

Callaway Plant

Pre-Submittal Meeting

for

Full Implementation of Alternative Source Term



March 2021

# Implementation of AST at Callaway

## Introduction

### – Callaway/Zachry Nuclear team

- Steve Meyer – Callaway Manager Regulatory Affairs
- Tom Elwood – Callaway Supervisor Regulatory Affairs
- Brian Richardson – Callaway Supervisor Reactor Engineering and Safety Analysis
- Jim Little – Callaway Licensing Engineer
- Jonathan Cordz – Callaway Safety Analysis Engineer
- Jim Harrell – Director of Analysis Division of Zachry Nuclear Engineering, Inc.
- Roger Gorman – Principal Consultant at Zachry Nuclear Engineering, Inc
- Samantha Smelley – Engineer at Zachry Nuclear Engineering, Inc.

## Implementation of AST at Callaway

### Agenda

- Purpose of Amendment Request
- AST Implementation Scope
- Key Changes to Current Licensing Basis
- Technical Specification Changes
- Amendment Outline & Timeline for Submittal

## Implementation of AST at Callaway

### Purpose of amendment request

- Generate margin for allowable unfiltered leakage for Control Room habitability
- Remove requirement for heaters associated with charcoal filters in Control Building pressurization
  - Reduce electrical load on emergency buses
- Use lessons learned from inleakage measurement testing to improve alignment of RADTRAD-NAI model with system design and operation.

## Implementation of AST at Callaway

### Purpose of pre-application review meeting

- Provide overview to NRC
- Promote common understanding
  - Scope
  - Regulatory expectations
- Obtain feedback from NRC prior to formal submittal

## Implementation of AST at Callaway

### Callaway Plant Description:

- Westinghouse 4-loop
- 17x17 fuel assembly
- Original Westinghouse Model F Steam Generators replaced with Framatome 73/19T design
- Original SNUPPS design is shared with Wolf Creek, but
  - Meteorological data is site specific
  - Evolutionary differences have developed with time/age, e.g.,
    - TSP for control of sump pH (instead of NaOH)
    - Different replacement steam generators
    - Callaway has already implemented Dose Equivalent I-131 and Xe-133 in Tech Spec Definitions
    - Replacement Reactor Vessel Head installed at Callaway

## Scope of work

Full scope implementation in accordance with Regulatory Guide 1.183, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors”

– with no changes to:

- Waste Tank Failure
  - Radioactive Waste Gas Decay Tank Failure (FSAR section 15.7.1)
  - Radioactive Liquid Waste System Leak or Failure (FSAR section 15.7.2)
  - Postulated Radioactive Release Due to Liquid Tank Failures (section 2.4.13 of the Site Addendum)
- Environmental Qualification of equipment
- NUREG-0737 items (other than control room habitability and estimation of Tech. Support Center dose)

## Scope of work (continued)

### Events in Regulatory Guide 1.183 appendices plus

- Loss of Non-emergency AC Power (aka, Loss of Offsite Power) in FSAR section 15.2.6
- Letdown Line Rupture in FSAR section 15.6.2

### Locations include

- Exclusion Area Boundary (EAB),
- Low Population Zone (LPZ),
- Control Room, and
- Technical Support Center



## Scope of work (continued)

### Source terms

- Core inventory
  - Calculated using ORIGEN-S computer code
- Gap fraction
  - In accordance with Footnote 11 provisions for high burnup fuel
- Primary coolant concentrations scaled to Dose Equivalent Iodine and Xenon limits in Tech Specs
- Release of contaminated steam to atmosphere
  - For cooldown to conditions to start RHR system for non-LOCA events

### New site-specific meteorological data

- Years of data analyzed include 2013 to 2016
- On an hourly and in a joint frequency distribution (jfd) basis
- Met data recovery rate was well over 90% for each year
  - Close to 98%
- Data screened and validated with METD-NAI\_R2 in accordance with Reg. Guide 1.23, “Onsite Meteorological Programs,” Rev. 1

## Scope of work (continued)

### New calculation of X/Q dispersion factors

- Based on new meteorological data
- Consistent with Reg. Guides 1.145 and 1.194

### Detailed calculation of post-LOCA sump pH

- Original conclusion associated with switch from NaOH to Trisodium Phosphate (TSP) baskets remains valid.
- Equilibrium sump pH is greater than or equal to 7.1

