LLW box	0.2	0.5	Class A/B/C												
Step-off pads	0.9	Compaction	LLW box	0.1	0.2	Class A/B/C												
Disposable protective clothing	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Plastic suits	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Containment hut material	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	33.6				8.4													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.3	None	Mixed drum	2.4	0.5	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Jumper - Piping	1.4	None	LLW Engineered	Unknown	1.8	Class A/B/C												
Jumper - Electrical and Instrument	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Offgas filter vessel	0.2	None	GTCC engineered	Unknown	0.3	GTCC												
Iodine reactor vessel	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Ruthenium filter vessel	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	2.1				2.6													
Maintenance Waste Subtotal GTCC	0.2				0.3													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.5													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A							0.0						See Balance of Plant					
Non-compactable Class A							0.0											
Compactable Class C							0.0											
Non-compactable Class C							0.0											
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							0.0				0.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							0.0				0.0							
Other Secondary Waste Subtotal Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							0.0				0.0		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							0.0				0.0		0.0				0.0	
Total Class A/B/C	35.7				11.0		0.0				0.0		0.0				0.0	
Total GTCC	0.2				0.3		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.5		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

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Appendix I
Balance of Plant Functional Area
Detailed Waste Comparison

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Balance of Plant - Detailed Summary of Secondary Waste Estimates for UNF1

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Packaging waste (low activity)	135.5	Compaction	LLW box	13.55	33.9	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Packaging waste (high activity)	4.8	None	GTCC box	3.75	6.4	GTCC												
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	135.5				33.9		0				0							
Operational Waste Subtotal GTCC	4.8				6.4		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C												
Laundered protective clothing	50.4	Compaction	LLW box	5.0	12.6	Class A/B/C												
Step-off pads	13.3	Compaction	LLW box	1.3	3.3	Class A/B/C												
Disposable protective clothing	2571.4	Compaction	LLW box	257.1	642.8	Class A/B/C												
Plastic suits	3685.6	Compaction	LLW box	368.6	921.4	Class A/B/C												
Containment hut material	106.1	Compaction	LLW box	10.6	26.5	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	7694.3				1923.6													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	5.3	None	Mixed drum	50.5	10.5	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Manipulator counterweights	0.1	None	Mixed drum	0.6	0.1	Mixed A/B/C												
Manipulator boots	1.5	Compaction	LLW box	0.2	0.4	Class A/B/C												
Manipulator arms	4.8	Compaction	LLW box	0.5	1.2	Class A/B/C												
Glovebox gloves	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
Glovebox gloves - leaded	0.2	None	Mixed drum	1.9	0.4	Mixed A/B/C												
Glovebox filters	4.7	Compaction	LLW box	0.5	1.2	Class A/B/C												
Fume hood filters	1.0	None	Mixed drum	9.6	2.0	Mixed A/B/C												
HVAC exhaust air filters (HEPA)	3700.2	Compaction	LLW box	370.0	925.1	Class A/B/C												
HVAC exhaust air filters (roughing)	1284.5	Compaction	LLW box	128.5	321.1	Class A/B/C												
Contaminated mop heads	32.0	Compaction	LLW box	3.2	8.0	Class A/B/C												
Fluorescent lamps	11.0	Compaction	LLW box	1.1	2.8	Class A/B/C												
Batteries	0.4	None	Mixed drum	3.8	0.8	Mixed A/B/C												
Jumper - Piping	13.8	None	LLW Engineered	Unknown	17.3	Class A/B/C												
Jumper - Electrical and Instrument	12.0	None	LLW Engineered	Unknown	15.0	Class A/B/C												
Vessel vent fan	13.6	None	LLW Engineered	Unknown	17.0	Class A/B/C												
Vessel vent condenser	0.3	None	LLW Engineered	Unknown	0.4	Class A/B/C												
Vessel vent filter	38.7	None	LLW Engineered	Unknown	48.4	Class A/B/C												
Vessel vent heater	1.0	None	LLW Engineered	Unknown	1.3	Class A/B/C												
Vessel vent separator	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	5120.0				1359.6													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	6.9				13.8													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Balance of Plant - Detailed Summary of Secondary Waste Estimates for UNF1																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							19.4	Compacted	4 m3 box	2.7	11.9	Class A	578	Compacted	4 m3 box	975	406	Class A
Non-compactable Class A							0.0						0					
Compactable Class C							3.4	Compacted	4 m3 box	0.5	2.2	Class C	0					
Non-compactable Class C							0.0						0.78	None	4 m3 box	4	0.8	Class C
GTCC-NT (non-TRU)							0.0						0					
Non-compactable GTCC-T (TRU)							0.0						4.8	None	55 gallon drum	24.6	5.1	GTCC
Compactable GTCC-T (TRU)							0.0						4.8	Compacted	55 gallon drum	8	3.3	GTCC
Other Secondary Waste Subtotal Class A							19.4				11.9		578				406	
Other Secondary Waste Subtotal Class B							0.0				0.0		0				0	
Other Secondary Waste Subtotal Class C							3.4				2.2		0.78				0.8	
Other Secondary Waste Subtotal Class A/B/C							22.8				14.1		578.78				406.8	
Other Secondary Waste Subtotal GTCC							0.0				0.0		9.6				8.4	
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0		0				0	
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0		0				0	
Total Class A							19.4				11.9		578.0				406.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							3.4				2.2		0.8				0.8	
Total Class A/B/C	12949.8				3317.0		22.8				14.1		578.8				406.8	
Total GTCC	4.8				6.4		0.0				0.0		9.6				8.4	
Total Mixed Class A/B/C	6.9				13.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Balance of Plant - Detailed Summary of Secondary Waste Estimates for UNF2

