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ANO SFP Storage Project

June 2006

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Purpose

- ANO-1 Spent Fuel Pool (SFP) Project
  - Metamic Poison Insert Assemblies (PIAs) Design
  - ANO-1 Technical Specification (TS) changes and timing
- ANO-2 SFP Project
  - Partial Re-rack
  - ANO-2 TS changes and timing
- Schedule Constraints

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ANO-1 SFP Design

- The ANO-1 SFP is currently divided into Region 1 and Region 2.
- Region 1 contains Boraflex®.
- Region 2 does not contain poison materials; fuel assembly storage is restricted in accordance with ANO-1 TS.
- Soluble boron is not credited in ANO-1 criticality analysis.

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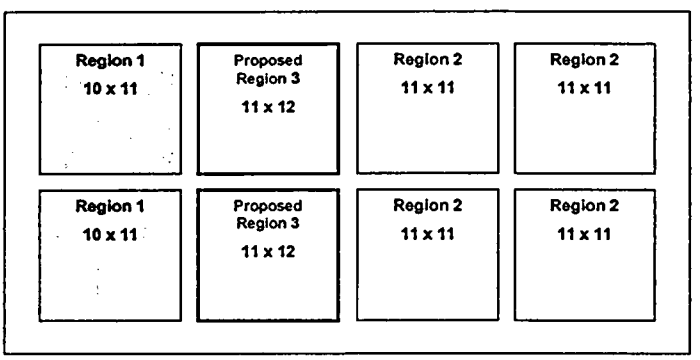
ANO-1 SFP Layout



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ANO-1 SFP Loading

- Boraflex® in Region 1 is degrading.
  - August 2002 Region 1 SFP racks were considered operable but degraded as allowed by GL 91-18.
  - April 2007 - Credit will no longer be taken for Boraflex® resulting in a loss of full core offload capability.
- Current fuel loading strategy includes loading 3 dry casks prior to the spring 2007 refueling outage.

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ANO-1 Metamic® Project Overview

- To provide an area where unrestricted storage is available, a portion of Region 2 will be defined as Region 3.
- Metamic® PIAs will be installed in the existing rack flux traps of Region 3.
- U-235 fuel enrichment will be increased from 4.1wt.% to 5.0wt.% for future core reload flexibility.
- Soluble boron will be credited as allowed by 10CFR50.68.

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Metamic® Overview

- Metamic® has been approved for use in Fuel Pool applications by NRC letter to Entergy dated June 17, 2003.
- Conditions and Limitations of NRC Safety Evaluation include:
  - Coupon Sampling Program
    - Discussion of coupons
  - Description of anodizing process and cleaning techniques (not using anodizing process)
  - B_4C content less than 31wt.% (using 25wt.%)

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ANO-1 Current Project Status

- Criticality analyses have been performed to analyze
  - Region 1 racks with no credit for Boraflex®
  - Region 2 racks with no poison insert material
  - Region 3 racks with Metamic® PIAs
  - New Fuel Vault and fuel handling equipment
- Structural /seismic for Region 3 racks and pool analyses considering poison insert design and additional weight.
- Thermal hydraulic analysis
- Postulated fuel assembly drop events for Region 3 of SFP racks.
- Evaluation of potential offsite and control room dose radiological consequences of a Fuel Handling Accident (FHA) is currently reflected in the ANO-1 SAR.

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PIA Design Modifications

- Original PIA design, as previously submitted to the NRC, was a collapsible design for insertion and expanded to fill the flux trap.
- Revised PIA design is a non-collapsible fixed design.

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PIA Design Overview

- PIA length is ~13 feet; active fuel length ~12 feet.
- PIA width is 7.12 inches.
- PIA thickness 1.20 inches.
- PIA weight ~50 lbs. each.
- External SS sheaths along the full length of the PIA protects the Metamic® panels when inserted in the flux trap.
- Internal SS sheathing bands secure the Metamic® panels to the external sheath. Bands are located at the ends and four locations along the length.

