DE LA RECHERCHE À L'INDUSTRIE

cea den

JULES HOROWITZ REACTOR

Update of JHR Project

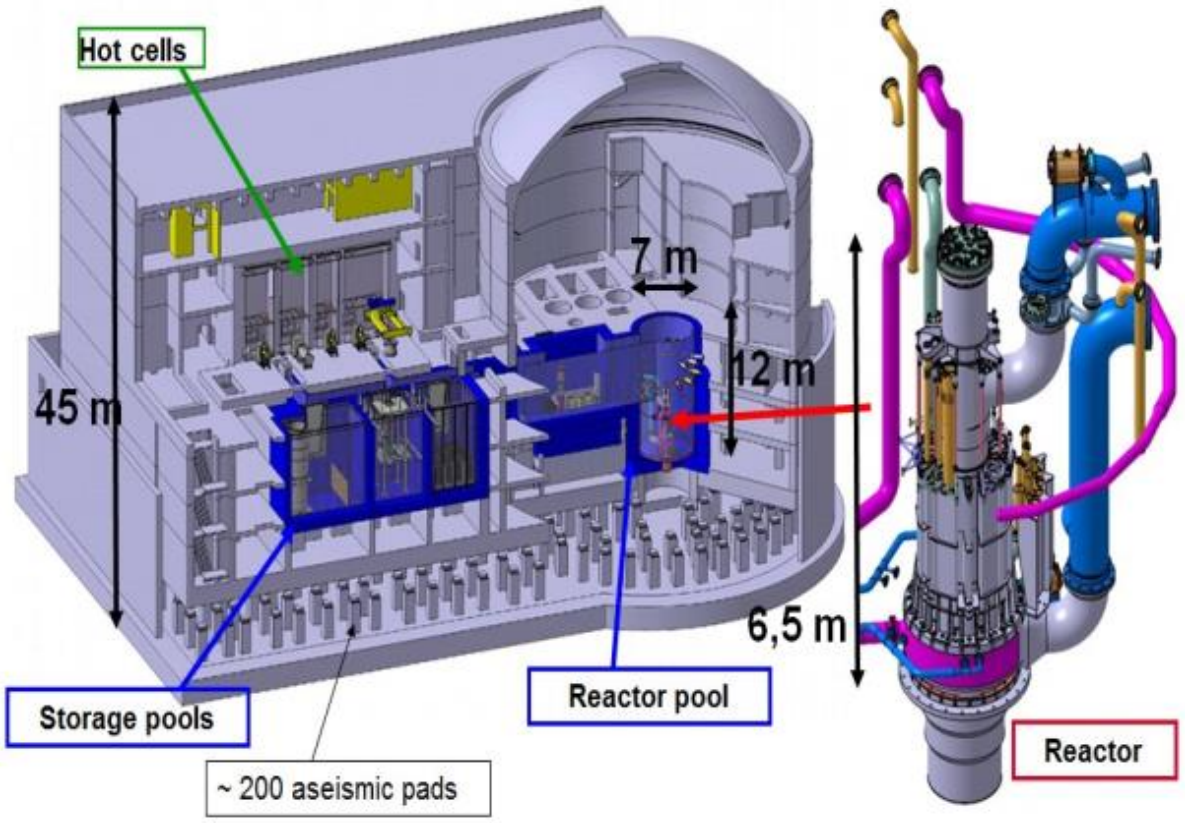
Site construction and Plant manufacture

Réacteur | Jules | Horowitz | Reactor

Jules Horowitz Reactor

- Material Testing Reactor : 100 MW th
- Design to simultaneously accomodate a large number of core and reflector experiments, with a very large range of thermal and fast flux level

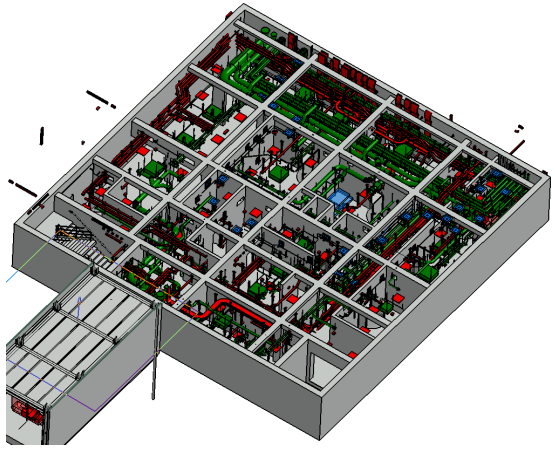
=> Ambitious conception and challenging manufacturing for the reactor pile-block



