



## Yankee Atomic Electric Company LTP Submittal Update

Meeting with USNRC  
February 11, 2004

1

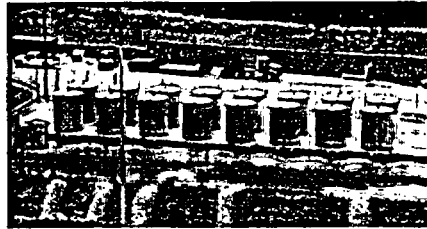
## Discussion Topics

- Update of Decommissioning Activities
- Submittal Summary
  - License Termination Plan
  - DCGL Calculations and Support Documents
    - Sensitivity Analysis
    - DCGLs and Area Factors
  - Historical Site Assessments
- Groundwater Investigation Update
- "Deep" Concrete Dose Assessment
- Ongoing Decommissioning Approach

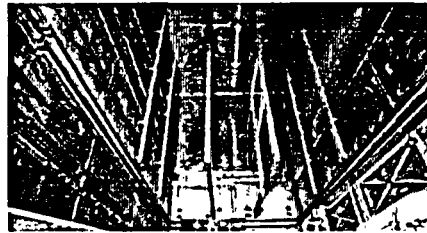
2

## Update of Decommissioning Activities

- Fuel Transfer Complete



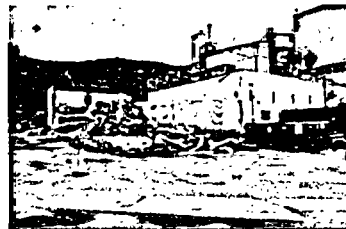
- Fuel Pool Drain Down



3

## Update of Decommissioning Activities (Con't.)

- Building Demolition
  - Service Building Annex
  - Warehouse
  - Administration Building
  - Service Building
  - Pedestal Implosion
  - Turbine Building



4

## LTP - Highlights

- Chapter 2 – Summary of HSA
- Chapter 3 – Summary of D&D Approach
- Chapter 5 – FSS (MARSSIM Compliant)
- Chapter 6 – Summary of Modeling Approach
  - Appendices Contain Calculation Details
- Chapter 7 – Financials
  - Based on D&D Approach
- Chapter 8 – Consistent with NRC Expectations

5

## DCGL Calculations

- Incorporated NRC Feedback Throughout Development
- Soil DCGLs
  - RESRAD Version 6.21
  - Parameter Sensitivity Analysis
    - Modified CY Method – Peak of the Mean
- Building Surface DCGLs
  - RESRAD-Build Version 3.21
  - Parameter Sensitivity Analysis
    - Modified CY Method – Peak of the Mean

6

## DCGL-Related Submittals

- YA-CALC-01-001-03, RESRAD 6.21 Sensitivity Analysis for Resident Farmer Scenario-Soil
- YA-CALC-01-002-03, "Derived Concentration Guideline Levels for Soil at the Yankee Rowe Site."
- YA-CALC-00-003-03, "RESRAD-BUILD V6.21 Sensitivity Analysis for Building Occupancy
- YA-CALC-00-004-03, "Building Surface Derived Guideline Levels (DCGLs)"
- YA-CALC-00-005-03, "Building Surface Area Factors"
- YA-CALC-00-006-03, "Determination of Area Factors for Soil at YNPS Site"
- YA-REPT-00-001-03, "Radionuclide Selection for DCGL Determination
- YA-REPT-00-010-03, "Evaluation of Dose Integration Parameter in RESRAD-BUILD

7

## Sensitivity Analysis Methodology

- Based on NRC Feedback
  - If "limited" site data exists, use national distribution
    - Example: Hydro-geological parameters, such as porosity and b parameter based on site lithology
  - Develop narrower site-specific distributions
  - Site-specific deterministic values

8

## Soil Sensitivity Analysis Results

Table 2 RESRAD Input Parameters Identified as Sensitive in YA-CALC-01-C01.03 [4]

