ELECTRIC POWER RESEARCH INSTITUTE

Investigation of Changes to Disposal Criteria

David James
D.W. James & Associates

Regulatory Framework

- Low Level Waste Policy Act
- 10CFR61
- BTP on Classification
- BTP on Concentration Averaging

© 2006 Electric Power Research Institute, Inc. All rights reserved.

LLWPA Major Features

- Directed NRC to set regulatory criteria for LLW disposal
- Identified LLW as a Regional responsibility
- Mandated the formation of Regional Compacts to develop localized disposal sites
- Allowed for surcharges on generators to pay for the development of the sites

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Emergence of Commercial Sites

- EnergySolutions – Clive, Utah
  Non-arable There has never been agriculture at this location and likely never will be. Soil and water table are saturated with salt
- WCS – Andrews, TX
  Generally not suitable for agriculture due location in clay layer

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Importance of Barnwell

- Only operating disposal site accepting B and C Wastes
- Designated site for unlikely compact comprising states from two geographical regions (SC, CT, NJ)
- Closing to outside generators in 2 years

© 2006 Electric Power Research Institute, Inc. All rights reserved.

10CFR61

- Performance Based regulation –sets individual dose rate limits through all pathways from LLW disposal
- Defines system of classification of wastes to determine disposal requirement
- Includes concentration limits for specific long-lived radionuclides

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Basis for 10CFR61 Limits

- Draft Environmental Impact Statement on 10CFR61
- Eight Exposure Scenarios
  - **Accident**
  - **Intruder Construction**
  - **Intruder Agriculture**
  - **Leaching and Migration with Well Access**
  - **Leaching and Migration with Open Water Access**
  - **Surface Transport of Exposed Waste**
  - **Atmospheric Transport of Exposed Waste**
  - **Intruder Drilling**

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Basis of 10CFR61 Limits

Radionuclide	Scenario	Dose Pathway
H-3	Intruder-Agriculture	Food Uptake
C-14	Intruder-Agriculture	Food Uptake
I-129	Intruder-Agriculture	Food Inhalation
Tc-99	Intruder-Agriculture	Food Uptake
All Transuranics	Intruder-Construction	Inhalation
Co-60	Intruder-Agriculture	Direct Gamma
Sr-90	Intruder-Agriculture	Food Uptake
Cs-137	Intruder-Agriculture	Food Uptake
Ni-59 (Activated Metals)	Intruder-Agriculture	Direct Gamma
Ni-63 (Activated Metals)	Intruder-Agriculture	Food Uptake
Nb-94 (Activated Metals)	Intruder-Agriculture	Direct Gamma
C-14 (Activated Metals)	Intruder-Agriculture	Food Uptake

© 2006 Electric Power Research Institute, Inc. All rights reserved.

10CFR61 DEIS Site Scenarios

Region Index	Site Name	General Environment	Population Density	Soil Permeability
1	Northeast	Humid	High	Low
2	Southeast	Humid	Moderate	Moderate
3	Midwest	Humid	Low	Low
4	Southwest	Semi-arid	Low	High

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Barriers to Public Exposure*

*"The Siting and System Performance of Low-Level Waste Disposal Facilities", V.C. Rogers, Waste Management '82, Tucson AZ

Pathways	Waste Form	Migration Barrier	Environmental Dilution	Exposure Time
Groundwater	Leach rate	Geologic retention	River dilution	
Surface erosion	Erosion rate	Dilution in soil	River dilution	
Inhalation reclaimer	Leach rate		Atmospheric dilution	Exposure time
Well water	Leach rate	Geologic retention	Aquifer dilution	
Direct exposure	Waste dilution	Soil dilution	Uptake limits	Exposure time
Food reclaimer	Waste dilution	Dilution in soil	Uptake limits	
Radioactive gase	Emanation fractions	Retention in soil	Atmospheric dilution	Exposure time

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Revisiting 10CFR61

- The LLWPA and 10CFR61 were promulgated more than 25 years ago (quarter of Century)
- The fundamental premise of the Act and basis for the Regulation has not been realized
- It's reasonable to revisit the issues raised

