

HI-STORM LAR 1014-5

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April 5, 2006

Purpose of LAR 1014-5

- Holtec International is providing HI-STORM systems to Indian Point Energy Center
- Indian Point Unit 1 (IP1), which is shutdown, needs to transfer all fuel from the spent fuel pool into dry storage
- A change to the HI-STORM System is necessary to accommodate IP1

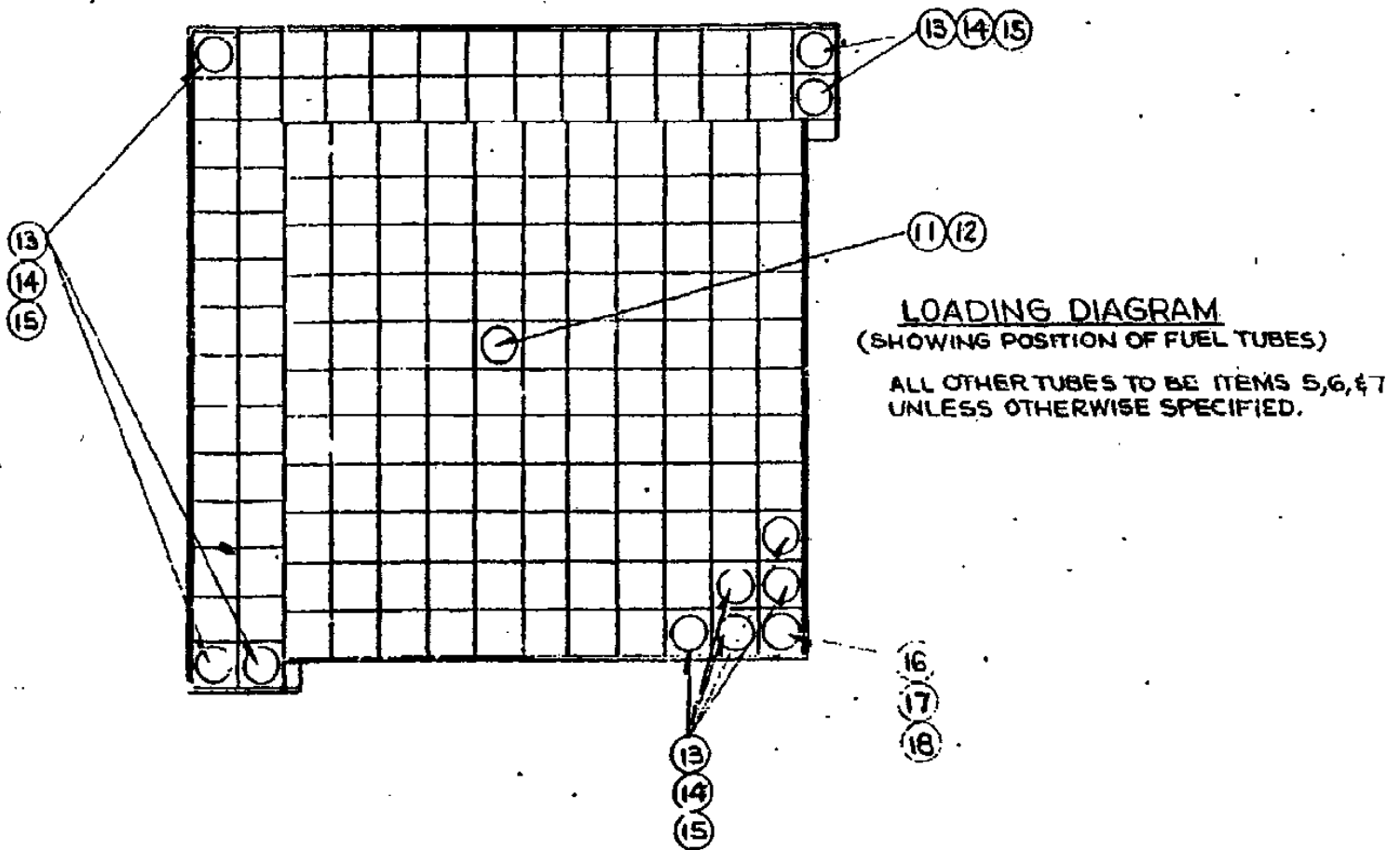
Indian Point 1

- IP1 is a PWR and was shutdown in October 1974
- There are currently 160 fuel assemblies in the spent fuel pool which will be stored in five MPC-32s
- Maximum crane capacity is 75 tons

