



Yankee Atomic Electric Company Dose Modeling

Meeting with USNRC

April 15, 2003

Goals for Meeting

- Review YNPS History
 - Identify Site Status at Time of FSS
 - Present Media and Scenarios Chosen to Represent Site
 - Present Input Value Selection Process
 - Present Process for Calculating DCGLs
 - Obtain Feedback from Staff
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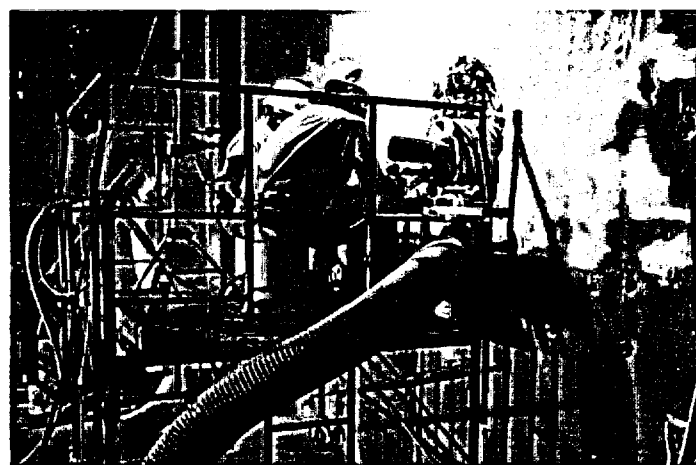
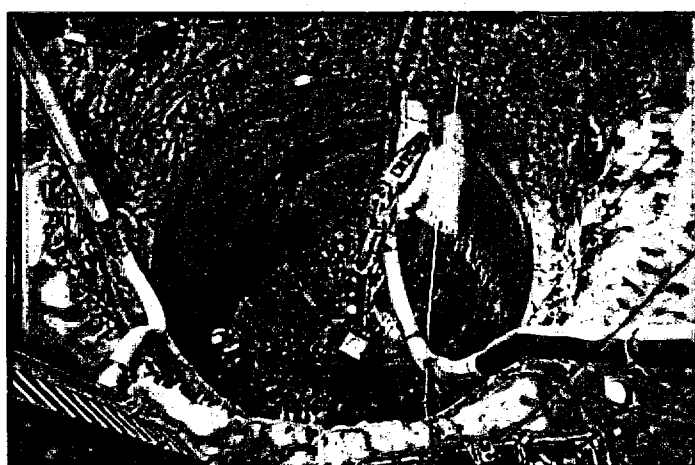
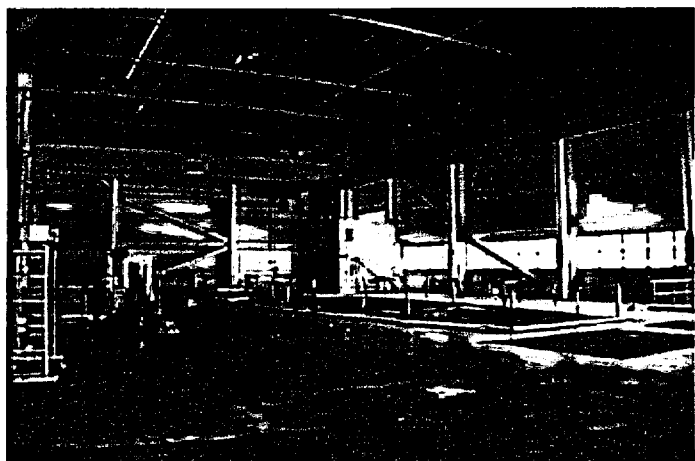
YNPS History

- Achieved Initial Criticality—1960
 - Began Commercial Operation—1961
 - Upgrade to 600 MWt—1963
 - Decision to Cease Operations—2/1992
 - Possession Only Status—8/1992
 - Decommissioning Activities—1992-present
 - Fuel Movement to ISFSI In Progress
(Anticipated Completion) - 6/2003
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Activities Completed

