



**Siempelkamp**

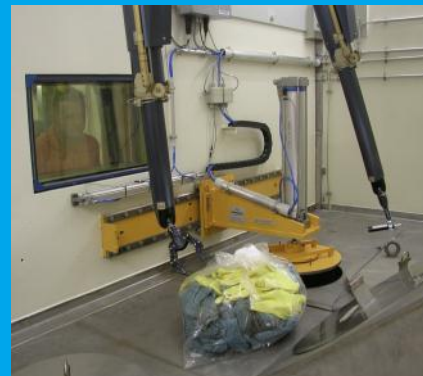
Nukleartechnik

# SIEMPELKAMP

## Experience and New Technologies of Decommissioning

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Stefan Bauer  
Stefan Klute

Moscow - June 10, 2014



# Content

- **Who is SIEMPELKAMP ?**
- **Nuclear branch and companies working in „decommissioning“**
- **References: Worldwide Experience in dismantling Internals and RPV's**
- **Project phases in dismantling projects**
- **Conclusion**



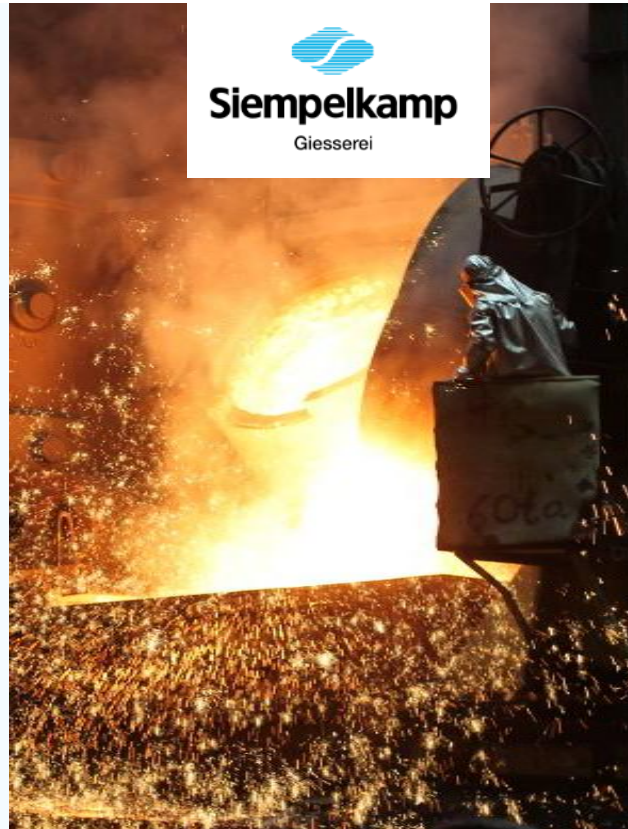
# Siempelkamp Divisions

**Siempelkamp Group 2013**  
Order intake: 588.9 Mio. €  
Turnover: 718.4 Mio. €  
Employees: 3,124\*



  
**Siempelkamp**  
Maschinen- und Anlagenbau

**Machinery and plant:**  
Planning and construction of complete factories for the woodworking industry, metal forming and the rubber industry.



  
**Siempelkamp**  
Giesserei

**Foundry:**  
Manufacturing of hand-formed large castings made of cast iron with nodular graphite from 3 t up to 320 t piece weight.



  
**Siempelkamp**  
Nukleartechnik

**Nuclear technology:**  
Products and Services for nuclear facilities.

# Structure Siempelkamp Nukleartechnik



## Siempelkamp

Nukleartechnik

3 Bereiche: **Recycling – Behälter und Fertigung - Engineering**  
Standorte: Krefeld, Mülheim, Heidelberg, Hamburg, Linz - Österreich