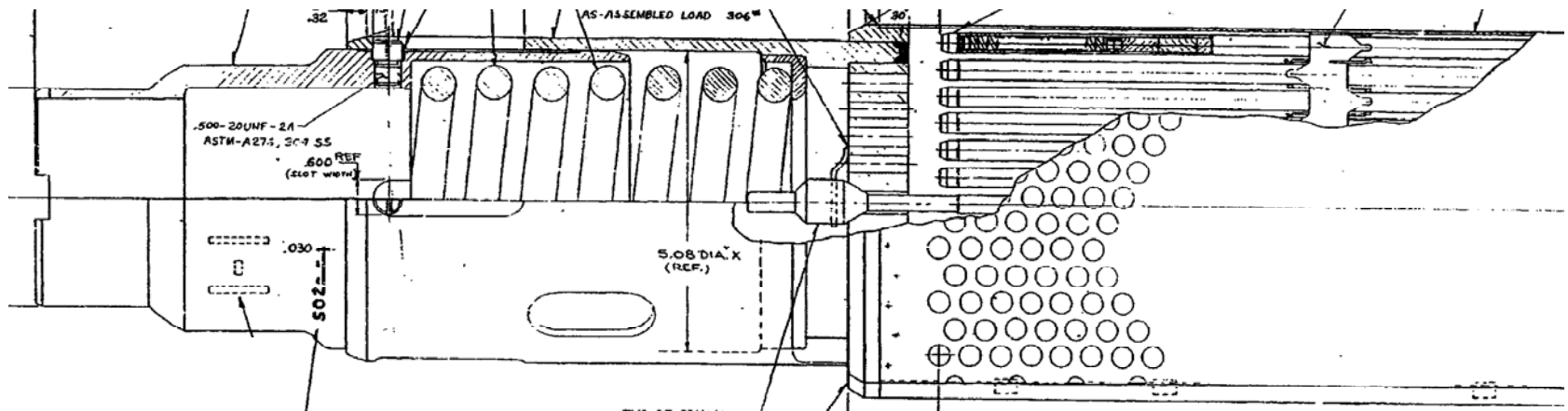
IP1 Fuel

- IP1 fuel is stainless steel clad, approximately 137 inches in length, active fuel length of 102 inches, and approximately 6.3 inches wide
- The fuel assemblies do not have guide tubes or instrument tubes but do have channels (with holes)
- The fuel assembly is a 14x14 array with rods removed along two sides where control rods were present
- Some fuel assemblies contain a single Sb-Be secondary source rod in place of a fuel rod

