Introduction to the Second NAC-LWT ANSTO FRR Shipment

June 30, 2008

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ANSTO Amendment Application

NAC-LWT Legal Weight Truck

Spent Fuel Transport Cask

Docket #71-9225

Utilized in DOE NNSA's Foreign Research Reactor (FRR) Program

Foreign Research Reactor (FRR) Program

- Non-Proliferation Initiative to return US origin Enriched Uranium to the US
- 27,000 fuel elements from 41 eligible countries – started in 1996 – extended until 2016 for irradiation (2019 for transportation)
- 40+ shipments performed representing > 7,000 fuel elements

Foreign Research Reactor (FRR) Program

- NAC is a significant transportation provider for the FRR program
- ANSTO has scheduled three shipments under the FRR program
- NAC completed initial ANSTO shipment in 2006
- Second ANSTO shipment scheduled for 2009

Participating Organizations

- ANSTO (Australian Nuclear Science and Technology Organization)
- ARPANSA (Australian Radiation Protection and Nuclear Safety Agency)
- US DOE (United States Department of Energy)
- US DOT (United States Department of Transportation)
- US NRC (United States Nuclear Regulatory Commission)
- AMSA (Australian Maritime Safety Agency)
- NAC International

Amendment Application
To Certificate of Compliance (CoC) No. 9225

NAC will prepare an Amendment Request to the NRC NAC-LWT CoC, Revision 47, by revision to the NAC-LWT Safety Analysis Report (SAR) for:

1. Additional Content Conditions
2. Modified Shipping Configurations

Content Conditions

- NAC-LWT Currently Authorized to Transport the Following Fuel Elements:
  - Tubular-type Mark IV DIDO HEU and LEU Elements
  - Spiral-type Mark III ANSTO-DIDO HEU Elements
  - MOATA Mark II Plate HEU Fuel Elements
- NAC intends to request authorization to load Mark II, III or IV fuel elements in aluminum screened damaged fuel cans (DFCs)

Modified Shipment Configuration

Four LWTs will be loaded as follows:

Cask #1 – Mix of 42 Mark IV DIDO HEU and LEU Elements

Cask #2 –Mix of 38 Mark IV HEU and LEU, and four (4) Damaged Fuel Cans (DFCs) containing disassembled Mark III spiral and Mark II plate elements

Cask #3 – Mix of up to 38 Mark IV HEU and LEU, and 4 DFCs containing disassembled Mark III elements

Cask #4 – Up to 42 Mark III Spiral elements

Modified Shipment Configuration

- LWT Casks # 3 and # 4 will incorporate a new basket assembly configuration to allow ANSTO designed DFCs to be accommodated
- The modified basket will have 1 DIDO base module; 4 intermediate DIDO modules; and 1 top ANSTO module
- The new basket assembly and transport cask assembly will be presented on a new license drawing to define requirements

Modified Shipment Configuration

- The ANSTO and DIDO basket modules are essentially identical except for fuel cell diameter, and will stack up and assemble normally
- The low heat load will preclude the need for any lid spacers to limit minor fuel content movement
- Screened ANSTO-designed Damaged Fuel Cans (DFCs) will be used to transport disassembled and damaged elements
- DFCs will be limited to loading in the ANSTO top module of an ANSTO or combined ANSTO/DIDO basket assembly

Modified Shipment Configuration

- No containment credit will be taken by the DFC
- DFC will be used as a plate holder to facilitate handling of the disassembled fuel
- ANSTO fuel plates have compromised cladding
- MTR damaged fuel criteria to be incorporated for the ANSTO fuel types