### Deutschland

### Großbritannien

### Frankreich

### USA

**Siempelkamp**  
NIS Ingenieurgesellschaft mbH

Standort: Alzenau,  
Dresden, Essen, Rheinsberg

**Siempelkamp**  
Tensioning Systems

Standort: Lünen

**Siempelkamp**  
Nuclear Technology UK

Standort: Glasgow

**Siempelkamp**  
Nucléaire France

Standort: Bouzonville

**Siempelkamp**  
Nuclear Technology US

Standort: Walnut Creek, CA

**Siempelkamp**  
Kranteknik

Standort:  
Moormerland

**Siempelkamp**  
Prüf- und Gutachter-Gesellschaft

Standort: Dresden

**Siempelkamp**  
M S D G

Standort: Forbach

**Siempelkamp**  
Nuclear Services

Standort: West Columbia



**Siempelkamp**  
Nukleartechnik

# Structure Siempelkamp Nukleartechnik

## Companies working in Decommissioning



Locations: Germany: Krefeld, Heidelberg, Muelheim, Hamburg; Austria: Linz

### Germany

### Great Britain

### France

### US



Locations: Alzenau,  
Dresden, Essen, Rheinsberg



Location: Lünen



Location: Glasgow



Locations: Bouzonville



Location: Walnut Creek, CA



Location: Moormerland



Location: Dresden



Location: Forbach



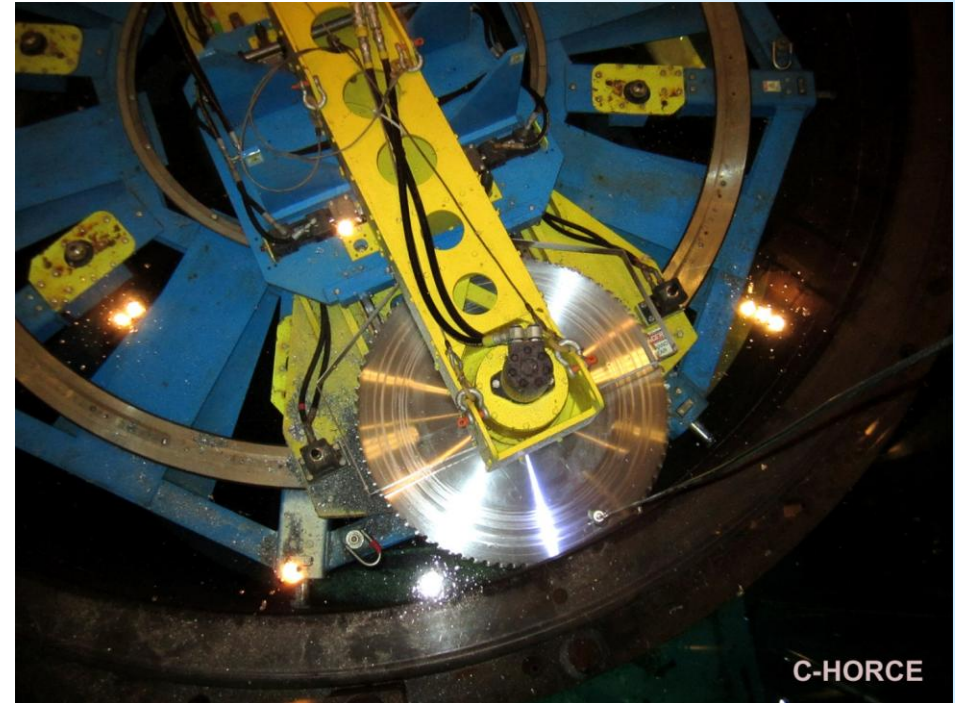
Location: West Columbia, SC

# References (1/2)

Regarding dismantling of Internals - Siempelkamp has references worldwide

## Internals:

- ✓ MZFR
- ✓ KNK
- ✓ FERMI
- ✓ Humboldt Bay
- ✓ ZION
- ✓ Rancho Seco
- ✓ Parr Site
- ✓ Big Rock Point
- ✓ Omega West
- ✓ Milestone Unit One
- ✓ NASA Plum Brook
- ✓ University of Michigan Ford Nuclear Reactor