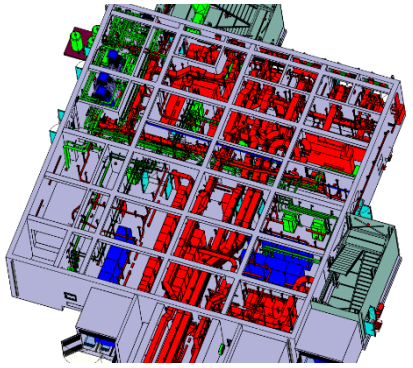
Site construction

Formal acceptance of civil works in April 2018

Fluids/ Ventilation/ Electricity contracts
Installation in the BAV building

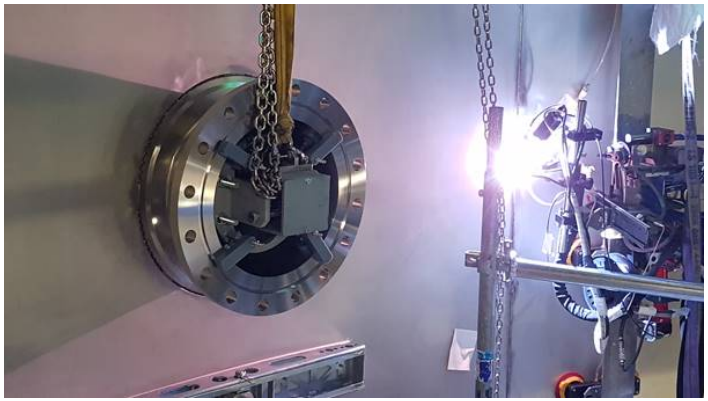


Mock-ups



POOL LINER

Sheet metal welding
RER pool lining

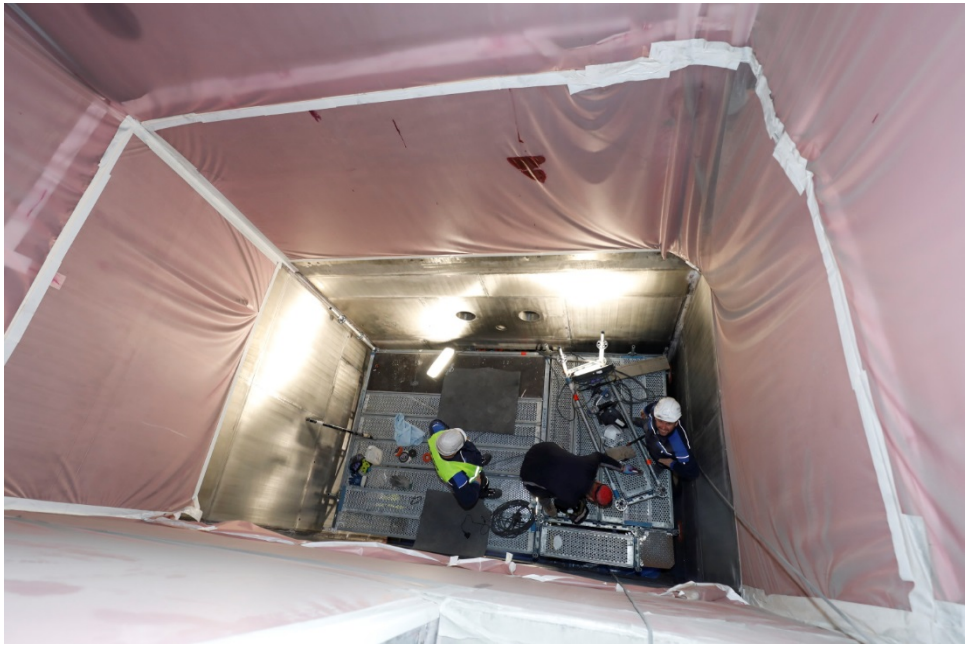


Full welding D9

Welding and concreting of segment 2

PRIMARY HEAT EXCHANGERS

HOT CELLS



Pile Block Reactor

Closure head (stainless steel)

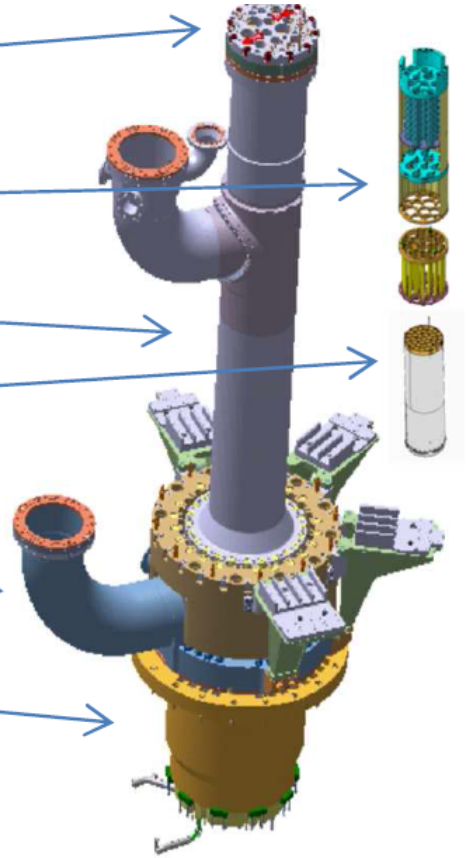
Upper support column Core vessel

Core vessel (forged Al 6061T6)

Fuel rack (forged Al 6061T6)

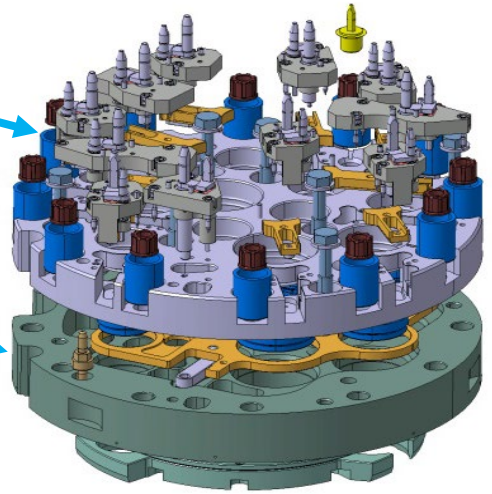
Water Boxes (blank forged steel)