Summary of Structural and Thermal Evaluations for the NAC-LWT ANSTO Shipment

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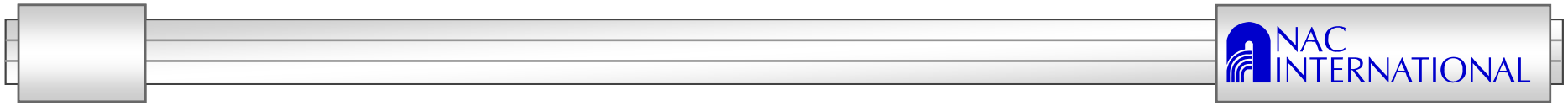

Thermal Evaluation – Heat Load (Watts)

Contents	Max. Heat Load per element (W) to be loaded	Max. CoC per Element. (W)	Analysis status
MOATA Fuel Bundle	< 1 In DFC	3	Bounded by MOATA Fuel
Mark III (Spiral fuel)	< 1	15.7	Bounded by ANSTO Spiral Fuel
Mark IV (DIDO fuel)	16	18.75 (no spacer)	Bounded by DIDO Fuel

- The one MOATA plate bundle is disassembled and placed in two DFCs
- The total heat load for the full ANSTO (Mark III) load (Cask #4) is < 25 W
- The maximum cask heat load of a full DIDO (Mark IV) load (Cask #1) is < 660 W

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Structural Evaluation – Contents Weight

Component	Actual Weight (lb)	Weight (lb) used in previous evaluation
MOATA plate bundle	9.9 [2]	18
Mark III (Spiral fuel)	7.9	18
Mark IV (DIDO)	6.0	Bounded by existing DIDO evaluation (15 lb)
Max. contents weight (top +4 intermediate + bottom baskets+ 7 DFCs + 42 fuel elements)	1,770	1,770 (4,000 [1])
Transport condition total weight	49,770	52,000

(1) Design basis LWT contents weight for cask body: 4,000 lb

(2) Represents 10 Plate MOATA Bundle

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Summary

- The proposed modified content conditions including damaged and dissasembled fuel in DFCs are bounded by the current SAR thermal analysis for Mark II, Mark III and IV fuels
- The modified ANSTO and DIDO combined basket assembly is bounded by the current structural analyses of both the ANSTO and DIDO baskets alone
- Transporting aluminum DFCs is not a significant structural load (weight is bounded)
- The SAR amendment will confirm that the ANSTO, DIDO and combined baskets will maintain their integrity for normal and accident conditions

Summary of Nuclear Evaluations for the NAC-LWT ANSTO Shipment

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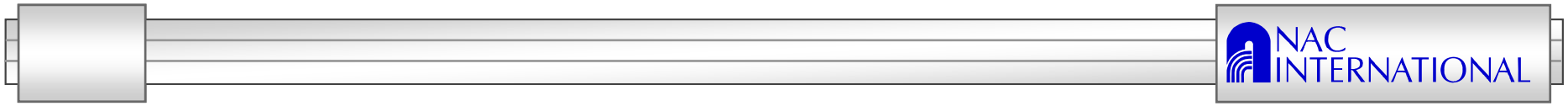


ANSTO Nuclear Evaluations

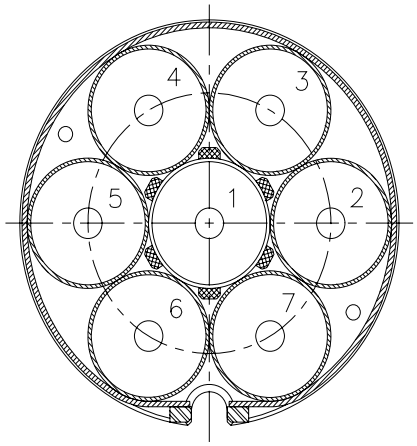
- Shielding
  - Previously generated SAS2H source term generation for ANSTO Mark III spiral fuel and MOATA plate bundle
  - No new shielding evaluation required due to
    - ANSTO basket stack well below limits (MOATA and spiral source << DIDO source)
    - 25W per element DIDO basket stack below limits (max. dose < 10 mrem/hr at 2m)
    - No interaction between baskets that would increase dose
    - DFCs provide additional shielding and offset of source from lid