	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**	**As Generated Volume (m^3)**	**Treatment**	**Container**	**Container Quantity**	**Packaged Volume (m^3)**	**Waste Classification**
Operational Waste																		
Packaging waste (low activity)	135.5	Compaction	LLW box	13.55	33.9	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Packaging waste (high activity)	4.8	None	GTCC box	3.75	6.4	GTCC												
Operational Waste Subtotal Class A							0				0		0				0	
Operational Waste Subtotal Class B							0				0		0				0	
Operational Waste Subtotal Class C							0				0		0				0	
Operational Waste Subtotal Class A/B/C	135.5				33.9		0				0		0				0	
Operational Waste Subtotal GTCC	4.8				6.4		0				0		0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				0	
Job Control Waste																		
Gloves	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C												
Laundered protective clothing	50.4	Compaction	LLW box	5.0	12.6	Class A/B/C												
Step-off pads	13.3	Compaction	LLW box	1.3	3.3	Class A/B/C												
Disposable protective clothing	2571.4	Compaction	LLW box	257.1	642.8	Class A/B/C												
Plastic suits	3685.6	Compaction	LLW box	368.6	921.4	Class A/B/C												
Containment hut material	106.1	Compaction	LLW box	10.6	26.5	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	7694.3				1923.6													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	5.3	None	Mixed drum	50.5	10.5	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Manipulator counterweights	0.1	None	Mixed drum	0.6	0.1	Mixed A/B/C												
Manipulator boots	1.5	Compaction	LLW box	0.2	0.4	Class A/B/C												
Manipulator arms	4.8	Compaction	LLW box	0.5	1.2	Class A/B/C												
Glovebox gloves	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
Glovebox gloves - leaded	0.2	None	Mixed drum	1.9	0.4	Mixed A/B/C												
Glovebox filters	4.7	Compaction	LLW box	0.5	1.2	Class A/B/C												
Fume hood filters	1.0	None	Mixed drum	9.6	2.0	Mixed A/B/C												
HVAC exhaust air filters (HEPA)	3700.2	Compaction	LLW box	370.0	925.1	Class A/B/C												
HVAC exhaust air filters (roughing)	1284.5	Compaction	LLW box	128.5	321.1	Class A/B/C												
Contaminated mop heads	32.0	Compaction	LLW box	3.2	8.0	Class A/B/C												
Fluorescent lamps	11.0	Compaction	LLW box	1.1	2.8	Class A/B/C												
Batteries	0.4	None	Mixed drum	3.8	0.8	Mixed A/B/C												
Jumper - Piping	13.8	None	LLW Engineered	Unknown	17.3	Class A/B/C												
Jumper - Electrical and Instrument	12.0	None	LLW Engineered	Unknown	15.0	Class A/B/C												
Vessel vent fan	13.6	None	LLW Engineered	Unknown	17.0	Class A/B/C												
Vessel vent condenser	0.3	None	LLW Engineered	Unknown	0.4	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	5120.0				1359.6													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	6.9				13.8													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Balance of Plant - Detailed Summary of Secondary Waste Estimates for UNF2																		
	UFD/EAS						AREVA						EnergySolutions					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							19.4	Compacted	4 m3 box	2.7	11.9	Class A	578	Compacted	4 m3 box	975	406	Class A
Non-compactable Class A							0.0						0					
Compactable Class C							3.4	Compacted	4 m3 box	0.5	2.2	Class C	0					
Non-compactable Class C							0.0						0.78	None	4 m3 box	4	0.8	Class C
GTCC-NT (non-TRU)							0.0						0					
Non-compactable GTCC-T (TRU)							0.0						4.8	None	55 gallon drum	24.6	5.1	GTCC
Compactable GTCC-T (TRU)							0.0						4.8	Compacted	55 gallon drum	8	3.3	GTCC
Other Secondary Waste Subtotal Class A							19.4				11.9		578				406	
Other Secondary Waste Subtotal Class B							0.0				0.0		0				0	
Other Secondary Waste Subtotal Class C							3.4				2.2		0.78				0.8	
Other Secondary Waste Subtotal Class A/B/C							22.8				14.1		578.78				406.8	
Other Secondary Waste Subtotal GTCC							0.0				0.0		9.6				8.4	
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0		0				0	
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0		0				0	
Total Class A							19.4				11.9		578.0				406.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							3.4				2.2		0.8				0.8	
