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Palais des Congrès de La Grande Motte - France

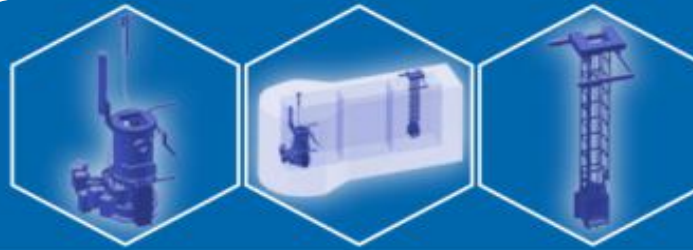
Organisé par l'Association pour les Techniques et les Sciences de Radioprotection, avec le soutien de



PVSI
PÔLE DE VALORISATION
DES SITES INDUSTRIELS



LANGUEDOC-ROUSSILLON
LA RÉGION MIDI-PYRÉNÉES



DISMANTLING OF THE SVAFO RESEARCH REACTORS R2 & R2-0, SWEDEN

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Dirk Schneider
AREVA GmbH

Gilles Clement
AREVA NC

SVAFO

AREVA
forward-looking energy



SVAFO R2 Dismantling Historical background

- ▶ AB Atomenergi ordered the facility by Allis-Chalmers (USA)
- ▶ Time of operation: 1960 to 2005
- ▶ Three sister facilities were built; whereof two facilities are still in operation: Safari (RSA) and Petten (NL)
- ▶ R2 and R2-0 reactors are in a three-part pond (150m³)
 - ◆ R2: 30MW, upgrade in 1969: 50MW
 - ◆ R2-0: 1MW
- ▶ Purpose: neutron experiments, material behavior
 - ◆ Test of fuel elements under BWR/PWR conditions
 - ◆ Isotope production for medical / industrial applications
 - ◆ BNCT radiotherapy
- ▶ 2010 Nuclear license transferred from Studsvik to SVAFO
- ▶ 2012 SVAFO R2 dismantling project started
- ▶ 2014 Decommissioning plan etc. approved by SSM
- ▶ 2014 Contract for dismantling and packing of the reactors (June)
- ▶ 2015 Completion. 3 pools were cleared from reactors R2-0, R2 and surroundings



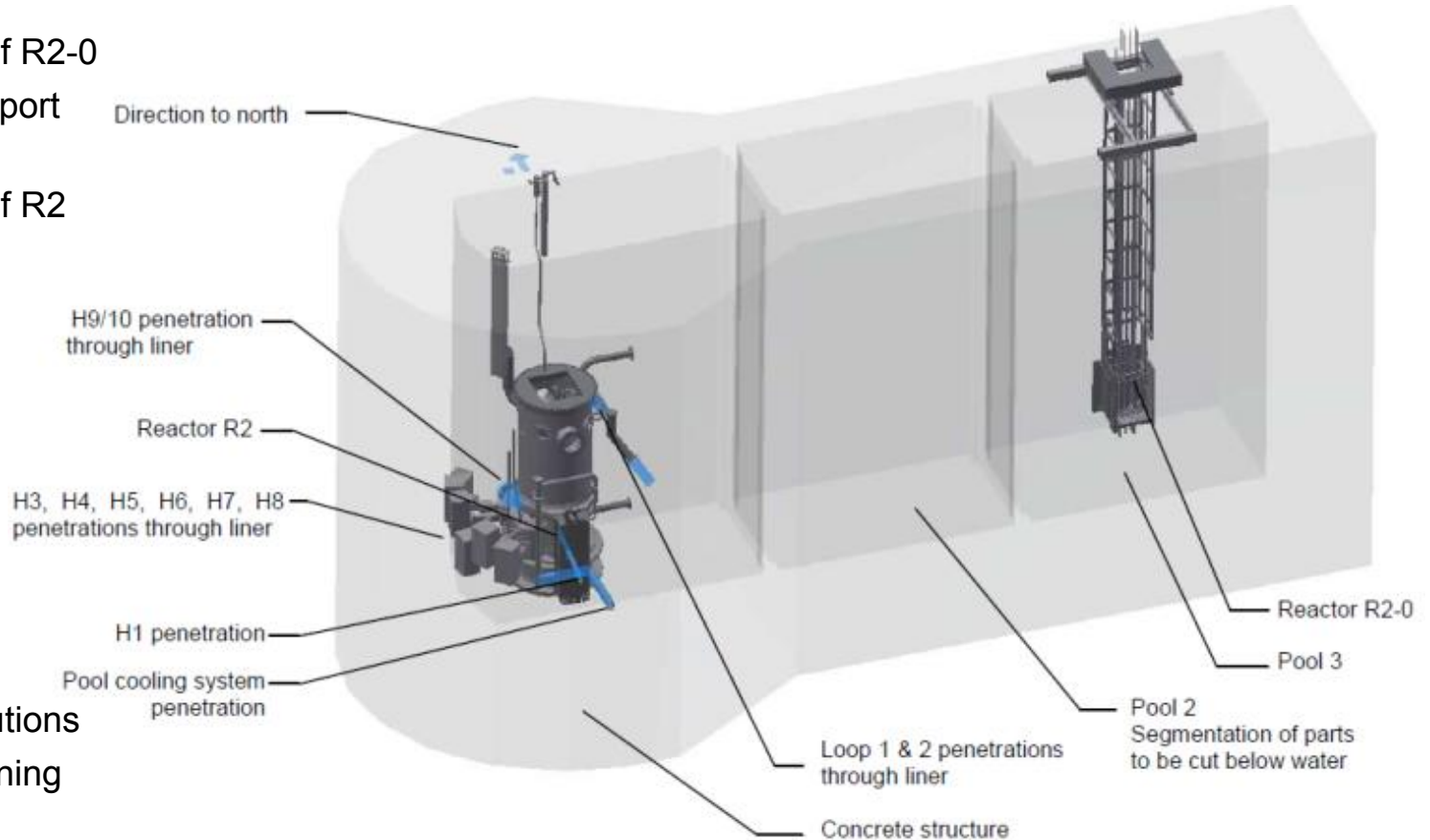
SVAFO R2 Dismantling Scope of work

Phase 1

- ◆ Dismantling / cutting of R2-0
- ◆ Removal of all R2 support equipment
- ◆ Dismantling / cutting of R2
- ◆ Emptying of pools
- ◆ Packaging, transport, documentation

Project features

- ◆ Experienced Swedish Subsuppliers
- ◆ Reliable technical solutions
- ◆ Combined FAT & Training

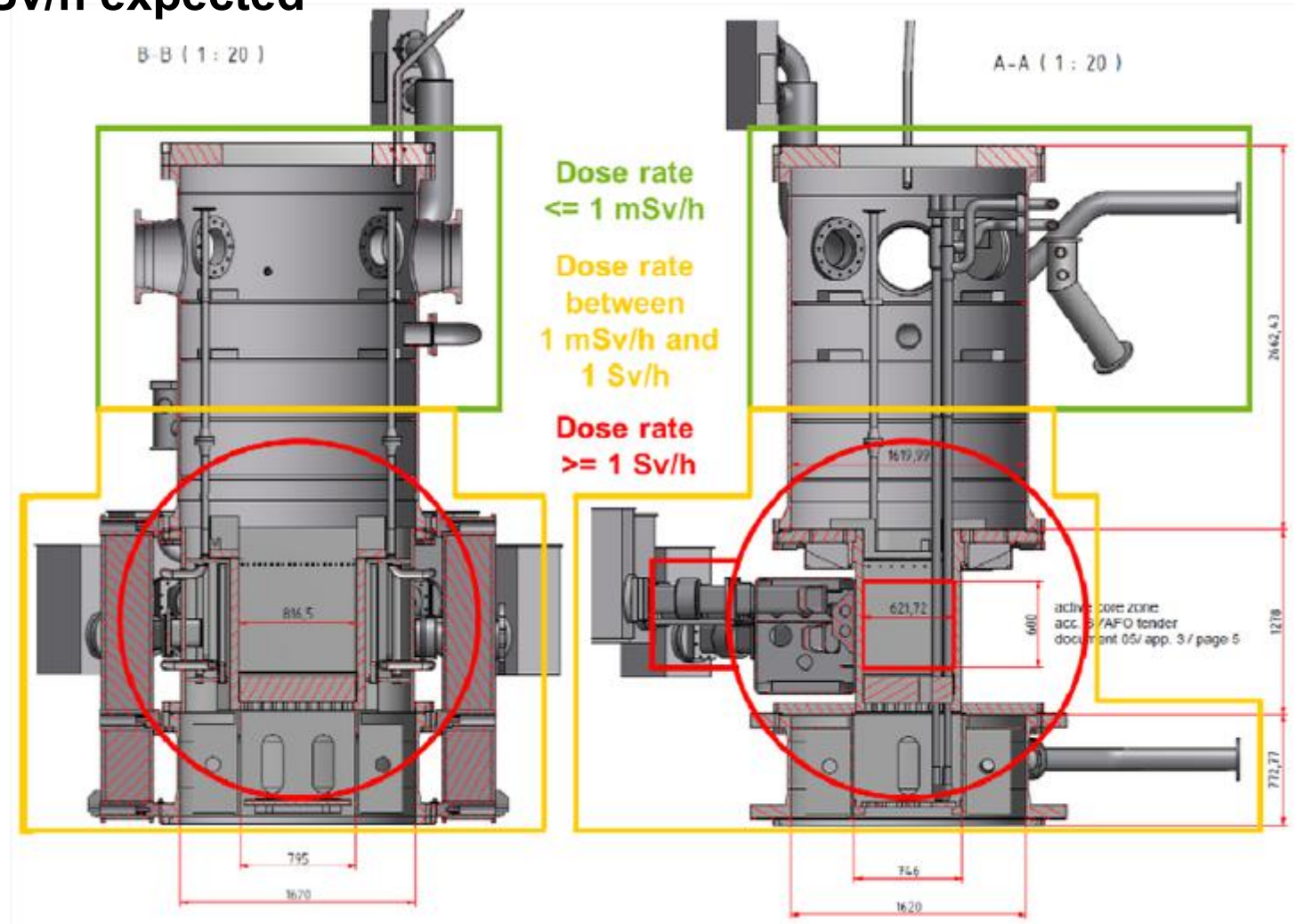


Combining AREVA's expertise in D&D with the knowledge of the former operators and with experienced Swedish on-site team securing effective performance



SVAFO R2 Dismantling Radiological Characterization

► up to 100Sv/h expected





SVAFO R2 Dismantling Waste Routes

- ▶ **Waste Route 1: DR > 2 Sv/h**
- ▶ **Waste Route 2: DR 2 mSv/h ... 2 Sv/h**
- ▶ **Waste Route 3: DR < 2 mSv/h**