DIDO to ANSTO Basket Comparison

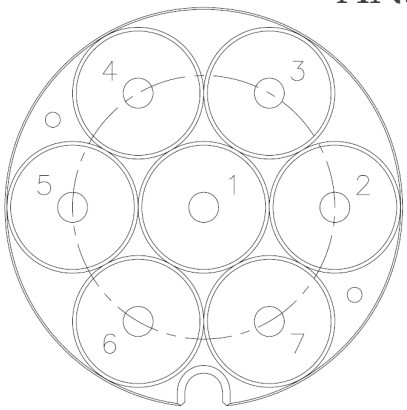
- Baskets similar construction
  - ANSTO basket has thicker larger diameter tubes
  - Slight increase in shielding
  - Aluminum components of DIDO basket not modeled

	ANSTO	DIDO
Basket opening	7	7
Fuel tube OD (inch)	4.254	4.375
Fuel tube wall thickness (inch)	0.120	0.125

DIDO Basket



ANSTO Basket



Shielding Evaluation Summary

- Only payload changes
  - Stack containing a mix of DIDO and ANSTO baskets
  - Addition of DFCs
  - Placement of DIDO elements in ANSTO baskets
    - Increased shielding basket design bounds DIDO baskets
- No revised shielding analysis required

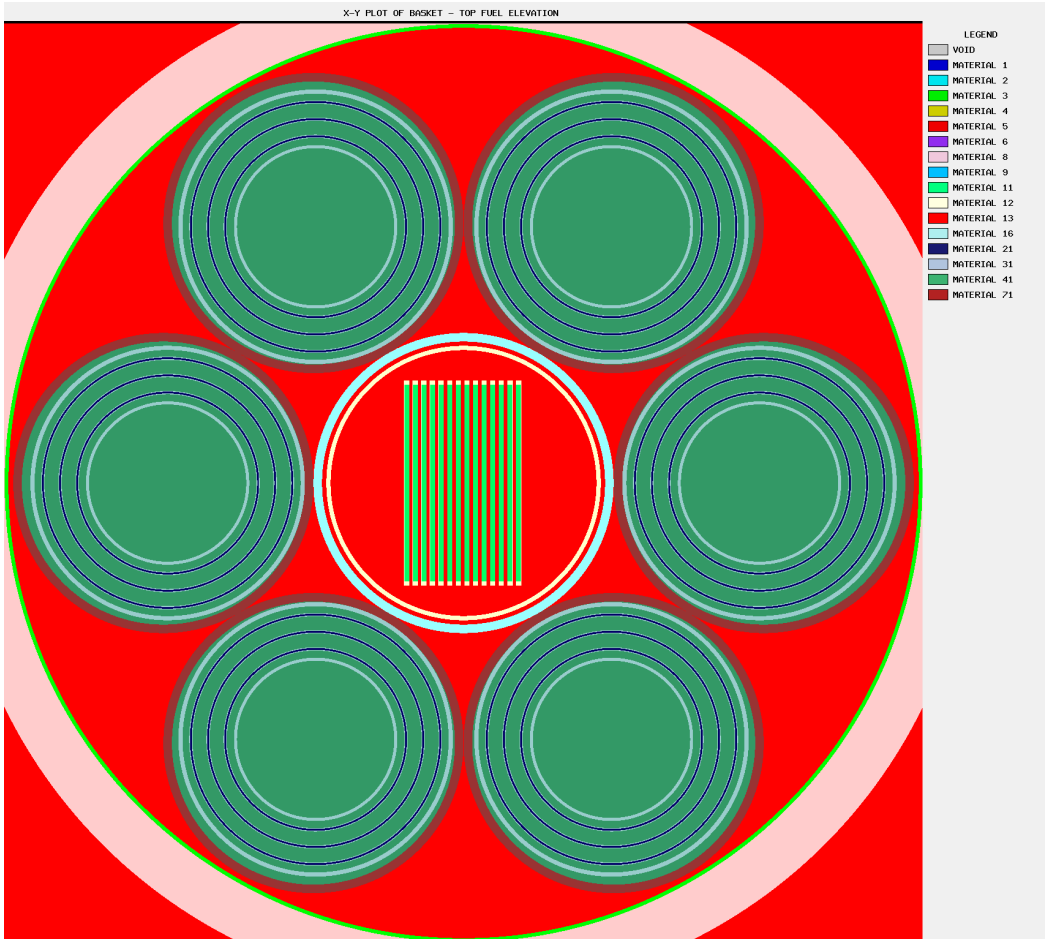
Containment Summary

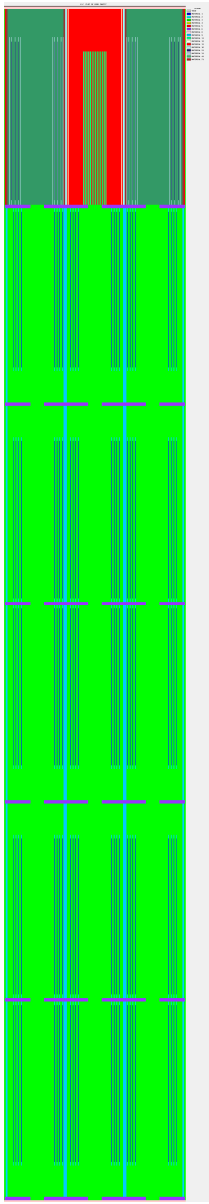
- Standard fuel conditions bounded by the current NAC-LWT containment analysis based on forty-two 25 W DIDO elements
- Disassembled and potentially damaged Mark II, III and IV fuel elements will be loaded into ANSTO designed aluminum DFCs
- DFCs are considered plate holders only and no credit is taken for confinement or containment capability.
- ANSTO fuel to be evaluated using MTR damaged metal fuel criteria