Total Class A/B/C	12949.8				3317.0		22.8				14.1		578.8				406.8	
Total GTCC	4.8				6.4		0.0				0.0		9.6				8.4	
Total Mixed Class A/B/C	6.9				13.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Balance of Plant - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste																		
Packaging waste (low activity)	135.5	Compaction	LLW box	13.55	33.9	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Packaging waste (high activity)	4.8	None	GTCC box	3.75	6.4	GTCC												
Operational Waste Subtotal Class A							0				0							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	135.5				33.9		0				0							
Operational Waste Subtotal GTCC	4.8				6.4		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Shoe covers	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C												
Laundered protective clothing	50.4	Compaction	LLW box	5.0	12.6	Class A/B/C												
Step-off pads	13.3	Compaction	LLW box	1.3	3.3	Class A/B/C												
Disposable protective clothing	2571.4	Compaction	LLW box	257.1	642.8	Class A/B/C												
Plastic suits	3685.6	Compaction	LLW box	368.6	921.4	Class A/B/C												
Containment hut material	106.1	Compaction	LLW box	10.6	26.5	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	7694.3				1923.6													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	5.3	None	Mixed drum	50.5	10.5	Mixed A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste					
Manipulator counterweights	0.1	None	Mixed drum	0.6	0.1	Mixed A/B/C												
Manipulator boots	1.5	Compaction	LLW box	0.2	0.4	Class A/B/C												
Manipulator arms	4.8	Compaction	LLW box	0.5	1.2	Class A/B/C												
Glovebox gloves	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C												
Glovebox gloves - leaded	0.2	None	Mixed drum	1.9	0.4	Mixed A/B/C												
Glovebox filters	4.7	Compaction	LLW box	0.5	1.2	Class A/B/C												
Fume hood filters	1.0	None	Mixed drum	9.6	2.0	Mixed A/B/C												
HVAC exhaust air filters (HEPA)	3700.2	Compaction	LLW box	370.0	925.1	Class A/B/C												
HVAC exhaust air filters (roughing)	1284.5	Compaction	LLW box	128.5	321.1	Class A/B/C												
Contaminated mop heads	32.0	Compaction	LLW box	3.2	8.0	Class A/B/C												
Fluorescent lamps	11.0	Compaction	LLW box	1.1	2.8	Class A/B/C												
Batteries	0.4	None	Mixed drum	3.8	0.8	Mixed A/B/C												
Jumper - Piping	13.8	None	LLW Engineered	Unknown	17.3	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	5120.0				1359.6													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	6.9				13.8													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Balance of Plant - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																		
	UFD/EAS						AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste																		
Compactable Class A							19.4	Compacted	4 m3 box	2.7	11.9	Class A	578	Compacted	4 m3 box	975	406	Class A
Non-compactable Class A							0.0						0					
Compactable Class C							3.4	Compacted	4 m3 box	0.7	3.1	Class C	0					
Non-compactable Class C							0.0						0.78	None	4 m3 box	4	0.8	Class C
GTCC-NT (non-TRU)							0.0						0					
Non-compactable GTCC-T (TRU)							0.0						4.8	None	55 gallon drum	24.6	5.1	GTCC
Compactable GTCC-T (TRU)							0.0						4.8	Compacted	55 gallon drum	8	3.3	GTCC
Other Secondary Waste Subtotal Class A							19.4				11.9		578				406	
Other Secondary Waste Subtotal Class B							0.0				0.0		0				0	
Other Secondary Waste Subtotal Class C							3.4				3.1		0.78				0.8	
Other Secondary Waste Subtotal Class A/B/C							22.8				15.0		578.78				406.8	
Other Secondary Waste Subtotal GTCC							0.0				0.0		9.6				8.4	
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0		0				0	
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0		0				0	
Total Class A							19.4				11.9		578.0				406.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							3.4				3.1		0.8				0.8	
Total Class A/B/C	12949.8				3317.0		22.8				15.0		578.8				406.8	
Total GTCC	4.8				6.4		0.0				0.0		9.6				8.4	
Total Mixed Class A/B/C	6.9				13.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Appendix J