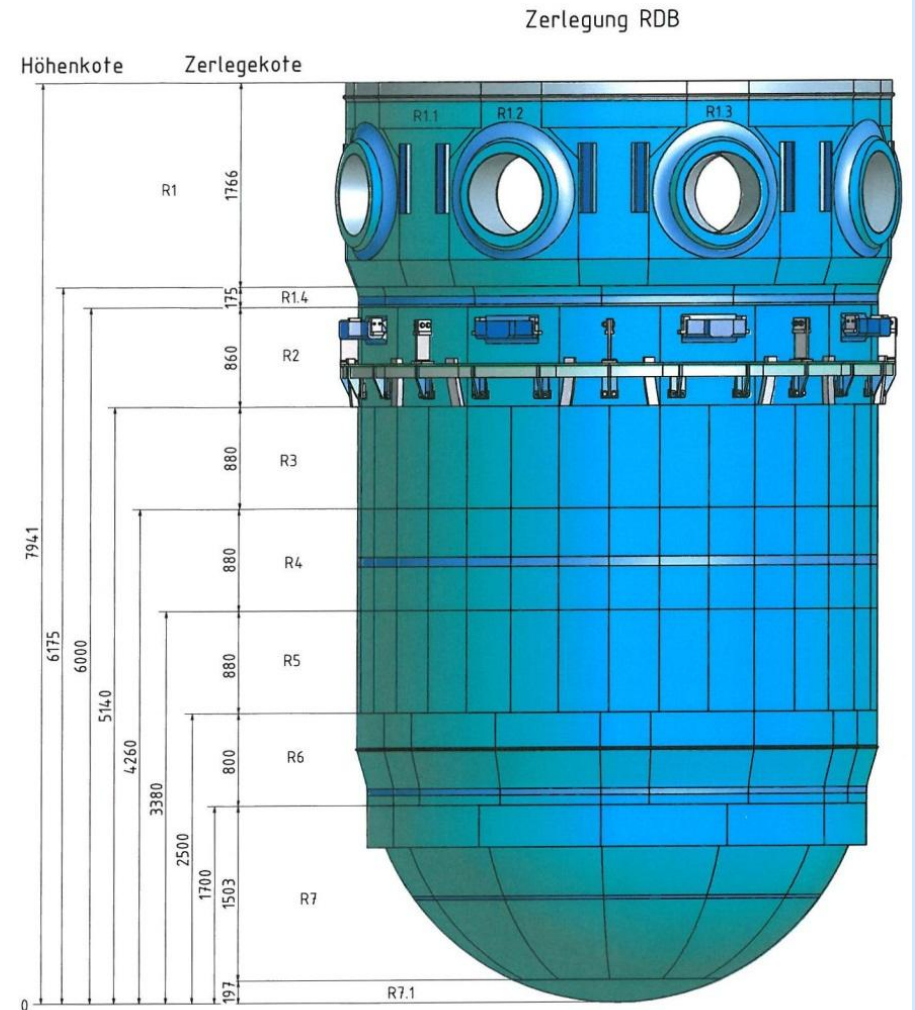


# References (2/2)

Regarding dismantling of Reactor Pressure Vessels (RPV's) - Siempelkamp has the most references worldwide

## RPV's:

- ✓ MZFR
- ✓ Stade
- ✓ ZION
- ✓ Humboldt Bay
- ✓ FERMI
- ✓ Big Rock Point
- ✓ Parr Site
- ✓ Omega West
- ✓ NASA Plum Brook
- ✓ University of Michigan Ford Nuclear Reactor