  - Increased release from exposed fuel matrix material "WSRC-TR-98-00317, Bases for Containment Analysis for Transportation of Aluminum-Based Spent Fuel"
  - No disintegration (rubbleization) of plate material

Criticality - Summary

- SCALE (CSAS) ANSTO basket specific evaluations for
  - DIDO fuel
  - DFCs containing DIDO, Mark II MOATA, and Mark III spiral fuel
  - ANSTO top basket module on DIDO basket stack
- Account for hypothetical preferential flooding of DFCs
- Investigated potential neutronic interaction between baskets (variations in payload)
- Preliminary conclusion – No increase in system reactivity

CSAS Model Graphics





Schedule for the NAC-LWT ANSTO Amendment

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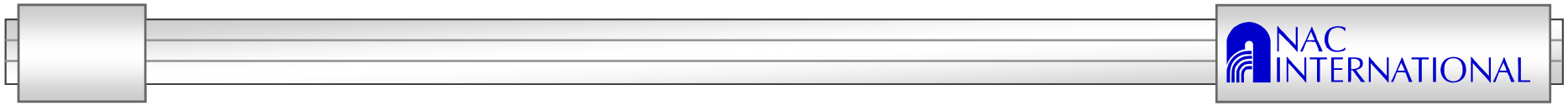

Licensing Submittal Schedule

- July 31, 2008 - NAC to Submit Amendment Request to the NRC
- December 31, 2008 – NRC Issue Revised CoC
- January 2, 2009 - Submit Application to US DOT
- January 16, 2009- DOT Issues Revised CoCA
- January 20, 2008 - Submit application to ARPANSA
- January 20, 2008 - Submit application to AMSA
- February 9, 2009 - ARPANSA/AMSA Review Complete
- 1st Quarter 2009 – Load and Complete Four NAC-LWT Transport Campaign

Questions?