MOX Fuel Fabrication Functional Area

Detailed Waste Comparison

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MOX Fuel Fabrication - Detailed Summary of Secondary Waste Estimates														
	UFD		AREVA						Energy*Solutions*					
Waste Stream	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste														
Zirconium swarf and samples	3.0	GTCC	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals below for Other Secondary Waste					
Inner cans	12.0	GTCC												
Outer cans	12.0	GTCC												
Sample vials	193.7	GTCC												
Glassware, crucibles	3.8	GTCC												
Moly boats	85.7	GTCC												
Zirconium cladding waste	3.8	GTCC												
Convenience cans	381.0	GTCC												
Non-routine waste (balls, wheels, boats)	144.8	GTCC												
Operational Waste Subtotal Class A														
Operational Waste Subtotal Class B														
Operational Waste Subtotal Class C														
Operational Waste Subtotal Class A/B/C	0.0													
Operational Waste Subtotal GTCC	839.8													
Operational Waste Subtotal Mixed Class A/B/C	0.0													
Operational Waste Subtotal Mixed GTCC	0.0													
Job Control Waste														
Potentially contaminated organic waste	319.5	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals below for Other Secondary Waste					
UO2 contaminated organic waste	13.5	Class A/B/C												
Potentially contaminated organic waste	159.8	GTCC												
Organic waste (low contamination)	40.3	GTCC												
Organic waste (high contamination)	416.7	GTCC												
Organic waste from cladding	13.4	GTCC												
Job Control Waste Subtotal Class A														
Job Control Waste Subtotal Class B														
Job Control Waste Subtotal Class C														
Job Control Waste Subtotal Class A/B/C	333.0													
Job Control Waste Subtotal GTCC	630.2													
Job Control Waste Subtotal Mixed Class A/B/C	0.0													
Job Control Waste Subtotal Mixed GTCC	0.0													

