Westinghouse Projects Status Updates

February 10, 2015

Presented to: NRC
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Westinghouse Projects

1. Traveller (USA/9297/AF-96) VVER Design and Application Timeline

2. MCC (USA/9239/AF) Special Authorization Request for Stainless Steel Rod Configuration

3. “unirradiated” Terminology

4. Application Timeline Summary

Traveller VVER Overview

1. Traveller VVER Design and Purpose
   - Clamshell and Overpack

2. Present Design Comparisons between Traveller XL and Traveller VVER

3. Summarize SAR changes by inclusion of Traveller VVER into SAR

Key Terms

RTP – Removable Top Plate

FA – Fuel Assembly

OP – Outer Pack

VVER – Traveller VVER for Hexagonal FA design (XL OP)

XL – Extended (14 foot fuel) Length Traveller

STD – Standard (12 foot fuel) Length Traveller

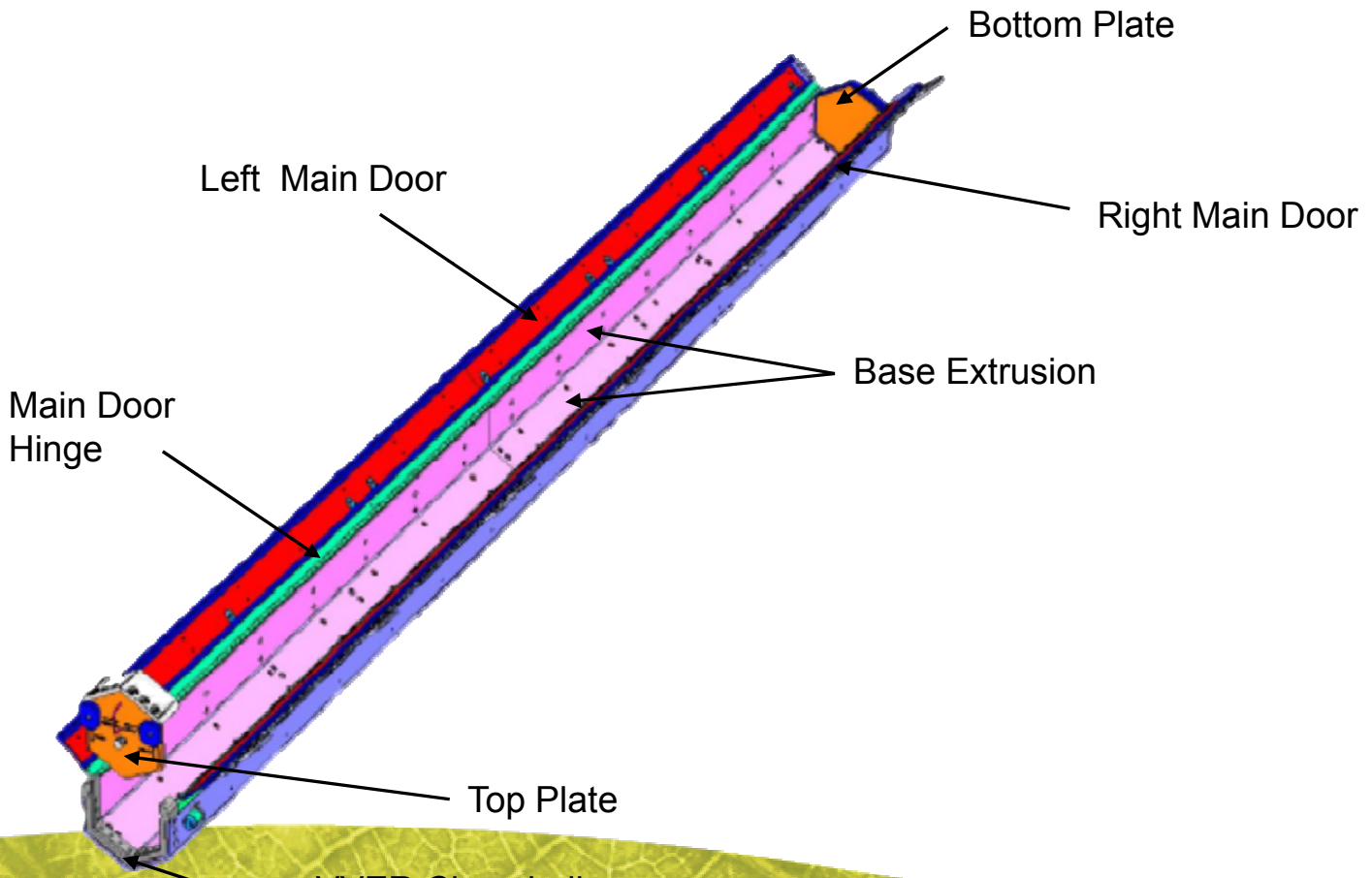
1. Traveller VVER Design

- Purpose is to enable transportation of VVER-type (hexagonal) fuel assemblies
- Traveller VVER structurally similar to other Traveller family designs
- Traveller Generic Design:
  - Doubled-walled foam-filled Stainless steel Outerpack connected to an Aluminum Clamshell

Traveller VVER Design

- Traveller VVER utilizes the Traveller XL Outerpack (OP)
- Traveller VVER utilizes a hexagonal Clamshell
- Traveller VVER Clamshell mounted to XL OP using slightly smaller rubber shock mounts.
- Otherwise, no OP Differences