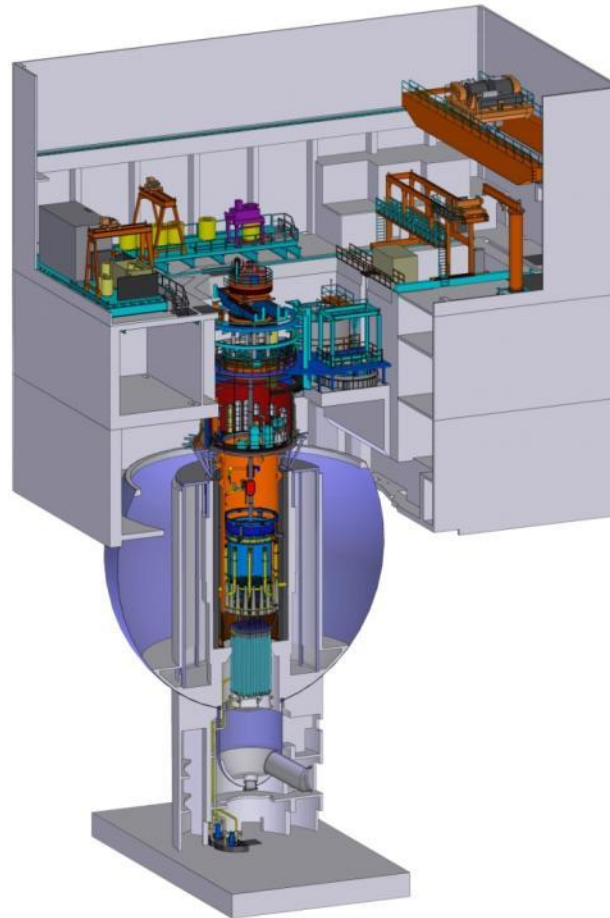


# Project phases in dismantling projects

## Contents

### Project phases in dismantling projects

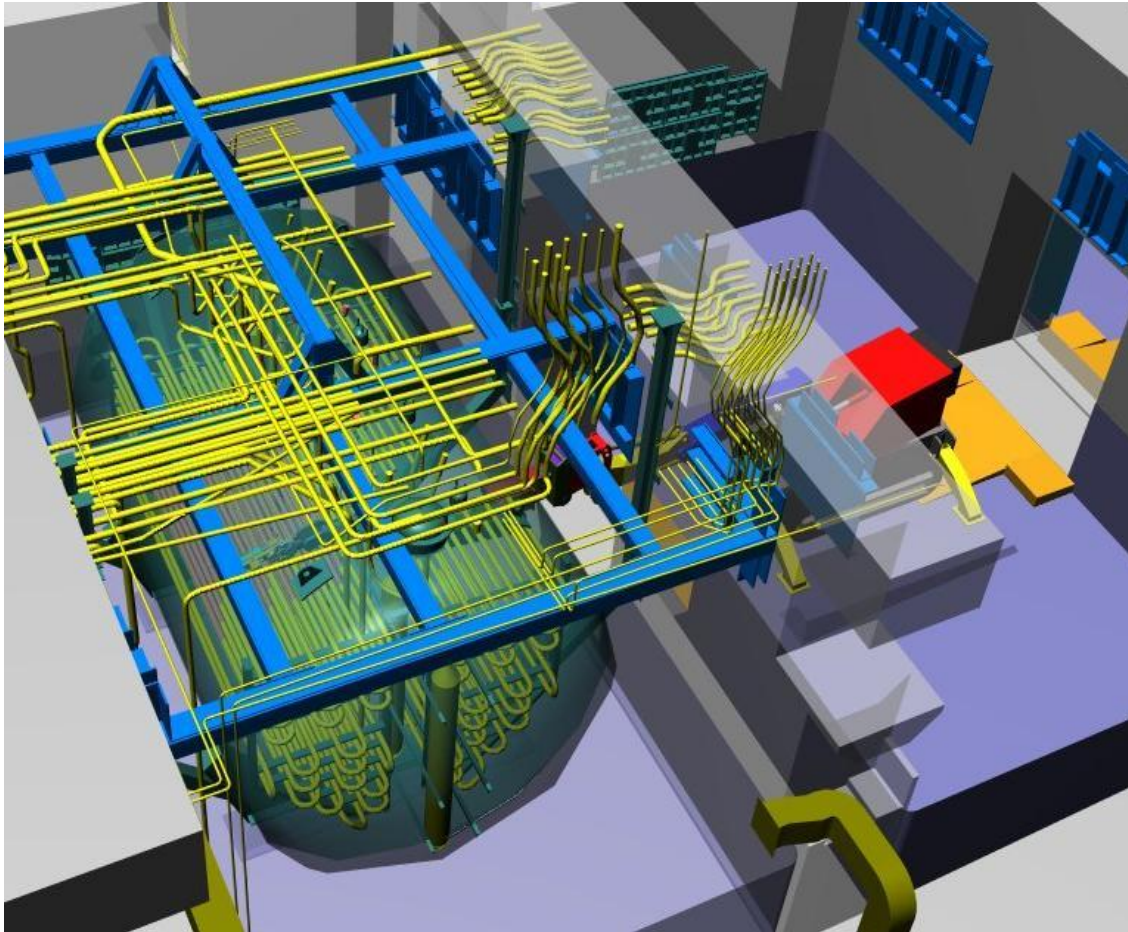
- ✓ Basic Concepts / Studies
- ✓ Licensing / Detail Planning
- ✓ Development of special tools
- ✓ Mock-Up
- ✓ Realization





