

## The R83 type B(U) transport package for used LEU fuel: a versatile package – HOTLAB 2018

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The International Atomic Energy Agency (IAEA) is very active in international efforts to minimize and eventually eliminate the use of Highly Enriched Uranium (HEU). A significant portion of this support involves the conversion of research reactors (RR) from HEU to low enriched uranium (LEU) fuel and radioisotope production targets<sup>1</sup>.

### **Design of a new package for NRG**

To cover the need of Nuclear Research and Consultancy Group (NRG)<sup>1</sup> to transport used LEU fuel from the High Flux Reactor (HFR) in Petten and Hoger Onderwijs Reactor (HOR)<sup>2</sup> in Delft to the intermediate storage facility HABOG at COVRA, Nieuwdorp, as well as waste from the Mo-99 production from its facilities in Petten, ROBATEL Industries is licensing a new type B(U) fissile package, the R83.

One of the challenges to design this package has been to comply with the latest IAEA regulations for the safe transport of radioactive waste while allowing a simple handling at both the HOR and the HFR where the package is loaded underwater, as well as at the HABOG facility in COVRA where the basket is unloaded and placed as a whole in a welded canister for final storage.

### **Involving of the ROBATELS' innovations in the design process**

The final design of this package is based on the multilayer approach stainless steel/lead/neutron absorber that has been the hallmark of ROBATEL Industries' type B(U) packages for the last decades and include the classic ROBATEL Industries PNT7™ concrete as the neutron absorber but also the new FENOSOL™ foam for shock absorbers. To the opposite of wood traditionally used as a shock absorber, this chemical-resistant, moisture-resistant foam is isotropic, avoiding sensitivity of shock absorption with the drop orientation. The drop tests performed with the R83 scale model provide once again the demonstration of the mechanical capabilities of this foam. Moreover, FENOSOL™'s very low heat conductivity and fire resistance make of it an excellent heat and fire protection.

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<sup>1</sup> Nuclear Research and Consultancy Group (NRG) is a Dutch institute that performs nuclear research for the government and private companies. It is the most important producer of radionuclides in Europe and maintains and operates the Petten nuclear reactor. NRG is an internationally operating nuclear service provider.

<sup>2</sup> HOR is a pool-type research reactor situated at the Interfaculty Reactor Institute of the Delft University of Technology and has been operated since 1963. It is the one and only university type research facility of its type in the Netherlands.

The main R83 package characteristics and performances are summarized below by focusing on the main safety issues according to regulations.

Table 4: Dimensions and mass of the R83 package model.

Dimensions	Values
Overall Height	≈ 2 140 mm
Outside diameter with shock absorbers	≈ 2 050 mm
Cavity height	950 mm
Cavity diameter	743 mm
Loaded package mass	≈ 16 200 kg

Table 5: Performances of the R83 package model.

Properties	Values
Content maximum mass	1 000 kg
Shielding materials	Refine pure lead Compound PNT7™ Stainless steel Boronated stainless steel
Thermal protection	Compound PNT7™ FENOSOL™ phenolic foam
Containment	EPDM double O-ring system
Closure system	36 x M24 bolts

### Progress of the project

In January, 2016 ROBATEL Industries started the project of a new cask R83, Figure 45. The package design safety file was submitted in the end of 2017 to The Authority for Nuclear Safety and Radiation Protection (ANVS) of Netherlands. This year we have started manufacturing of two R83 casks. By the end of 2018 we plan to obtain its Type B(U) fissile license. In 2019 this package needs to be available to guarantee the transportation of LEU material.