Traveller VVER Design – Clamshell Overview



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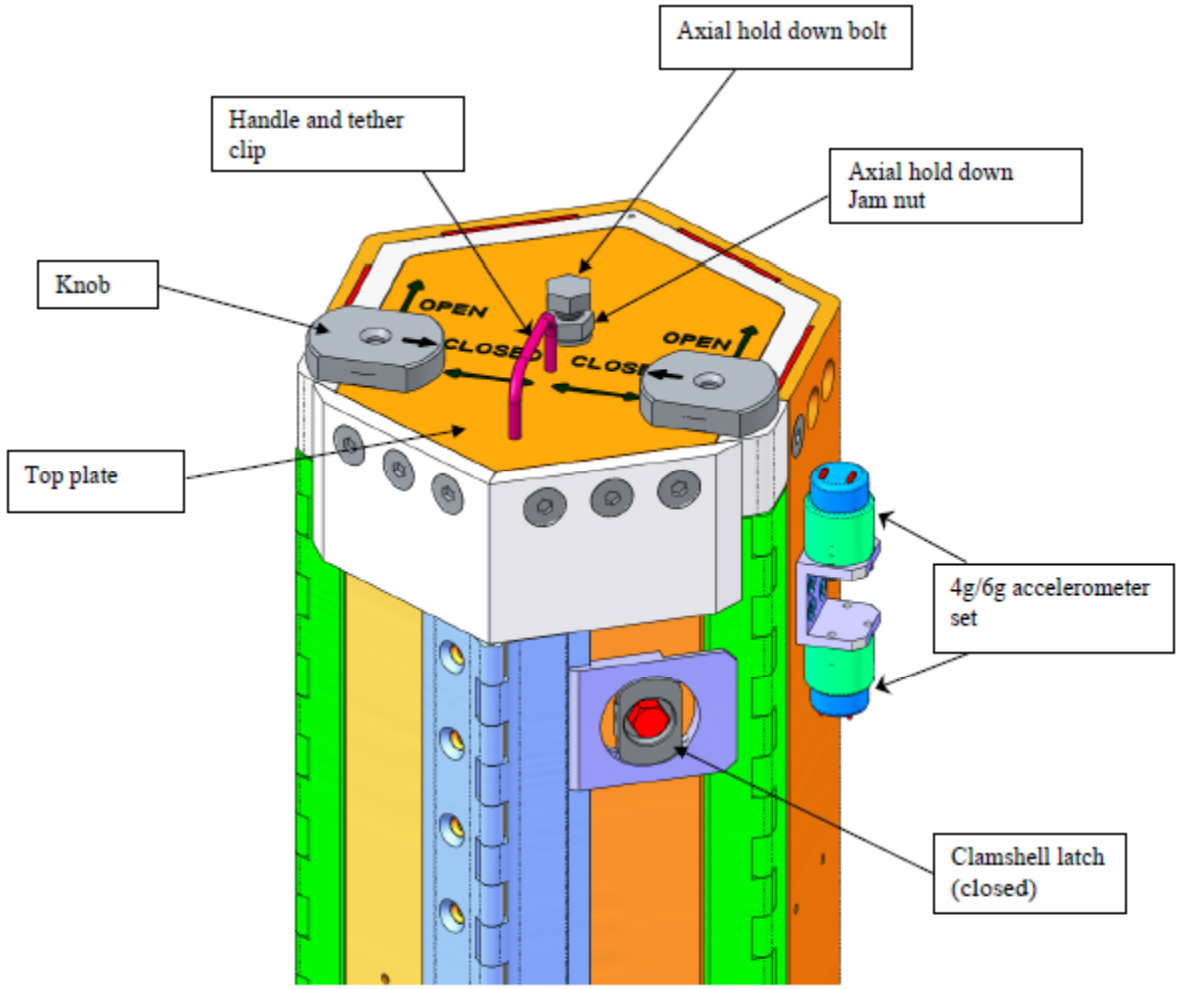
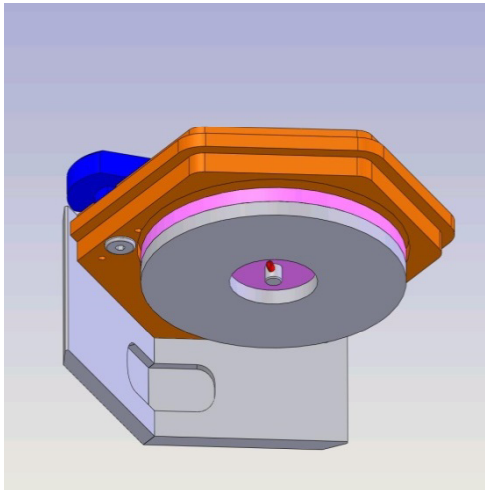
Traveller VVER Design – Clamshell Top Plate Detail