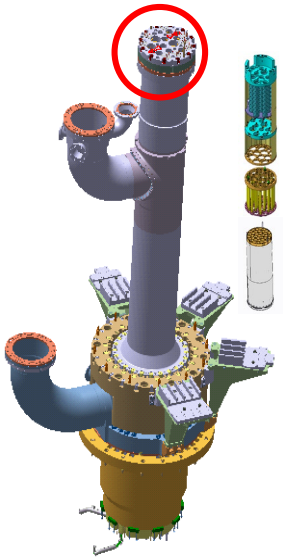
Plug (blank forged steel)



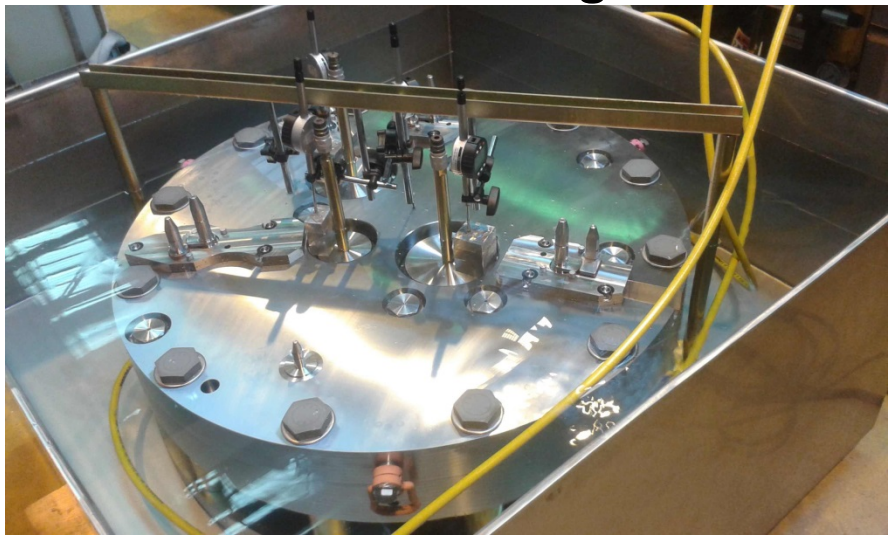
Closure Head

- Confinement of primary coolant
- Anti blow out of experimental devices by double locking system





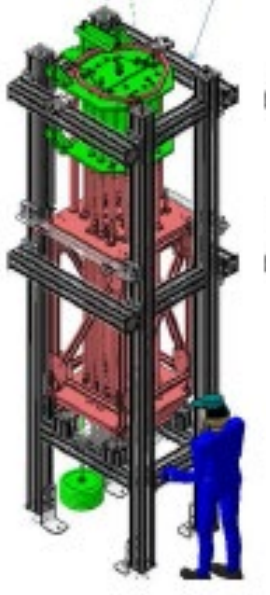
- Representative model to validate this concept
  - No specific difficulty in manufacturing

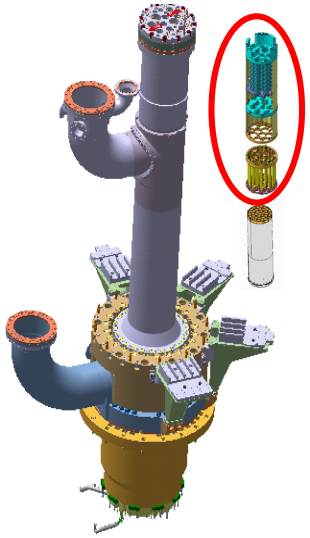


Upper Support Column

- It prevents the blowout of the fuel rack.
- It participates in supporting experimental devices
- Tight tolerances required realization of prototype

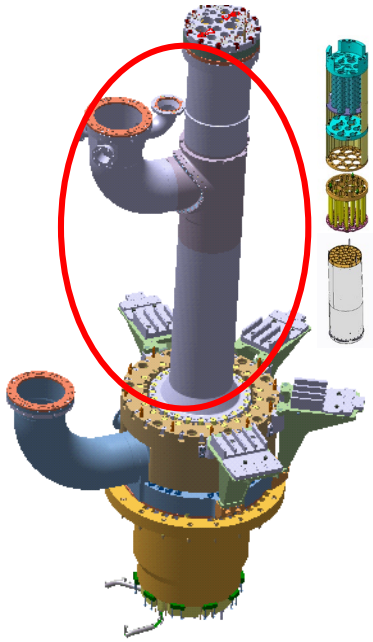
- Mock-up used to validation introduction and extraction of the component