Baskets for WR 1

- Size: Ø 160mm x 760mm
- Weight: max. 25kg load
- Under water loading

▶ 7 baskets, 87kg



Cassettes for WR 2

- Size: 810mm x 810mm x 800mm
- Weight: max. 3.400kg
- Under water loading

▶ 24 cassettes, 8.753kg



Handling according to WR 3

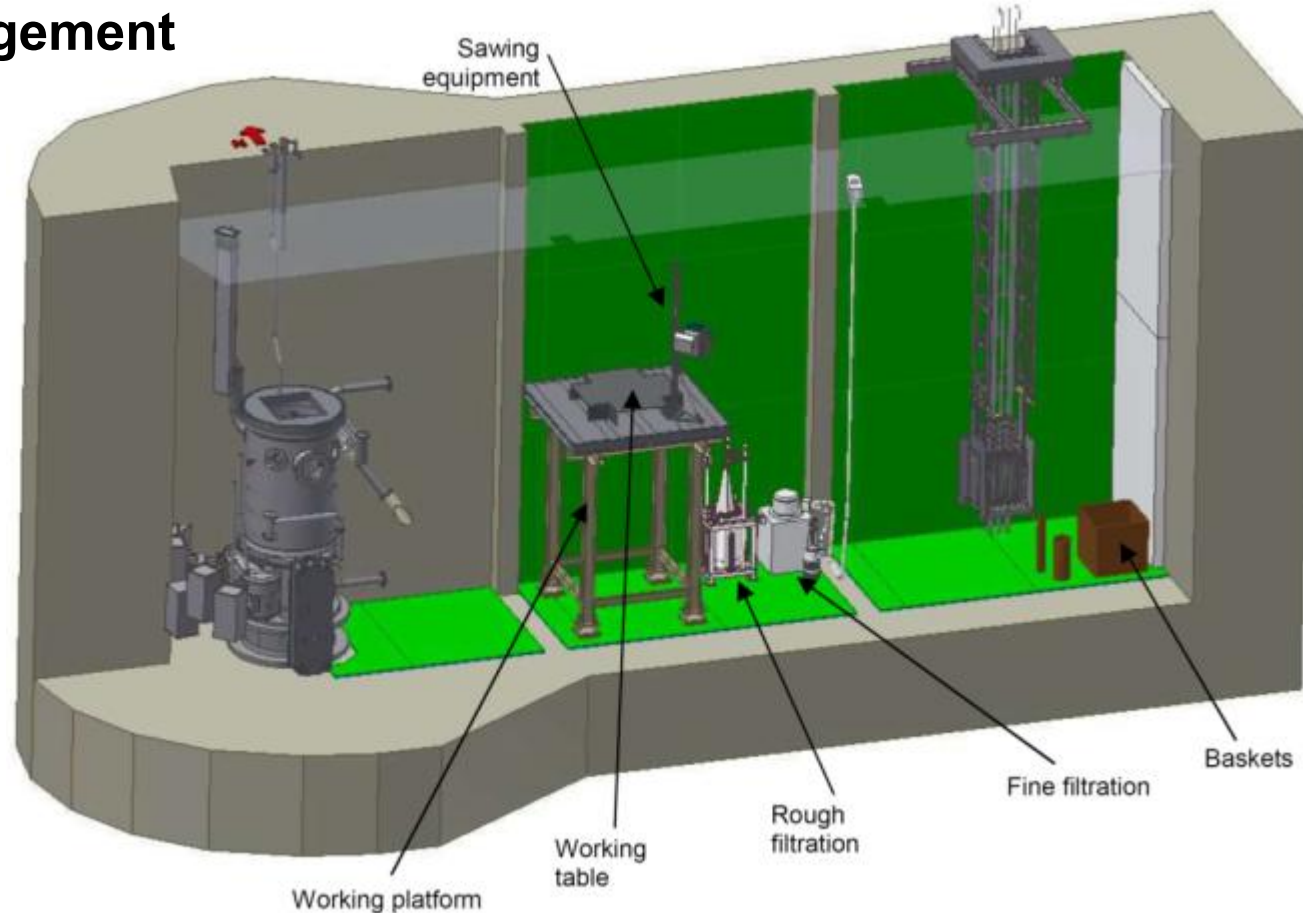
- Max. size: 2.500mm x 1.000m x 1.000mm
- Lifting, rinsing and packing in plastics
- On air handling

▶ 3.561kg



SVAFO R2 Dismantling Planned Sequence

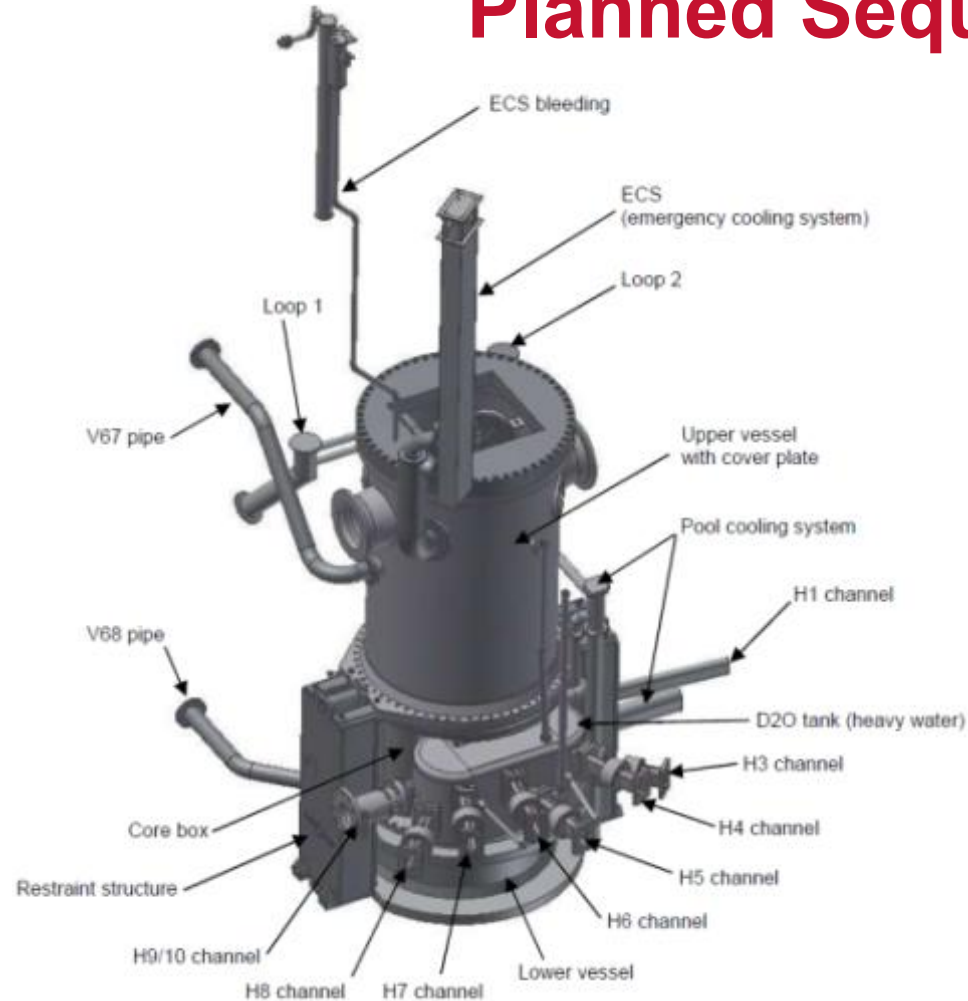
- ▶ Dismantling of R2-0
- ▶ Working arrangement





SVAFO R2 Dismantling Planned Sequence

► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

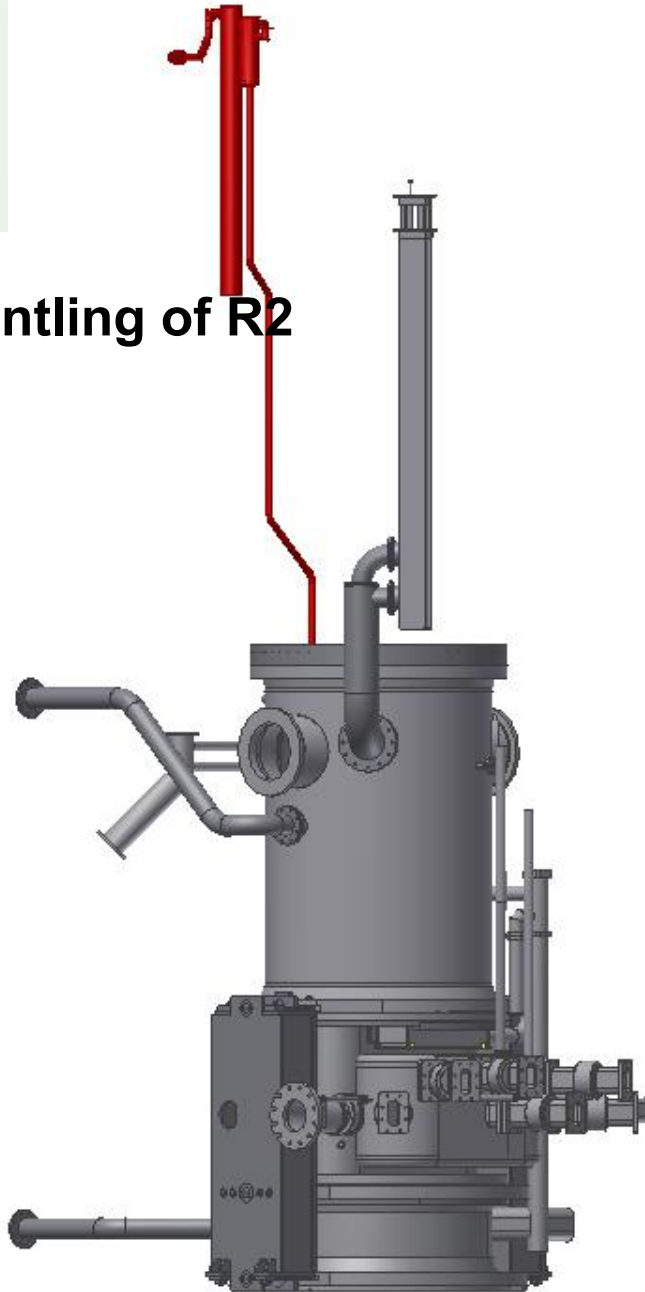
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

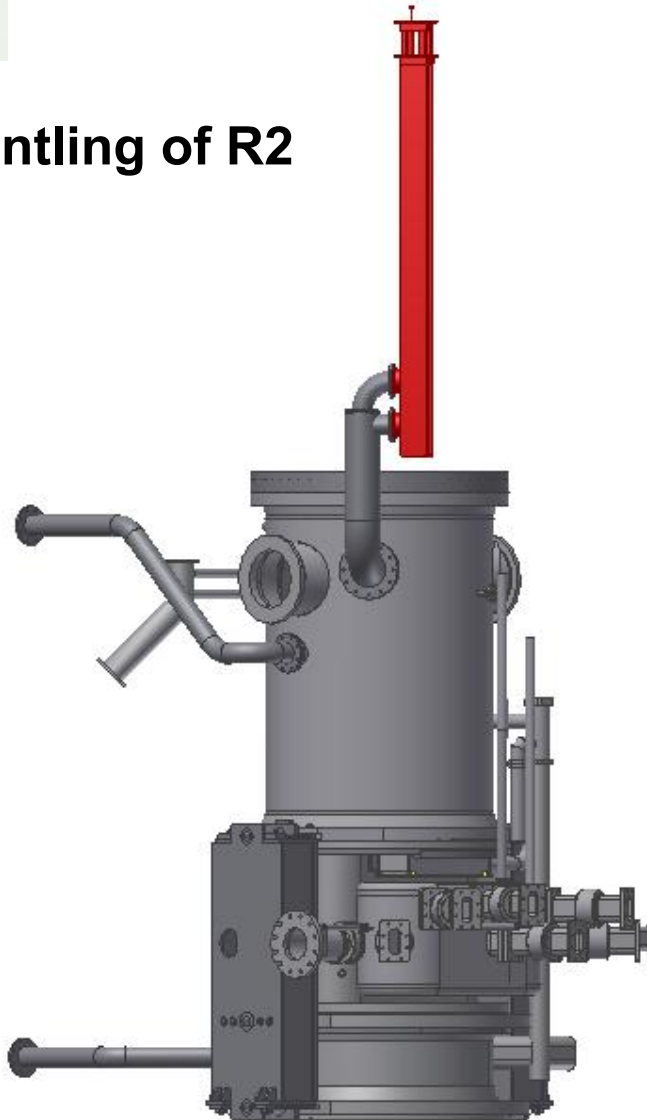
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

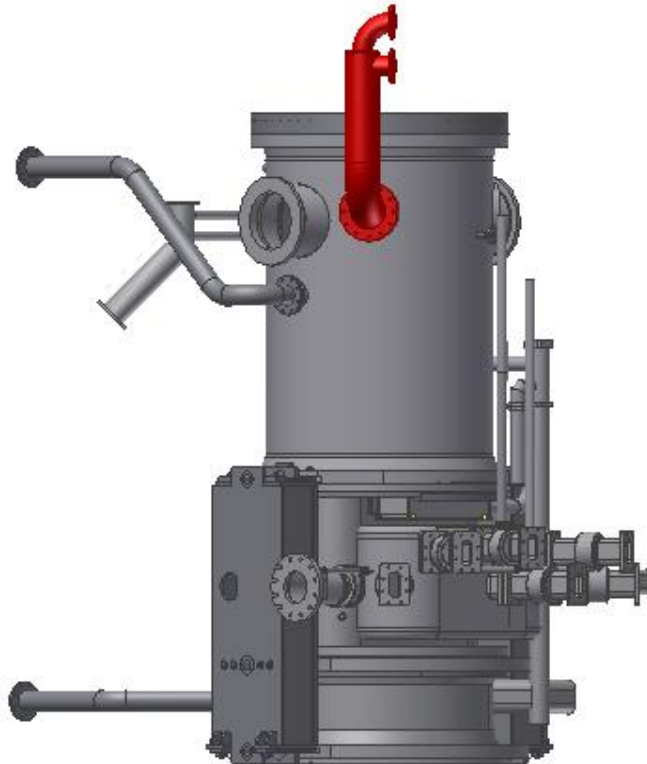
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