## Key features

### Computer Codes

- RADTRAD-NAI
  - Input format is not directly compatible with other versions of RADTRAD
  - Compartment volume is allowed to be variable with time
- ORIGEN-S
  - Fission product inventory in core
  - 107 different isotopes are included in source term used by RADTRAD-NAI
- PAVAN-NAI and ARCON96-NAI
  - Dispersion factors for offsite and onsite locations
  - Consistent with Reg. Guides 1.145 and 1.194
- RETRAN-3D
  - Amount of contaminated steam released to atmosphere
    - For cooldown to RHR conditions for non-LOCA events
  - Steam generator secondary side collapsed water level
  - Flashing fraction for SG tube leakage when top of tube bundle is uncovered
  - Break flow and flashing fraction for SG tube rupture event
- MicroShield
  - Shine (gamma) dose to control room operators for LOCA

## Key features (continued)

### Very few Technical Specification changes

- Dose Equivalent iodine and xenon already incorporated (having replaced E-bar) in definitions
- Federal Guidance Report No. 11 and No. 12 already in definitions
- Remove requirement for heaters for charcoal filter in Control Building/Room pressurization
  - AST analysis is very conservative in not crediting charcoal filtration in Control Building/Room pressurization
  - HEPA filters are not affected and so continue to be credited in Control Building pressurization
  - Control Room recirculation is a separate function and its charcoal filtration is retained
  - Surveillance Requirement 3.7.10.1 and Tech Spec 5.5.11
- Refine definition of Control Room and Control Building envelope
  - Add “Equipment Room Envelope/Boundary” as new term(s)
  - To be established and defined in the Control Room Envelope Habitability Program referenced in Tech. Spec. 5.5.17.

## Key features (continued)

### Analysis changes to Current Licensing Basis include:

- More detailed model of Control Room and Control Building
  - The Callaway Control Room ventilation system is linked to an unusual extent with associated ventilation in the Control Building that (partially) surrounds it.
  - Provides better alignment with system design and operation
- Increased limits on unfiltered inleakage for Control Room habitability
  - FSAR Figure 15A-2 shows current limits
  - Trade-off between unfiltered inleakage to the Control Room vs. inleakage via the Control Building to the Control Room.

## Key features (continued)

### Analysis changes to Current Licensing Basis (continued):

- Increased gap fraction for high burnup fuel
  - In accordance with footnote 11 in Reg. Guide 1.183
  - Dose analysis supports currently established limits regarding the number of assemblies and fuel rods that achieve burnup >54 GWD/MTU.
- RETRAN-3D is used to estimate amount of contaminated steam released
  - During cooldown to RHR entry conditions for non-LOCA events with Loss of offsite power assumption preventing steam dump to condenser
  - replacing manual/hand or spreadsheet calculations
- Track SG secondary side collapsed water level and flashing fraction with RETRAN-3D

