UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 2, 2009

LICENSEE: Exelon Generation Company

FACILITY: LaSalle County Station, Unit 2

SUBJECT: SUMMARY OF JANUARY 29, 2009, PRE-APPLICATION MEETING WITH EXELON GENERATION COMPANY, LICENSE AMENDMENT REQUEST FOR UNIT 2 SPENT FUEL STORAGE RACK MODIFICATIONS

On January 29, 2009, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of Exelon Generation Company (the licensee) at the NRC Headquarters, One White Flint North, 11555 Rockville Pike, Rockville, Maryland. The purpose of the meeting was to discuss a pre-application license amendment request (LAR) for Unit 2 spent fuel storage rack modifications involving NETCO-SNAP-IN ® Inserts. A list of attendees is provided as Enclosure 1.

The licensee presented information on the proposed LAR (See Enclosure 2). This presentation provided an overview status of the LaSalle County Station LaSalle, Unit 2 spent fuel pool (SFP) storage and Boraflex ® degradation issue, summarized the licensee's integrated approach to spent fuel storage, and described the NETCO-SNAP-IN ® rack inserts and associated criticality analysis.

The NRC staff and the licensee discussed the codes which were used for the criticality analysis for use of the NETCO-SNAP-IN ® rack inserts with the licensee, and assumptions and conservatisms used when performing the analysis. The licensee also discussed the resolution strategy for the ability to maintain full core discharge capability at LaSalle Unit 2, with respect to dry cask storage.

Members of the public were in attendance. Public Meeting Feedback forms were not received.

Please direct any inquiries to me at 301-415-3154, or SPS1@nrc.gov.

Stephen Sands, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-374

Enclosures:
1. List of Attendees
2. Licensee Handout

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LIST OF ATTENDEES

JANUARY 29, 2009, MEETING WITH EXELON GENERATION COMPANY

PRE-APPLICATION MEETING TO DISCUSS NETCO-SNAP-IN® INSERTS

FOR LASALLE UNIT 2 SPENT FUEL STORAGE RACK MODIFICATIONS

Name	Organization	Phone Number
Stephen Sands	NRC/NRR/DORL/LPLIII-2	301-415-3154
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Adam Levin	Exelon	630-657-2193
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Kenneth Lindquist	NETCO	845-331-8511
Terrence Simpkin	Exelon	630-657-2800
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Emma Wong	NRC/NRR/DCI/CSGB	301-415-1217
Lisa Shofield	Exelon	630-657-2815
Patrick Simpson	Exelon	630-657-2823

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LaSalle County Station Unit 2 Spent Fuel Storage Racks

Pre-Submittal Meeting

January 29, 2009

ENCLOSURE 2

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Opening Remarks

Terry Simpkin
Regulatory Assurance Manager

Exelon Nuclear

Purpose

- ✓ Overview status of LaSalle County Station (LSCS) Unit 2 spent fuel pool (SFP) storage and Boraflex degradation
- ✓ Summarize Exelon Nuclear's integrated approach to resolution
- ✓ Describe NETCO-SNAP-IN® rack inserts and criticality analysis
- ✓ Outline regulatory interactions
- ✓ Obtain NRC feedback

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Agenda

- ✓ Opening Remarks . . . . . Terry Simpkin
- ✓ Background. . . . . Adam Levin
- ✓ Resolution Strategy. . . . . Adam Levin
- ✓ NETCO-SNAP-IN® Rack Inserts . . . . . K. Scot Leuenroth
- ✓ Criticality Analysis. . . . . Adam Levin
- ✓ Regulatory Interactions. . . . . Terry Simpkin
- ✓ Closing Remarks. . . . . Terry Simpkin
- ✓ NRC Feedback . . . . . NRC

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Background

Adam Levin
Director, Spent Fuel and Decommissioning

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Background
Spent Fuel Pool Design

- ✓ LSCS Unit 2 SFP consists of 20 high density fuel storage racks and 43 special storage cells
- ✓ Unit 2 SFP has a storage capacity of 4078 fuel assemblies; 3461 storage cells are in use
- ✓ Unit 2 fuel storage racks contain a 0.075" thick sheet of Boraflex neutron poison material and a nominal B-10 loading of 0.0238 g/cm^2 between the side walls of all adjacent boxes
- ✓ LSCS Unit 1 fuel storage racks contain BORAL® neutron poison material
- ✓ Unit 1 and 2 SFPs are cross-connected