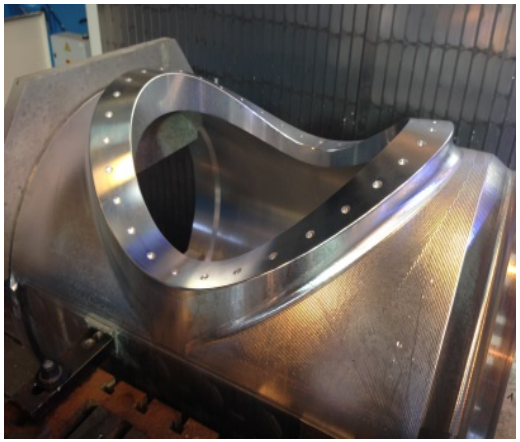


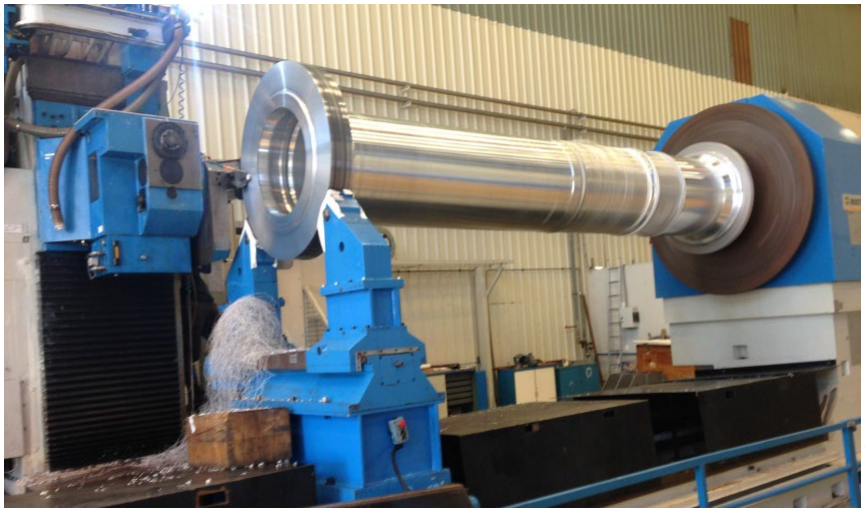


Core Vessel (1/2)

- Main characteristics :
  - height: 5185mm
  - diameter: 716mm
  - thickness: 20mm
  - material: forged Al 6061T6 (neutron perf.)
  - ESPN N2 Cat.II, RCC-MX level 1
- Very tight tolerances, such as 0.1 mm cylindricity and 0.2 mm coaxility in the core area
- Manufacturing complexity, in particular, for the « horse saddle » flange.

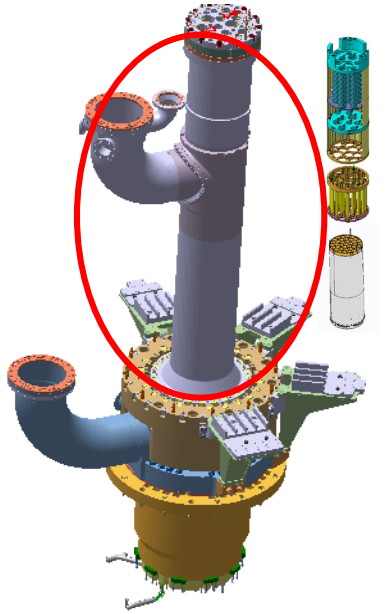


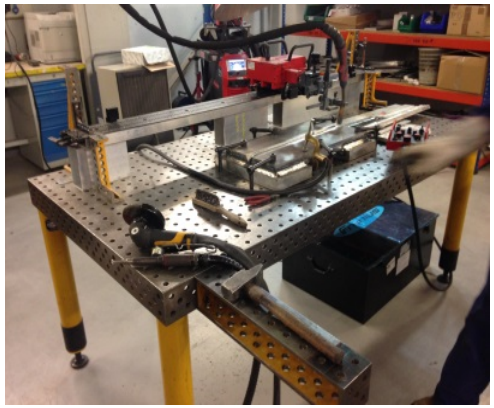


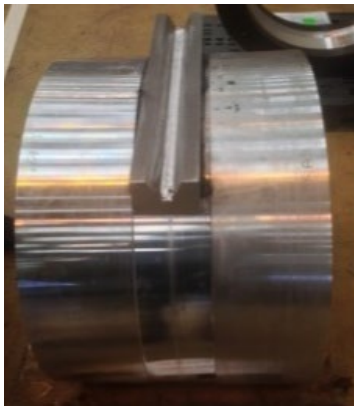


Core Vessel (2/2)

- **Welding of the aluminium blanks (final thickness 20 mm) performed with the electron beam method, completed by a recovery in MIG in the closure area of the electron beam weld**