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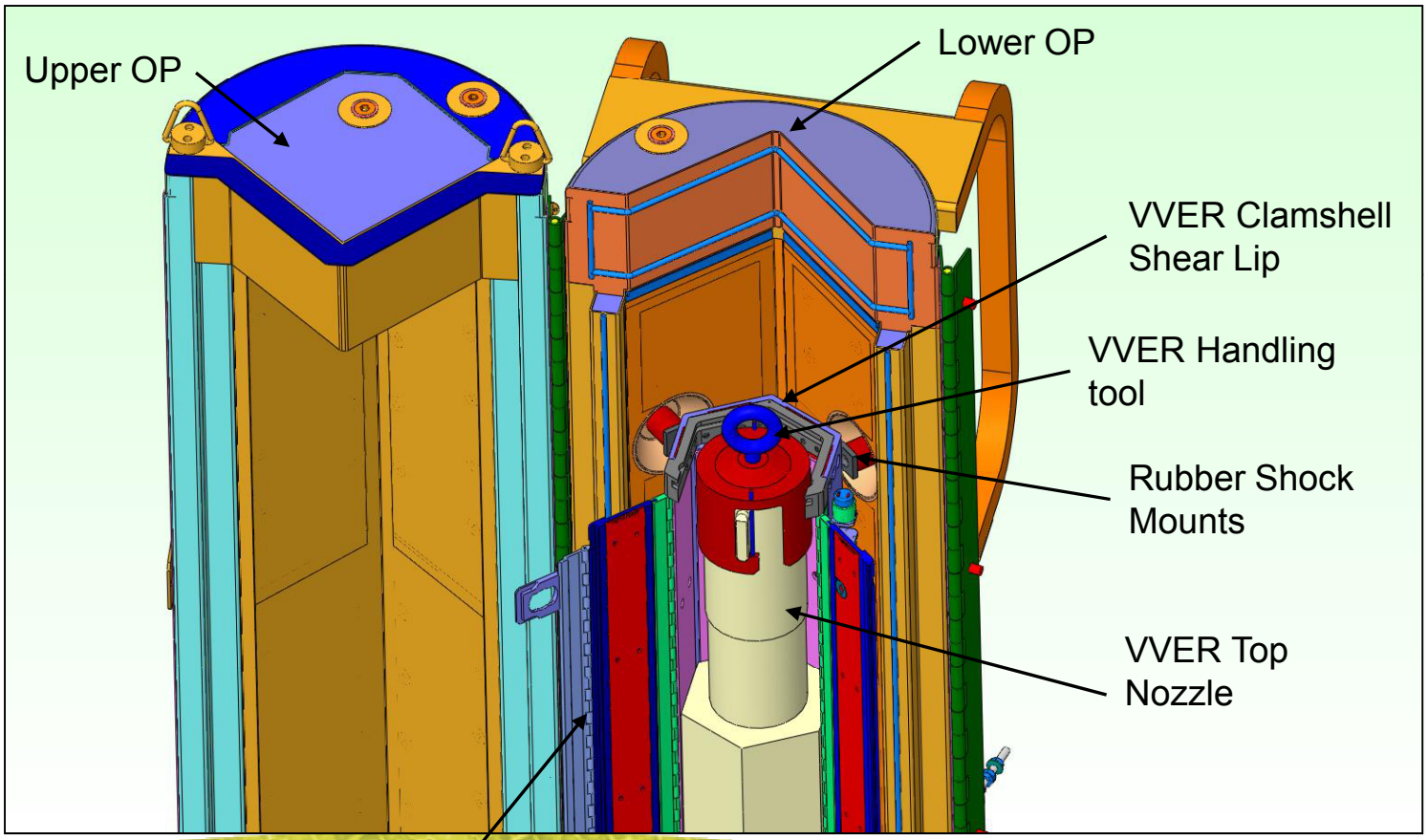
Traveller VVER Design – Top End Detail