# Project phases in dismantling projects

## Basic Concepts / Studies



### STI-WAK Step 5

Remote-controlled dismantling of HAWC containers in the HWL and the LAVA

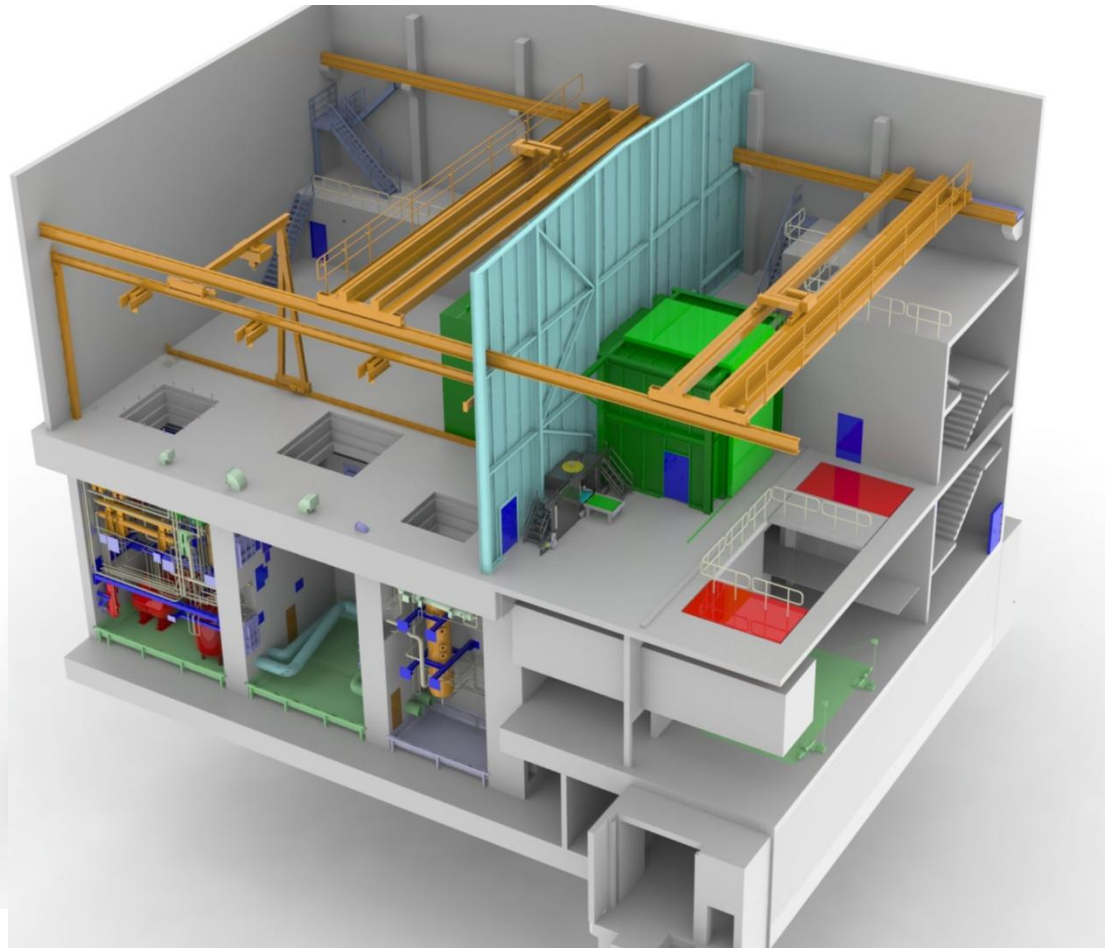
### Performances

- Planning of conception in 3D
- Preparation of specifications
- coordination of interfaces
- 3D simulation