► Dismantling of R2

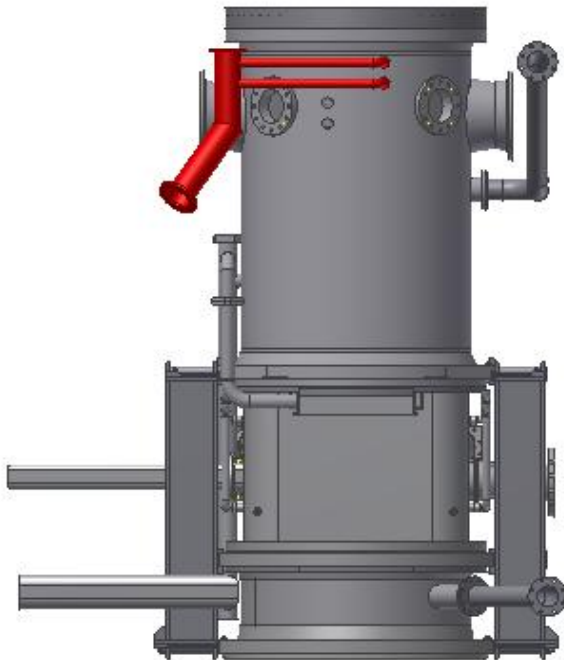




SVAFO R2 Dismantling Planned Sequence



► Dismantling of R2

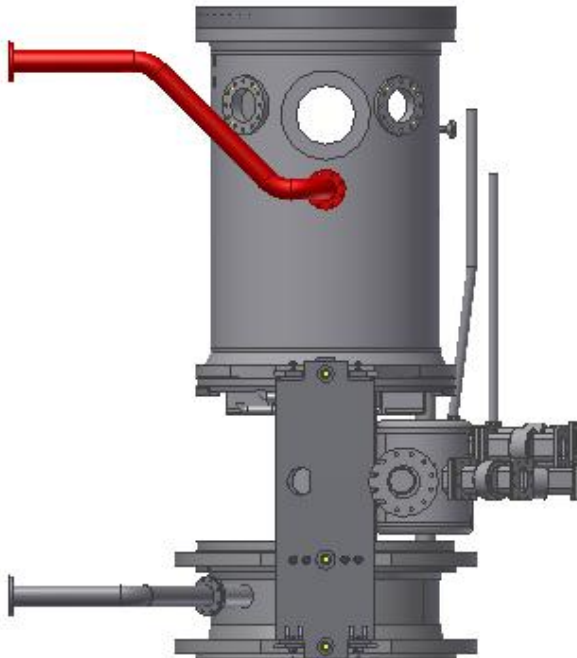




SVAFO R2 Dismantling Planned Sequence



► Dismantling of R2

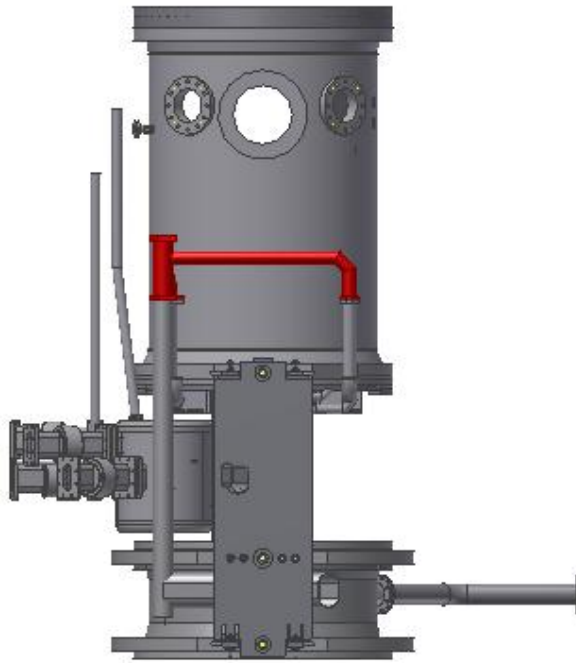




SVAFO R2 Dismantling Planned Sequence



► Dismantling of R2

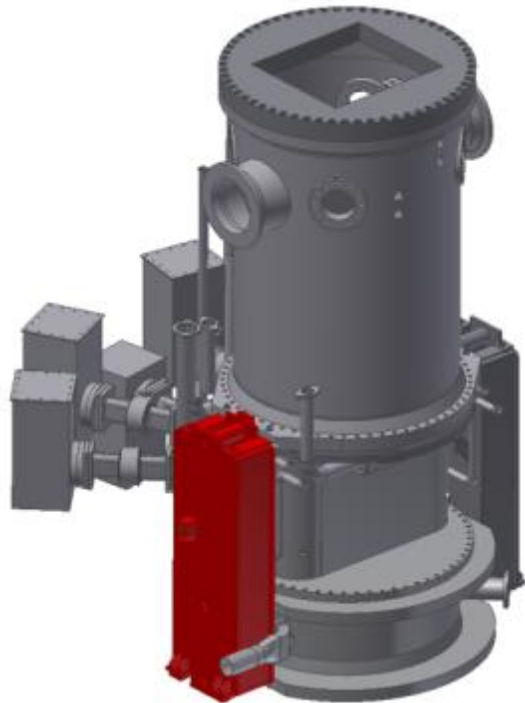




SVAFO R2 Dismantling Planned Sequence



► Dismantling of R2

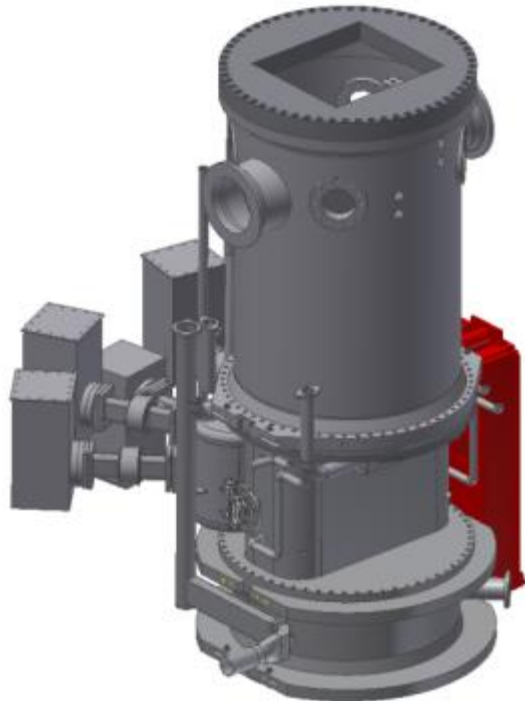




SVAFO R2 Dismantling Planned Sequence



► Dismantling of R2

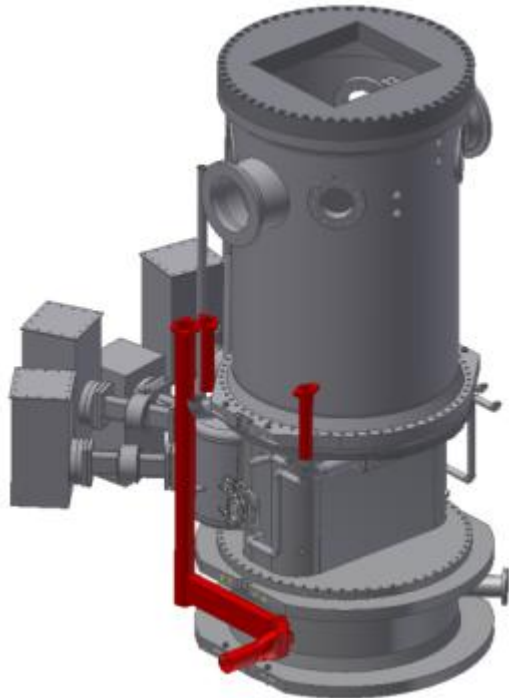




SVAFO R2 Dismantling Planned Sequence



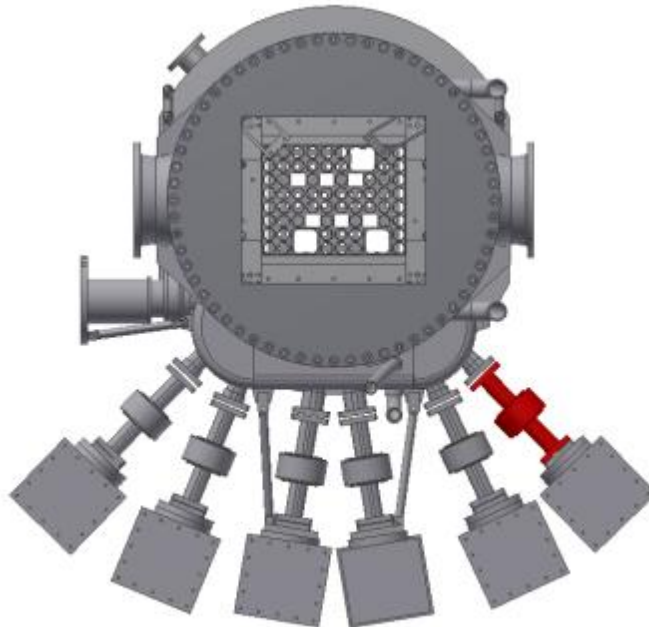
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

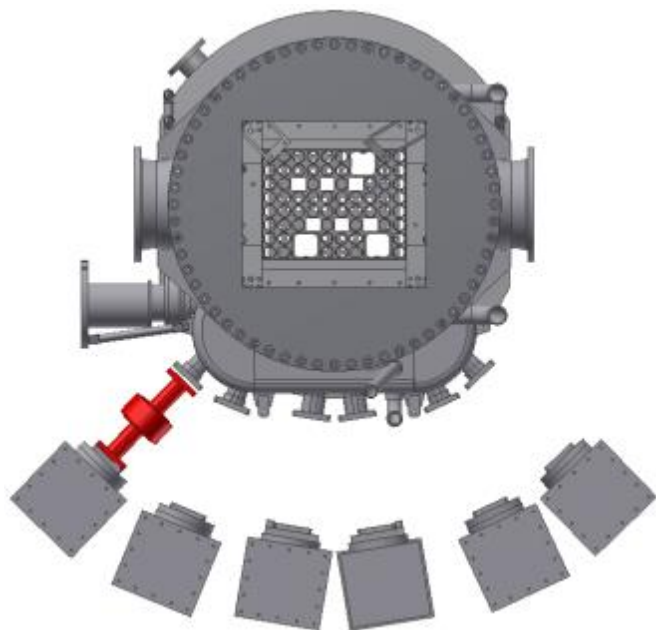
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

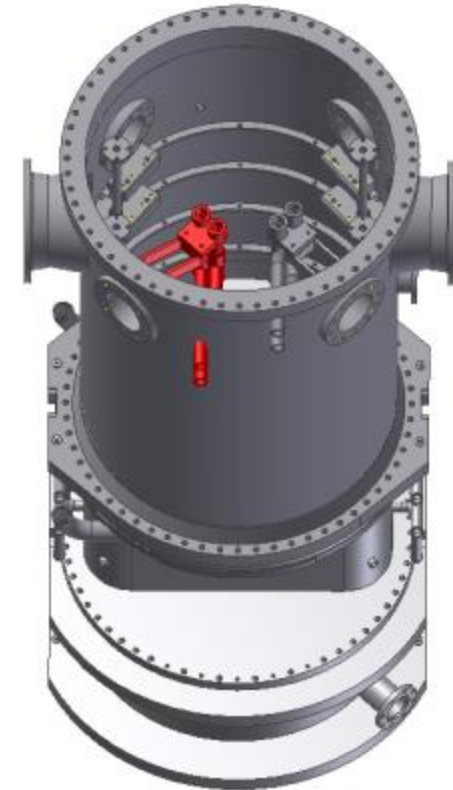
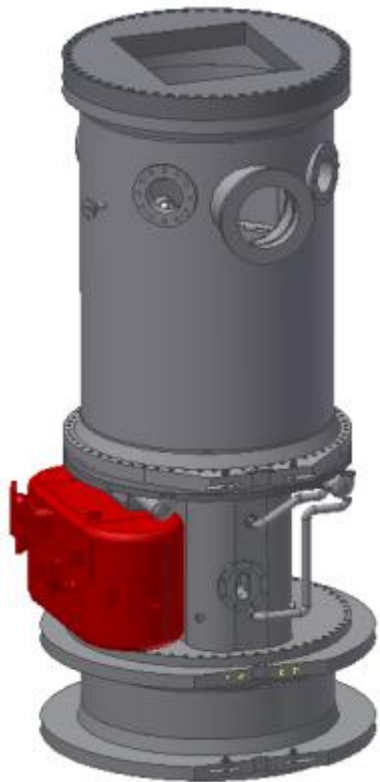
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