Nuclide	Sensitive Parameter (parameter code)	Nuclide	Sensitive Parameter (parameter code)
H-3	Depth of roots (DROOT) Kd in contaminated zone (DCATC(H-3)) Thickness of contaminated zone (THICKC)	Sb-125	External shielding factor (SHF1) Kd in contaminated zone (DCATC(Sb-125))
C-14	Depth of roots (DROOT) Thickness of contaminated zone (THICKC) Thickness of erosion layer (DNC)	Cs-134 and Cs-137	External shielding factor (SHF1) Plant transfer factor (BRFT (25.1)) Depth of roots (DROOT) Wet transfer factor (BRFT (25.2)) Wet transfer factor (BRFT (25.2))
Fe-55	Wet transfer factor (BRFT (25.2)) Plant transfer factor (BRFT (25.1))	Eu-152 and Eu-154	External shielding factor (SHF1)
Co-60	External shielding factor (SHF1) Plant transfer factor (BRFT (27.1)) Wet transfer factor (BRFT (27.2))	Eu-155	External shielding factor (SHF1) Plant transfer factor (BRFT (25.1))
Ni-63	Plant transfer factor (BRFT (25.1)) Wet transfer factor (BRFT (25.2)) Depth of roots (DROOT)	Pu-238 and Pu-239	Plant transfer factor (BRFT (24.1)) Depth of roots (DROOT)
Sr-90	Plant transfer factor (BRFT (25.1)) Depth of roots (DROOT)	Pu-241	Am-241 Plant transfer factor (BRFT (24.1)) Depth of roots (DROOT) Kd of Am-241 in contaminated zone (DCATC(Am-241))
Nb-94	External shielding factor (SHF1) Kd in contaminated zone (DCATC(Nb-94))	Am-241	Plant transfer factor (BRFT (25.1)) Depth of roots (DROOT)
Tc-99	Plant transfer factor (BRFT (43.1)) Depth of roots (DROOT) Kd in contaminated zone (DCATC (Tc-99))	Cm-243	External shielding factor (SHF1) Depth of roots (DROOT) Plant transfer factor (BRFT (25.1))
Ag-108m	External shielding factor (SHF1)		

9

## Soil DCGLs

Nuclide	DCGL (pCi/g)	Nuclide	DCGL (pCi/g)
H-3	3.7E+02	Cs-134	5.0E+00
C-14	5.5E+00	Cs-137	8.6E+00
Fe-55	2.9E+04	Eu-152	1.0E+01
Co-60	4.0E+00	Eu-154	9.5E+00
Ni-63	8.1E+02	Eu-155	4.0E+02
Sr-90	1.7E+00	Pu-238	3.3E+01
Nb-94	7.2E+00	Pu-239	3.0E+01
Tc-99	1.4E+01	Pu-241	9.8E+02
Ag-108m	7.3E+00	Am-241	2.9E+01
Sb-125	3.2E+01	Cm-243	3.2E+01

10

## Building Surface Sensitivity Analysis Results

Radionuclide	Rank 1 parameter	Rank 2 parameter	Rank 3 parameter	Rank 4 parameter	Rank 5 parameter	Rank 6 parameter	Rank 7 parameter
H-3	RFO(1) -0.85	RFO(2) -0.78	RFO(4) -0.78	RFO(5) -0.76	RFO(3) -0.76	DKSUS 0.35	UD -0.31
C-14	RFO(1) 0.89	RFO(4) 0.85	RFO(3) 0.84	RFO(5) 0.82	RFO(2) 0.82	--	--
Fe-55	RFO(3) 0.28	RFO(1) 0.28	RFO(4) 0.27	RFO(5) 0.23	DKSUS 0.23	UD -0.21	RFO(2) 0.15
Co-60	RFO(1) 0.45	RFO(5) 0.16	DKSUS -0.14	RFO(2) 0.13	UD 0.13	RFO(4) 0.10	--
Ni-63	RFO(1) -0.64	RFO(3) -0.58	RFO(5) -0.58	RFO(2) -0.58	RFO(4) -0.58	DKSUS 0.12	--
Sr-90	RFO(1) -0.71	RFO(4) -0.59	RFO(2) -0.54	RFO(5) -0.54	RFO(3) -0.52	DKSUS 0.37	UD -0.30
Nb-94	DKSUS -0.38	UD 0.25	RFO(1) 0.24	--	--	--	--
Tc-99	RFO(1) 0.40	RFO(4) 0.34	RFO(2) 0.29	RFO(3) 0.27	RFO(5) 0.26	--	--
Ag-108m	RFO(1) 0.50	DKSUS -0.49	UD 0.41	RFO(4) 0.13	RFO(5) -0.10	--	--
Sb-125	RFO(1) 0.45	RFO(4) 0.38	RFO(3) 0.32	UD 0.26	DKSUS -0.25	RFO(2) 0.20	RFO(5) 0.16
Cs-134	RFO(1) 0.37	RFO(4) 0.28	RFO(2) 0.16	RFO(5) 0.15	RFO(3) 0.14	UD 0.12	DKSUS -0.11
Cs-137	RFO(1) 0.81	RFO(3) 0.59	RFO(5) 0.59	RFO(4) 0.57	RFO(2) 0.54	DKSUS -0.48	UD 0.43
Ba-132	RFO(1) 0.24	RFO(5) 0.11	--	--	--	--	--
Ba-134	RFO(1) 0.42	DKSUS -0.20	UD 0.17	RFO(2) 0.13	--	--	--
Ba-135	RFO(4) -0.48	RFO(5) -0.46	RFO(3) -0.44	RFO(2) -0.43	RFO(1) 0.19	--	--
Pu-238	RFO(1) -0.91	RFO(4) -0.87	RFO(3) -0.86	RFO(5) -0.85	RFO(2) -0.85	DKSUS 0.11	--
Pu-239	RFO(1) -0.91	RFO(4) -0.87	RFO(3) -0.86	RFO(5) -0.85	RFO(2) -0.85	--	--
Pu-241	DKSUS 0.60	UD -0.54	RFO(2) -0.14	RFO(1) -0.13	RFO(4) -0.13	--	--
Am-241	RFO(1) -0.91	RFO(4) -0.87	RFO(3) -0.86	RFO(5) -0.85	RFO(2) -0.85	--	--
Cm-243	RFO(1) -0.91	RFO(4) -0.86	RFO(3) -0.85	RFO(5) -0.85	RFO(2) -0.84	DKSUS 0.22	UD -0.17