- Large Components Removed
 - Majority of SSCs Disposed of Off-Site
 - Significant Remediation and Survey Activities Performed Under Previously Submitted LTP
 - Surveys Conducted Based Upon Guidance in:
 - RG 1.86
 - Draft NUREG/CR-5849
 - Draft NUREG-1500
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Activities Completed



Site End State Affects Dose Modeling

- VC (Containment) Removed as Waste
 - Selected Structures Removed to Grade
 - In-Ground Structures to Remain (Perforated and Filled with Clean Fill)
 - PAB
 - IX Pit
 - SF Building
 - Intake Structure
 - Miscellaneous Support Buildings to Remain
 - Pads to Remain
 - Turbine Building
 - Waste Disposal Building
 - Service Building
 - Warehouse Building
 - VC Support Ring
 - Remaining Buried Commodities Will Be Free Released
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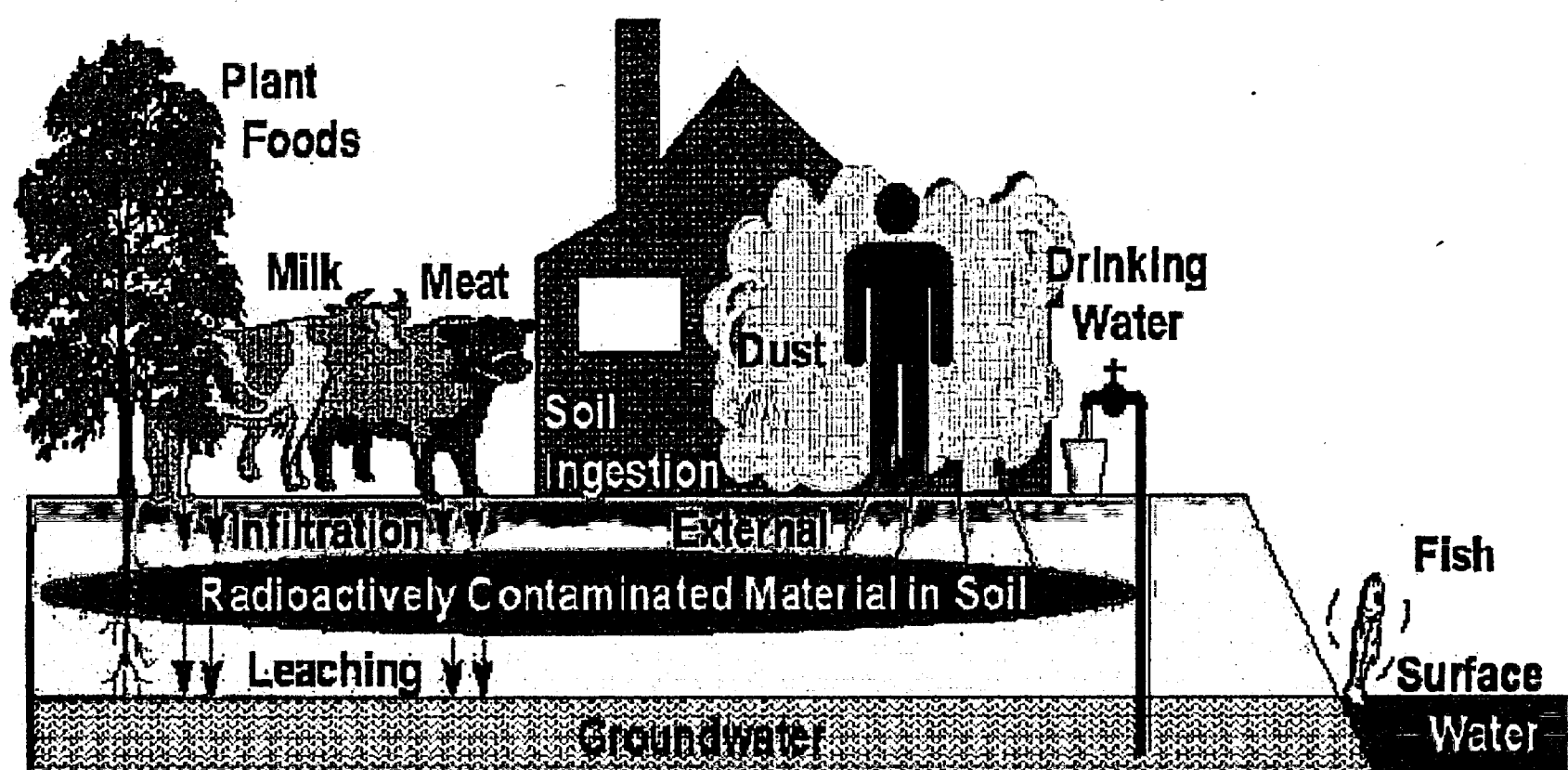
Site's Impact on Code Selection