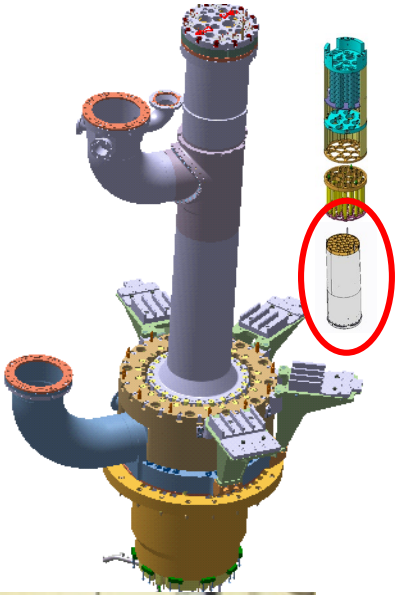


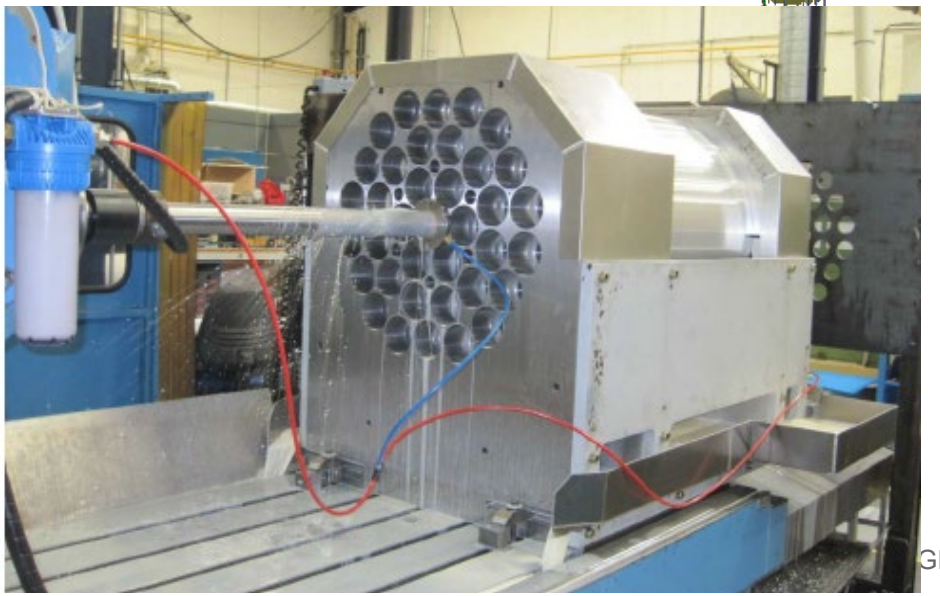




Fuel Rack (1/2)

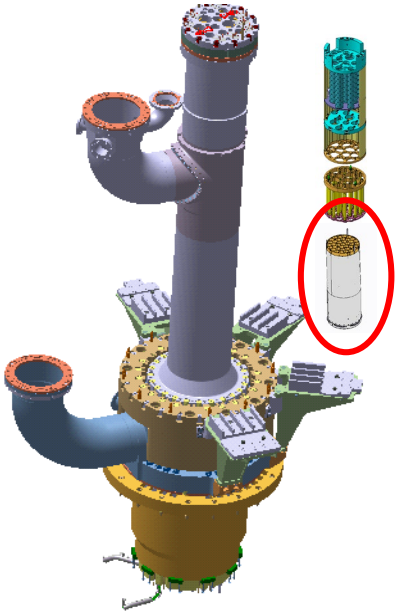
- It accomodates fuel elements, inter-element mandrels, irradiation rigs, core pressure loss and output pressure measurements
- material: forged Al 6061T6
- some prototypes needed





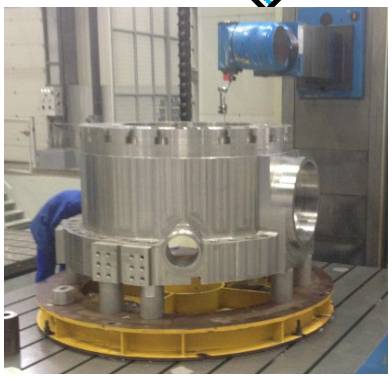
Fuel Rack (2/2)

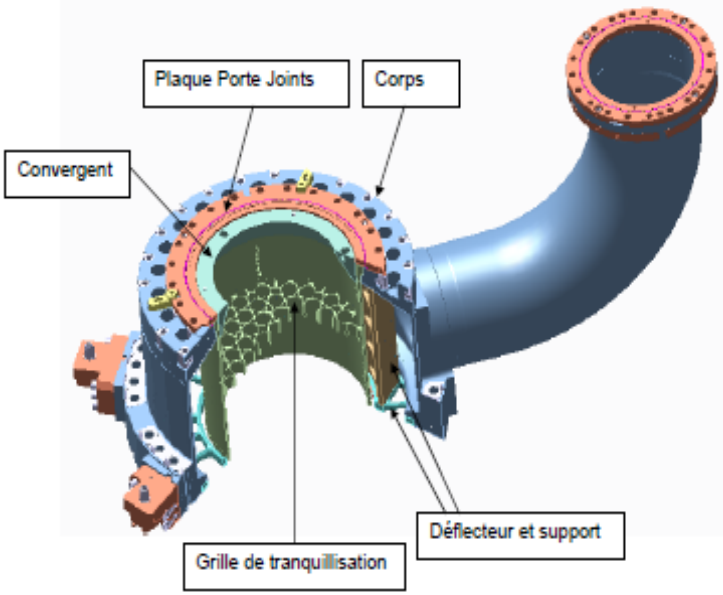
- **Done**



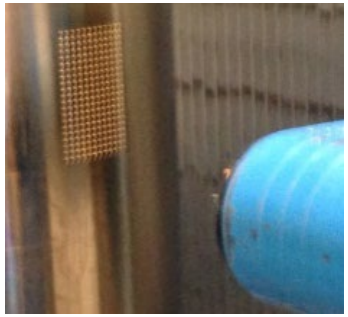
Water Box (Primary cooling system) (1/2)