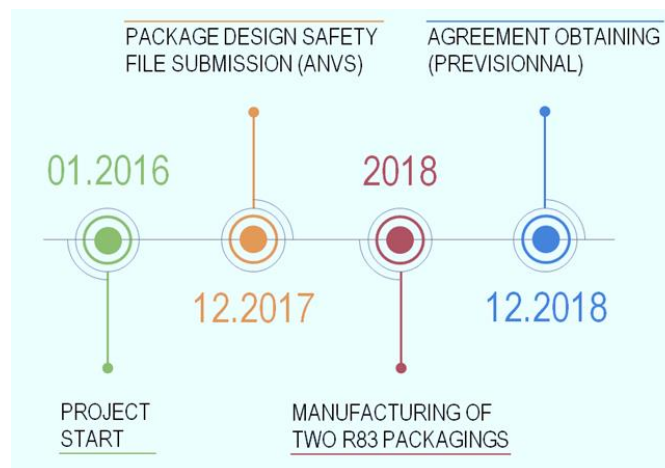


Figure 45: Progress of R83 project.

The schematic image of R83 is given on the Figure 46.

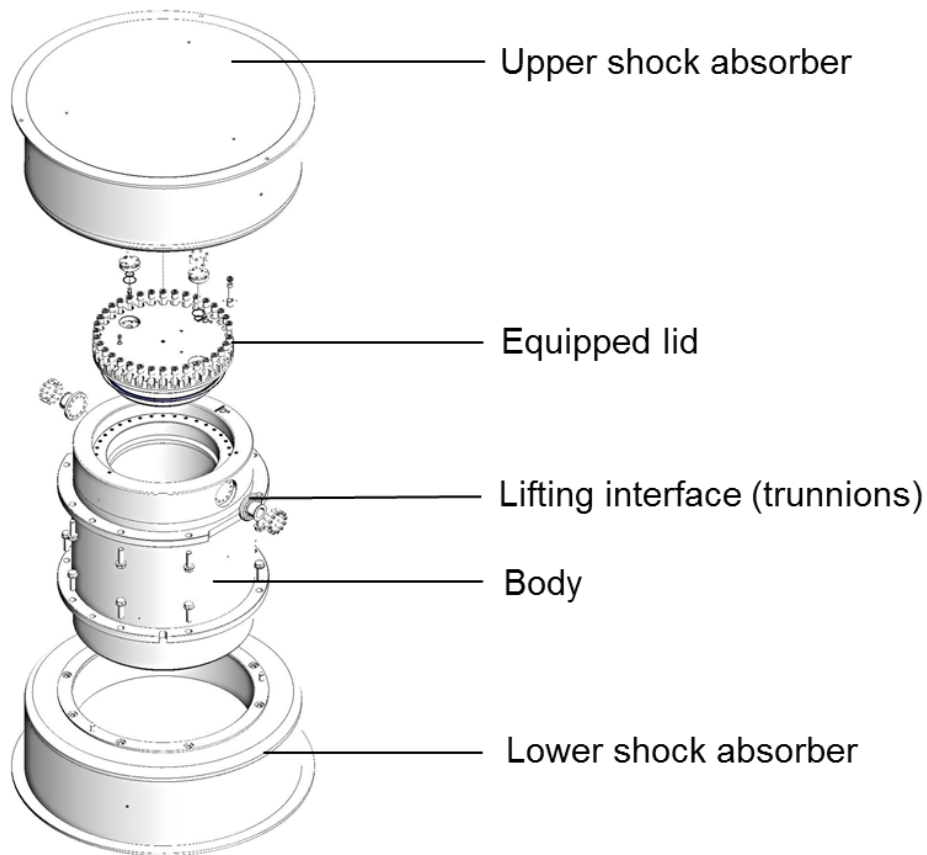


Figure 46: Packaging R83.

### Conclusion

ROBATEL has proven that we can design and deliver solutions that fit the best technical and economical requirements for type B packaging. This new cask will replace the current CASTOR MTR-2 cask in view of the conversion of fuel from HEU to LEU. ROBATEL will supply licensing, manufacturing, operation and maintenance documentation packages for this project. Thanks to ROBATELs' expertise and experience in cask licensing, this full cask project will be delivered within 3 years after contract start.

### Reference

"IAEA Support of Research Reactor HEU to LEU Fuel Conversion", Research Reactor Section from [www.iaea.org](http://www.iaea.org)