# Project phases in dismantling projects

## Licensing / Detail Planning



### **STI-WAK Step 5 RB 5.4**

Dismantling of LAVA HA laboratory and LAVA cells L3, L4 and L5

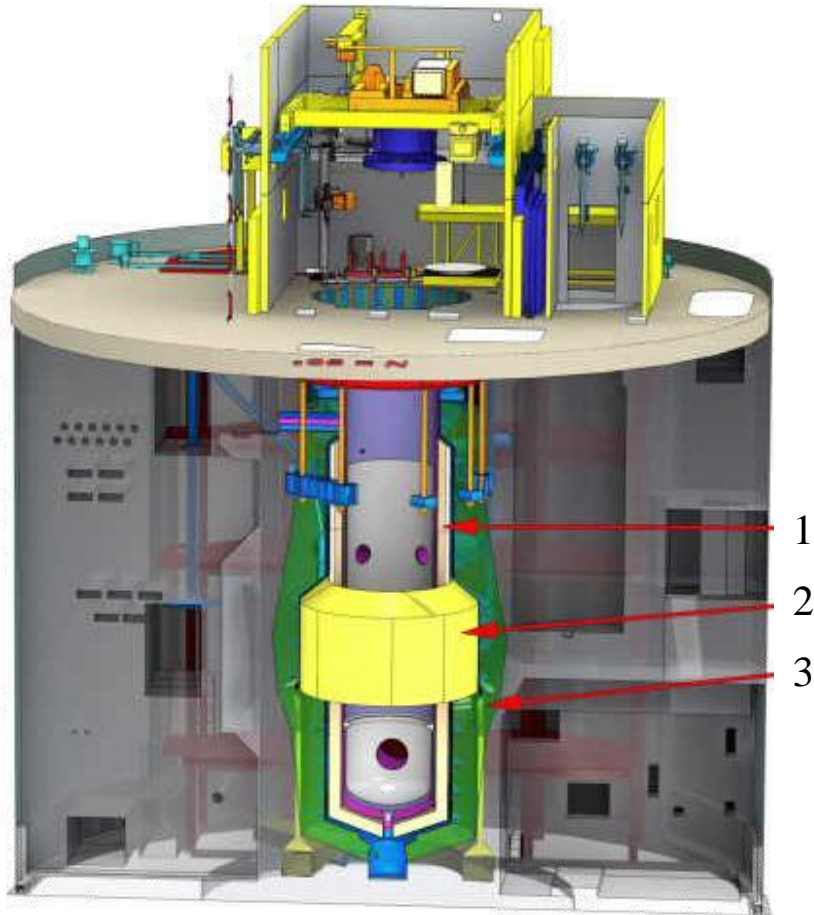
#### **Performances:**

- Planning of licensing
- Preparation of tenders

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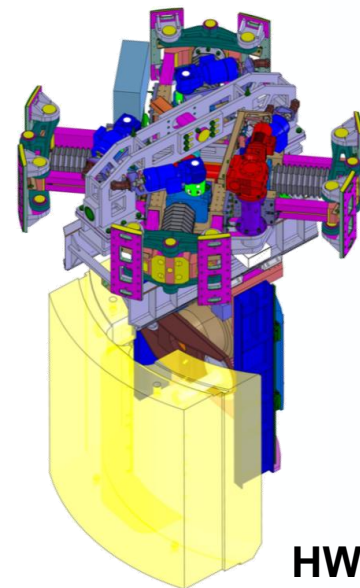
# Project phases in dismantling projects

## Development of special tools 1/2

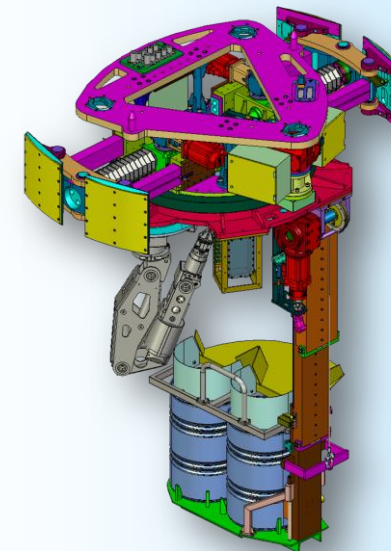


### Special Tools for KNK (Compact sodium cooled nuclear reactor facility)

- Dismantling Thermal Insulation [1] (WTS)
- Dismantling Primary Shielding [2] (HWZ)
- Dismantling of Biological Shielding [3] (Preliminary Mock-Up Test)



HWZ



WTS



# Project phases in dismantling projects

## Development of special tools 2/2



### Lifting Tool (HWZ) for KNK

Special remote controlled tool for the dismantling of up to 16t of cast iron pieces in extremely limited space

- Milling, drilling, clamping and lifting unit with 9 axes (7 linear axes and 2 rotatable axes)
- Redundant design of all axes by means of hydraulic drives