From blank to final dimensions



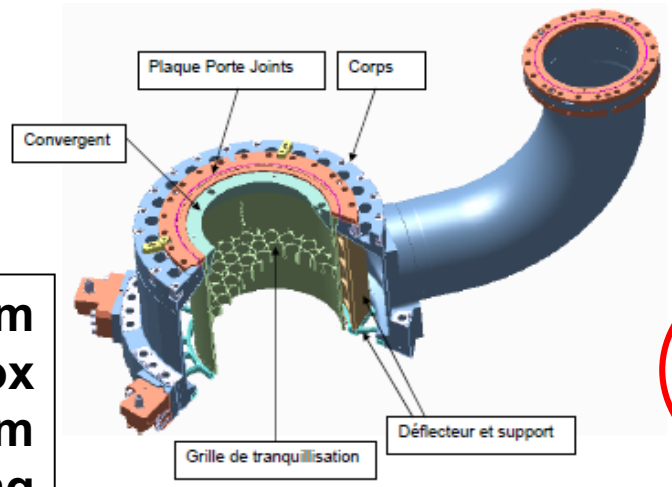


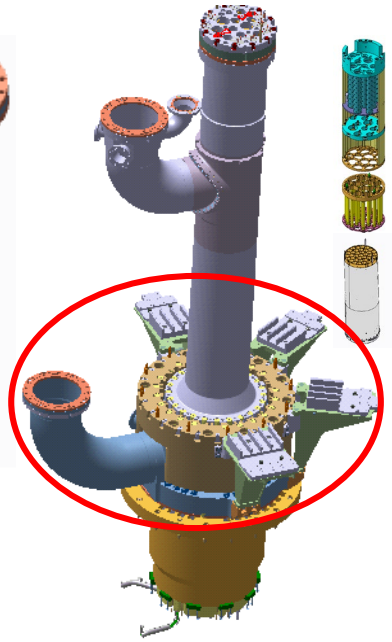
Stilling grid needs 17000 calibrated holes



Water Box (Primary cooling system) (2/2)

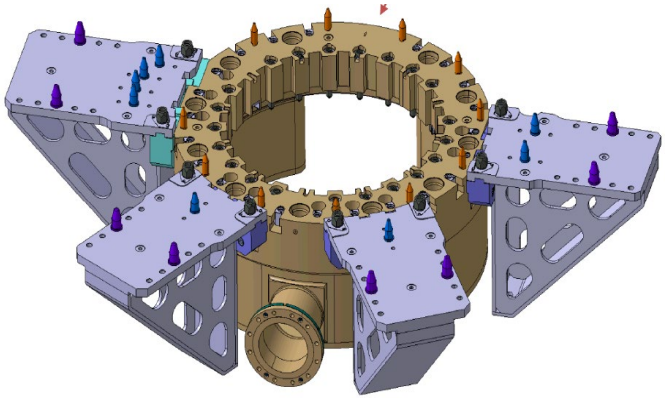
- Issue: Homogenity of hydraulic distribution
- Mock-ups
- CFD 3D calculations



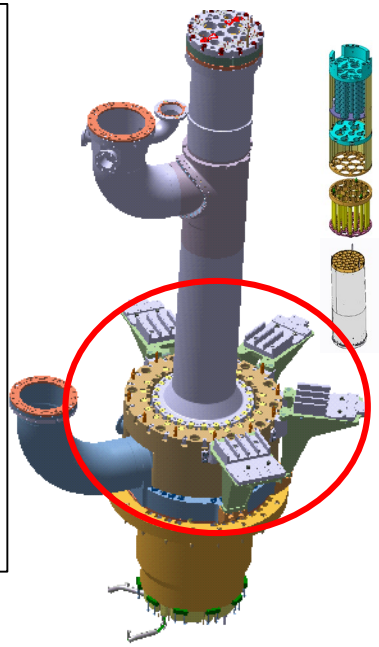


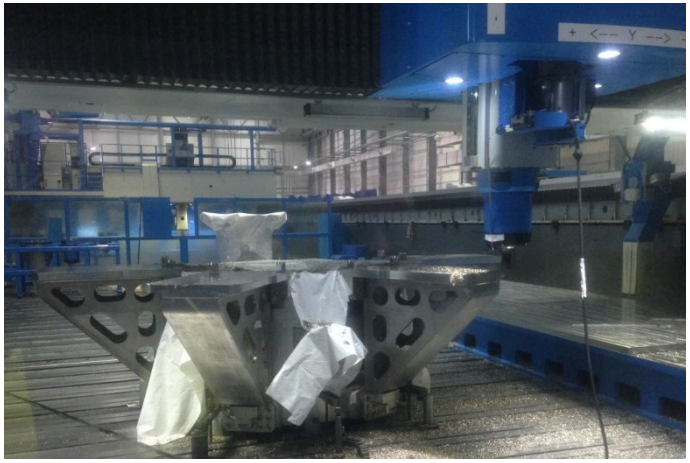
- Welding of the Φ 600 mm pipe with the body of the box realized with electron beam method with a positioning controlled by laser tracker