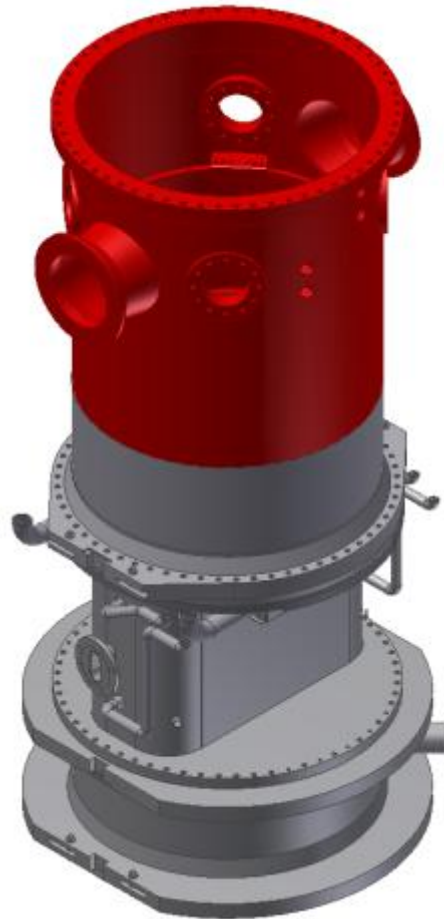
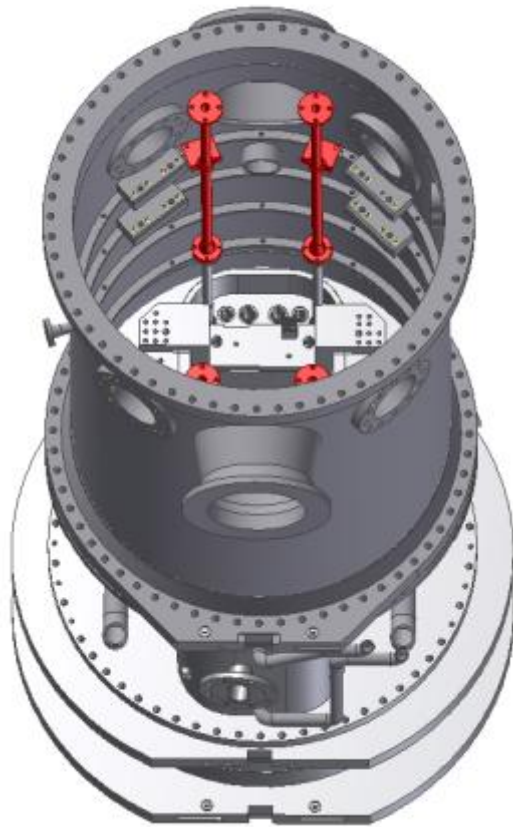
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SVAFO R2 Dismantling Planned Sequence

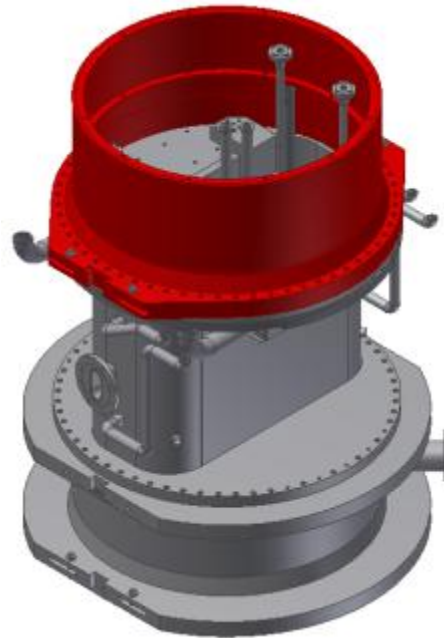
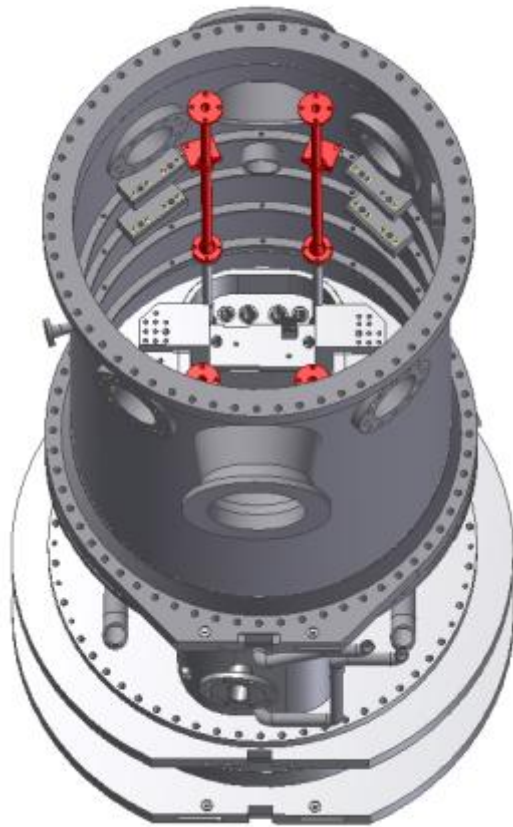
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

► Dismantling of R2

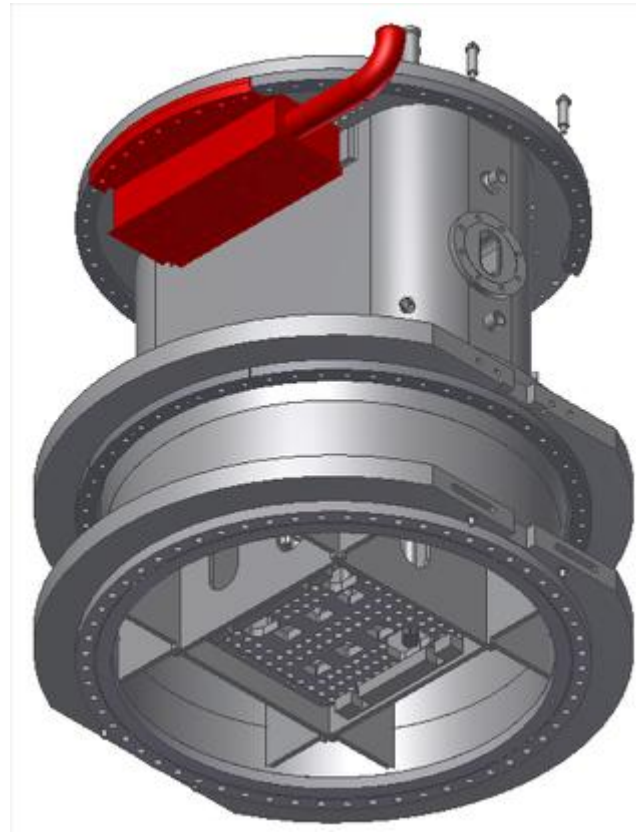




SVAFO R2 Dismantling Planned Sequence



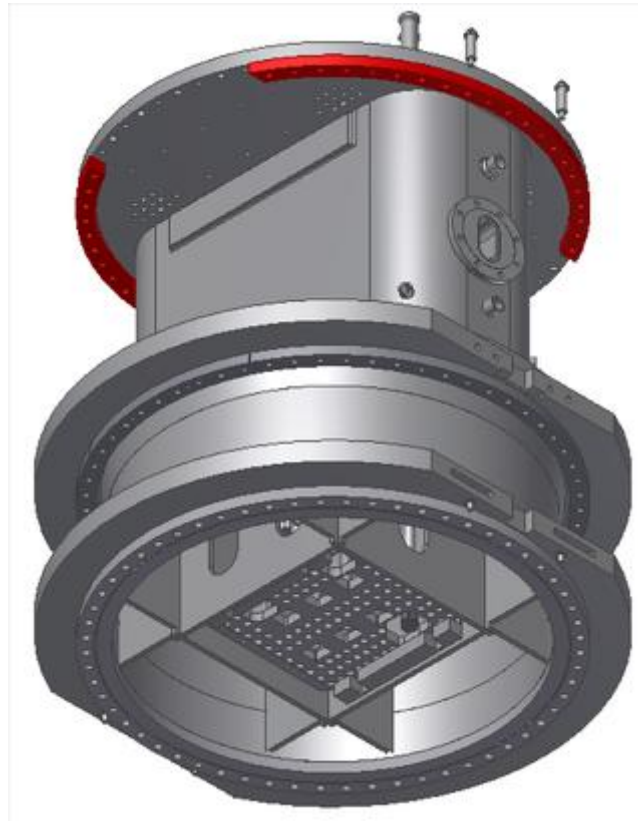
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