Parameter Definition: DKSUS = Resuspension Rat; UD = Deposition Veloc; RFO(#) = Time for Source Removal,

11

## Building Occupancy DCGLs

Nuclide	DCGL (dpm/100cm <sup>2</sup> )	Nuclide	DCGL (dpm/100cm <sup>2</sup> )
H-3	3.4E+08	Co-134	2.9E+04
C-14	1.0E+07	Cs-137	6.3E+04
Fe-55	4.0E+07	Eu-152	3.7E+04
Co-60	1.8E+04	Eu-154	3.4E+04
Ni-63	3.7E+07	Eu-155	6.5E+05
Sr-90	1.4E+05	Pu-238	5.7E+03
Nb-94	2.6E+04	Pu-239	5.1E+03
Tc-99	1.4E+07	Pu-241	2.5E+05
Ag-108m	2.5E+04	Am-241	5.0E+03
Sb-125	1.0E+05	Cm-243	7.2E+03

12

## Historical Site Assessment Summary

- Submitted on January 23, 2004
- Provides Comprehensive Assessment for Chapter 2 Summary
- Ongoing Process

13

## Groundwater Monitoring Update

- Prior to 2003
  - 39 wells Installed
  - Tritium Identified
  - No Other Radionuclides Identified
  - No Depth Greater Than 30 feet
- 2003 Well Installations
  - 17 Wells
  - Depths to 300 feet
  - Rotosonic Drilling Method
    - Sampling during drilling
    - Aquifer isolation
  - Need for Additional Wells Being Evaluated
- Monitoring Program Enhancements
  - Expanded Sampling Procedures
  - Standardized Radionuclide Suites (Including HTDs)
  - Quarterly Sampling
- Two Rounds of Sampling Completed

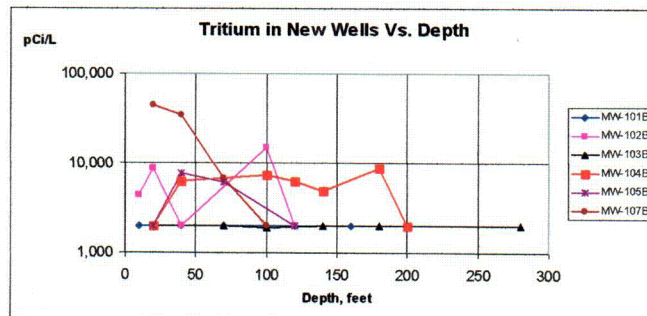
14

## Radionuclide Analysis Suites

Suite	Nuclide	MDC, pCi/L	Method of Analysis
A	<sup>60</sup> Co	50	Gamma Spectrometry
	<sup>54</sup> Mn	25	Gamma Spectrometry
	<sup>93</sup> Nb	25	Gamma Spectrometry
	<sup>106m</sup> Ag	25	Gamma Spectrometry
	<sup>125</sup> Sb	25	Gamma Spectrometry
	<sup>137</sup> Cs	25	Gamma Spectrometry
	<sup>137</sup> Cs	10	Gamma Spectrometry
	<sup>152</sup> Eu	25	Gamma Spectrometry
	<sup>154</sup> Eu	25	Gamma Spectrometry
	<sup>152</sup> Eu	25	Gamma Spectrometry
B	<sup>3</sup> H	500	LSC
	Circum Alpha	5	Gas Proportional Counting
	Circum Beta	5	Gas Proportional Counting
C	<sup>14</sup> C	200	LSC
	<sup>59</sup> Fe	200	LSC
	<sup>63</sup> Ni	200	LSC
	<sup>90</sup> Sr	5	LSC
D	<sup>239</sup> Pu	5	Alpha Spectrometry
	<sup>239</sup> Pu & <sup>240</sup> Pu	5	Alpha Spectrometry
	<sup>241</sup> Pu	15	LSC
	<sup>241</sup> Am	5	Alpha Spectrometry
	<sup>240</sup> Cm	5	Alpha Spectrometry
	<sup>240</sup> Cm	5	Alpha Spectrometry

