Enclosure 4

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Summary of Investigation into Changes to Disposal Criteria

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Project Purpose

- Open discussion on changes to low-level waste disposal criteria to clarify performance bases for Class A wastes.
  - Objectives:
    - Develop nuclear power plant waste stream profiles
    - Develop better understanding of regulatory bases
    - Investigate alternative approaches to classification

General Approach

- Remain within the regulatory framework of 10 CFR 61.
- Realign definition of disposal unit to coincide with the intruder volume
- Preserve Class A disposal limits
- Develop rationale to justify this approach

Study Involved

- Database inquiries to develop industry profiles
- Review of DEIS, FEIS and UPDATE documentation to identify NRC's intentions
- Installation and setup of IMPACTS computer code to generate doses
- Development of EXCEL spreadsheets for re-construction of dose models

Dose Modeling Information

- Original IMPACTS computer code not available, but Update of code is available.
- Updated code has not been verified.
- Detailed descriptions of dose models available in DEIS and UPDATE documentation
- Dose models re-constructed in EXCEL
- Comparisons not possible with original IMPACTS, but were possible with UPDATE.

Results of Regulatory Information Review

- Intruder-construction allowable dose rate set at 500 mrem/yr, same as intruder-agriculture, but construction event is one-time only whereas agriculture is every year for 30 years. Higher allowable dose should have been set for construction scenario.
- Deeper disposal provides a factor of 10 reduction in doses, or alternatively a factor of 10 increase in allowable concentrations.

Regulatory Review (cont'd)

- Scenarios undefined for deeper disposal.
- Raises questions:
  - How do exposures occur?
  - Should the intruder-agriculture scenario apply since house construction is not the aim of the excavation?
  - Should either of the scenarios apply as prescribed?
  - What are protective features that would apply to an unknown scenario.

Regulatory Review (cont'd)

- FEIS acknowledged that trench average concentrations would be well below allowable limits in 10 CFR 61, but attributed this to an ALARA benefit.
- Cs-137 allowable limit raised by a factor of 20 to account for wide range of concentrations observed in the 1980-1983 data with a lower average concentration in the waste.

Regulatory Review (cont'd)

- Allowable concentrations limits in 10 CFR 61 based on 2 meter disposal depth---no alternative set of concentrations for a deeper disposal facility.

Review Dose Models Results

- Dose impacts for Ni-63 and Sr-90 significantly reduced in UPDATE, should play virtually no role in classification.
- Gamma pathway dose conversion factor (PDCF) too high by a factor of 2.8 compared to MicroShield calculations.

Update of Nuclear Power Plant Waste Stream Profiles- Data Collection Effort

Objective:

To characterize process waste stream and to determine the quantities of waste generated on an industry level.

Results:

- Data Sources – shipping records
  - Gives indication of number of shipments and disposal volumes
  - Break down by radionuclide
  - Didn't require additional efforts, worked with WMG
- 41 PWR units and 24 BWR units responded, representing ~65% of the industry
- Total of 10,000 records compiled covering period from January '03 to February '07

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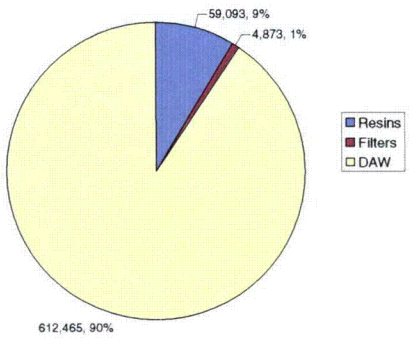
Average Annual Waste Profile

Average Annual Waste Volumes for 65 Plants (Ft3) by Waste Type



- Resins
  - Charcoal
  - Ion exchange media
- Filters
  - Filter media
  - Mechanical filter
- DAW
  - Compactable trash
  - Non-compactable trash
- Industry Totals
  - DAW – 938,000 Ft3
  - Resins – 98,800 Ft3
  - Filters – 7,500 Ft3