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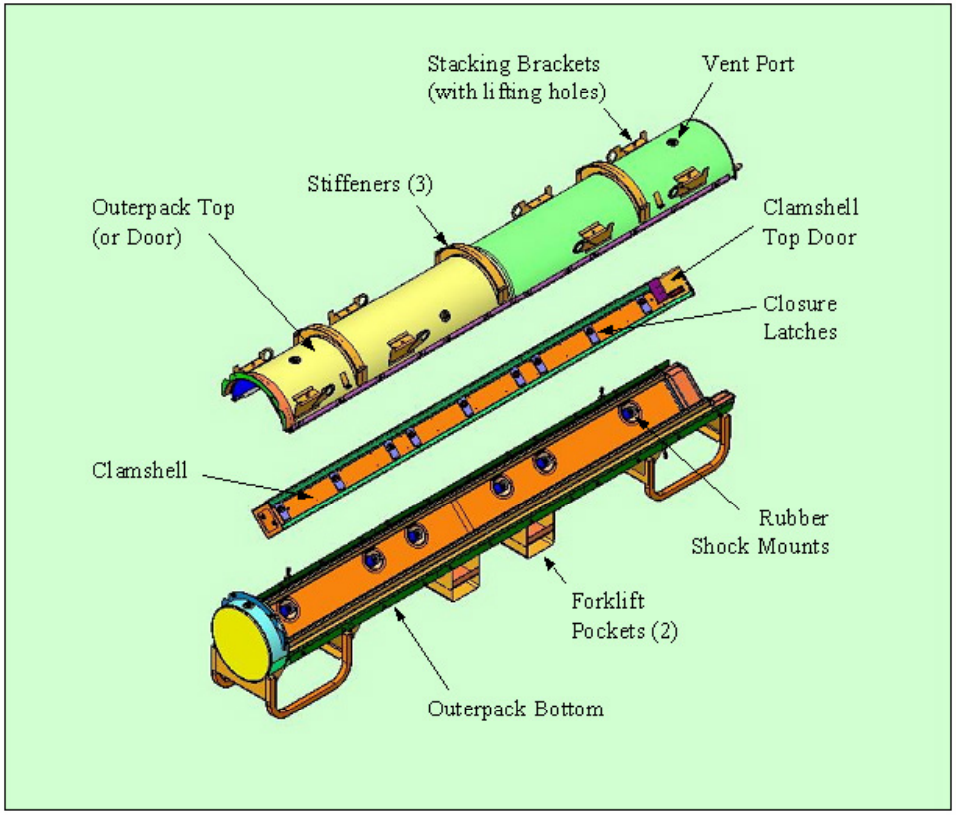
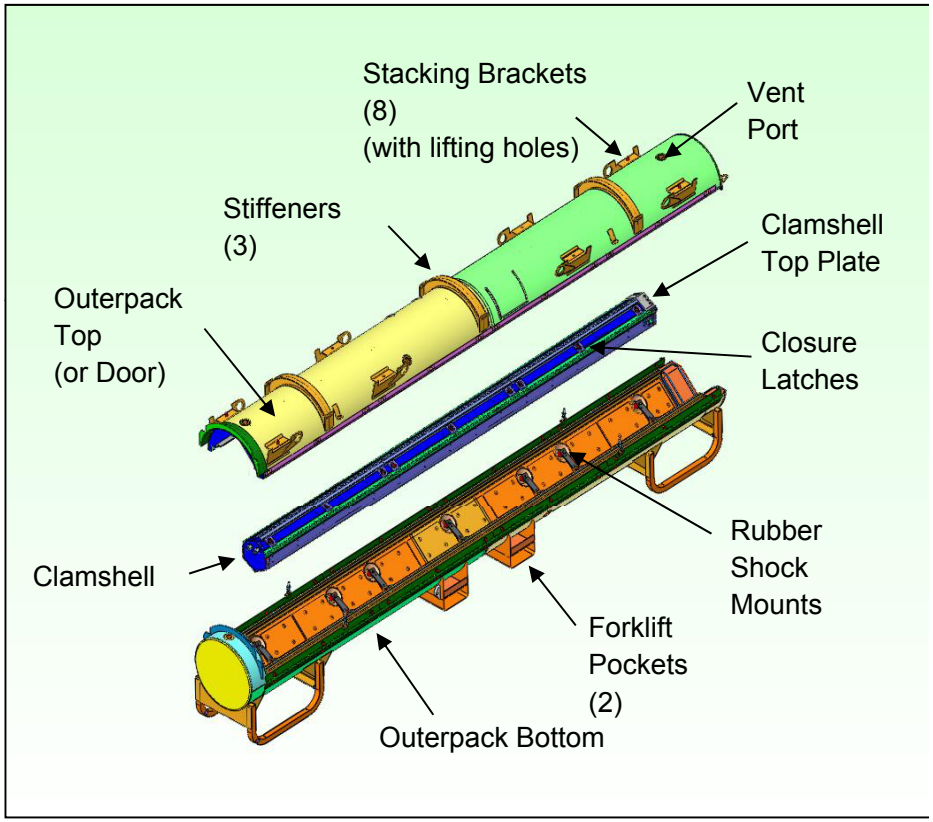
2. Design Comparison: Traveller XL and Traveller VVER



Traveller XL



Traveller VVER

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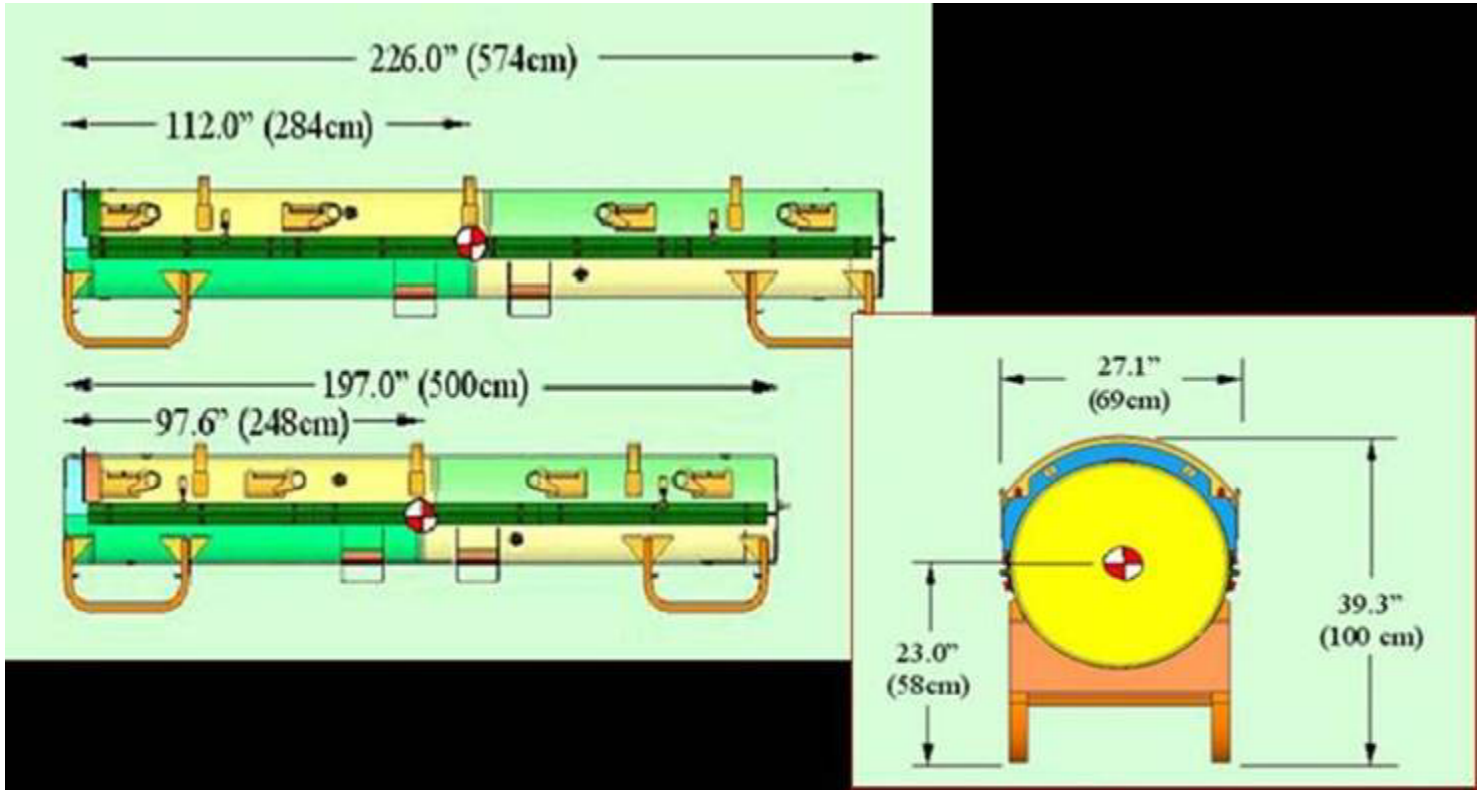
Design Comparison: Outerpacks