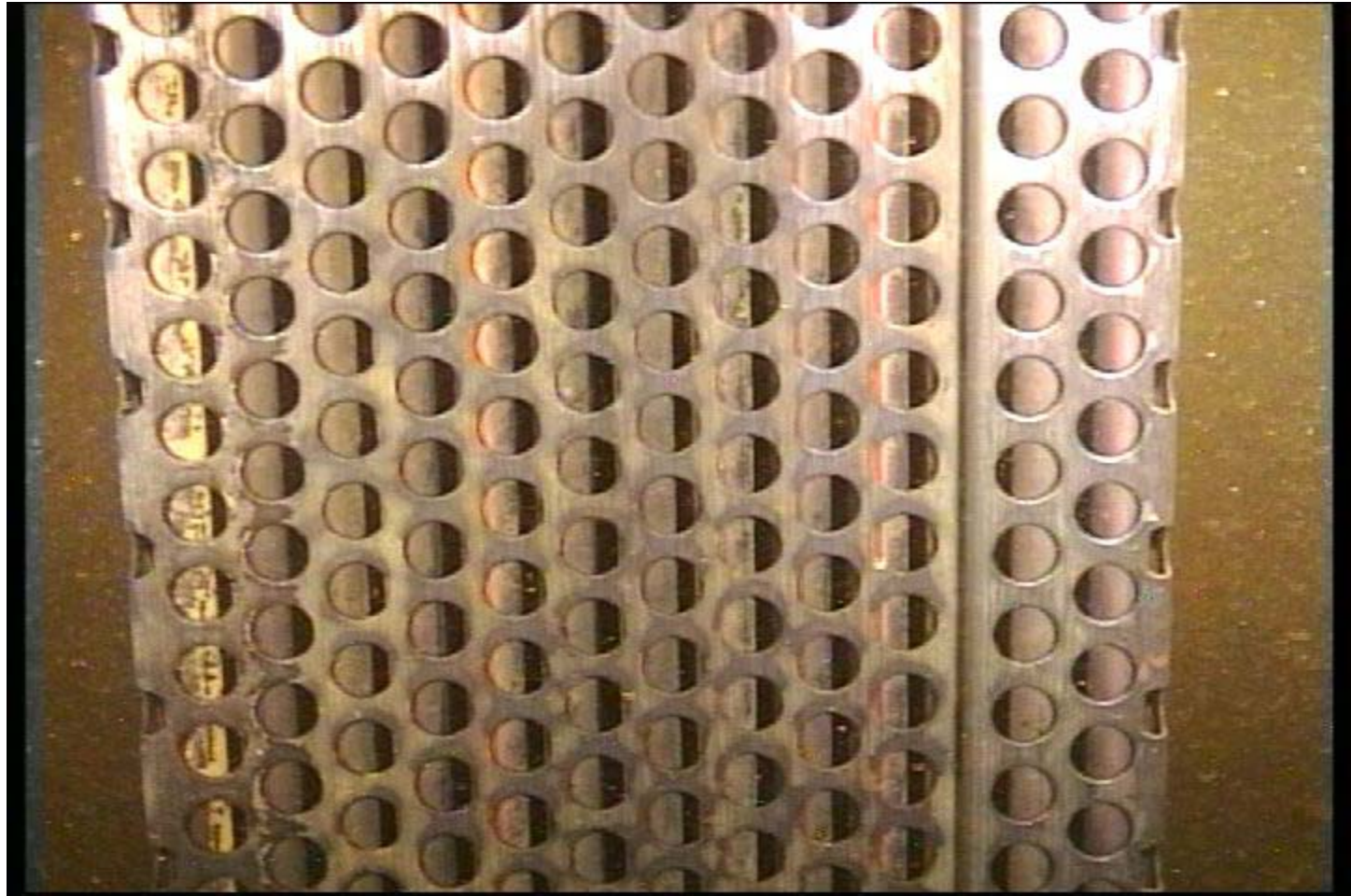
Cross Section of IP1 Fuel Assembly



Top Portion of IP1 Fuel Assembly



Active Fuel Region of IP1 Fuel



IP1 Fuel (continued)

- HI-STORM CoC array class 14x14E already covers IP1 fuel
- Maximum burnup - less than 28000 MWD/MTU
- Maximum enrichment - 4.36 wt% U-235
- Minimum cooling time - 32 years in October, 2006

IP1 Fuel (continued)

- All fuel assemblies have recently been cleaned, inspected, and handled with no issues
- Fuel visual inspections revealed no apparent degradation of fuel or support structures

HI-STORM CoC Definitions of Intact or Damaged Fuel

- Even though all fuel assemblies are “intact”, IP1 may not be able to classify them as such
- Plant records are not adequate to demonstrate that the fuel assemblies meet the CoC definition of intact fuel
- Fuel sipping could possibly be used to determine if a fuel assembly is damaged

Fuel Classification Solution

- Fuel sipping is costly and may or may not produce adequate results for 30+ year old fuel with low burnups
- Solution: Conservatively classify all fuel assemblies as damaged and place in DFCs