► Dismantling of R2

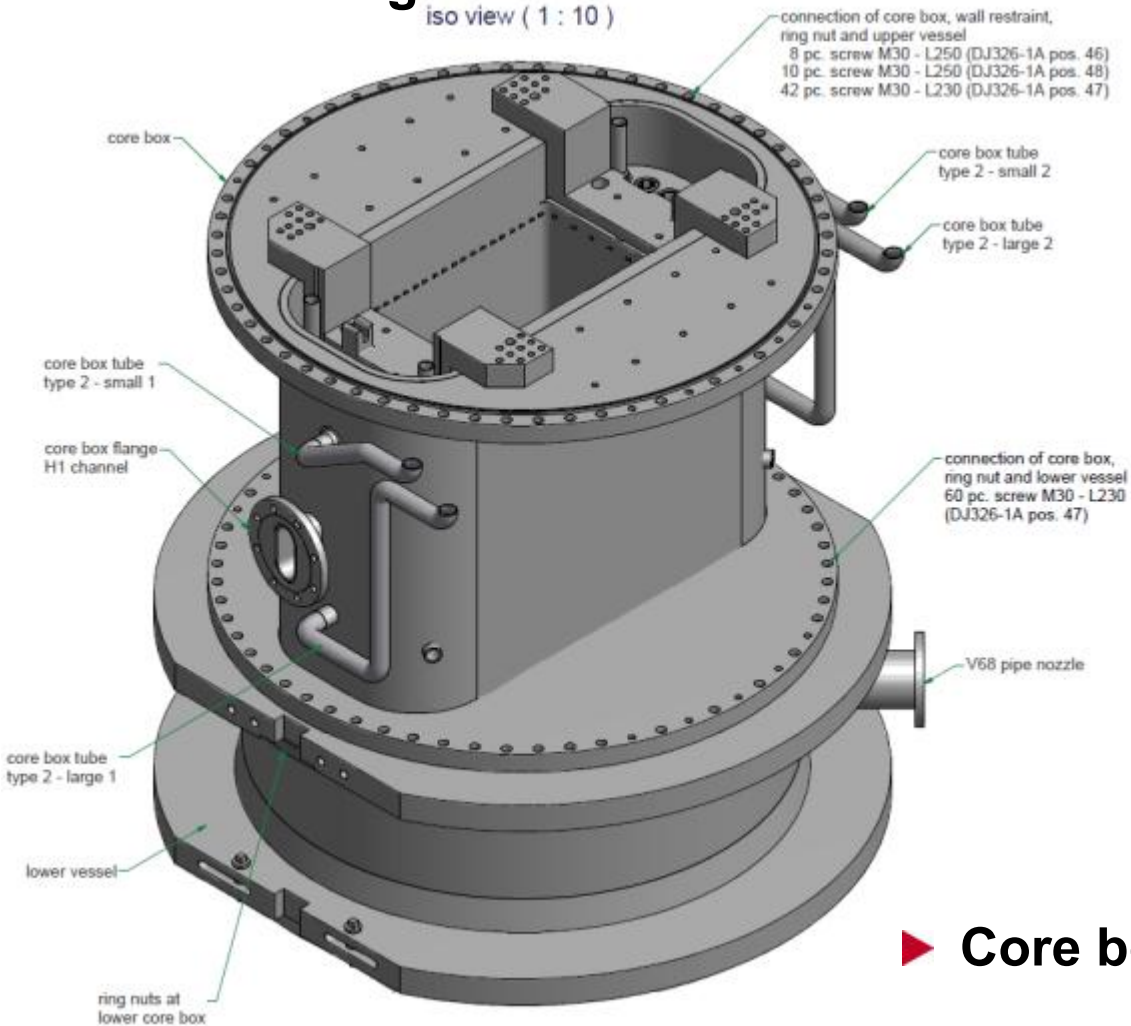




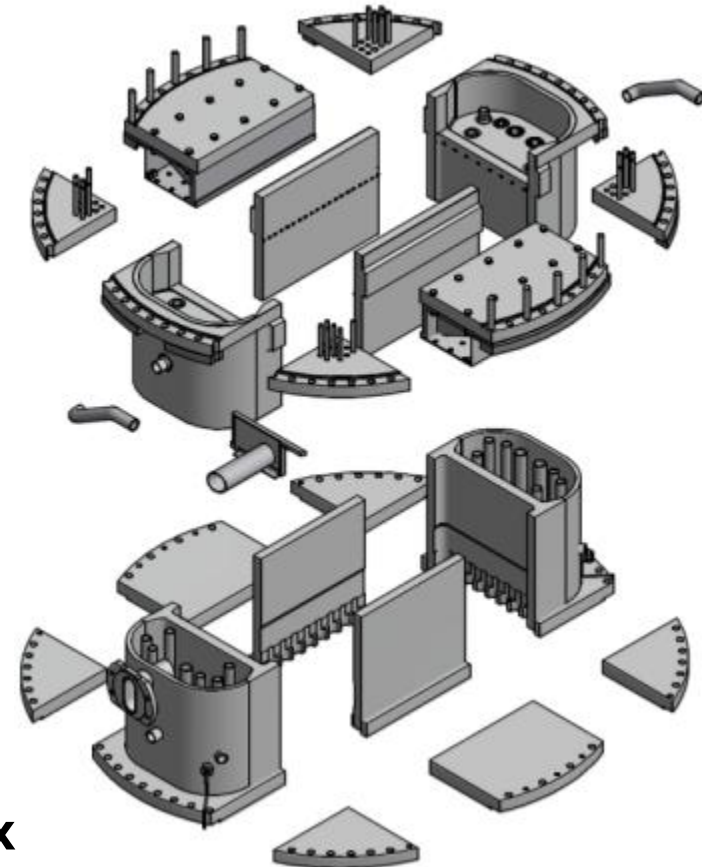
SVAFO R2 Dismantling Planned Sequence

► Dismantling of R2

iso view (1 : 10)



core box (1 : 20)

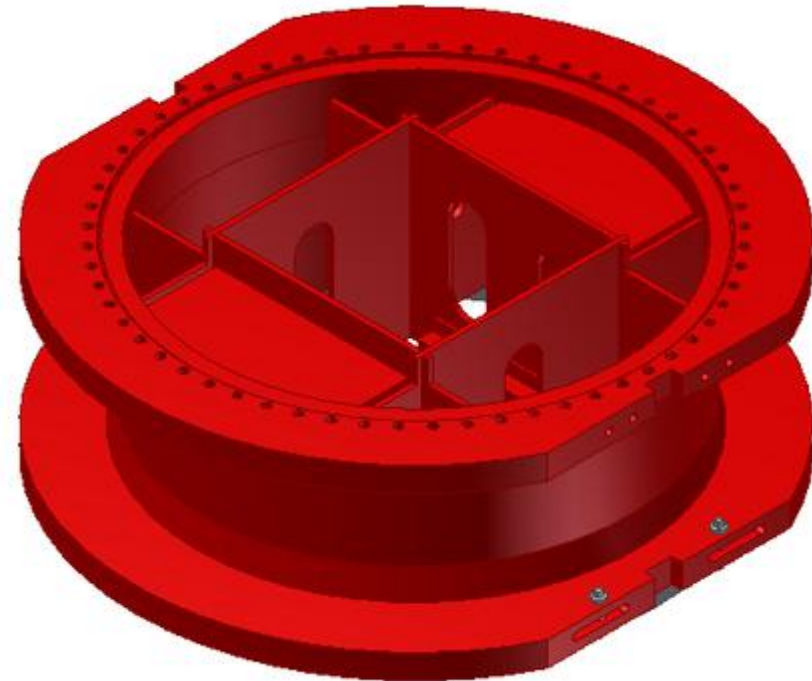
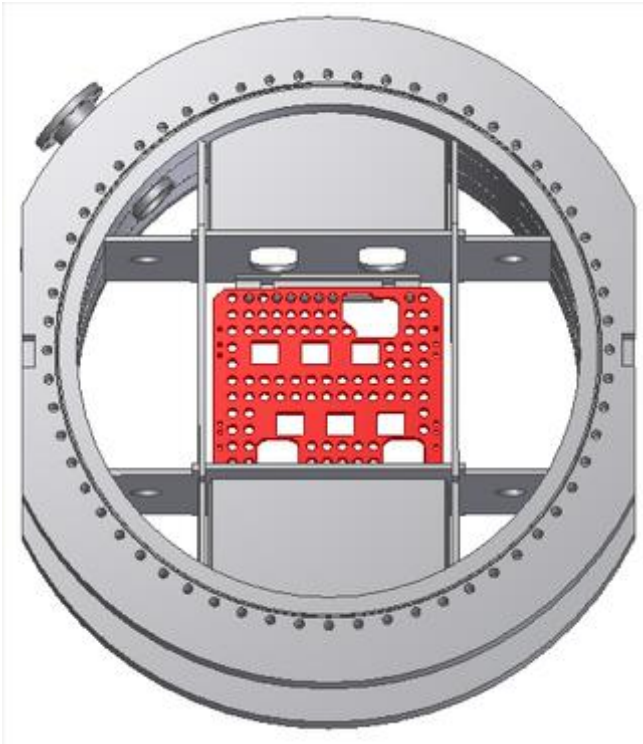


► Core box



SVAFO R2 Dismantling Planned Sequence

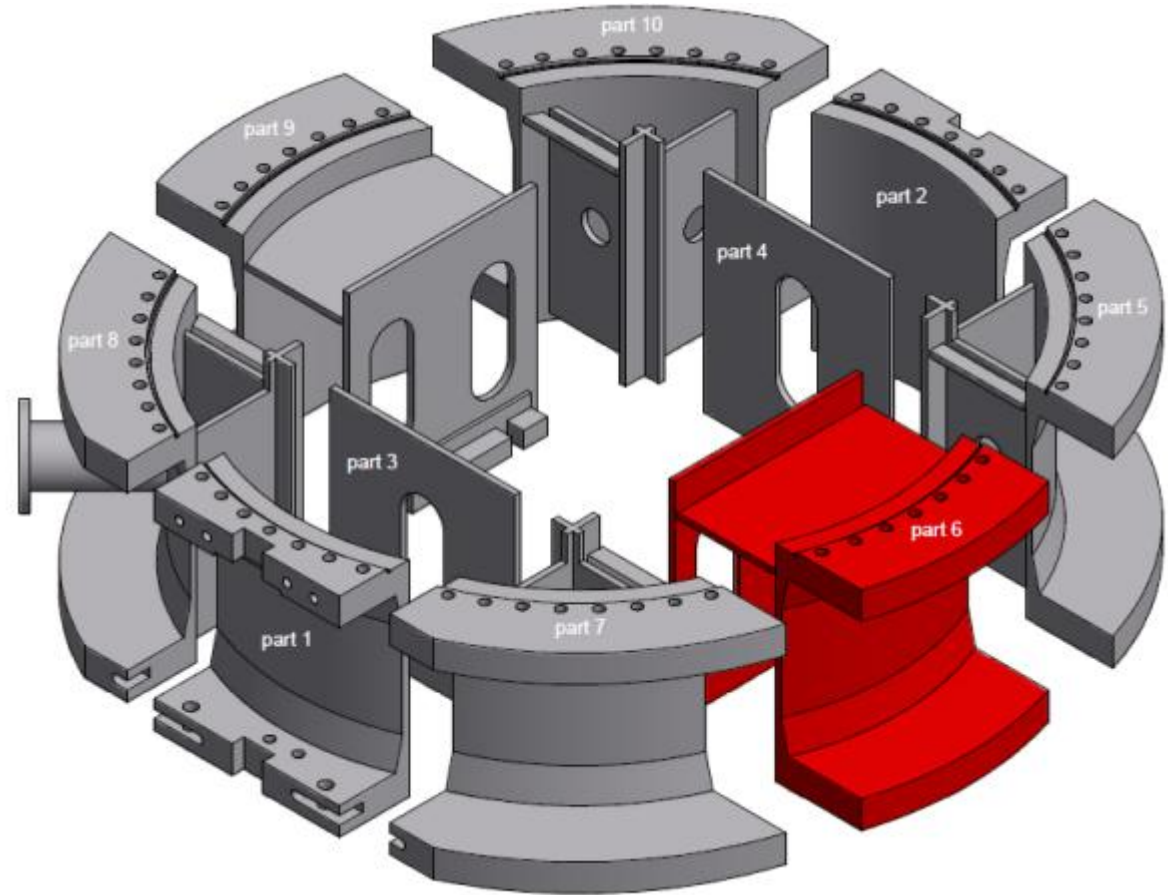
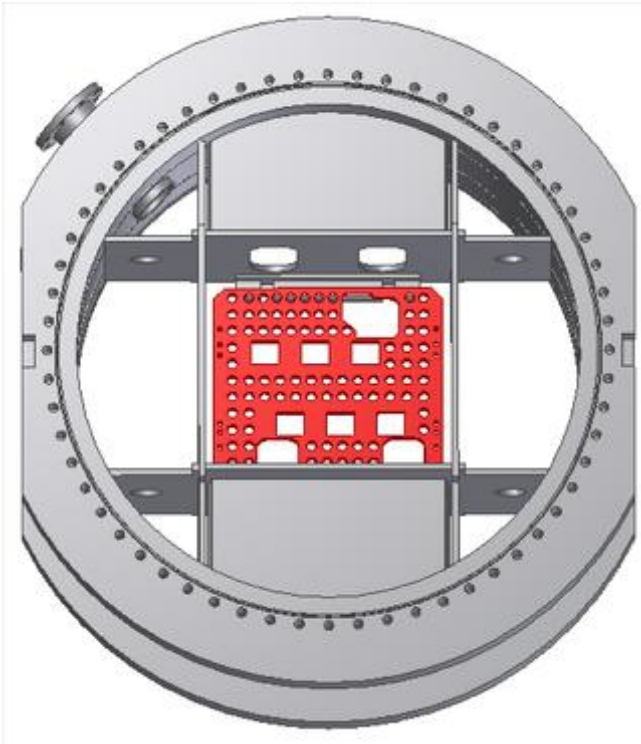
► Dismantling of R2