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Background
Monitoring Programs

- ✓ Silica trending in pool shows increased degradation beginning in 1999
- ✓ Part length and full length coupons indicate accelerated degradation in 2005
- ✓ BADGER testing in 2006 used to renormalize projections (RACKLIFE)
- ✓ Full core discharge capability will be lost in first half of 2009

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Resolution Strategy

Adam Levin
Director, Spent Fuel and Decommissioning

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Resolution Strategy
Overview

- ✓ Implement 3-of-4 loading configuration – 2009
  - License amendment request submitted December 13, 2007
- ✓ NETCO-SNAP-IN® rack inserts – 2010
  - Neutron poison replacement for fuel storage applications
  - Requires NRC approval
- ✓ Dry cask storage – 2010
  - Implementation of dry cask storage will not eliminate the need for the other elements of strategy

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Resolution Strategy

Dry Cask Projections to Maintain Full Core Discharge

Strategy	Dry Casks in 2010	Dry Casks in 2011	Dry Casks in 2012
Without 3-of-4 analysis	23	11	10
With 3-of-4 analysis	9	6	6
With rack inserts and 3-of-4 analysis	2	4	5

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Resolution Strategy

Summary

- ✓ Options to manage the Boraflex degradation and maintain full core discharge capability have been evaluated
- ✓ Preferred resolution pathway is revision to licensing basis to use 3-of-4 loading methodology and NETCO-SNAP-IN® rack inserts
- ✓ Results in fewer manipulations and minimizes dose, waste generation, and cost

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NETCO-SNAP-IN® Rack Inserts

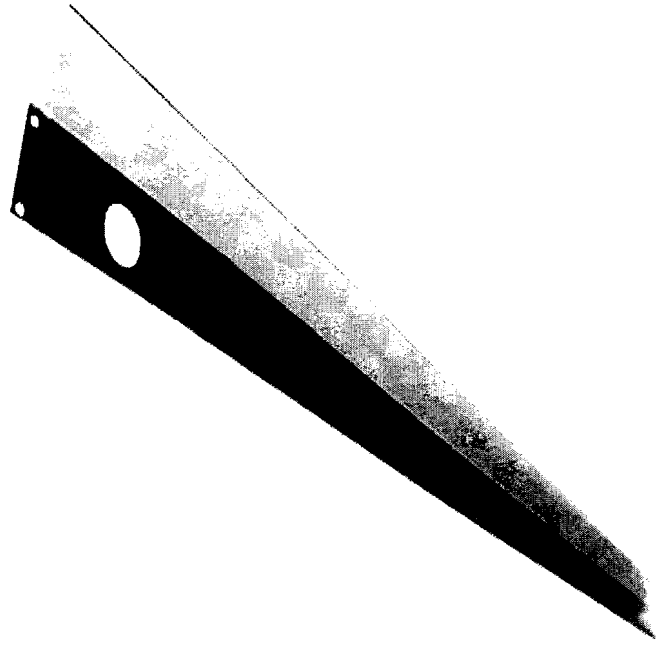
K. Scot Leuenroth
NETCO Project Manager

Exelon Nuclear

NETCO-SNAP-IN® Rack Inserts

Overview

- ✓ Refurbish the neutron absorption capability of spent fuel storage racks with degraded Boraflex
- ✓ Made of Al/B_4C composite
- ✓ Extends useful storage rack life
- ✓ Minimal impact on fuel move operations



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NETCO-SNAP-IN® Rack Inserts

Project Overview

- ✓ Joint venture between NETCO and Exelon
- ✓ NETCO issued U.S. Patent 6,741,669 B2 in 2004 for absorber insert design
- ✓ Clean pool prototype testing performed at Penn State in 2007
  - Full size insert, dummy cell, underwater installation
- ✓ Proof of concept demonstration completed at LSCS in 2007