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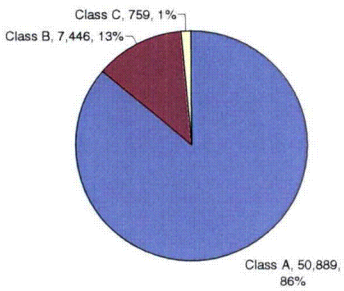
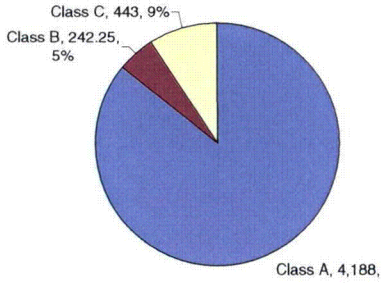
Annual Waste Volumes by Waste Class

Average Annual Resin Waste Volume (Ft3) for 65 Plants by Waste Class



Average Annual Filter Waste (Ft3) for 65 Plants by Waste Class



Industry Distribution (DAW + Resin +Filters):

- 86% Class A (82,355 Ft3)
- 13% Class B (11,317 Ft3)- majority from resins
- 1% Class C (1,152 Ft3)- majority from filters

Radionuclides driving overall classification:

- Ni-63
- Cs-137
- Sr-90

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Classification/Blending Results

- Classification based on industry-wide waste streams averages:

Table 1 Sum of the Fractions

	Resins	Filters	Resins & Filters	Resins, Filters & DAW
C-14	0.03	0.19	0.04	0.00
Tc-99	0.05	0.34	0.07	0.08
TRU	0.02	0.05	0.02	0.02
Pu-241	0.01	0.02	0.01	0.01
Cm-242	0.00	0.00	0.00	0.00
Total SOF	0.10	0.59	0.14	0.10

Table 2 Sum of the Fractions

	Resins	Filters	Resins & Filters	Resins, Filters & DAW
H-3	0.00	0.00	0.00	0.00
Co-60	0.00	0.01	0.00	0.00
Ni-63	0.31	0.41	0.32	0.32
Sr-90	0.11	0.04	0.10	0.10
Cs-137	0.61	0.21	0.59	0.58
LT5	0.01	0.03	0.01	0.01
Total SOF	1.05	0.70	1.02	1.01

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Evaluation Results

- All routine resin and filter waste could likely be classified as Class A.
- Because of the factor of 20 increase in the allowable Cs-137 concentration by the NRC and the fact that Cs-137 controls nuclear plant waste classification; the dose impacts for a 2 meter disposal are likely too high.
- Therefore; deeper disposal or Class A stabilization will likely be required.
- At deeper disposal resin and filter waste SOF is ~ 0.1

Dose Results

- Doses (mrem/yr) for deeper disposal were calculated at industry-average concentrations for Southwestern Site:

	DEIS		UPDATE	
	Construction	Agriculture	Construction	Agriculture
Ni-63	31.4	57.6	0.2	0.3
Cs-137	745.9	882.5	571.3	678.8
TRU	0.0	0.2	10.5	4.2
Co-60	0.1	0.1	0.1	0.1
Sr-90	1.5	112.2	0.1	4.8
Pu-241	2.3	0.0	1.1	0.9
Cm-242	0.0	0.0	0.0	0.0

No significant contribution from Sr-90 or Ni-63 determined in the Update. The same is true for the 10CFR61 bases scenarios.

Dose Results (cont'd)

- Doses (mrem/yr) for Class A Stabilized were calculated at industry-average concentrations for Southwestern site:

	DEIS		UPDATE	
	Construction	Agriculture	Construction	Agriculture
Ni-63	69.5	127.7	0.4	0.6
Cs-137	75.7	89.6	58.0	68.9
TRU	0.0	2.3	104.6	41.8
Co-60	0.0	0.0	0.0	0.0
Sr-90	0.1	9.6	0.0	0.4
Pu-241	0.0	0.0	0.0	0.0
Cm-242	0.0	0.0	0.0	0.0

Conclusions

- Cs-137 is clearly the classification-controlling radionuclide in resins and filter waste.
- All routine nuclear plant resins and filter waste could likely be classified as Class A.
- Credit for deeper disposal or stabilization in accordance with current disposal practice.
- Averaging BTP needs to be addressed—does not make sense for non-discreet waste.

Conclusions (cont'd)

- Evaluation assumptions
  - Maintain doses below 500 mrem/yr
  - Account for current disposal practices
  - Control of the radionuclide concentrations in a disposal volume of approximately 50 liners.
  - Allow averaging

Future Work

Continuing evaluation of 10CFR61 bases:

- Revisit EIS cost-benefit assessment
- Partial verification of IMPACTS code
- Assess impacts of/on other generators

Enclosure 5

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Waste Class BC Reduction Initiatives – An Industry Guide

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NRC Public Meeting
October 4, 2007
NEI Office- Washington, D.C.