- Codes Selected
 - RESRAD, Version 6.21
 - Soils
 - RESRAD-BUILD, Version 3.21
 - Building Surfaces
 - Pads
- Selection Based on Ability to Address:
 - Subsurface contamination
 - Radionuclides (e.g., Ag-108m) not included in DandD.

Conservative Scenarios Selected

- Resident Farmer Scenario to Address:
 - Soils (surface and subsurface)
- Building Occupancy Scenario to Address:
 - Remaining Below-Grade Building Structures
 - Remaining Building Pads
- Concrete Debris Not to Be Used as Backfill—
No Resident Farmer-Concrete Debris
Scenario Used

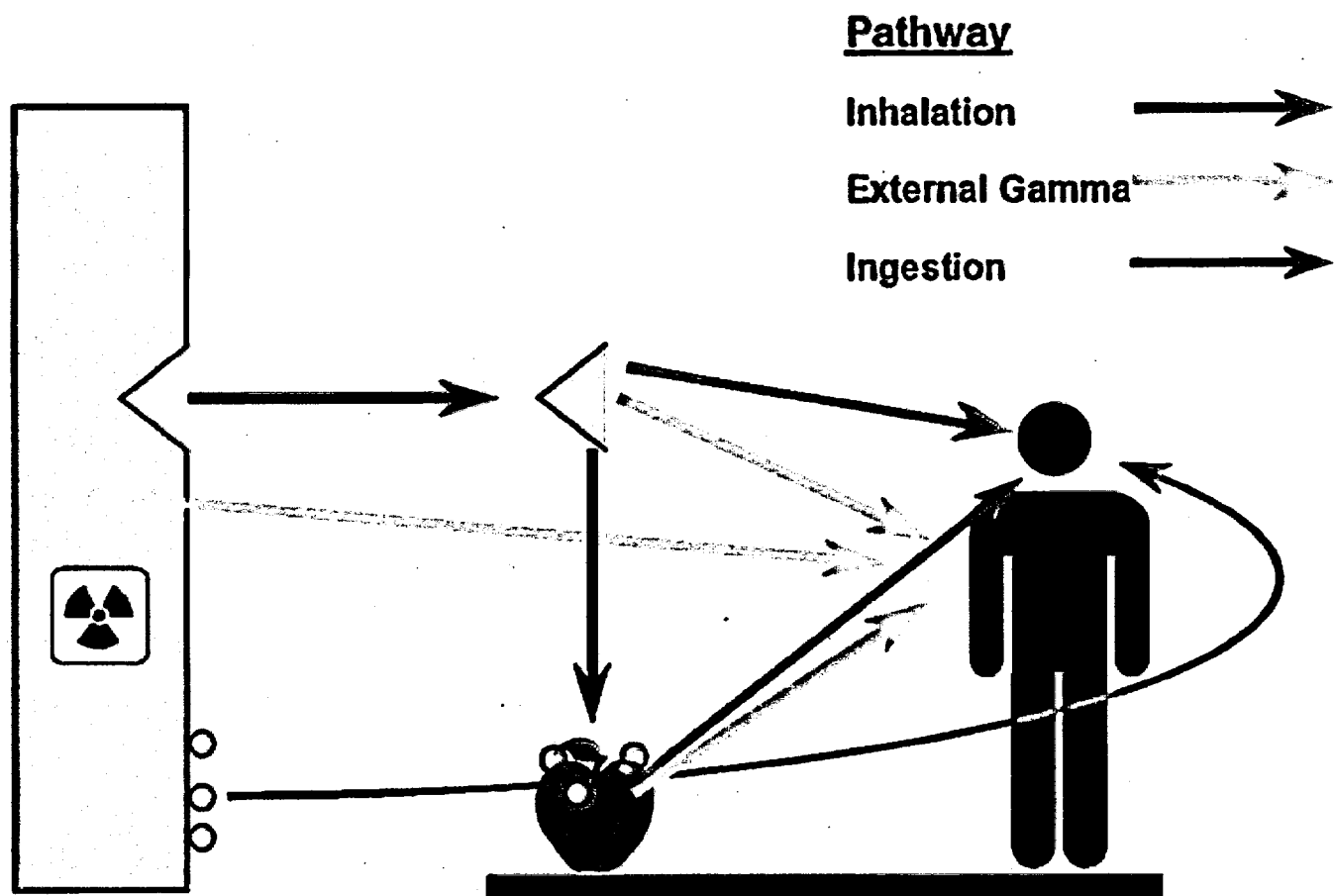
Resident Farmer Scenario Pathways



RESRAD Conceptual Model

- **Contaminated Zone**
 - Exposed at ground surface – no cover
 - Radioactivity initially confined here
 - 0.15 to 3 m thick
- **Unsaturated Zone**
- **Saturated Zone**
- **Groundwater Is Initially Uncontaminated**

Building Occupancy Pathways



RESRAD-BUILD Conceptual Model

- Uniform Contamination on Floor and Walls
- No Contaminated Ceilings
- Receptor Location at Center of Floor and at Height of 1 m

Probabilistic Insights Applied to DCGLs

- Probabilistic Module of RESRAD or Build
- Inputs Based Upon Available Data and Flowcharted Process
- Per NUREG-1727, Calculate DCGL Using Peak of the Mean Dose:
 - Peak of the mean dose
 - Initially assumed radionuclide concentration (1 pCi/g)