## Key features (continued)

### Analysis changes to Current Licensing Basis (continued):

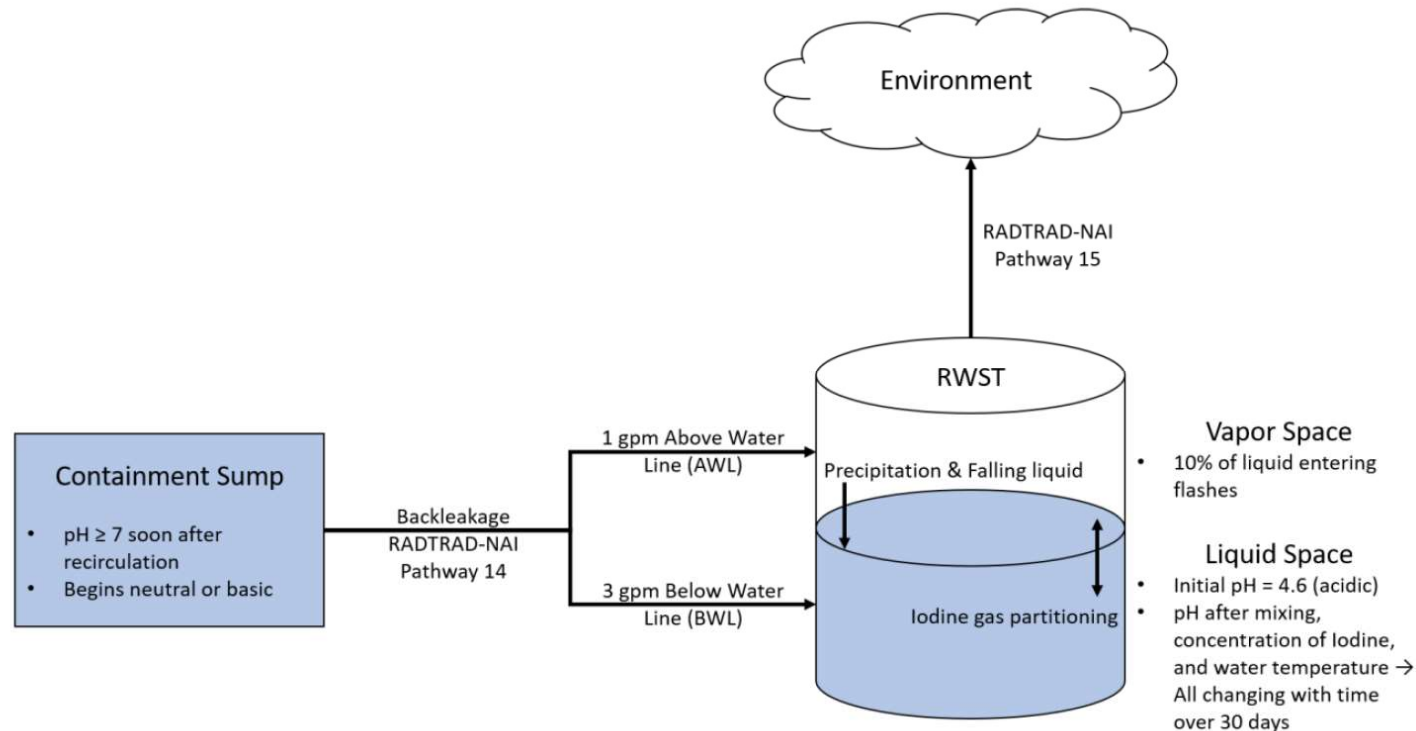
- New X/Q dispersion factors
  - Based on new met data
  
- Switch to TEDE dose
  - while FGR No. 11 and No. 12 are already in Technical Specification definitions for dose conversion factors, the basis for results presented in FSAR Chapter 15 changes from thyroid and whole body basis to TEDE

## Key features (continued)

### Analysis changes to Current Licensing Basis (continued):

#### – RWST Iodine Evolution Analysis

- NUREG/CR-5950 Iodine re-evolution methodology





## Key features (conclusion)

Analysis changes to Current Licensing Basis (continued):

- Operator Ingress & Egress Dose
  - In accordance with 10 CFR 50.67(b)(2)(iii), dose to the operators during travel to and from the control room is calculated including:
    - Inhalation
    - Immersion/Cloudshine
    - Containment shine
    - Ground deposition shine

## Implementation of AST at Callaway

### Outline of License Amendment Request package

- Cover letter
- Enclosures
  1. Evaluation of the Proposed Changes
    - Attachment A – conformance with Reg. Guide 1.183
    - Attachment B       “               “       Reg. Guide 1.145
    - Attachment C       “               “       Reg. Guide 1.194
    - Attachment D       “               “       RIS 2006-04
    - Attachment E       “               “       RIS 2001-19
  2. Technical Specification Markups
  3. Technical Specification Bases Page Markups
  4. FSAR Markups
  5. Retyped document pages showing Technical Specification changes

## Implementation of AST at Callaway

### Schedule

– Planned submittal date

March 2021

March 2021

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## Implementation of AST at Callaway

### Questions(?)

### Any feedback from NRC regarding

- Scope of submittal,
- LAR contents, or
- Regulatory expectations?

### Closing Remarks

## Implementation of AST at Callaway



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