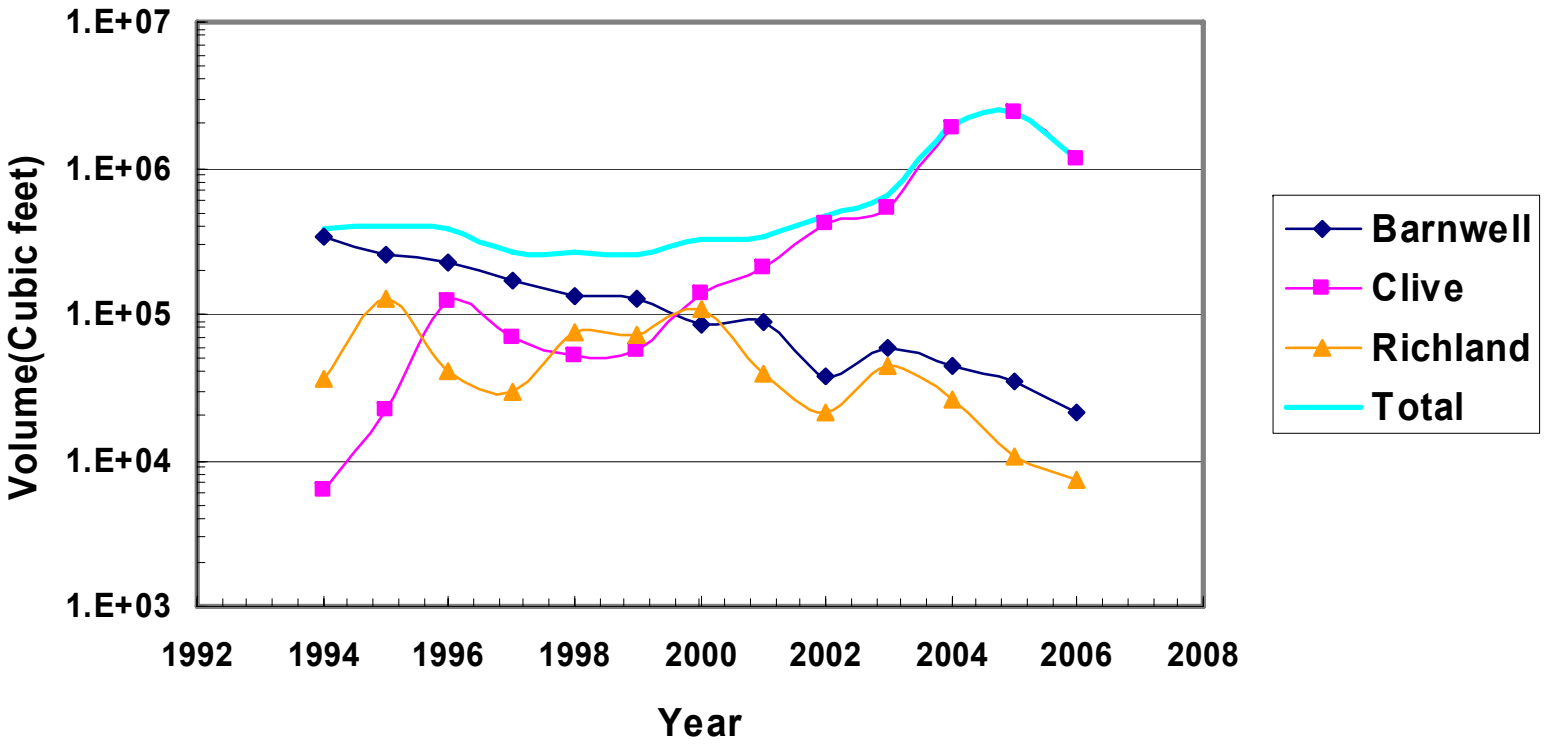
© 2006 Electric Power Research Institute, Inc. All rights reserved.

Averaging Inititative

- Establish general classification of waste streams by stream profile (e.g. Resins, filter media, cartridge filters) as acceptable for Class A disposal
- Allow blending on an industry wide basis to preserve concentration limits

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Utility Waste Volumes (MIMs)



© 2006 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

Average Classification BW Plus Clive (1994-2006)

Nuclide	Conc.	Class A Limit	% of Limit
H-3	4.1E-03	40	0.01%
C-14	2.2E-03	0.8	0.27%
Co-60	1.1E+01	700	1.50%
Ni-63	7.3E-01	3.5	20.77%
Sr-90	4.3E-04	0.04	1.08%
Cs-137	3.2E-02	1	3.20%
Pu238	6.3E-06		
Pu-239	2.5E-06		
Pu241	2.2E-04	350	0.06%
Am241	2.8E-05		
Cm242	2.3E-06	2000	0.00%
Cm244	1.0E-05		
Alpha	4.7E-02	10	0.47%

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Revisit Concentration Averaging Issues

- Develop a better understanding of industry source term – particularly focusing on material type and disposal classification
- Examine alternative disposal options including new ways of blending materials to achieve disposability
- Examine rules and need for rule changes
- Prepare cost/benefit

© 2006 Electric Power Research Institute, Inc. All rights reserved.

Anticipated Outcome

Almost all power plant low level waste currently generated, when looked at in composite, and given the current disposal venues, would be suitable for Class A disposal.

© 2006 Electric Power Research Institute, Inc. All rights reserved.