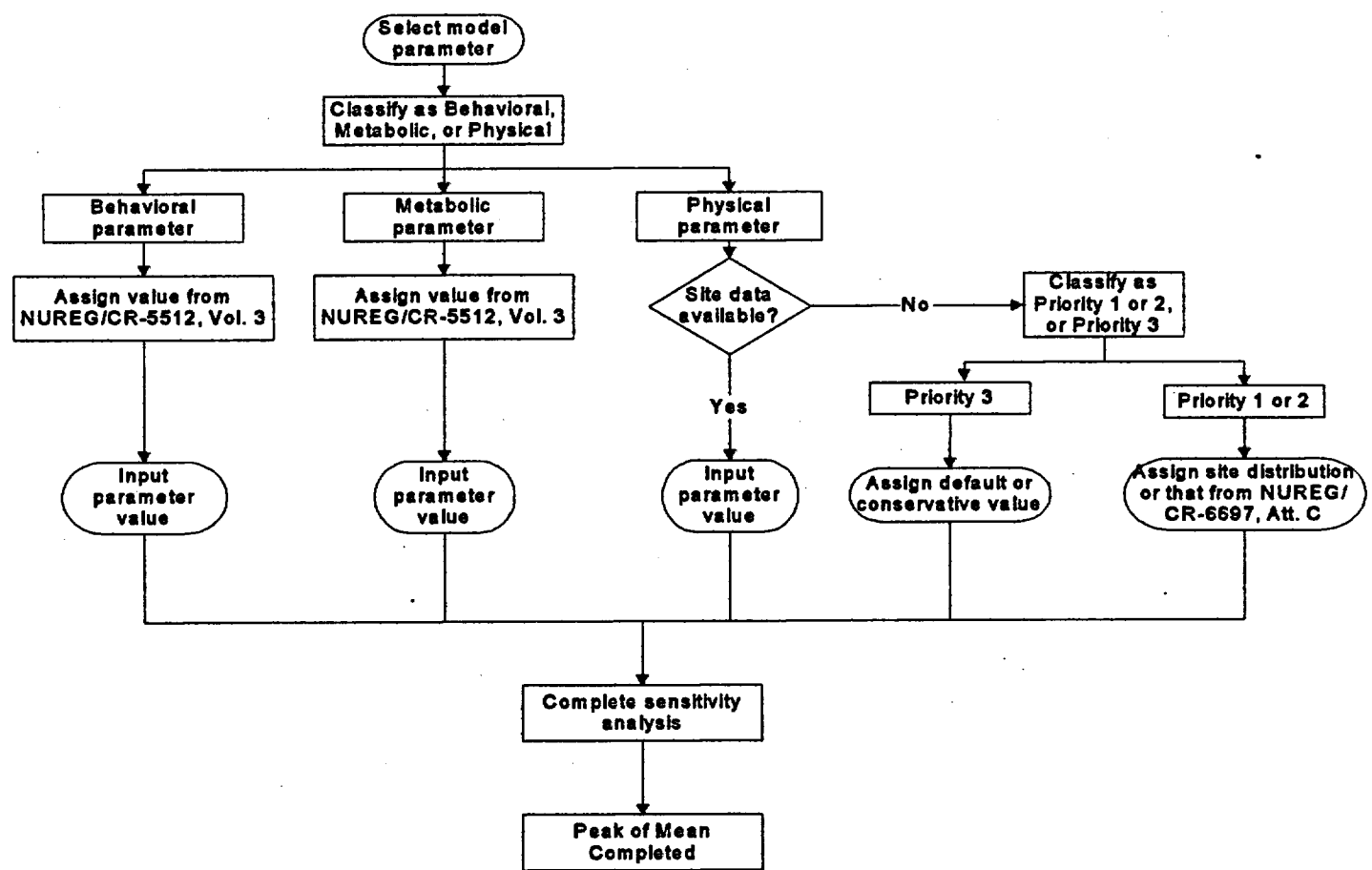
Guidance Endorses Peak of the Mean Dose

- NUREG-1727: “The staff will verify:...If the licensee has randomly sampled the parameter ranges, the licensee has used the ‘peak of the mean’ dose distribution to either calculate the dose or derive the DCGLs.”
- Draft NUREG-1757, Vol 2: Provides Similar Guidance and Suggests Upfront Discussions with the NRC.
- Extensive Use of Site-Specific Parameters and Distributions
- Use of Parameter Values from NUREG/CR-5512 and Distributions NUREG/CR- 6697
- 300 Observations and 3 Repetitions

Selection Process Based on NRC Guidance

- Identify Parameters Pertinent to Scenario
- Classify Based Upon Type
 - Behavioral
 - Metabolic
 - Physical
- Prioritize (1, 2, 3)
- Perform Analysis Using:
 - Site-Specific Information Where Available
 - NUREG/CR-5512 Vol. 3 Values
 - NUREG/CR-6697 Parameter Distributions

Parameter Selection Process



Site Data & End State Impact on Parameters

■ RESRAD

- Thickness of contaminated zone evaluated from 0.15 cm to 3 m.
- Groundwater is initially uncontaminated.

■ RESRAD-BUILD

- End-state indicates that no contaminated ceilings will exist for buildings in RCA.
 - Model assumes floor and all four walls are equally contaminated (conservative).
 - Release fraction determined to be small (between 0.01 and 0.1). Analysis based on post-decontamination measurements.
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Milestones to Obtain Approval in 2004

- Public Comment Received
on Draft: 10/2003
 - Submittal to NRC: 11/2003
 - Public Meeting: 3/2004
 - RAI Issued: 6/2004
 - RAI Response: 9/2004
 - NRC Approval: 11/2004
 - Complete FSS: 2005
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Continue Dialogue with NRC

- Groundwater/FSS (at Site) 5/2003
- Submittal Mechanics 6/2003

Summary of Important Features

- Concrete Debris with Residual Radioactivity Not Used as Fill
- Building Occupancy Scenario to Address Building Structures
- Use of Site-Specific Parameters
- Peak of the Mean Dose Used to Determine DCGLs