MOX Fuel Fabrication - Detailed Summary of Secondary Waste Estimates														
	UFD		AREVA						EnergySolutions					
Waste Stream	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Maintenance Waste														
Potentially contaminated miscellaneous waste	43.5	Class A/B/C	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						Similar waste streams are assumed to be included in the totals below for Other Secondary Waste					
HEPA filters from building ventilation	129.8	Class A/B/C												
Filters from other rooms	2.2	Class A/B/C												
Miscellaneous LLW	1.5	Class A/B/C												
Potentially contaminated miscellaneous waste	21.8	GTCC												
HEPA filters from building ventilation	64.9	GTCC												
Filters from other rooms	1.1	GTCC												
Miscellaneous	0.8	GTCC												
Miscellaneous waste (low contamination)	16.1	GTCC												
Miscellaneous waste (high contamination)	251.6	GTCC												
Stainless steel	1.9	GTCC												
Glovebox filters (grinding unit)	78.8	GTCC												
Glovebox filters (large)	18.3	GTCC												
Glovebox filters (Small)	0.8	GTCC												
Process filters (woven metallic)	2.6	GTCC												
Process filters (metallic)	17.9	GTCC												
Dust filters	279.3	GTCC												
Pneumatic transfer filters	3.2	GTCC												
Maintenance Waste Subtotal Class A														
Maintenance Waste Subtotal Class B														
Maintenance Waste Subtotal Class C														
Maintenance Waste Subtotal Class A/B/C	177.0													
Maintenance Waste Subtotal GTCC	759.1													
Maintenance Waste Subtotal Mixed Class A/B/C	0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0													
Other Secondary Waste														
Compactable Class A			162.0	Compacted	4 m3 box	22.5	99.0	Class A	195.0	Compacted	3 compacted 55 gallon drums/110 gallon drum	313.0	130.0	Class A
Non-compactable Class A			0.0			0.0	0.0		12.0	None	55 gallon drum	60.7	12.6	Class A
Compactable Class C			0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable Class C			0.0			0.0	0.0		0.0			0.0	0.0	
GTCC-NT (non-TRU)			0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable GTCC-T (TRU)			227.0	None	55 gallon drum	1034.0	237.8	GTCC	22.5	None	55 gallon drum	114.0	23.7	GTCC
Compactable GTCC-T (TRU)			0.0			0.0	0.0		0.0			0.0	0.0	
Total Class A			162.0				99.0		195.0				130.0	
Total Class B			0.0				0.0		0.0				0.0	
Total Class C			0.0				0.0		0.0				0.0	
Total Class A/B/C	510.0		162.0				99.0		195.0				130.0	
Total GTCC	2229.1		227.0				237.8		22.5				23.7	
Total Mixed Class A/B/C	0.0		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0		0.0				0.0		0.0				0.0	

Appendix K

Fast Reactor Fuel Fabrication Functional Area

Detailed Waste Comparison

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Fast Reactor Fuel Fabrication - Detailed Summary of Secondary Waste Estimates												
	AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Operational Waste												
Gloves and Transfer Bags	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						1.49	None	55 gallon drum	7.54	1.57	Mixed GTCC
Decontamination Wipes and Smears							3.00	None	55 gallon drum	15.18	3.16	Mixed GTCC
Debinding							0.43	None	55 gallon drum	2.20	0.46	GTCC
Pellet Grinding							0.01	None	55 gallon drum	0.03	0.01	Unknown
Carbon Sulfur & Halides							0.02	None	55 gallon drum	0.11	0.02	Unknown
Operational Waste Subtotal Class A												
Operational Waste Subtotal Class B												
Operational Waste Subtotal Class C												
Operational Waste Subtotal Class A/B/C												
Operational Waste Subtotal GTCC												
Operational Waste Subtotal Mixed Class A/B/C												
Operational Waste Subtotal Mixed GTCC												
Job Control Waste												
	Specific job control waste streams are not identified but are assumed to be included in the totals below for Other Secondary Waste						Specific job control waste streams are not identified but are assumed to be included in the totals below for Other Secondary Waste					
Job Control Waste Subtotal Class A												
Job Control Waste Subtotal Class B												
Job Control Waste Subtotal Class C												
Job Control Waste Subtotal Class A/B/C												
Job Control Waste Subtotal GTCC												
Job Control Waste Subtotal Mixed Class A/B/C												
Job Control Waste Subtotal Mixed GTCC												

