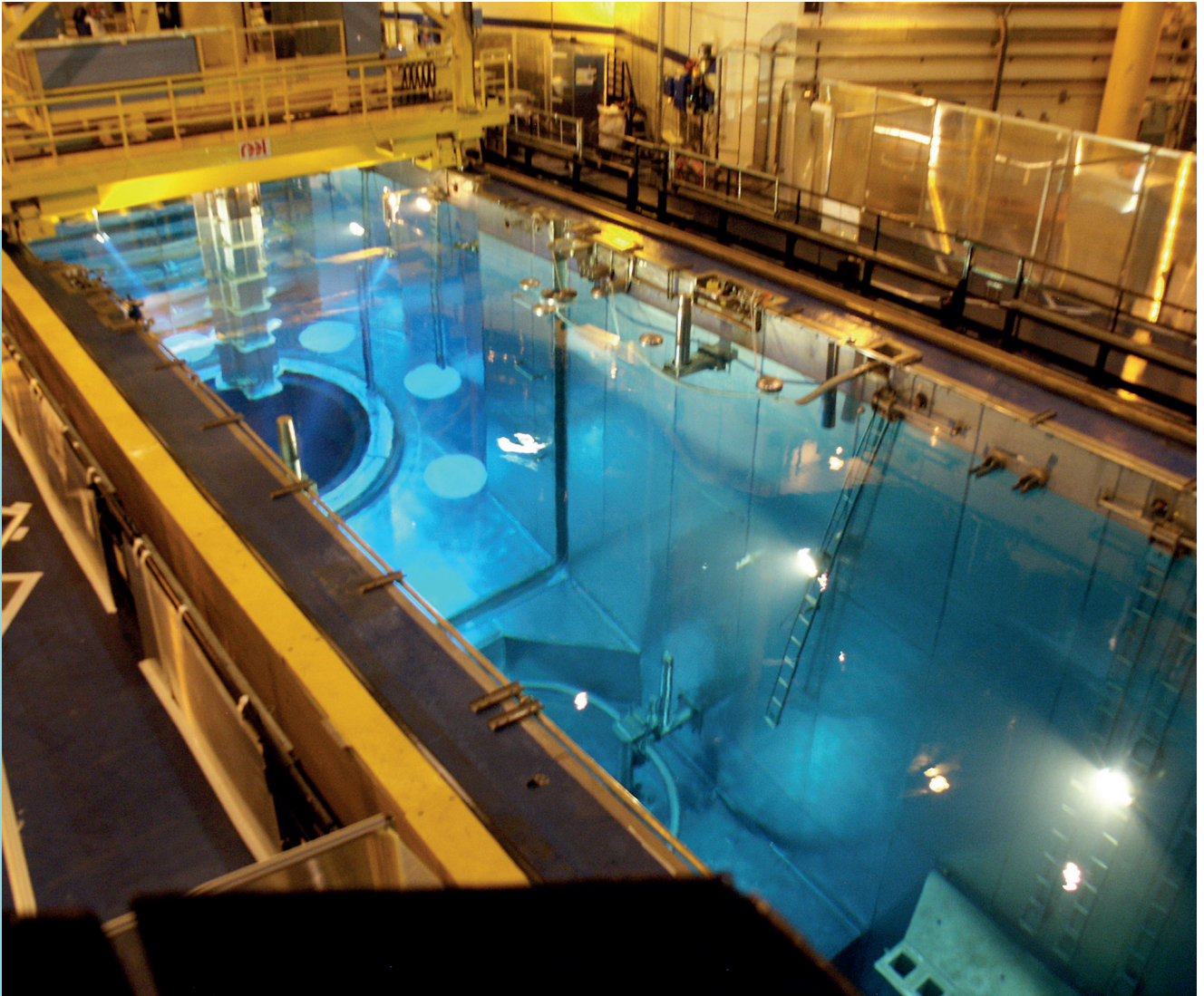


# Opening and closing of reactor pressure vessels



Specific expertise

[johncockerill.com/services](http://johncockerill.com/services)



A nuclear power plant outage involves opening the reactor pressure vessel and removing the reactor head to perform fuel replacement while carrying out mechanical and valve maintenance operations.