XL/VVER

STD



All Traveller types

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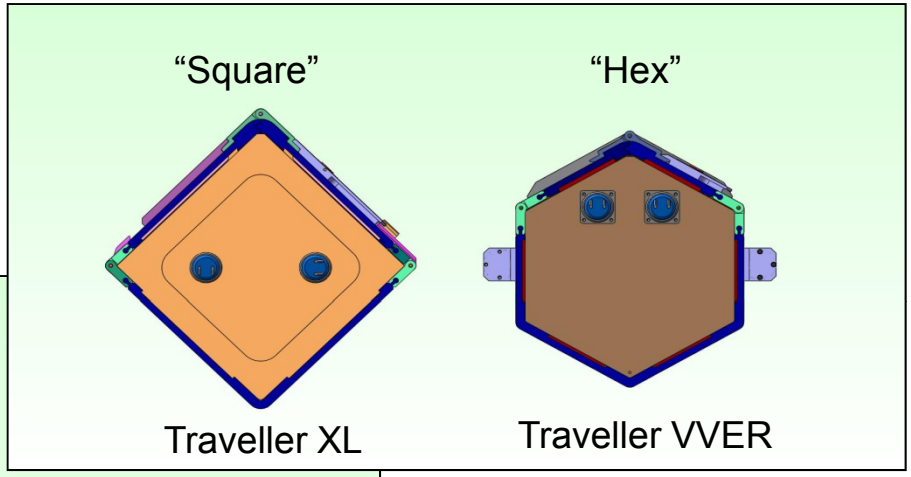
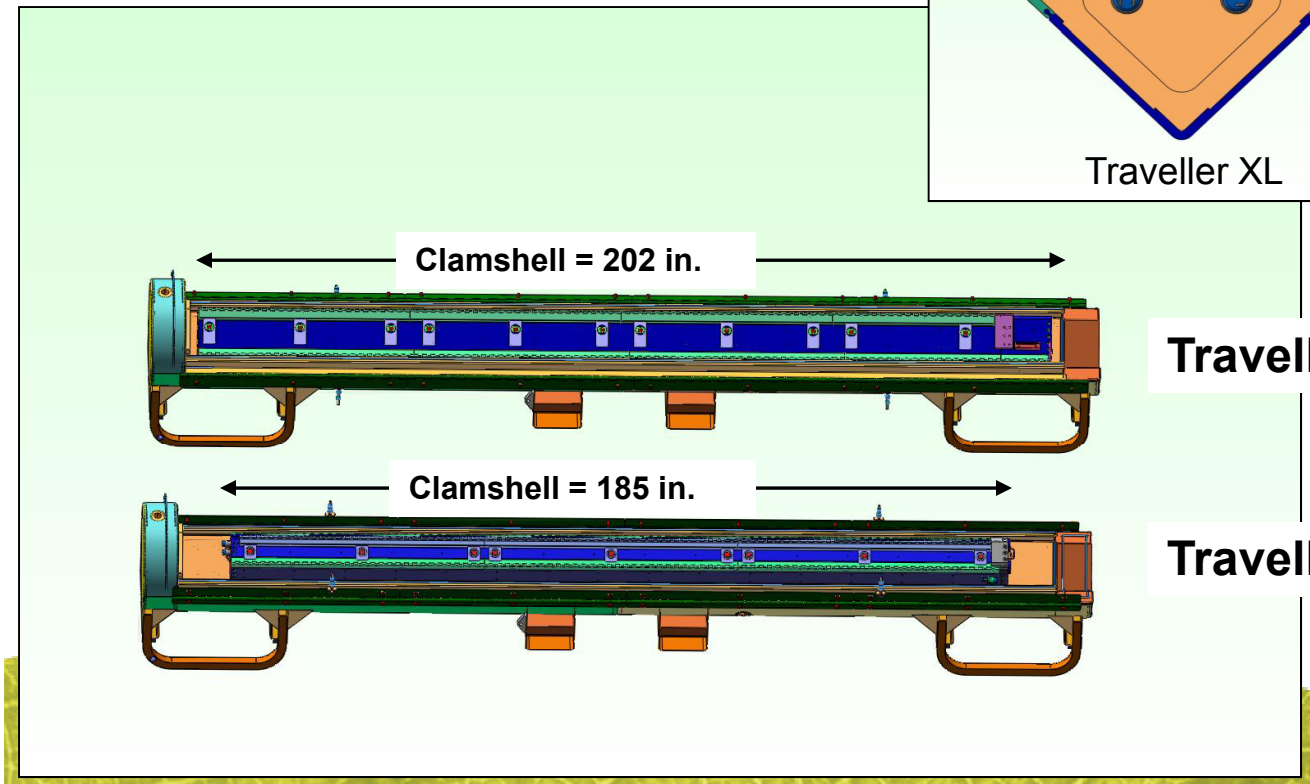
Design Comparison: Clamshell