SVAFO R2 Dismantling Planned Sequence

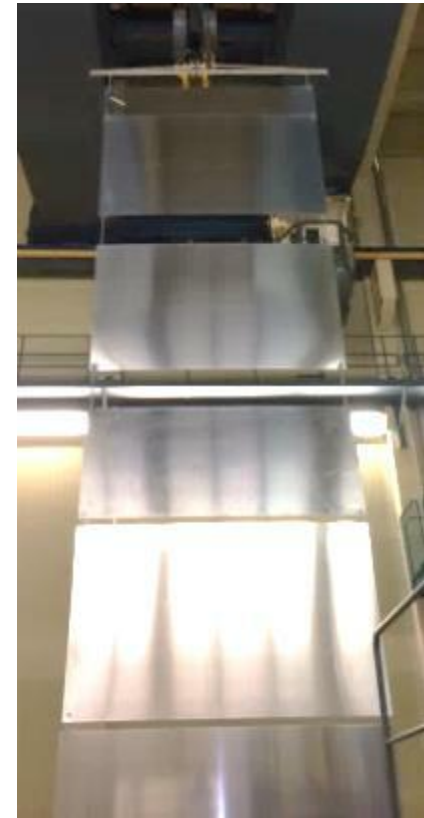
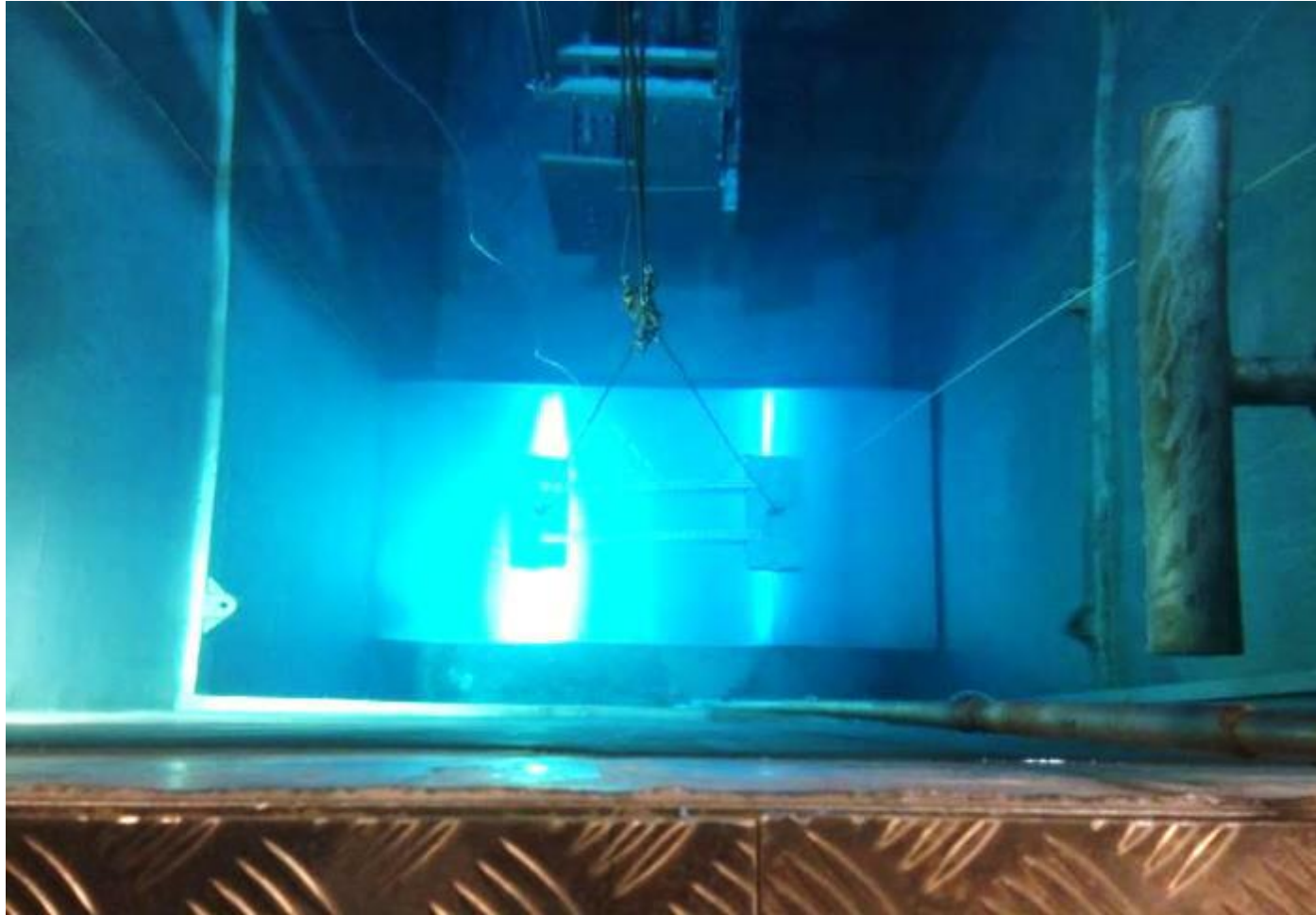
► Dismantling of R2





SVAFO R2 Dismantling Preparation of Working Area

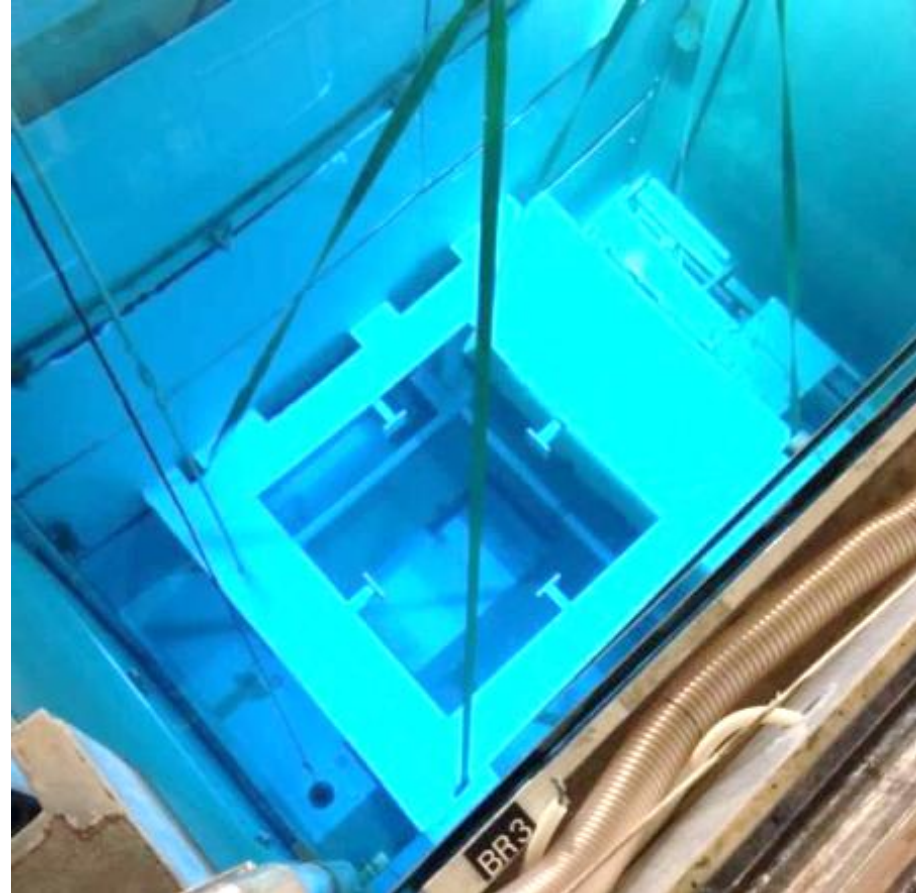
- Installation of pool bottom & wall protection plates





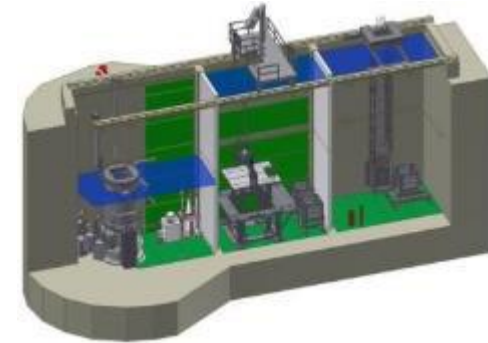
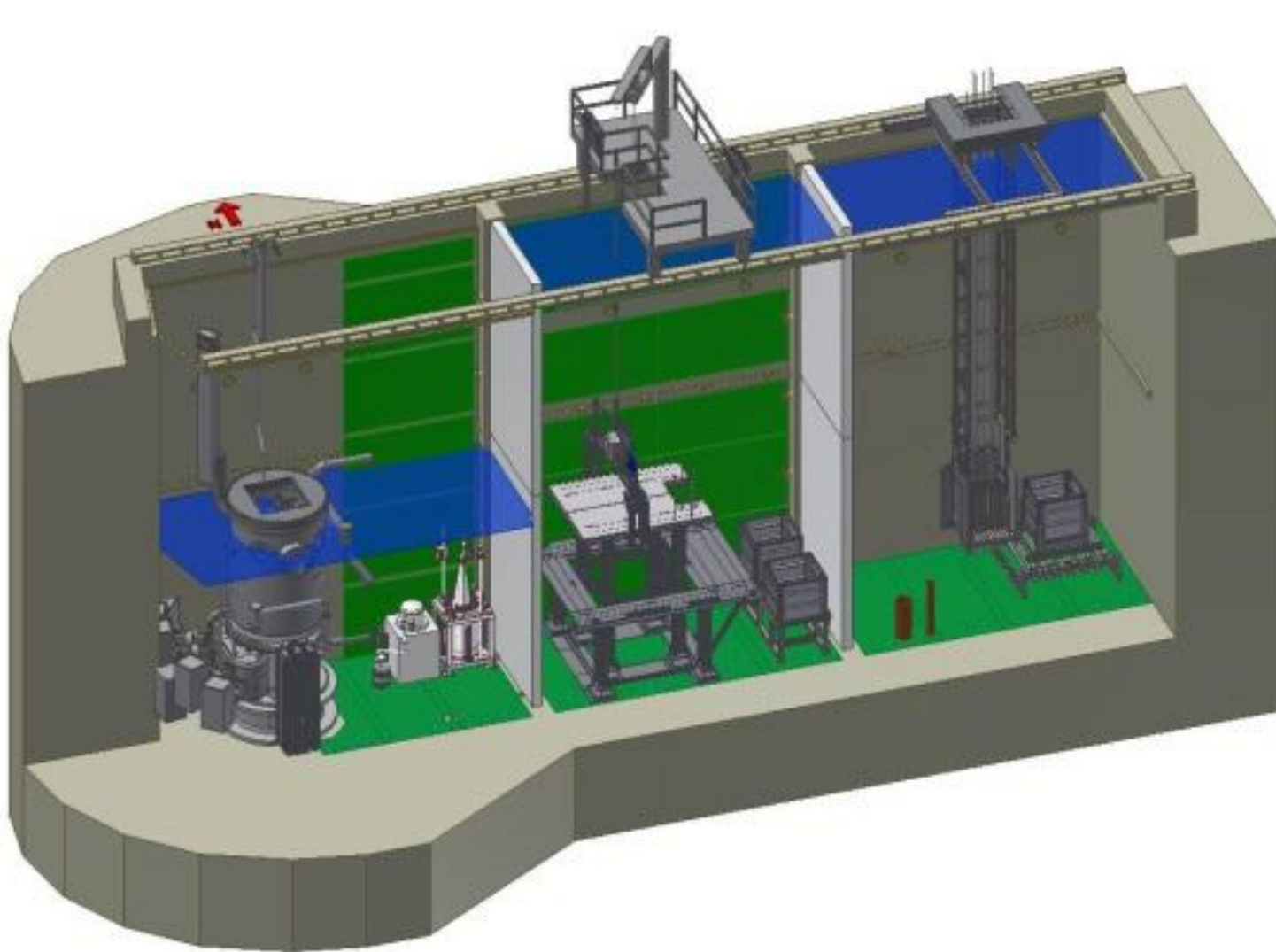
SVAFO R2 Dismantling Preparation of Working Area

- Installation of working table inside platform in Pool 2





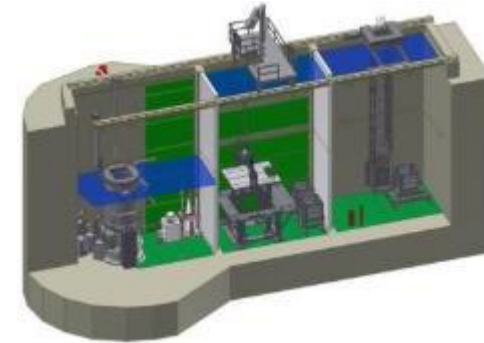
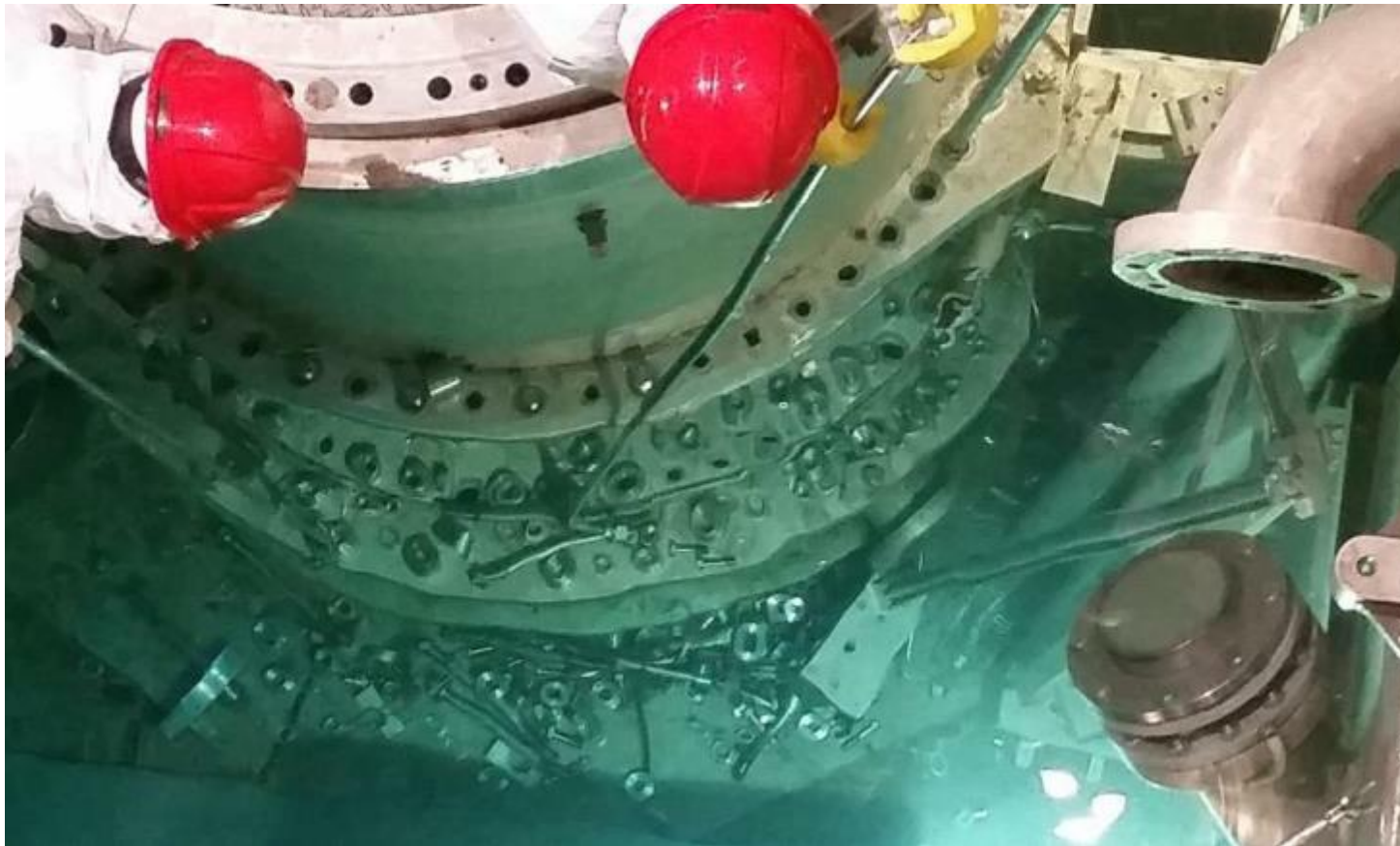
SVAFO R2 Dismantling Preparation of Working Area