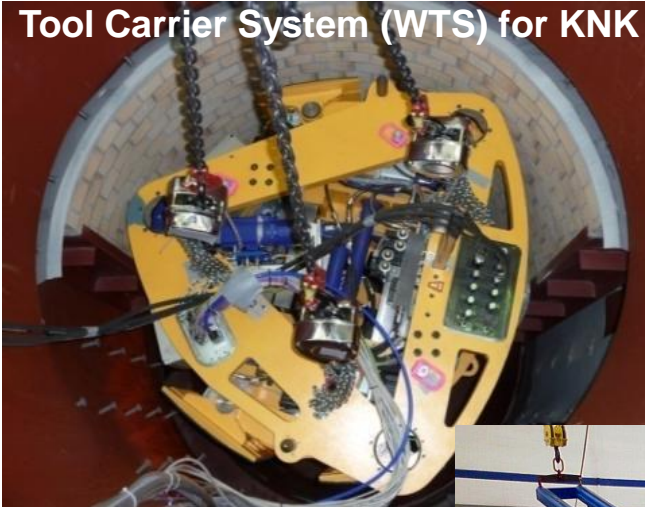
KNK



# Project phases in dismantling projects

## Mock-Up

### Tool Carrier System (WTS) for KNK



### Tool Carrier System for the dismantling of the thermal insulation

- remote controlled mechanical removal of the fireclay wall, cutting of the liner plates and stud bolts
- hydraulic driven manipulator system, application of a quick coupling system for the hydraulics



# Project phases in dismantling projects

## Realization 1/3



**Stade NPP**

**Customer: E.ON**

**Performances**

- Dismantling and packaging of reactor pressure vessel, thermal insulation of RPV, neutron shielding chambers



# Project phases in dismantling projects

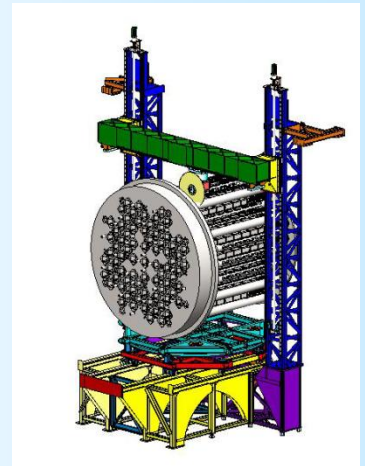
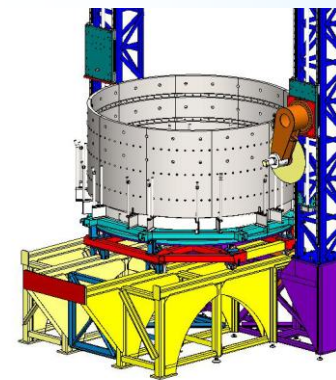
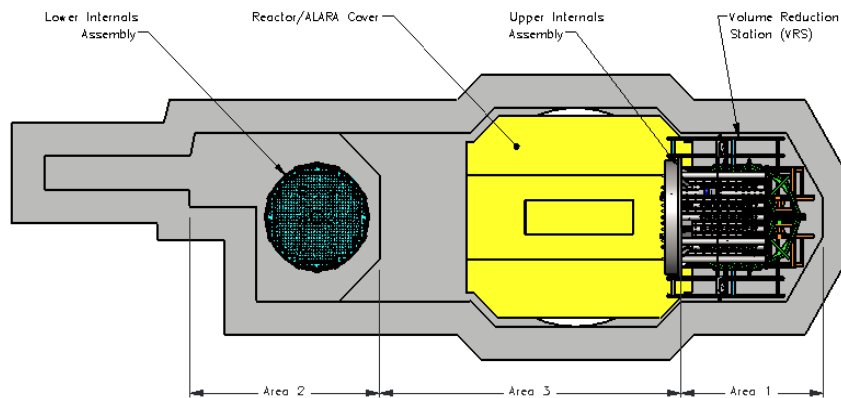
## Realization 2/3