Traveller XL

Traveller VVER

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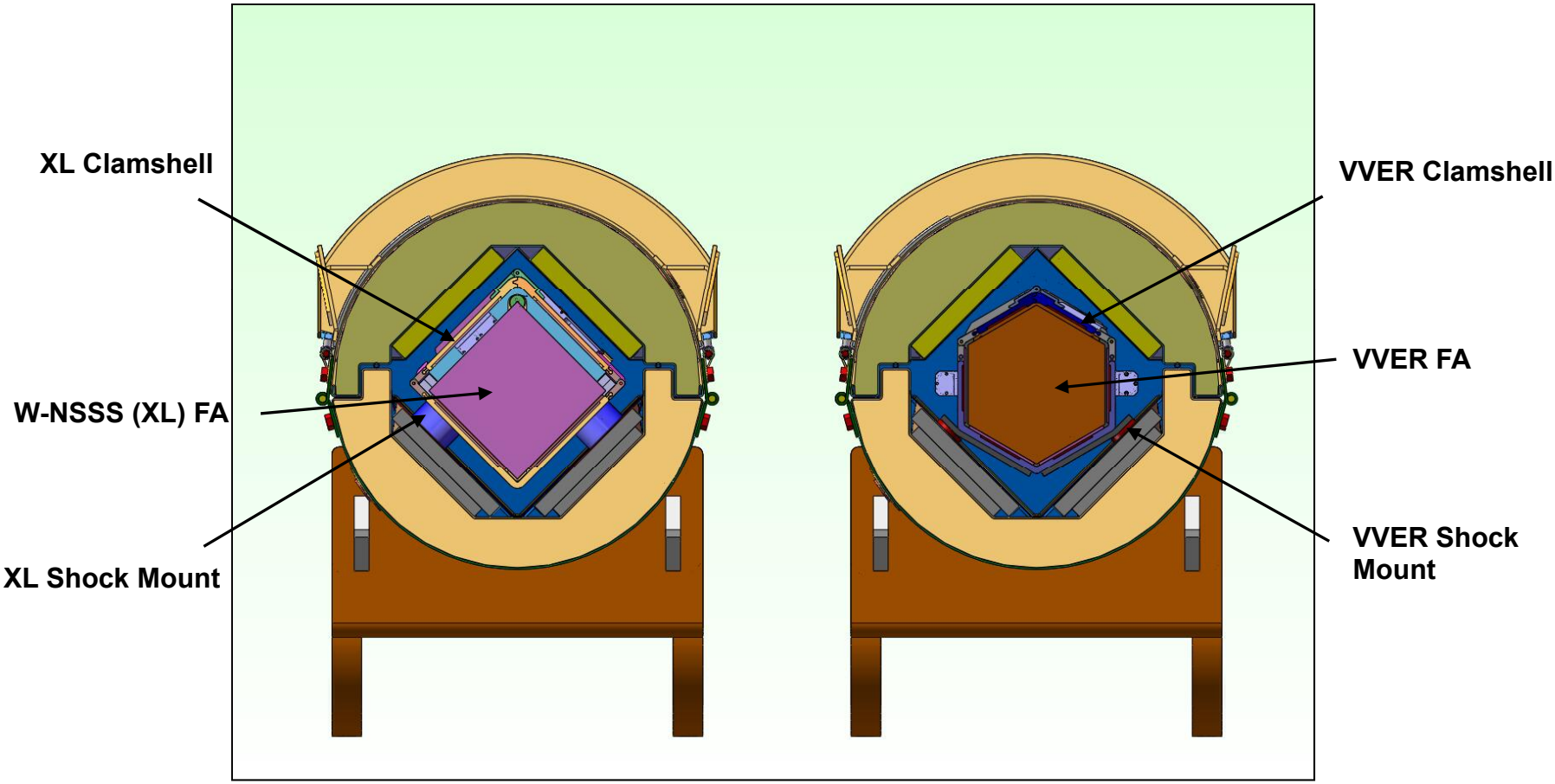
Design Comparison: Package (section cut)