15

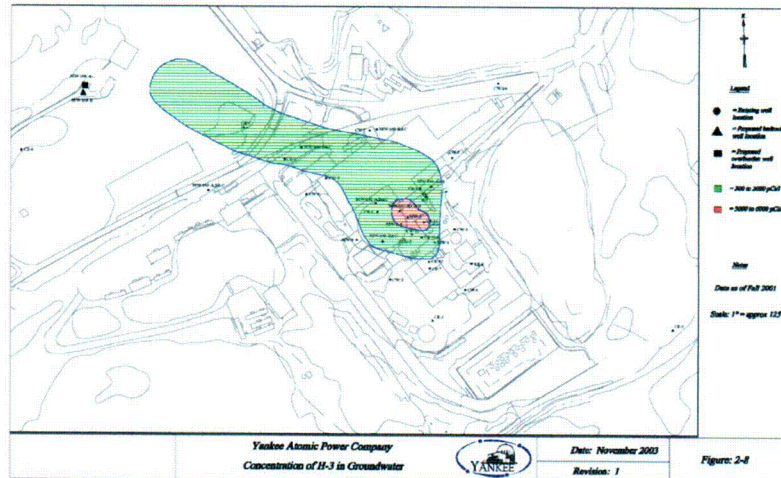
## New Wells – Sampling Results (Taken During Well Installation)



16



## Approximate Plume Delineation



17

## Recent Campaign Preliminary Information

- Two Rounds of Sampling and Analysis Complete
- Aquifer Adjacent to SFP ~ 45,000 pCi/l
- Remaining Aquifer << EPA MCL
- Investigation of Multiple Aquifers
- No Evidence of Other Radionuclides
- Expect Resident Farmer Well at Time of License Termination < MCL

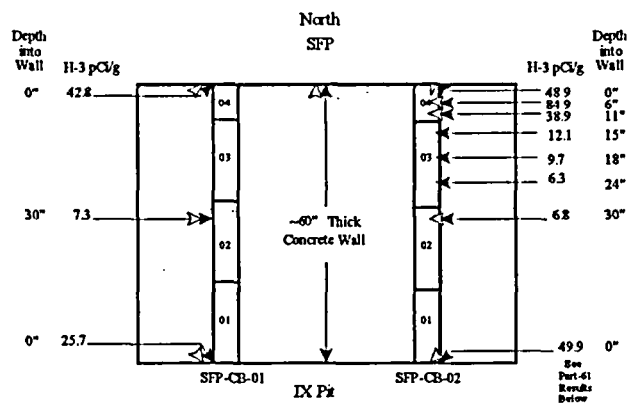
18

## Deep Concrete Analysis Update

- Draft Calculation Submitted 2/4/04
- Diffusion Analysis by BNL
  - H-3, C-14, Co-60, Ni-63, Sr-90, Cs-137, Cs-134
  - DUST Computer Code – Calculates Curies per year Into aquifer for several radioactivity distributions
  - Effective Kd calculated for each radionuclide
    - RESRAD Used to Calculate Water Dose
  - Accounts for site- specific hydro parameters
  - Conservative approach
- Results to be Used to Establish 0.5 mrem/yr Concentration
  - No remediation needed when below
- Final Calcs and LTP Appendix to Be Submitted by End of February

19

## Deep Concrete Measurement Data



20

## Results for Concrete at 1 pCi/g (Uniform Distribution Through Wall)

Radionuclide	Peak well concentration (pCi/l)	Peak Dose (mrem/yr)	Contaminated Zone Kd (cm <sup>3</sup> /g)	DUST-MS Fractional Release Rate (1/yr)	RESRAD Fractional Release Rate (1/yr)
H-3	18.8	8.5E-04	0.73	6.29E-02	6.34E-02
C-14	0.02	2.6E-03	159	3.02E-04	3.02E-04
Co-60	0.3	1.2E-02	47	1.02E-03	1.02E-03
Ni-63	1.6	2.0E-03	9.8	4.88E-03	4.88E-03
Sr-90	1.1	1.2E-01	14.1	3.41E-03	3.40E-03
Cs-137	2.5	2.4E-01	4.1	7.82E-03	7.82E-03

21

## Draft Remediation Level for Concrete (Corresponds to 0.5 mrem/hr)

Nuclide	Concentration, pCi/g
H-3	588
C-14	192
Co-60	41.7
Ni-63	250
Sr-90	4.17
Cs-137	1.92

22

## Ongoing Decommissioning Approach

- Phase 2 Development Underway
  - Removal of slabs and subgrade foundations to 18" below ground surface
- Address Site Restoration Concurrently with Decommissioning (To Extent Possible)

---

23

## Discussions and Questions

---

24