SVAFO R2 Dismantling Preparation of Working Area

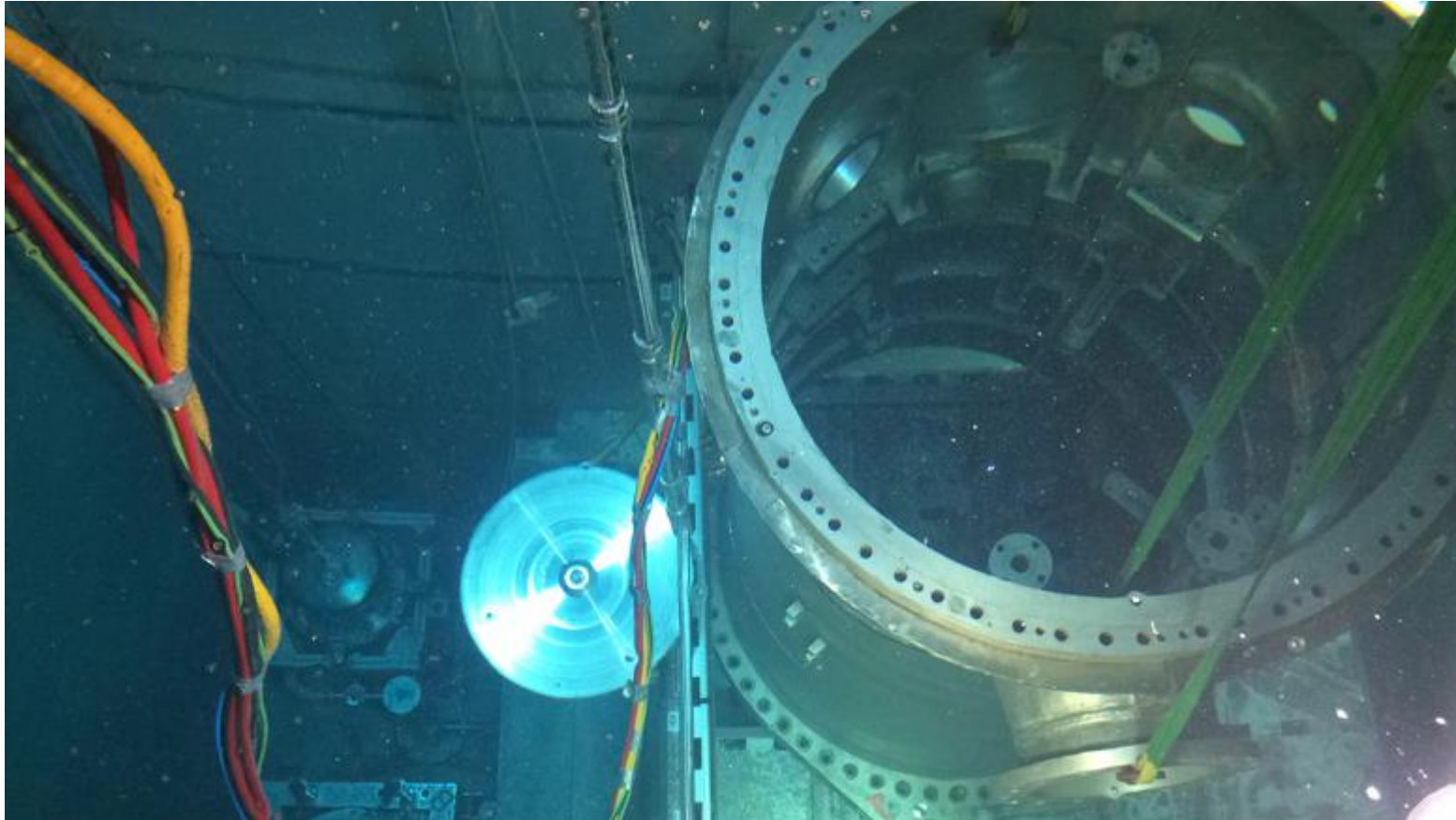
► Dismounting work in Pool 1





SVAFO R2 Dismantling Component Dismantling

► Cutting of Upper Vessel

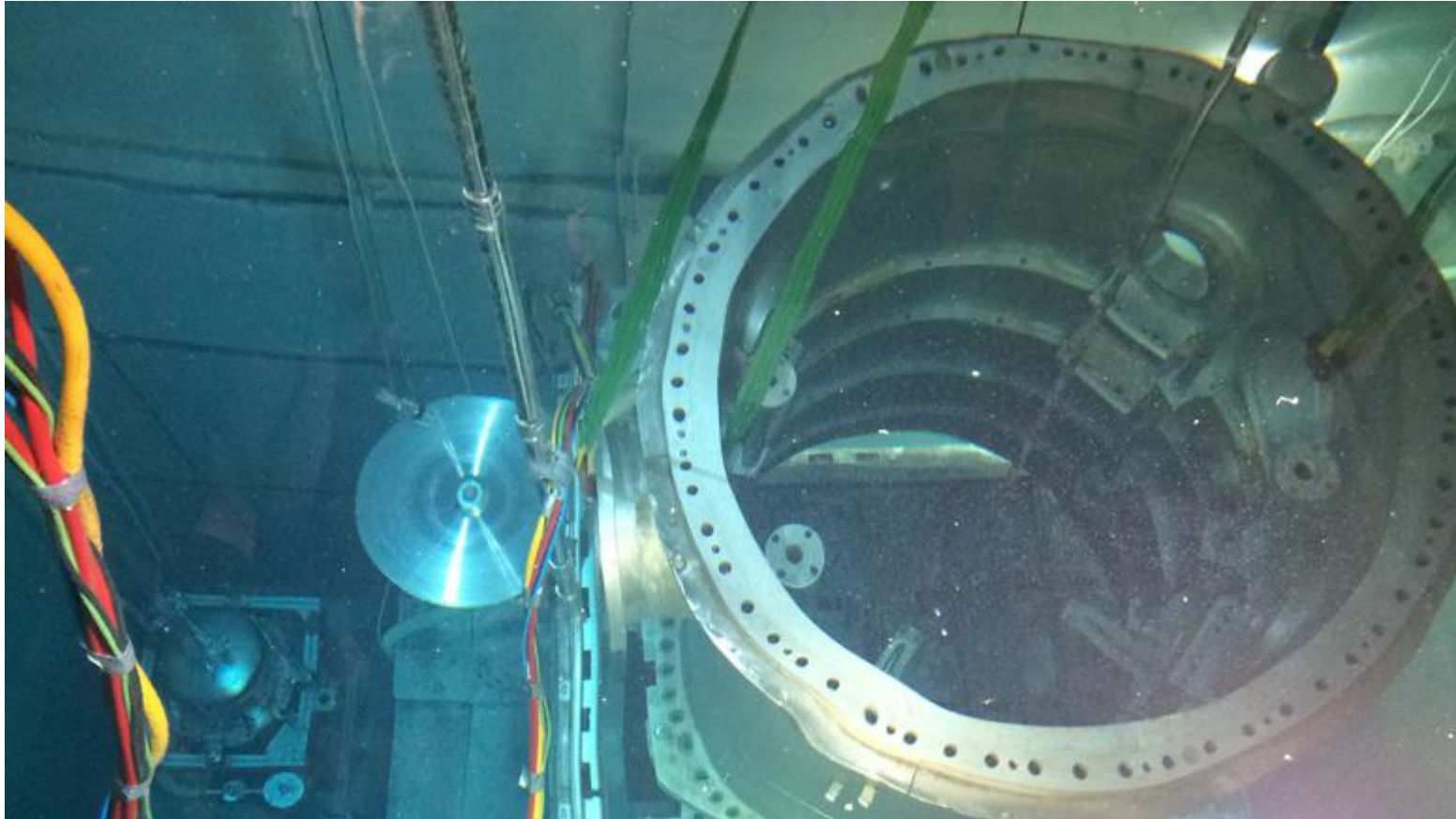


► Video



SVAFO R2 Dismantling Component Dismantling

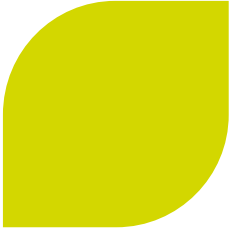
► Cutting of Upper Vessel



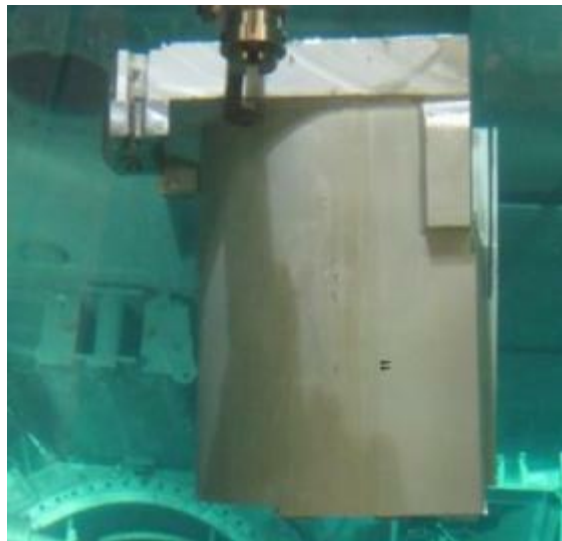
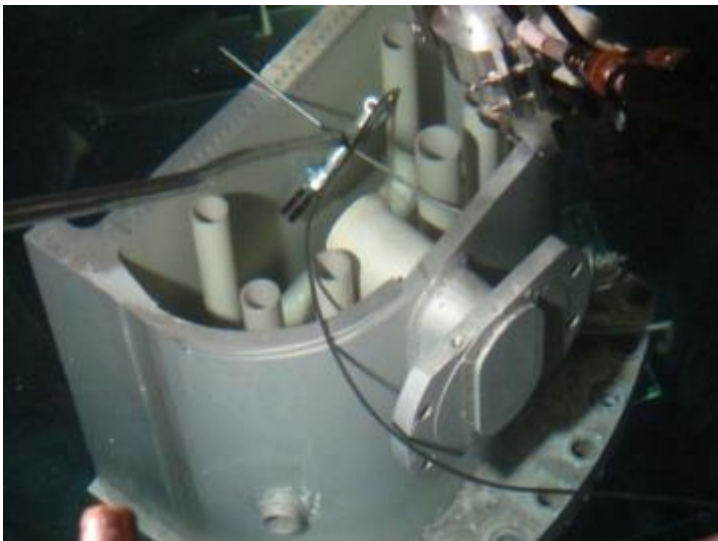
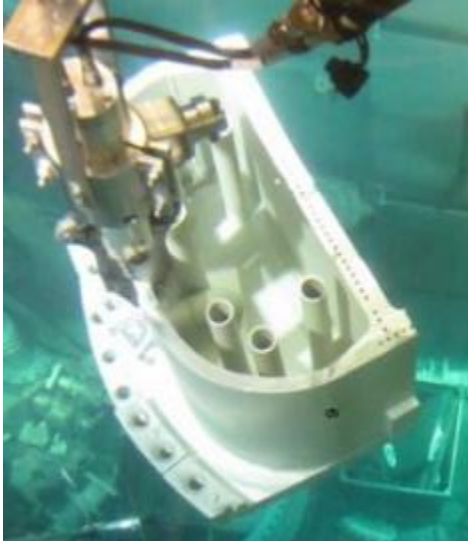
► Video