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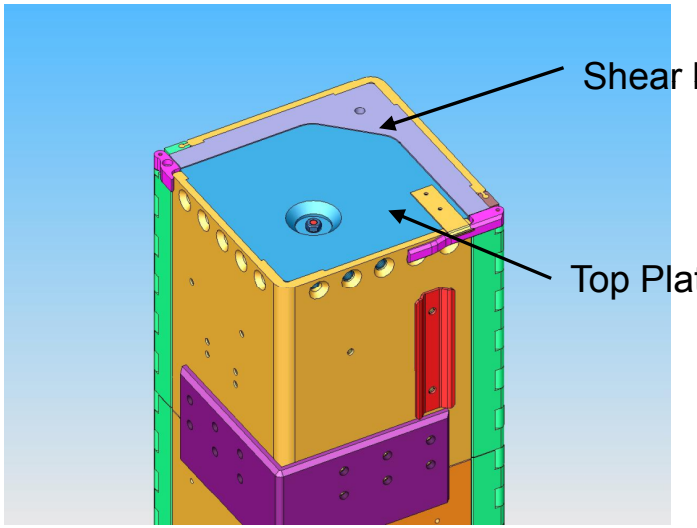
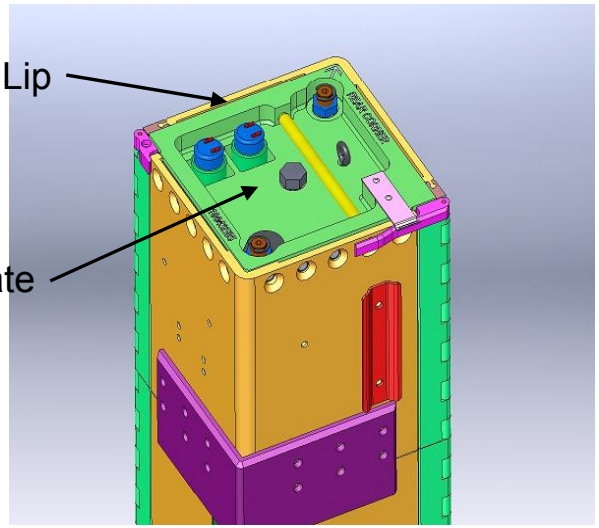
Design Comparison:
Top Plate (secured/transport position)

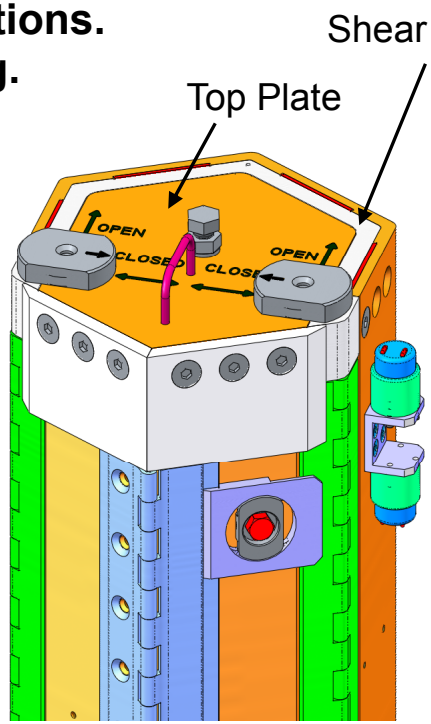
The top plate designs are similar: A structural plate bolted to a "shear lip" to maintain FA axial position during NCT and HAC conditions. Functionality is to accommodate fuel handling tool grappling.



XL - FTP



XL – RTP



VVER

KEY:
FTP – fixed top plate
RTP – removable top plate

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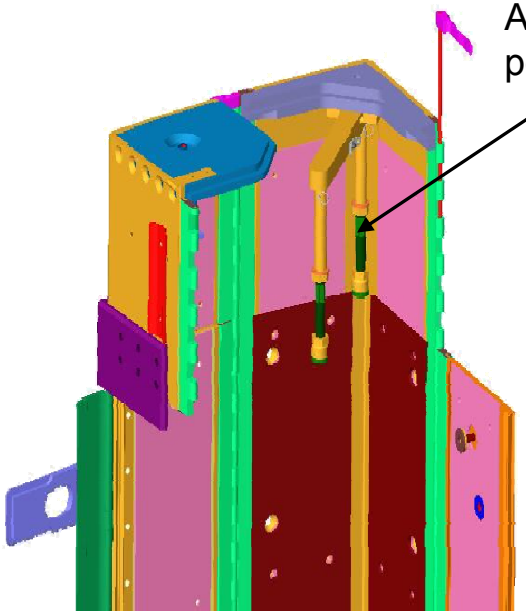
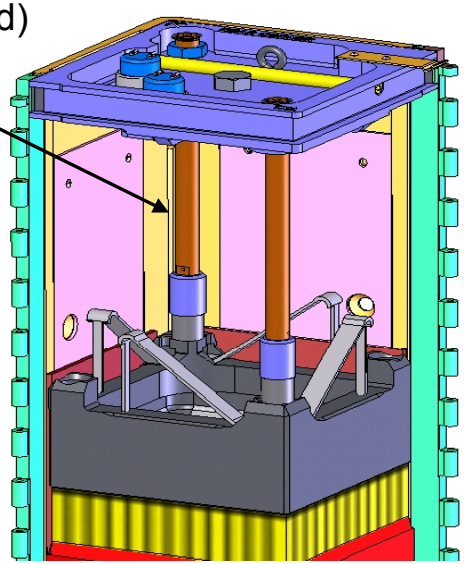
Design Comparison:
Top Plate (open/operating position)

All designs contain a positive FA axial restraint device.