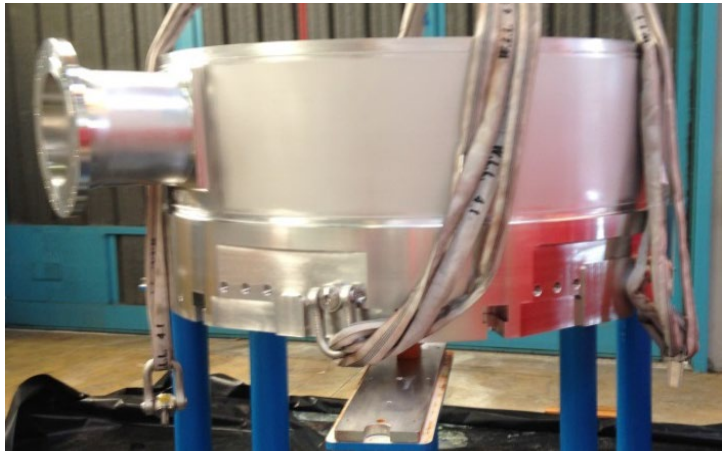
Water Box (Reflector)



- It allows the cooling of the reflector and experimental devices from the reactor pool
- It supports displacement systems with chairs and fixing interfaces
- Very tight manufacturing tolerances

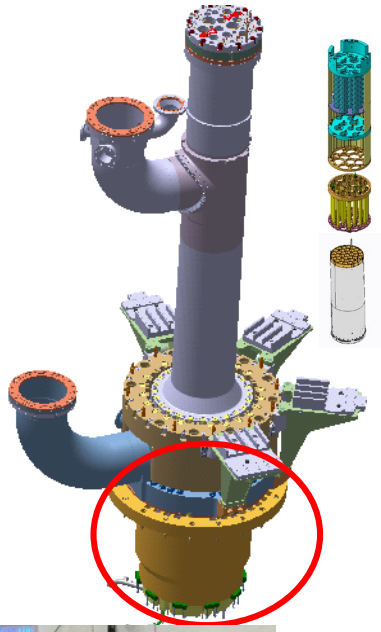


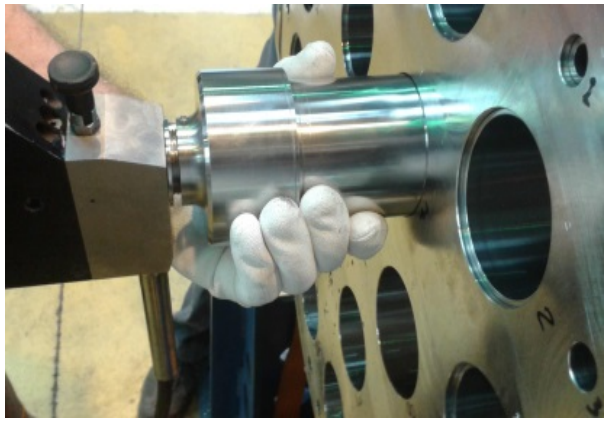


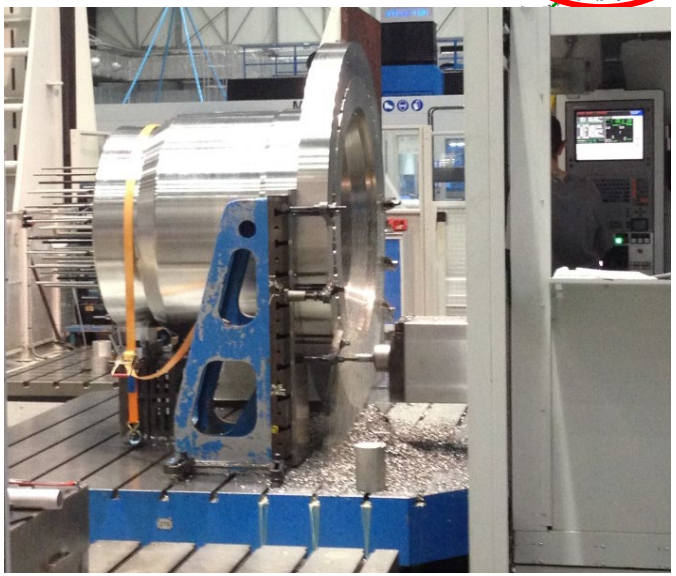


Plug

- It allows the guiding of the control rods of the mechanisms (sheath of the mechanisms),
- It ensures the integrity of the 2nd containment barrier, contributes to the sealing between the water reactor pool and the crypt
- It limits the dose rate received by operators during crypt interventions (thanks to its filling with barite sand).







Hydrostatic test

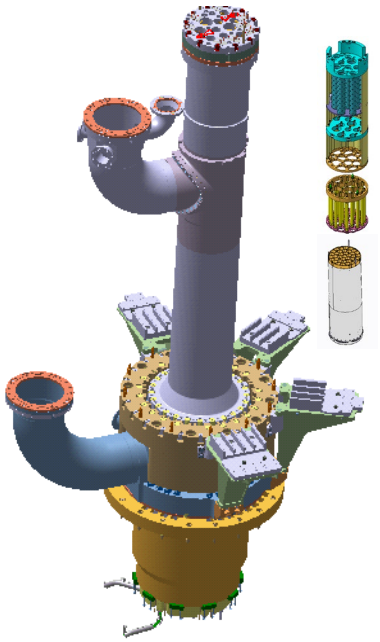
ESPN regulation rated components under a hydrostatic pressure test of 23 bar