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Top View of PIA

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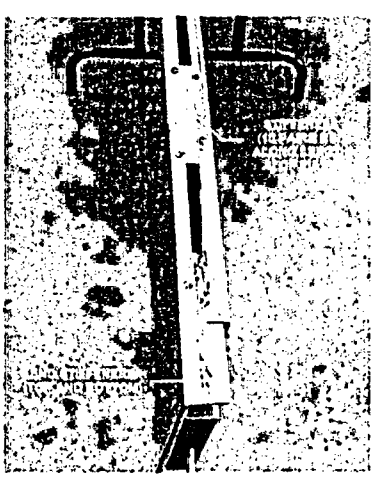
Stiffeners



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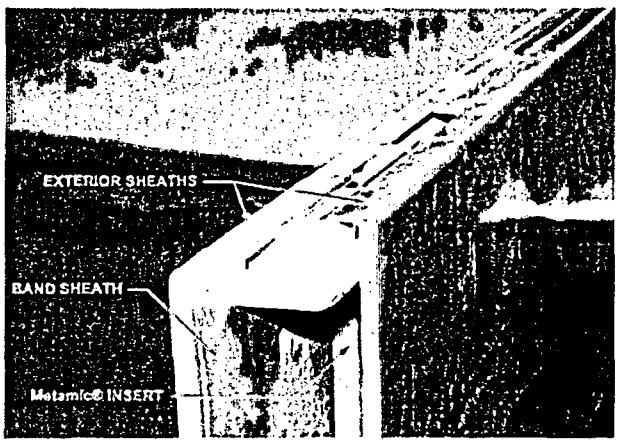
Bottom View Close-up



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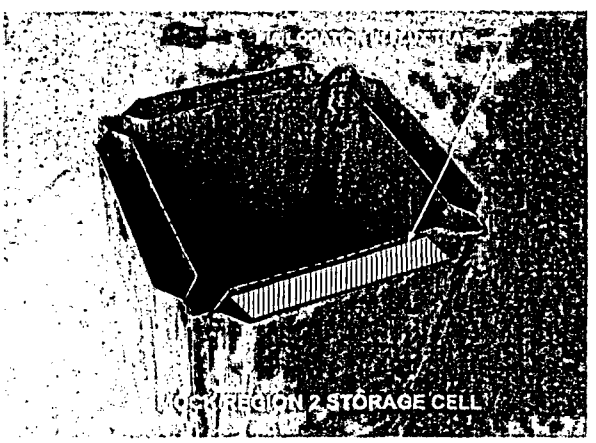
PIA Location in Flux Trap



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ANO-1 Submittal History

- Topical Report
  - August 8, 2002 - Entergy submitted Topical Report "Use of Metamic® In Fuel Pool Applications."
  - June 17, 2003 – NRC approves Topical Report.
- ANO-1 License Amendment
  - April 2, 2003 – Entergy submitted license amendment to modify spent fuel loading restrictions for Regions 1, 2, and 3.
  - June 24, 2004 – Entergy withdrew the license amendment due to the inability to manufacture PIAs to meet the design specifications to support the criticality analysis.

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Project Activities

- The following is a summary of activities performed since the 2004 amendment withdrawal.
  - The original design concept was reevaluated which resulted in a design change to a non-collapsible, fixed design.
  - A comprehensive examination of the spent fuel pool (SFP) racks was performed for additional design input.
  - Preliminary analyses were performed and two PIAs were manufactured using the fixed design to ensure constructability.
  - Performance of formal design documentation and analyses for licensing PIAs.

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ANO-1 Proposed Licensing Amendment

- License amendment reflects new design and will include the following:
  - Storage restrictions for SFP where appropriate.
  - Boron credit
  - Compliance with 10 CFR 50.68(b).
  - Fuel enrichment increased from 4.1wt%. to 5.0wt.%
  - Metamic® Coupon Sampling Program will be added.

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ANO-1 Submittal Plans

- LAR submitted by July 2006 with approval by January 15, 2007.
- Advantage
  - Allows insertions of PIAs in January/February 2007.
  - Allows full core offload following outage.
- Disadvantage
  - NRC review time shortened.

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Other ANO-1 Options Considered

- Continue to address ANO-1 SFP conditions as degraded with alternate loading scheme
  - Requires applying the Region 2 rack analysis to Region 1 under 10 CFR 50.59 using the current licensing basis and accounting for the Boraflex® structure without crediting its neutron absorption capability.
  - Allows full core offload capability for spring 2007 outage, but not after the outage.

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Other ANO-1 Options Considered

- Insert PIAs in January under 50.59
  - Requires analytical confirmation of current licensing basis for:
    - Criticality analysis
    - Structural analysis
  - Allows NRC review time to be extended from January to March 2007.
  - Allows full core offload capability when Metamic® amendment is approved.
  - Substantial analysis for short duration.

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ANO-2 SFP Project

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ANO-2 Project Overview

- The ANO-2 Spent Fuel Pool (SFP) is currently divided into Region 1 and Region 2.
- Region 1 racks contain Boraflex® that is no longer credited.
- Region 2 racks do not contain poison materials.
- Flux trap dimensions in Region 2 racks prohibit PIA insertion.
- Region 1 racks will be replaced with Metamic® racks restoring unrestricted fuel assembly storage.