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NETCO-SNAP-IN® Rack Inserts

Description

- ✓ Al-1100/B_4C composite, supplied by Rio-Tinto Alcan, formed into a chevron shaped rack sleeve
- ✓ Installed via custom tool from the refueling bridge
- ✓ Chevron is compressed during installation
  - Friction and compression forces hold insert in place

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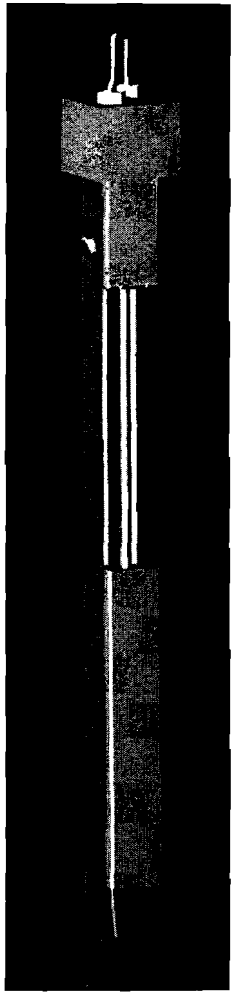
NETCO-SNAP-IN® Rack Inserts

Key Features



- ✓ Simplicity of NETCO-SNAP-IN®
  - Standard fabrication methods demonstrated by Manufacturing Sciences Corporation with actual Al/B_4C composite material
- ✓ Simplicity of installation tool
  - Only two moving parts
  - No electrical or hydraulic systems
- ✓ Once Installed, NETCO-SNAP-IN® rack inserts are an integral part of the rack modules

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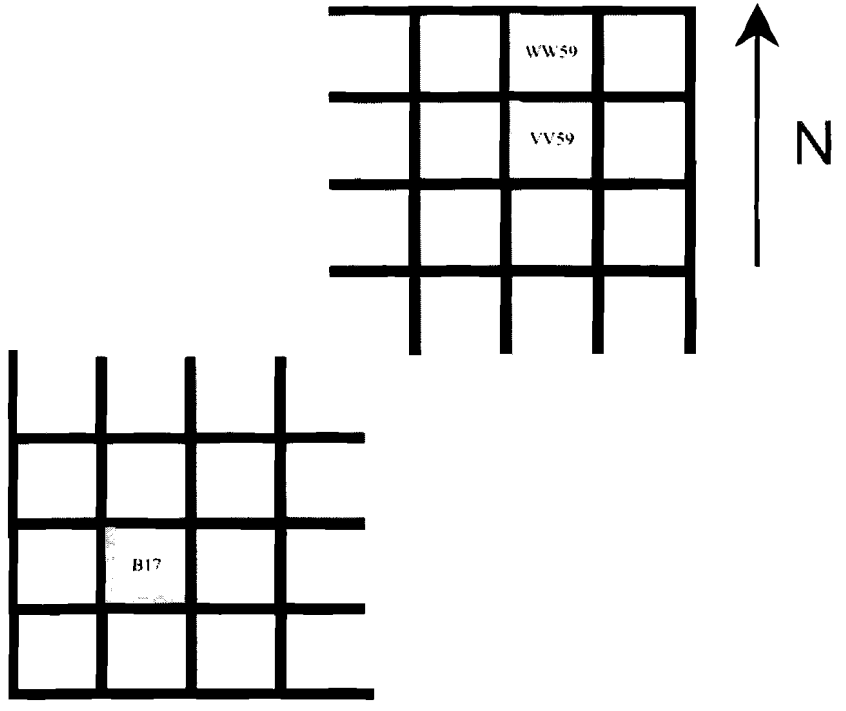
NETCO-SNAP-IN® Rack Inserts

Application

- ✓ When placed in each storage location, the NETCO-SNAP-IN® rack inserts mitigate the positive reactivity effect associated with degraded Boraflex
- ✓ Installation will be done as-needed at LSCS by onsite fuel handlers
- ✓ Once installed, fuel can be moved in and out of the storage locations as usual

Installation Locations for the LSCS Demonstration



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NETCO-SNAP-IN® Rack Inserts

LSCS Demonstration

- ✓ Three inserts were installed in the LSCS Unit 2 fuel storage racks the week of October 22, 2007
- ✓ Ease of installation was well received by Exelon fuel handlers
- ✓ Drag testing with a new fuel channel was performed in each location to test clearances
- ✓ No clearance issues were encountered during testing

