

Selective Implementation of AST for the Point Beach Nuclear Plant Fuel Handling Accident

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Introduction

Purpose:

- Discuss Selective Implementation of AST for the Fuel Handling Accident Analysis at PBNP

NMC PBNP Representatives

- Sara Scott (Radiological Analysis Engineer)
- Jack Gadzala (Licensing Manager)
- Lisa Schofield (Licensing Engineer)



Background

- February 28, 2002, LAR 224 submitted to NRC
 - ◆ Requested implementation of AST for a limited number of the design basis accidents
 - ◆ Requested changes to various TS
- Discussions with NRC staff following submittal resulted in staff requesting additional information
- Approach
 - ◆ LAR 224 was retracted (1/24/2003)
 - ◆ Analyses to be resubmitted in two parts
 - ★ Fuel Handling Accident
 - ★ Remaining Analyses (LOCA, MSLB, SGTR, LR, CRE)

Topics of Discussion

- Current Licensing Analysis
- Proposed Fuel Handling Accident
- Proposed FHA Dose Results
- Atmospheric Dispersion Factor Basis
- Control Room Envelope and HVAC
- Proposed Technical Specification Changes
- Commitments
- Conclusion

FHA Current Licensing Basis

- Thermal Power Level 1548.9 MWt (102%)
- Accident Occurs 161 hours post-shutdown
- All rods in one assembly damaged
- NG gap inventories based on RG 1.25
- Halogen activities based on NUREG/CR-5009
- Radial peaking factor of 1.77 applied
- Overall pool DF of 100 for iodine (none for NG)
- Activity is released in 2 hours
- ICRP 30 iodine DCF used for thyroid doses

FHA Current Licensing Basis Doses

	Whole Body	Thyroid
Exclusion Area Boundary	0.23 rem	75 rem
Low Population Zone	0.14 rem	4.5 rem
Control Room	Dose not specified, but FHA is not limiting	
10 CFR 100 Limits	75 rem	300 rem

Proposed FHA Analysis

- RG 1.183 Appendix B guidance followed
- Parameters for Source Term
 - ◆ Core Power Level of 1683 MWt
 - ◆ Radial Peaking Factor of 1.8
 - ◆ All Rods in One Assembly Damaged
 - ◆ Decay time of 65 hours
 - ◆ RG 1.183 Gap Fractions and Chemical Forms
 - ◆ Water Depth (minimum) 23 feet
 - ◆ Effective Pool DF for Iodine is 200
 - ◆ Effective Pool DF for NG is 1

Proposed FHA Analysis

■ Release Point

- ◆ Unit 2 Purge Stack (bounding)
- ◆ No Credit for Purge Stack Filtration
- ◆ 2 hour Release Duration

■ CR HVAC

- ◆ Emergency Mode Actuated at 10 min Post-Accident
- ◆ 4550 cfm Filtered Intake
- ◆ 500 cfm Unfiltered Inleakage
- ◆ 95% Elemental and Organic Iodine Filter Efficiency
- ◆ 99% Particulate Iodine Filter Efficiency
- ◆ No Credit for the Administration of KI

Proposed FHA Dose Results

	TEDE	RE 1.183 Accept. Criteria
Exclusion Area Boundary	< 2.0 rem	6.3 rem
Low Population Zone	< 0.5 rem	6.3 rem
Control Room	< 3 rem	5 rem

Offsite χ/Q Basis

- EAB/LPZ values consistent with CLB LOCA
 - ◆ Submitted to the NRC as part of TSCR 192 (SW Pump Operability Requirements)
 - ◆ Analysis approved as amendments 174/178 (July, 9, 1997)
- RG 1.145 used to calculate EAB and LPZ χ/Q 's
- 1/1/1991 to 12/31/1993 Primary Tower Met Data
- Values based on True North

Control Room χ /Q Basis

- χ /Q Values were developed using ARCON96
- 1/1/1997 – 12/31/1999 Primary Met Data Used
 - ◆ Most of December 1999 data unavailable from Primary Tower
 - ◆ Unavailability due to implementation of digital recorders (replaced strip charts)
 - ◆ Overall data recovery > 90%
- Stability class determined from temp difference of 10 m and 45 m instruments