Fast Reactor Fuel Fabrication - Detailed Summary of Secondary Waste Estimates												
	AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Maintenance Waste												
Fissile/Fertile Receiving	Similar waste streams are assumed to be included in the totals below for Other Secondary Waste						0.05	None	55 gallon drum	0.26	0.05	GTCC
Batching							0.02	None	55 gallon drum	0.11	0.02	GTCC
Blending Milling							0.12	None	55 gallon drum	0.60	0.12	GTCC
Binder Addition							0.15	None	55 gallon drum	0.78	0.16	GTCC
Compaction and Granulation							0.33	None	55 gallon drum	1.68	0.35	GTCC
Lube Addition							0.05	None	55 gallon drum	0.25	0.05	GTCC
Pressing							0.20	None	55 gallon drum	1.02	0.21	GTCC
Boat Loading							0.07	None	55 gallon drum	0.33	0.07	GTCC
Boat Inspection							0.43	None	55 gallon drum	2.18	0.45	GTCC
Debinding							0.12	None	55 gallon drum	0.59	0.12	GTCC
Sintering Furnace							0.50	None	55 gallon drum	2.54	0.53	GTCC
Property Adjustment							0.04	None	55 gallon drum	0.21	0.04	GTCC
Boat Unloading							0.04	None	55 gallon drum	0.21	0.04	GTCC
Pellet Storage							0.07	None	55 gallon drum	0.34	0.07	GTCC
Boat Transport							0.10	None	55 gallon drum	0.52	0.11	GTCC
Interface Conveyors							0.02	None	55 gallon drum	0.08	0.02	GTCC
Pellet Surface Inspection							0.09	None	55 gallon drum	0.43	0.09	GTCC
Pellet Grinding							1.18	None	55 gallon drum	5.95	1.24	GTCC
Pellet Gaging							0.04	None	55 gallon drum	0.22	0.05	GTCC
Pellet Transport							0.01	None	55 gallon drum	0.06	0.01	GTCC
Column Makeup							0.01	None	55 gallon drum	0.03	0.01	GTCC
Cold Component Makeup							0.00	None	55 gallon drum	0.00	0.00	GTCC
Pin Loading & Fuel Storage							0.005	None	55 gallon drum	0.02	0.01	GTCC
Pin End Decontamination							0.01	None	55 gallon drum	0.07	0.01	GTCC
Pin Welding							0.01	None	55 gallon drum	0.05	0.01	GTCC
Three Auto Sample Handling Receiving Station Plus One Manual							0.04	None	55 gallon drum	0.19	0.04	GTCC
Two Auto Sending Station Plus One Manual							0.03	None	55 gallon drum	0.14	0.03	GTCC
Fuel Assembly							0.0008	None	55 gallon drum	0.004	0.0009	GTCC
O/M Ratio & Moisture							0.01	None	55 gallon drum	0.04	0.01	GTCC
Offgas							0.002	None	55 gallon drum	0.01	0.002	GTCC
Carbon Sulfur & Halides							0.03	None	55 gallon drum	0.15	0.03	GTCC
Fuel Assembly							0.003	None	55 gallon drum	0.01	0.003	GTCC
Maintenance Waste Subtotal Class A												
Maintenance Waste Subtotal Class B												
Maintenance Waste Subtotal Class C												
Maintenance Waste Subtotal Class A/B/C												
Maintenance Waste Subtotal GTCC												
Maintenance Waste Subtotal Mixed Class A/B/C												
Maintenance Waste Subtotal Mixed GTCC												

Fast Reactor Fuel Fabrication - Detailed Summary of Secondary Waste Estimates												
	AREVA						Energy*Solutions*					
Waste Stream	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification	As Generated Volume (m^3)	Treatment	Container	Container Quantity	Packaged Volume (m^3)	Waste Classification
Other Secondary Waste												
Compactable Class A	113.0	Compacted	4 m3 box	16.0	70.4	Class A	100.0	Compacted	3 compacted 55 gallon drums/110 gallon drum	160.0	66.0	Class A
Non-compactable Class A	0.0			0.0	0.0		0.0			0.0	0.0	
Compactable Class C	0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable Class C	0.0			0.0	0.0		0.0			0.0	0.0	
GTCC-NT (non-TRU)	0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable GTCC-T (TRU)	127.0	None	55 gallon drum	578.0	132.9	GTCC						
Compactable GTCC-T (TRU)	0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable Mixed GTCC-T (TRU)	0.0			0.0	0.0							
Total Class A	113.0				70.4		100.0				66.0	
Total Class B	0.0				0.0		0.0				0.0	
Total Class C	0.0				0.0		0.0				0.0	
Total Class A/B/C	113.0				70.4		100.0				66.0	
Total GTCC	127.0				132.9		4.2				4.4	
Total Mixed Class A/B/C	0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		4.5				4.7	

Notes:

1. Energy*Solutions* designated operational waste streams from Process Enclosures (i.e. Gloves and Transfer Bags and Decontamination Wipes and Smears) as Mixed GTCC waste in Table 4-13 of their final report. These waste streams appear to be included in the GTCC total shown in Table 5-8 of the Energy*Solutions* final report. The Mixed GTCC waste streams are shown separately above.
2. Energy*Solutions* designated the waste streams from Pin Welding, Auto Sampling, Auto Sending and Fuel Assembly as LLW (i.e. Class A, B or C) in Table 4-13 of their final report. It appears that Energy*Solutions* included these waste streams in their GTCC total presented in Table 5-8 of their final report. These waste streams are designated as GTCC waste in the table above. The total waste volume for these waste streams is relatively low and would not have a significant impact regardless of the waste classification.

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