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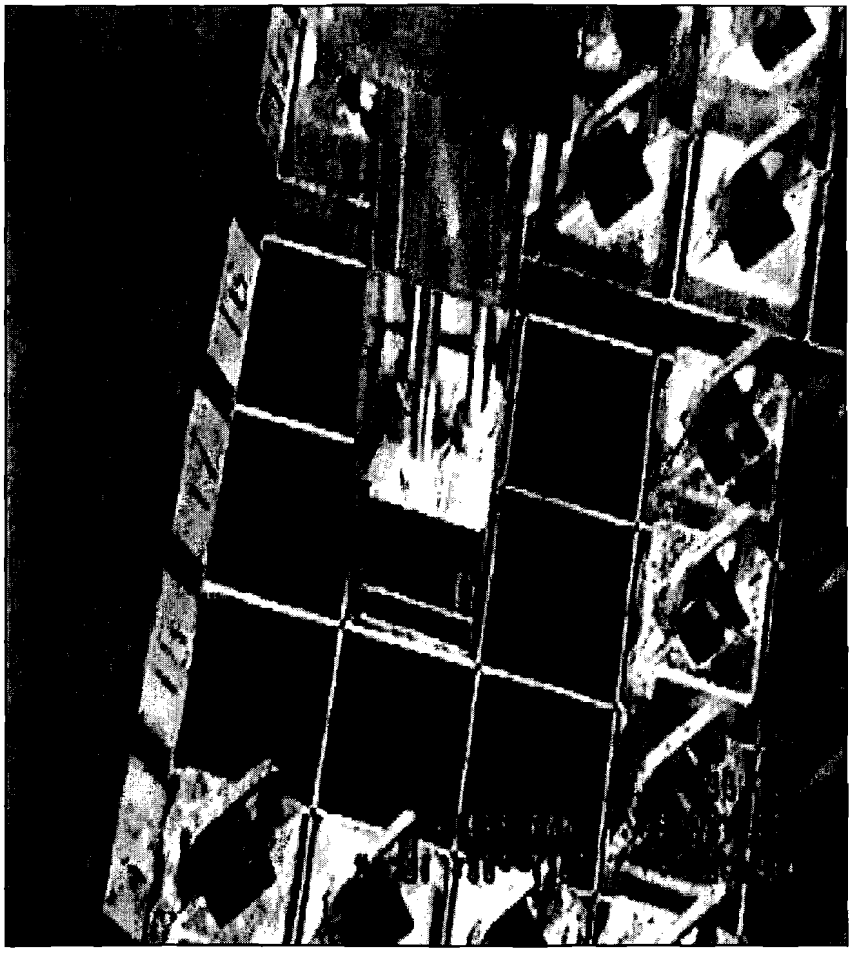
NETCO-SNAP-IN® Rack Inserts