Control Room χ /Q Basis

- Possible Release Paths for FHA
 - ◆ Unit 2 Purge Stack
 - ◆ Spent Fuel Pool Deck
 - ◆ Drumming Area Vent Stack
- All release points treated as Ground Release
- Plume centerline transported directly over CR intake
- All releases influenced by Building Wake
 - ◆ Containment Building for U2 Purge Stack / DAVS
 - ◆ PAB for SFP Deck

Control Room χ /Q Basis

- ARCON96 default wind direction range of 90°
- Values based on True North
- ARCON96 default parameter changes based on DG-1111
 - ◆ Surface roughness length set equal to 0.2 m
 - ◆ Sector averaging constant set equal to 4.3
- Unit 2 Purge Stack represents most bounding

χ /Q

Control Room Envelope and HVAC

- PBNP is a pre-GDC plant and not licensed to 10 CFR 50 Appendix A, GDC
- Designed and Licensed under PBNP GDC 11
 - ◆ Includes provisions for continuous occupancy under any credible post-accident condition
 - ◆ No dose value associated with PBNP GDC 11
- Envelope contained in control building
 - ◆ Control Room Proper
 - ◆ Computer Room
 - ◆ Reactor Engineering Room
 - ◆ CR Ventilation Duct Work

Control Room Envelope and HVAC

- CR HVAC System provides heating, ventilation, air conditioning, and radiological habitability
- CR HVAC has 4 modes of operation
 - ◆ mode 1: Normal mode
 - ◆ mode 2: 100% recirculation
 - ◆ mode 3: 25% filtered return air / 75% recirc
 - ◆ mode 4: 25% filtered outside air / 75% recirc;
positive pressure > 1/8 in w.g.
 - ★ Actuated on high rad signal
- HVAC ductwork design/construction considered commercial: S-Slip and Drive joints

Control Room Envelope and HVAC

■ Modifications

- ◆ Hardcasting of the majority of the seams of the ventilation ductwork
- ◆ Replacement of dampers on the periphery with bubble tight dampers
- ◆ Installation of new balancing dampers
- ◆ Installed position indication for washroom exhaust fan isolation
- ◆ New fusible links installed in the equipment room roof penetrations
- ◆ Replaced CR to Turbine Bldg differential pressure indicator

Control Room Envelope and HVAC

- Benefits of modifications made to CR/HVAC
 - ◆ Increase system reliability
 - ◆ Improve program implementation
 - ◆ Gain system operating margin
 - ◆ Increase integrity of CR HVAC system

Proposed Technical Specification Change

- Deletion of TS 3.9.3, “Containment Penetrations” (Refueling Operations)
 - ◆ Currently Requires
 - a. Equipment hatch closed and held in place with all bolts
 - b. One door in each air lock capable of being closed
 - c. Containment Purge/Exhaust penetration closed by a manual or automatic isolation valve...or capable of being closed by an OPERABLE isolation system

Proposed Technical Specification Change

- Technical Support for Deletion
 - ◆ Revised analysis does not credit
 - ★ Closure of the equipment or personnel hatches
 - ★ Isolation of the purge stack
 - ★ Ventilation system filtration of the release
 - ◆ Although the SFP release is not limiting, this area does not have closure requirements during refueling operations
 - ◆ Drumming Area Vent Stack does not have automatic isolation

Commitments

- A supplement to the proposed submittal which addresses the remaining accidents of concern
 - ◆ LOCA
 - ◆ Main Steam Line Break
 - ◆ Steam Generator Tube Rupture
 - ◆ Locked Rotor
 - ◆ Control Rod Ejection

Conclusion

- PBNP requesting Selective Implementation of AST for the Fuel Handling Accident
- No exceptions to RG 1.183 are taken
- Calculated doses do not challenge the limits specified in 10 CFR 50.67
- Revised analysis supports deletion of TS 3.9.3
- PBNP commits to submitting a supplement to the proposed LAR to address remaining analyses