Core vessel and closure head

Primary water box and plug

Pile Block Reactor

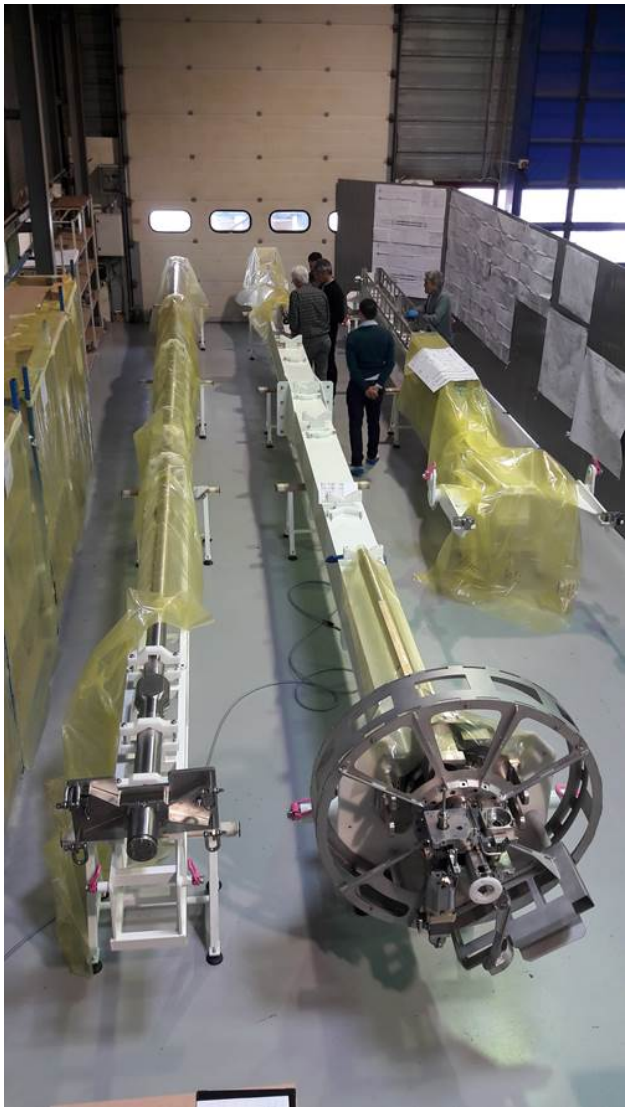
- **Pile block reactor :**
  - **Completed manufacturing**
  - **Whole equipment tested**
  - **Blank mounting done**



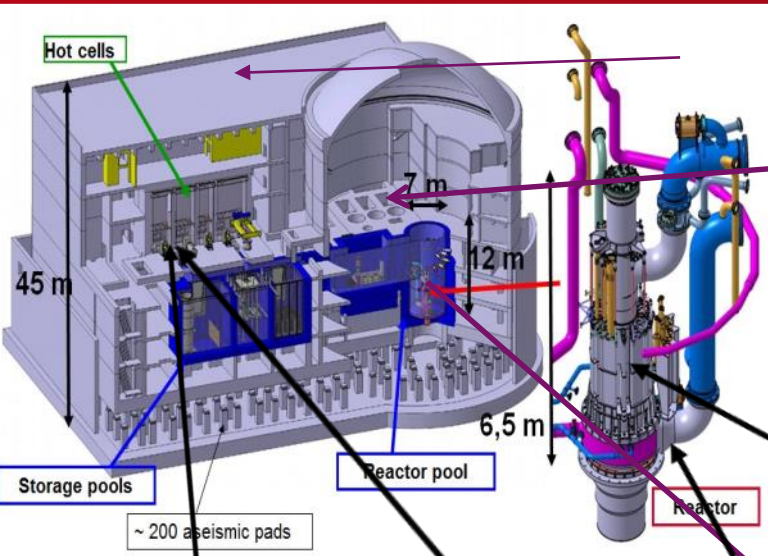
Assembly of the loading machine

Construction and assembly of the RMT platform

DRG mast and RCM column



Update of JHR project (site construction and Plant manufacture)

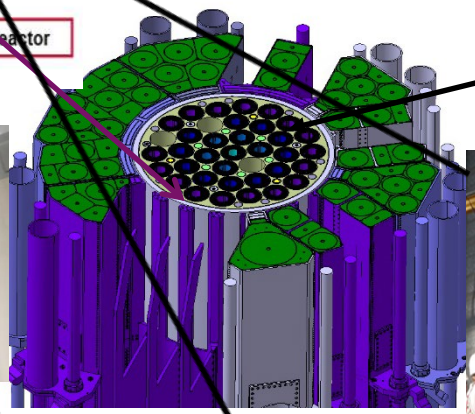


Ventilation-Fluids-circuits

Primary Circuit Heat Exchangers

Lining the hot cells

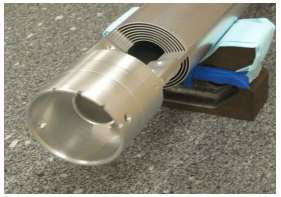
Installing lead panels



Core Vessel

Casier for fuel elements

Water Box and primary system junction



First Fuel elements under fabrication

Conclusion

Next Step : Assembly on JHR site

Thank you for your Attention