Installation

- ✓ Insert being installed in location B17 of the LSCS Unit 2 SFP



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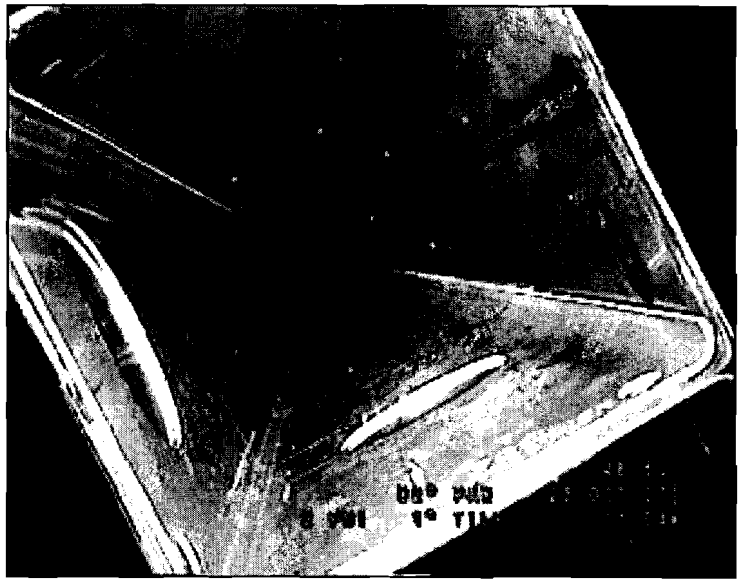
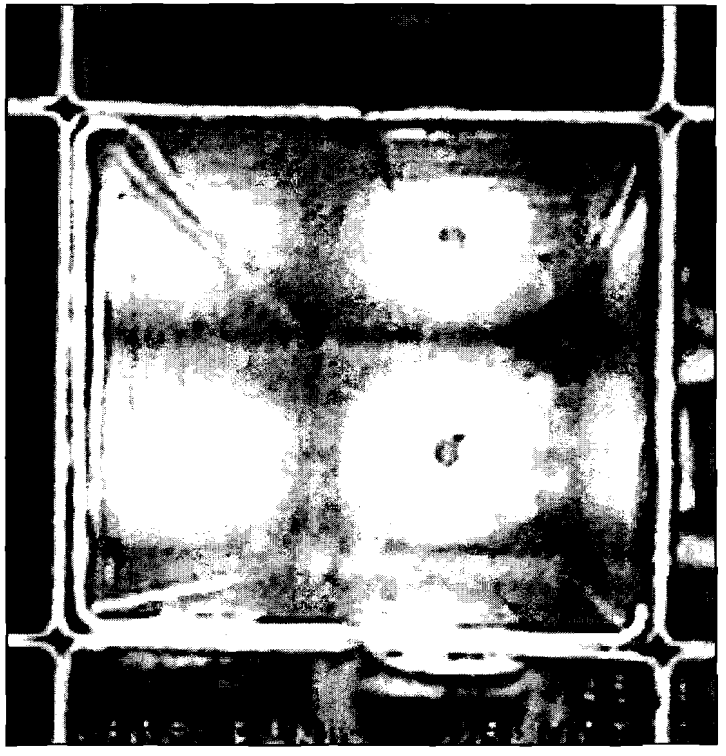
NETCO-SNAP-IN® Rack Inserts

Installed Insert





View Looking Into Locations VV59 and B17 After Installation of a NETCO-SNAP-IN® Rack Insert

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NETCO-SNAP-IN® Rack Inserts

Borated Aluminum Material

- ✓ Evaluation of Alcan and similar materials
  - Comparison of Alcan material with BORAL®
  - Review of wet storage experience with BORAL®
  - Accounting of NETCO's experience in materials qualification including NRC reviewed evaluations
- ✓ Accelerated corrosion testing
  - Pre-test characterization
  - Accelerated corrosion environment
  - Post-test characterization
  - 2000 hour and 4000 hour test results
  - Accelerated corrosion testing (6000 hour, 8000 hour)

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NETCO-SNAP-IN® Rack Inserts

Fast Start Coupon Surveillance Program

- ✓ Provide early performance data on the composite material in the LSCS Unit 2 SFP environment
- ✓ Series of 24 coupons (nominal 16 vol% boron carbide) cut from composite material produced for the LSCS demonstration have been installed
- ✓ Exelon plans to place fast start coupons in a cell surrounded with freshly discharged fuel (i.e., center of 3x3 array) following each Unit 2 refueling outage to maximize gamma energy disposition and temperatures
- ✓ Exelon plans to remove two coupons approximately every six months for testing and inspection (i.e., post-test characterization) at a qualified laboratory

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NETCO-SNAP-IN® Rack Inserts

Long-Term Surveillance Program

- ✓ Specially designed surveillance tree with 24 coupons (nominal 17 vol% boron carbide) attached to each side of a four-sided structure (96 total)
- ✓ Surveillance tree will be installed during the first insert installation campaign and will reside there as long as the fuel racks continue to be used
- ✓ Coupons will be periodically removed and sent to a qualified laboratory for testing
  - Quantify long-term corrosion, including pre- and post-examination
  - Track effects along bend radii
  - Trend galvanic corrosion with 304SS, Inconel 718, and Zircaloy coupons