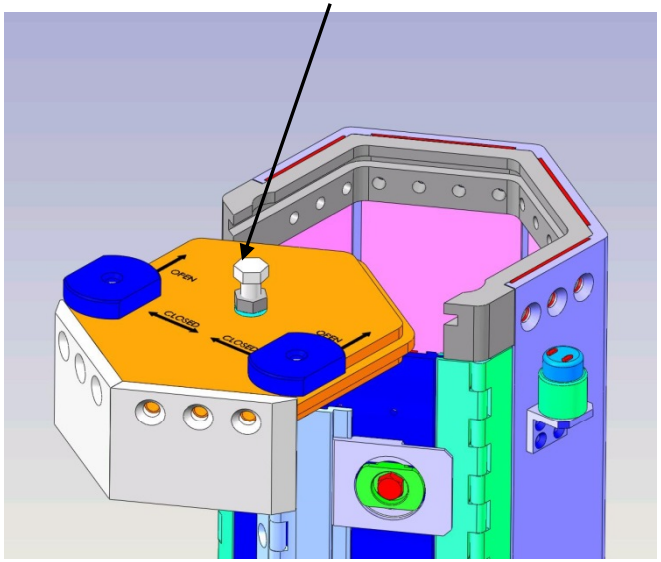
XL - FTP

Axial restraint post (stud)

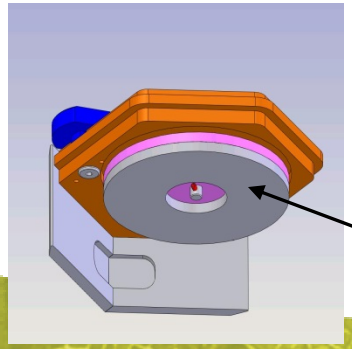


XL – RTP

Axial restraint stud



VVER



Axial restraint plate

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3. SAR Changes Summary for VVER

Chapter 1: General Information

- New Traveller VVER License drawing
- General Traveller VVER design Information

Chapter 2: Structural Evaluation

- Structural Integrity of VVER Clamshell - Finite Element Analysis
- Structural Integrity of VVER Shear Lip- Finite Element Analysis
- VVER Shear Lip Bolt Integrity- Finite Element Analysis/Hand Calculations

Chapter 3: Thermal Evaluation

- Qualitative comparison of key thermal evaluation parameters
- Qualitative Thermal Evaluation of VVER Clamshell using XL analytical model

Chapter 4 & 5

- No changes.

SAR Changes Summary for VVER

Chapter 6: Package Operations

- New VVER individual package and package array NCT and HAC criticality evaluations
- Methodology for most limiting case maintained
- CSI of 0.7 maintained

Chapter 7: Package Operations

- Basic operations during shipping and handling for all Traveller packages the same.
- No changes expected.

Chapter 8: Acceptance Test and Maintenance Program

- Life-cycles for all Traveller packages the same.
- No changes expected.

VVER Application Timeline

31 March 2015 – NRC application submittal

1 May 2015 – Manufacturing begins

November 2015 – International application submittals

MCC Special Authorization Request

- One 14x14 fuel assembly with 5 stainless steel rod in a corner configuration

- Prior criticality evaluation of SS rods shown less reactive than safety case
  - MCC license includes a single case approval

‡ 15x15 (Type B) OFA fuel assemblies may be modified by replacing seven fuel rods in locations O10 through O15 and N15 with solid stainless steel.

- 2 delivery dates: Fall 2015 and Spring 2016

MCC Special Authorization Request

N	M	L	K	J	I	H	G	F	E	D	C	B	A	
x	x	x	x											1
x														2
														3
														4
														5
														6
														7
														8
														9
														10
														11
														12
														13
														14

14x14 SS rod configuration

O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	
															1
															2
															3
															4
															5
															6
															7
															8
															9
x															10
x															11
x															12
x															13
x															14
x	x														15

Prior approved 15x15 SS rod configuration

“unirradiated” Terminology

- 10CFR71.4 definition

Unirradiated uranium means uranium containing not more than 2 x 103 Bq of plutonium per gram of uranium-235, not more than 9 x 106 Bq of fission products per gram of uranium-235, ***and not more than 5 x 10–3 g of uranium-236 per gram of uranium-235.***

- Westinghouse is looking at future commercial opportunities for using slightly “off spec” material.
- This would require a number of investigations, including Transportation
- Intent to remove “unirradiated” term from licenses and maintain safety by A2 calculation and radiation survey

Application Timeline Summary

31 March 2015 – NRC application submittal for Traveller VVER amendment

- Removal of unirradiated term

31 March 2015 – MCC special authorization request

June 2015 – Patriot 5-year renewal (expires 8/2015)

- -96 application
- Removal of unirradiated term

October 2016 – MCC 5-year renewal (expires 3/2017)

- Removal of unirradiated term

Questions / Comments