**Customer: Zion Solution**

### Performances

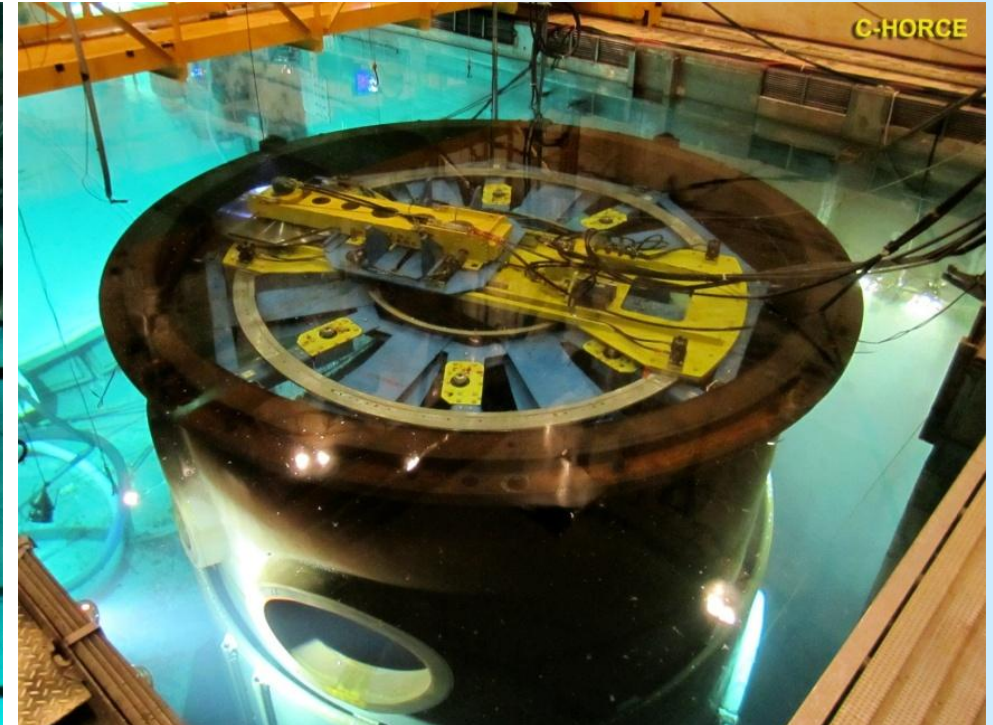
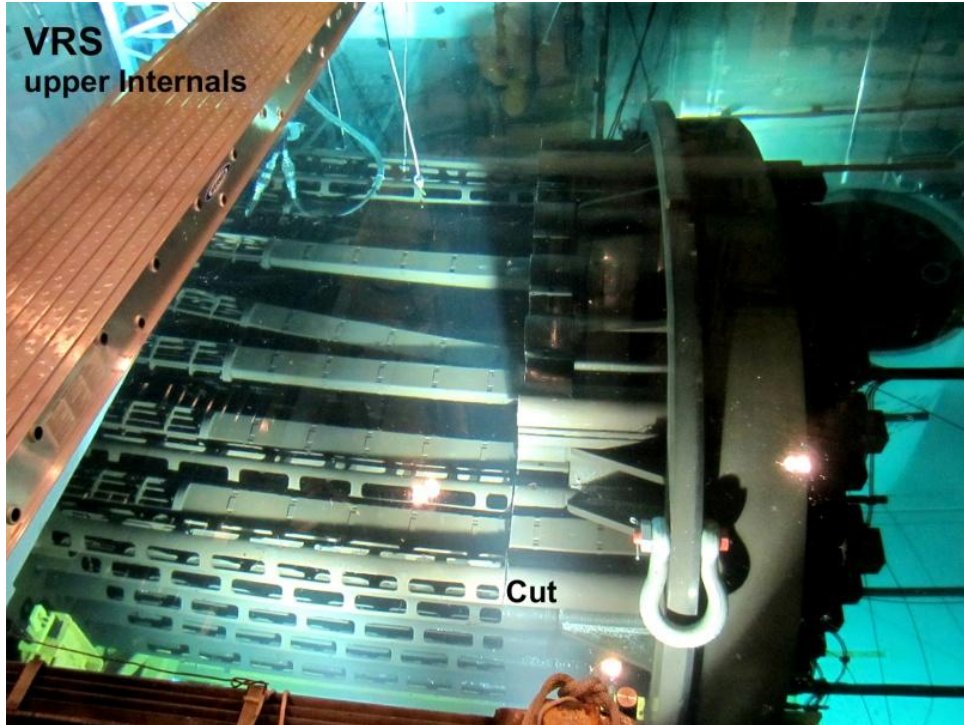
- Mechanical dismantling and packaging of reactor pressure vessel including internals
- Waste management



**VRS in different configurations**

# Project phases in dismantling projects

## Realization 3/3





# Conclusion

**Excellent ideas, good and proven remote controlled technique  
realised as high-tech paired  
with robust and easy approach in decommissioning projects**

- ✓ **Proven technologies**
- ✓ **Optimization of dismantling approach**
- ✓ **Waste Minimization**
- ✓ **Modular design of tools**
- ✓ **Cost efficiency**
- ✓ **In-time and budget**
- ✓ **Experienced experts on site**