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Criticality Analysis

Adam Levin
Director, Spent Fuel and Decommissioning

Exelon Nuclear

Criticality Analysis

- ✓ Reactivity results meet the 0.95 K-eff acceptance criteria including uncertainties and worst case abnormal and accident conditions
- ✓ Analysis takes no credit for any neutron absorption of the Boraflex
  - Boraflex material replaced with water in rack model
- ✓ All NETCO-SNAP-IN® rack inserts are assumed to be loaded in the same orientation through the pool so all stored fuel assemblies "see" a face of the inserts wing

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Criticality Analysis

- ✓ Criticality analysis performed by AREVA
  - CASMO-4 for determination of differential reactivity associated with manufacturing tolerances
  - KENO V.a for absolute SFP rack reactivity calculations
- ✓ Base analytical model assumes one insert and one bounding reactivity ATRIUM-10 assembly in each spent fuel storage cell
- ✓ Base analysis performed at the most limiting temperature of 4°C

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Criticality Analysis

- ✓ Reactivity uncertainty for the following manufacturing uncertainties included:
  - Fuel rod pitch
  - U-235 fuel enrichment
  - UO2 fuel pellet density
  - Channel bulge
  - Pellet diameter
  - Clad diameter
  - Pellet volume
  - Gadolinia concentration
  - Areal B-10 density
  - NETCO-SNAP-IN® insert thickness
  - Stainless steel wall thickness
  - Storage cell pitch
  - Storage cell inside dimension

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Criticality Analysis

- ✓ Criticality analysis documentation quantitatively demonstrates the bounding reactivity nature of the ATRIUM-10 design used in criticality analysis relative to all past fuel used at LSCS (GE8x8, ATRIUM-9, ATRIUM-10, and GE14)
- ✓ Appendix in analysis report compares in-rack K-inf values of bounding reactivity ATRIUM-10 design (with installed insert) to the most limiting fuel of past designs (GE8x8, ATRIUM-9, ATRIUM-10, and GE14)

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Criticality Analysis

- ✓ Resultant rack reactivity using the bounding design is 0.940 K-eff
  - This includes these major components:
    - 0.918 rack K-eff
    - 0.01 ΔK manufacturing reactivity uncertainty
    - 0.0035 ΔK impact associated with the accident condition of a single insert missing from the interior of the storage rack
- ✓ Analysis specifically incorporates the reactivity effect associated with those assemblies loaded on the periphery being enclosed by only two or three wings of an insert
- ✓ Analysis specifically demonstrates the SFP reactivity decreases when storage cells contain neither an insert nor a fuel assembly

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Criticality Analysis
Summary

- ✓ Calculation performed in accordance with Standard Review Plan
- ✓ Analysis takes no credit for any neutron absorption of the Boraflex
- ✓ Results show maximum K-eff < 0.95
- ✓ Unit 2 SFP may at times contain individual rack configurations that reflect the originally installed Boraflex configuation, 3-of-4 configuration, and rack insert configuration
  - Each of these unique configurations individually meet the criticality acceptance criteria
  - A SFP containing a combination of these configurations also meet the criticality acceptance criteria

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Regulatory Interactions

Terry Simpkin
Regulatory Assurance Manager

Exelon Nuclear

Regulatory Interactions

- ✓ Plan to submit license amendment request to reflect use of NETCO-SNAP-IN® rack inserts in first quarter 2009
  - Request approval by first quarter 2010
- ✓ If approved, the rack inserts will be installed and credited to maintain SFP criticality requirements

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Closing Remarks

Terry Simpkin
Regulatory Assurance Manager

Exelon Nuclear

Closing Remarks

- ✓ Ultimate goal is to maintain full core discharge capability
- ✓ Proposed resolution involves several elements
  - 3-of-4 loading configuration
  - NETCO-SNAP-IN® rack inserts
  - Dry cask storage
- ✓ Exelon plans to submit a license amendment request to reflect use of NETCO-SNAP-IN® rack inserts in first quarter 2009

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NRC Feedback

April 2, 2009

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FACILITY: LaSalle County Station, Unit 2

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/RA/

Stephen Sands, Project Manager
Plant Licensing Branch III-2
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Docket No. 50-374

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2. Licensee Handout

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