Changes to the HI-STORM CoC

- Permit DFCs with IP1 fuel in all locations in the MPC-32
- Permit IP1 fuel with Sb-Be sources
- No soluble boron requirement for IP1 fuel
- Other minor editorial changes to accommodate IP1
- All changes are specific to IP1 – no generic changes

Basis for LAR

- The basis for this LAR will be HI-STORM FSAR Revision 4
- Revision 4 will be submitted very shortly as part of the biennial update

Changes to HI-STORM System for IP1

- The MPC-32, HI-STORM 100S Version B, and HI-TRAC 100D are being shortened by approximately 33 inches
- The HI-TRAC 100D is also being modified by reducing the lead thickness by 3/8 inch and reducing the thickness of the outer steel shell from 1 inch to 3/4 inch to accommodate the 75 ton crane capacity

Shielding Analysis

- HI-STORM containing IP1 fuel is bounded by design basis fuel
- Modified HI-TRAC will be analyzed to show dose rate at midplane – calculated dose rate will be approximately a factor of 10 lower than 100-ton HI-TRAC with design basis fuel
- No changes to Chapter 10 – bounded by design basis analysis

Thermal Analysis

- Preliminary analysis conservatively used a heat load of 8 kW (actual closer to 4 kW)
- No convection assumed within MPC – only conduction and radiation
- Peak clad temperature estimated to be approximately 550 °F (limit is 752 °F)

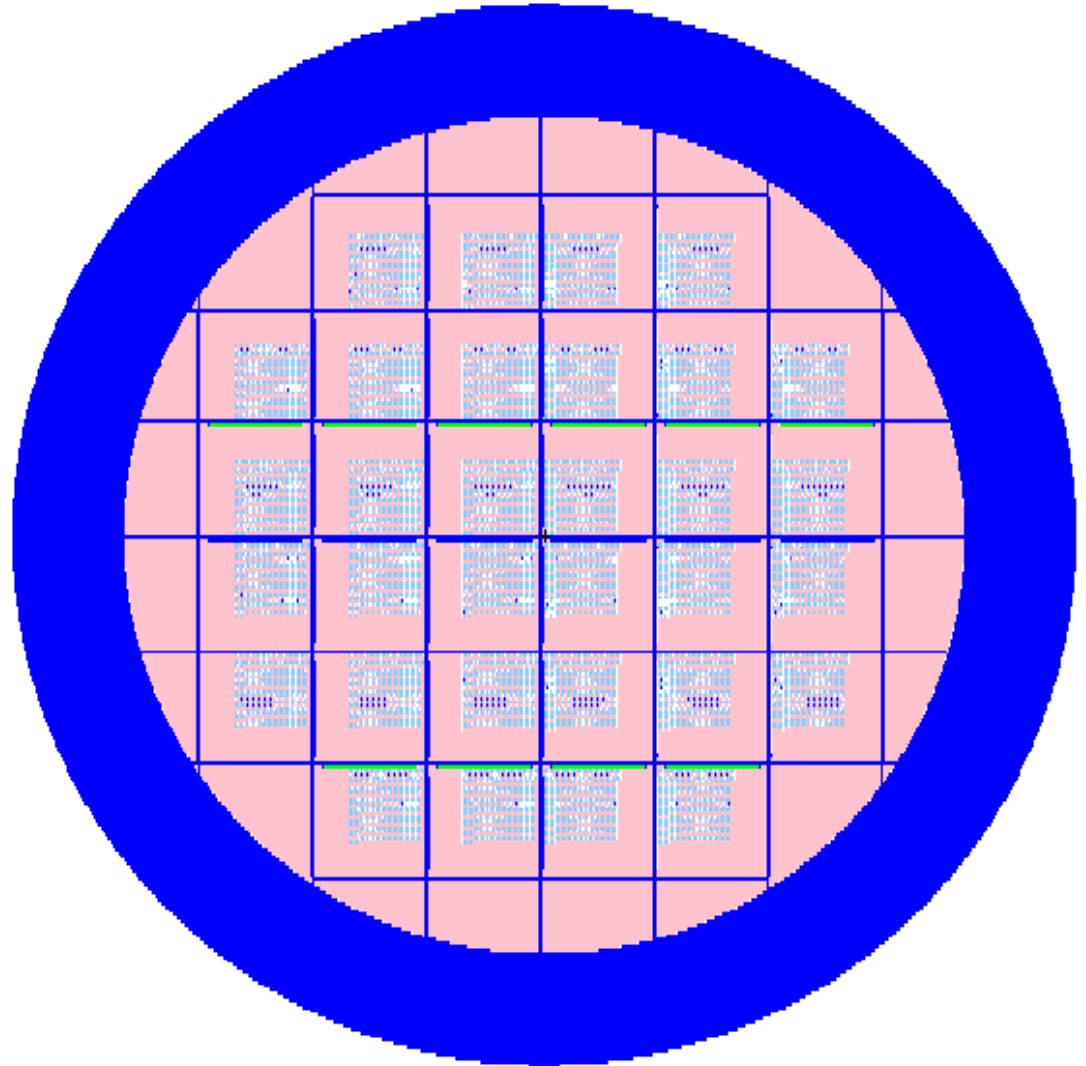
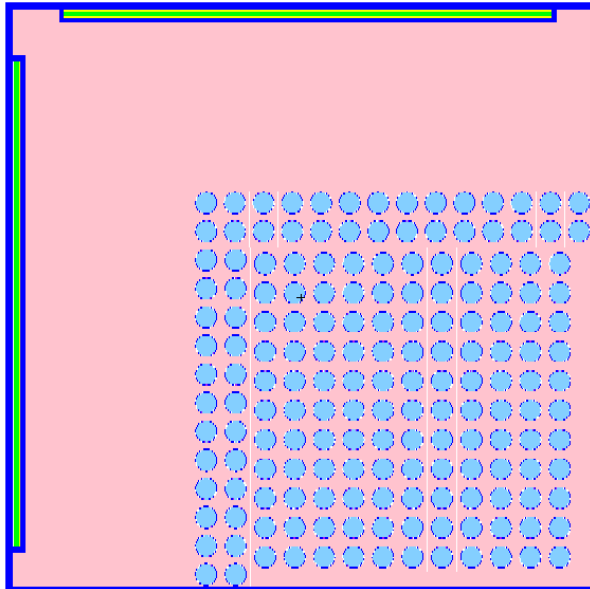
Structural Analysis