SVAFO R2 Dismantling Component Dismantling

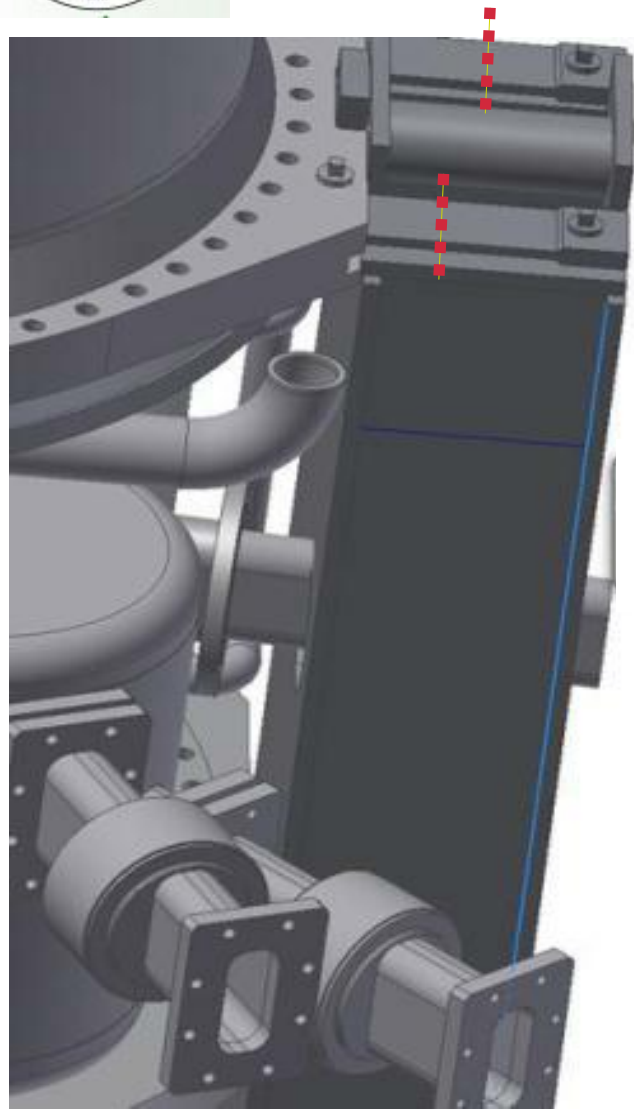


- ▶ Packing of Core Box
- ▶ DR measurement





SVAFO R2 Dismantling Challenges



- ▶ **Pendular hacksaw combined with shear**
 - ◆ **Removal of stainless restraint structure**
 - ◆ **Confined working conditions**



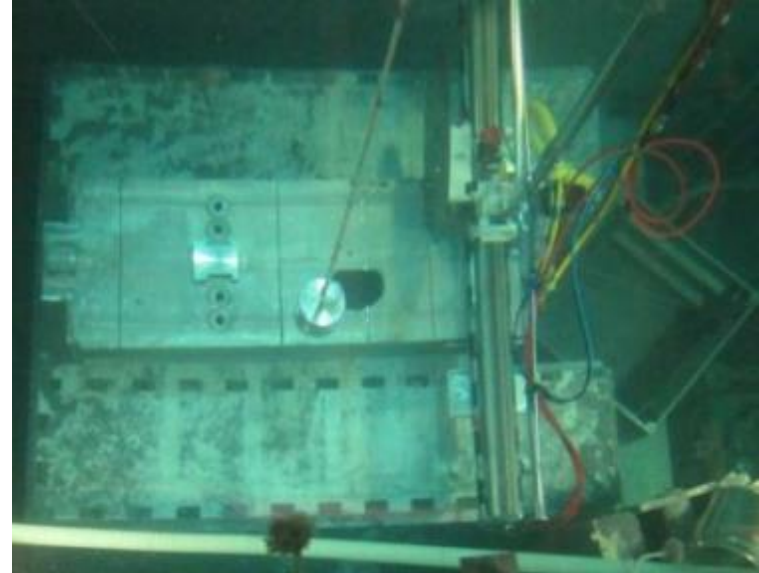
▶ Video



SVAFO R2 Dismantling Challenges



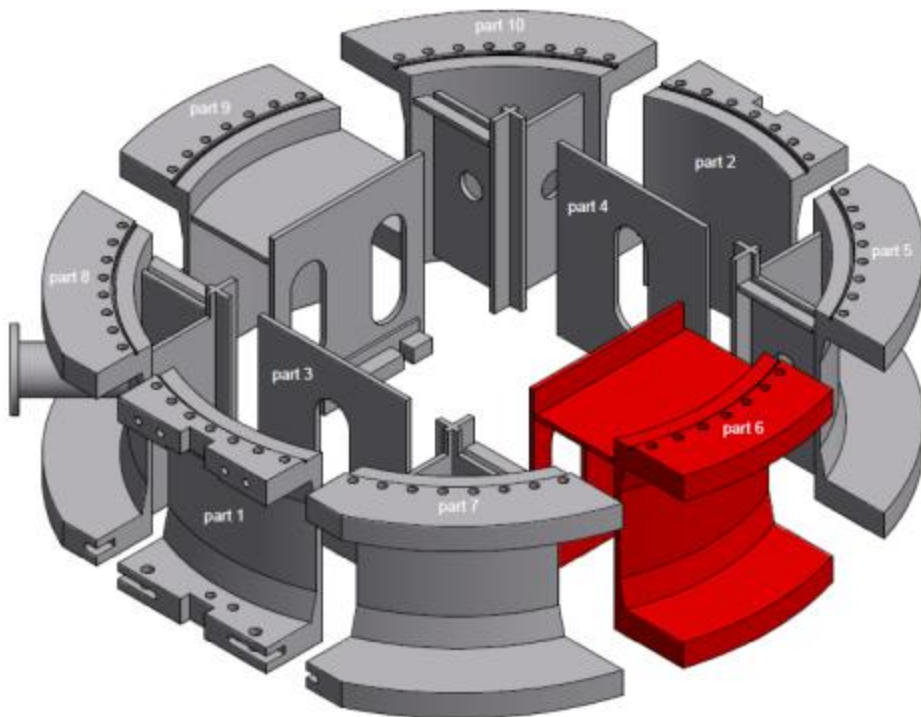
- ▶ Pneumatic balancer for sensitive disassembling of components and transfer to the cutting table
- ▶ DR measurement



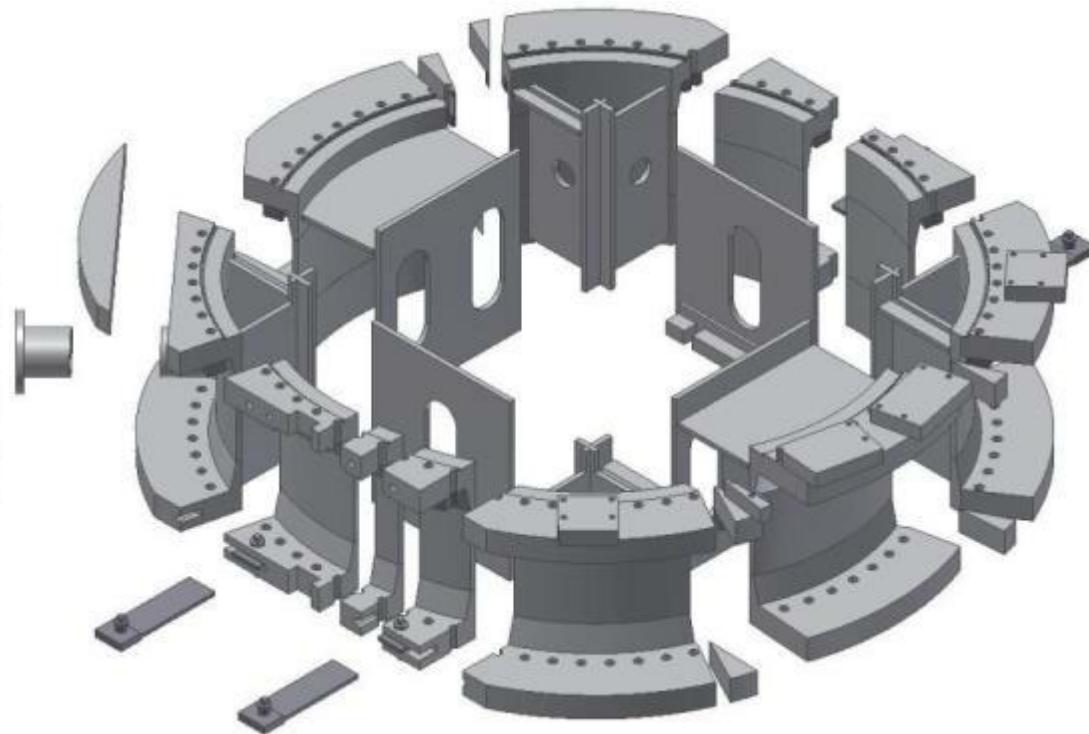


SVAFO R2 Dismantling Preliminary vs. Final Packing Plan

► Lower vessel



◆ Originally planned layout (10pc.)



◆ Realized layout (28pc.)



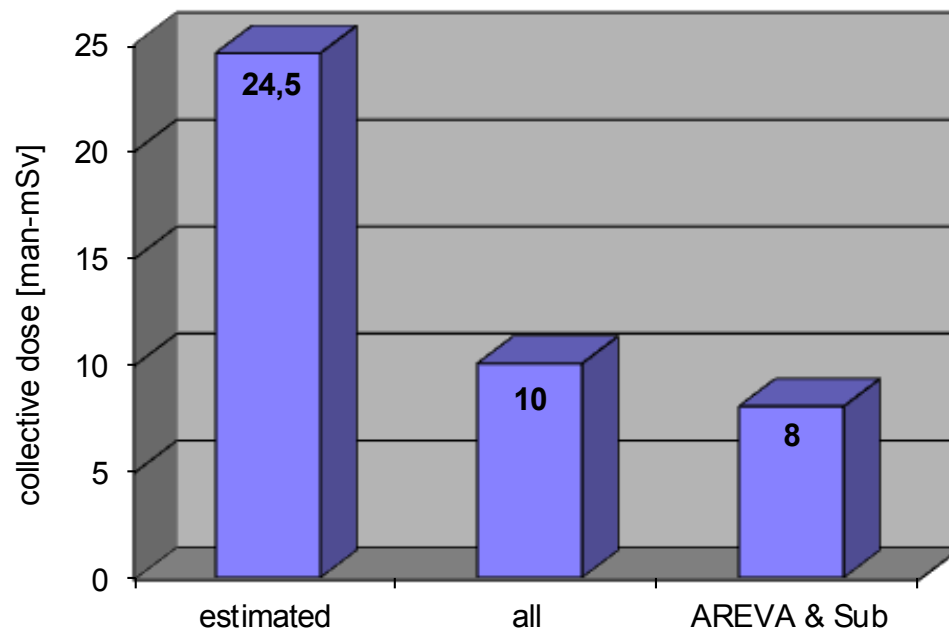
SVAFO R2 Dismantling Results

| R2-0 & R2 | masses |
|----------------------|----------|
| Aluminium | 5.400kg |
| Stainless steel | 6.000kg |
| Peripheral equipment | 1.000kg |
| total | 12.400kg |

| reactor | pieces |
|---------|--------|
| R2-0 | 88 |
| R2 | 257 |
| total | 345 |

| WR | → | WR | delta |
|-----|---|-------|---------|
| WR1 | → | WR2 | 270kg |
| WR2 | → | WR3 | 808kg |
| WR2 | → | WR1 | 47kg |
| | | total | 1.125kg |

- ▶ No accidents
- ▶ Collective dose below estimation
- ▶ One-shift operation only





SVAFO R2 Dismantling Lessons learned

- ◆ Build a “Decommissioning Team”
- ◆ Prepare a thorough “Radiological Characterization”
- ◆ Replace the legacy operation systems with new, flexible “Decommissioning Support Systems”



Thank you for your kind attention !

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