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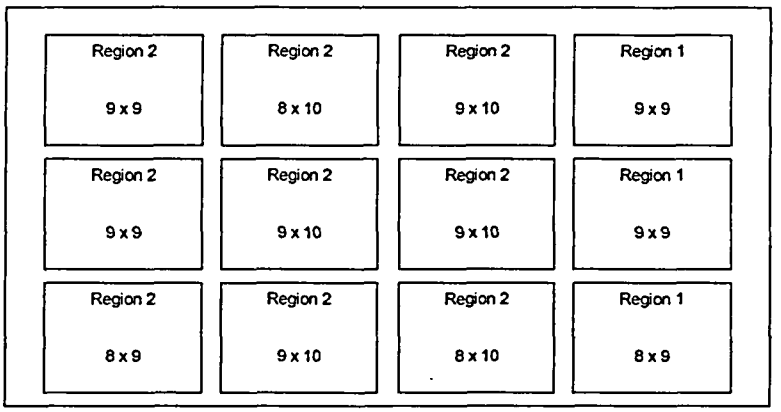
ANO-2 SFP Layout



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ANO-2 Project Overview

- Current loading pattern is complex.
- ~ 1/2 of fuel assemblies in the core are replaced each cycle. Minimal cooling time is 5 years prior to loading fuel in a dry fuel cask; however time is typically longer.
- Currently, all available fuel is loaded into dry fuel casks.
- More fuel assemblies will be available to load into dry fuel casks by June 2007.
- Window of opportunity (due to other competing SFP activities) for re-rack September – December 2007.

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ANO-2 License Amendment History

- Topical Report
  - August 8, 2002 - Entergy submitted Topical Report "Use of Metamic® In Fuel Pool Applications."
  - June 17, 2003 – NRC approves Topical Report.
- ANO-2 License Amendment
  - January 29, 2003 – Entergy submitted license amendment to modify spent fuel loading restrictions for Regions 1, 2, and 3.
  - August 26, 2003 – Entergy withdrew the license amendment due to extrusion problems.

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Project Activities

- The following is a summary of activities performed since the 2003 amendment withdrawal.
  - Alternate loading pattern TS change submitted and approved.
  - The original design concept was reevaluated which indicated that a design similar to ANO-1 cannot be manufactured for ANO-2 due to the smaller flux trap.
  - A comprehensive examination of the SFP racks and other designs was performed.
  - Partial re-rack resulted in only viable option that results in unrestricted storage.

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ANO-2 Proposed License Amendment

- The proposed amendment will reflect the partial re-rack and include the following:
  - New storage restrictions.
  - Increase in fuel enrichment from 4.55wt% to 5.0wt.%.
  - Boron credit (ANO-2 currently complies with 10CFR50.68(b)).
  - Add Metamic® Coupon Sampling Program.

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ANO-2 Submittal Plans

- Submit by December 31, 2006
- Requested approval by September 1, 2007.

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Schedule Constraints

- Common SFP floor and equipment
- Activities in ANO-1 and ANO-2 SFPs
  - March - April 2006 loaded 3 casks for ANO-2.
  - May 2006 reconfigured ANO-2 SFP for new fuel receipt and to support criticality analysis for fuel core offload.
  - June 2006 new fuel receipt ANO-2.
  - July 2006 load 2 casks for ANO-1.
  - Sept. – Oct. 2006 ANO-2 Refueling Outage.
  - Nov. 2006 load 1 cask for ANO-1.
  - **Jan. - February 2007 Insert PIAs in ANO-1 SFP.**
  - March 2007 new fuel receipt and fuel reconfiguration ANO-1.
  - April 2007 – ANO-1 Region 1 Boraflex no longer credited.
  - April – May 2007 ANO-1 Refueling Outage.
  - June 2007 load 2 casks for ANO-2.
  - July 2007 load 2 casks for ANO-1.
  - **September – December 2007 partial re-rack ANO-2.**
  - Jan/Feb 2008 – New fuel receipt ANO-2.

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Summary

- ANO-1 SFP Project
  - Metamic® PIAs need to be inserted in the SFP in January / February 2007.
  - Unless PIA insertion can be accomplished prior to the approval of the TS, license amendment approval is needed by January 15, 2007.
- ANO-2 SFP Project
  - Partial Re-rack
  - License amendment approval needed by September 1, 2007.

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