**John Cockerill Services has developed specific expertise in RPV opening and closing operations for various types of outage:**

- Simple refueling outage
- Partial intervention
- Ten-year inspection

### Expertise

Operations on different types of reactors : 900 MW – 1300 MW

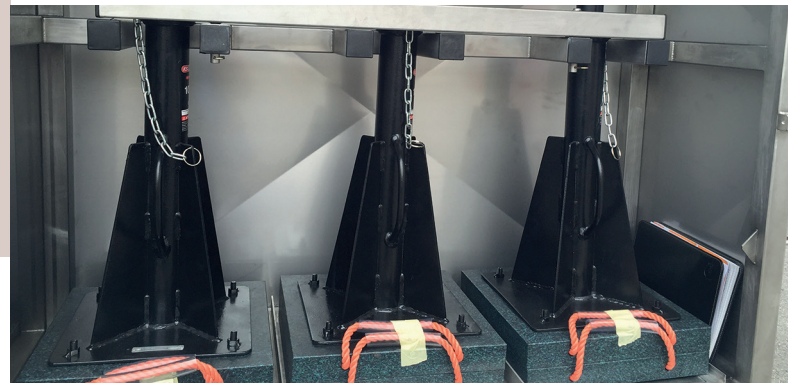
- Provisions for experts in video-inspections
- Advanced skills in nuclear valves and fittings
- Assist our customers in their progress-making approach (safety, security) by designing and supplying specific equipment and for the RPV opening & closing
- Expertise in bolted joints

### Benefits

- Teams trained continuously with the required certifications to operate on nuclear sites
- Significant measures taken for the protection of the operators and their environment
- Significant references: Engie and EDF Removal of the vessel pin tightening and loosening machine to position the machine on the stand
- Make proposals to improve methodologies and equipment utilized in RPV opening and closing operations

### Process Improvement

- Design and supply (CNPE Gravelines & St Laurent Des Eaux) of safety equipment for the operation of the TRIPODE hoist for handling of the RPV head. This piece of equipment ensures personnel safety and compliance to applicable hoisting regulation.
- Design of a new footbridge for the TAM (equipment lock) for personnel safety when opening the reactor building and moving equipment into it during outage.



### Opening phases

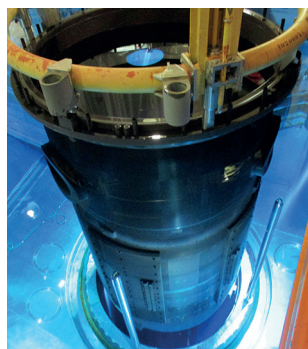
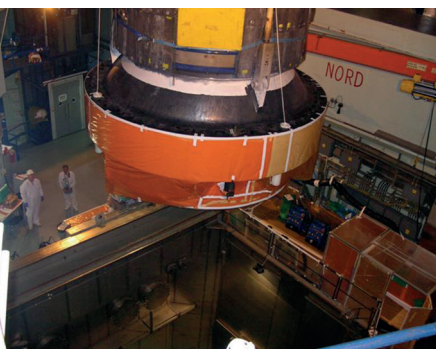
- Stripping down of the vessel cover: removal of the seismic slab, removal of the insulation, disconnection of the thermocouples, removing of the vessel level measurer, lifting of the antiseismic rods, lifting of the cable ducts, etc.
- Positioning of the vessel pin tightening and loosening machine (MSDG) on the reactor head (to loosen and unscrew the vessel pins)
- Expert examination and cleaning of pins and studs before greasing
- Removal of the reactor head and placing it on its stand
- Disconnecting the control rods
- Removal of the upper internal equipment (EIS) and placing it on its stand
- Unloading of the fuel and storing it in the pool (fuel building)
- Video assistance during fuel unloading and transfer into the fuel building (BK)

### RCD stage (reactor totally unloaded) :

- Maintenance on all equipment in pressure vessel and RPV head
- Maintenance on RPV studs
- Video inspections on fresh and used fuel assemblies

### Closing stage

- Video assistance while reloading fuel in the reactor vessel
- Positioning of the upper internal equipment (EIS) in the vessel
- Connecting the control rods
- Positioning of the head on the reactor vessel
- Positioning of the vessel pin tightening and loosening machine on the cover (to screw the pins and tighten the cover)
- Reassembling of the reactor head (lowering the cable ducts and seismic rods, positioning of the thermocouples, vessel level measurer, insulation, seismic slab, etc.)



### References



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