Overview

Objectives:

1. Identify and evaluate proven and potential processing operation strategies that offer significant reductions to Waste Class B/C waste volumes and improvements in overall economic performance (2005-2006)
2. Develop an industry implementation guide (2007)

- Approach
  - Industry experience reports; 2005 & 2006
  - Develop implementation template using peer input
- Status
  - Template is defined
  - Guide is currently being developed

Strategies Addressed in Document

- Primary Ion Exchanger – On Line Lithiation
- Reactor Water Cleanup in Service Run Length
- In Service Media Management – Spent Fuel Pool
- Media Separation and Vessel Short Loading
- Fuel Cleaning Impact on Reactor Coolant System Purification Filter Waste
- Media Segregation in Spent Resin Tanks or Filter Vaults and Waste Containers

Template for 2007 Report

1. Description of proposed option
2. Feasibility assessment
   - Fundamental system and component configuration
   - Life of plant support requirements
     - Contractors, Engineering, Operations, Chemistry, RP, etc.
   - Cost Evaluation
   - Prioritization
     - Outage, fuel cycle, current site specific initiatives
   - Barrier identification
     - System, component or structural configuration
     - License documents: TS, FSAR, NRC Commitments
     - Environmental, ALARA, Personnel safety

Template for 2007 Report

3. Implementation Plan
   - Resources
     - Engineering, Planning and Scheduling,
   - Design considerations
   - Balance of plant processes and schedule
   - Final License Basis impact determination
     - i.e., license applicability and 50.59 evaluation if needed
4. Implementation
   - Resources
     - Operations, contractors, maintenance, performance testing
   - Engineering Design Change Process
   - Planning and Scheduling considerations
   - Other considerations
5. Results Monitoring and Evaluation

Primary Ion Exchanger – On Line Lithiation

- On line lithiation is a lithium management option typical of CE and B&W type PWRs
- Load two mixed beds in parallel:
  - One bed as de-lithiator for a cycle (to control pH)
  - The second is a reactor system coolant clean up bed that was lithiated in the previous cycle
    - RESULT→ one bed used for two purposes; reduces generation of waste

Reactor Water Cleanup (RWCU) in Service Run Length

- BWR Precoat filter
- Historically tried to increase run length to reduce total volume of media generated; however, this may increase media activity
- Evaluated run length reduction at BWR unit
  - from 60 to 30 days
  - Media remained within Class A limits
  - Able to utilize volume reduction options to reduce disposed volume

In Service Media Management – Spent Fuel Pool (SFP)

Issues:

1. Typically, spent fuel pool system is operated continuously without regard to waste generation
2. Resin change-out due to sulfate levels caused by resin degradation

Evaluation at one PWR:

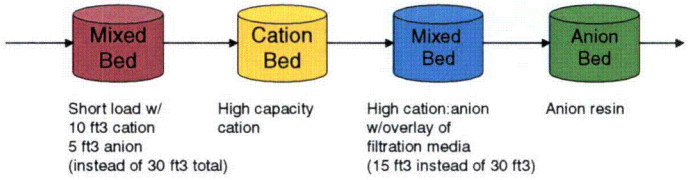
- Selected media that was more resistant to degradation
- Instead of operating continuously, only operated SFP as needed to control chemistry and activity

Result:

- Extended resin life and media throughput
- No compromise to chemistry or general area dose rates

Media Separation and Vessel Short Loading

1. In-service (by vessel) media separation
   - Cation bed followed by anion bed (rather than mixed bed)
   - Segregates high activity cation from lower activity anion
   - Segregation may increase total resin volume, but reduces the volume of BC and is cost effective
2. Ion exchange vessel short loading
   - Short loading volumes vary by vessel design
   - Chemistry not affected
   - 30 ft3 savings per unit (short load 2 vessels)



Reports

- Guide will be published at the end of 2007
- Two reports summarize industry experience:

Radioactive Wet Waste Reduction Opportunities for Waste Class B and Class C; ID# 1011727; December 2005

Operational Strategies to Reduce Class B/C Wastes; ID 1014707; April 2007