- Change in fuel weight
 - The IP1 fuel in a DFC weighs 800 lbs
 - The design basis fuel weighs 1680 lbs
- Change in length
 - The MPC, HI-TRAC, and HI-STORM are approx. 33 inches shorter
- Due to these changes the following analyses will be addressed
 - HI-TRAC side drop
 - HI-STORM vertical drop
 - HI-STORM tip over

Criticality Analysis

- Preliminary criticality calculations for intact and damaged conditions were performed
- Maximum k_{eff} of intact IP1 assemblies in the MPC-32 with *unborated* water, and all assemblies conservatively moved towards the center of the basket is 0.8975
- Under conditions of hypothetical damage to the assemblies, the maximum k_{eff} value could be as high as 0.92
- There is sufficient margin to the limit of 0.95

Criticality Model MPC-32 with Intact Fuel



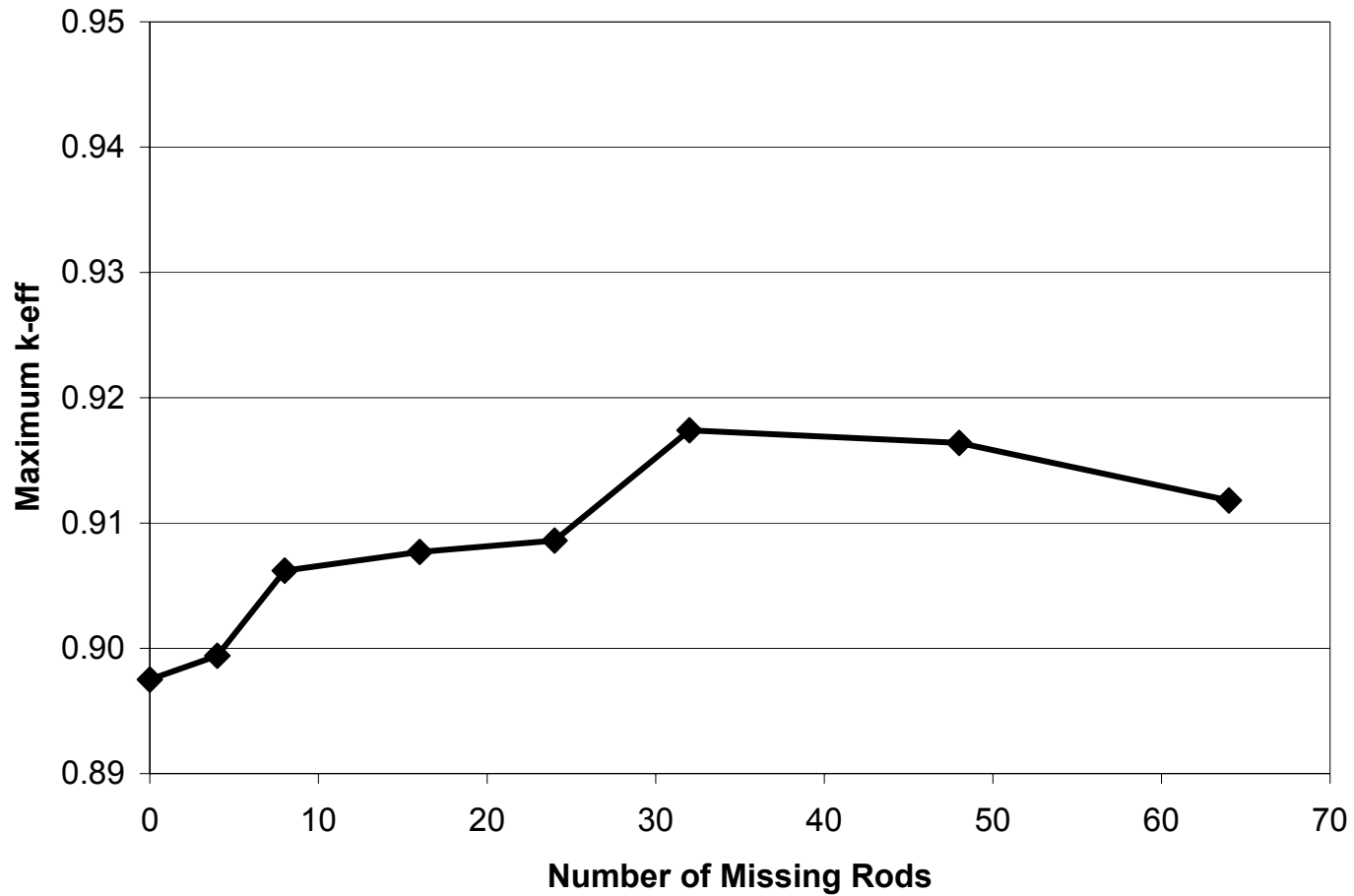
Criticality Analysis – IP1 Fuel Features

- Rods bundles are enclosed in perforated channels
- Grid straps are located every ~10 inches, and are attached to channel
- Assemblies are intact from an engineering perspective, and no significant damage would be expected under normal and accident conditions
- In case of damage, fuel cladding and larger fuel fragments (pellets) would be contained inside the channel

Criticality Analysis – Damaged Fuel Modeling

- Assemblies are under-moderated under intact conditions. Therefore, removing rods will increase reactivity
- To model hypothetical damage to the assemblies, selected configurations are analyzed with increasing numbers of missing rods in the rod array, to determine an optimum moderation condition
- Condition is assumed to be present for the entire length of all assemblies in the basket.

Criticality Analysis Preliminary Results



Schedule

- LAR will be submitted by June 1, 2006
- Request expedited review due client need and minimal changes to CoC and FSAR
- Is another pre-submittal meeting desirable?