

UdD Lot 3.1 – TEΩ 2.0 Robotics@Orano

CERN - KUKA - Orano Meeting

A. COUDRAY

20/09/23

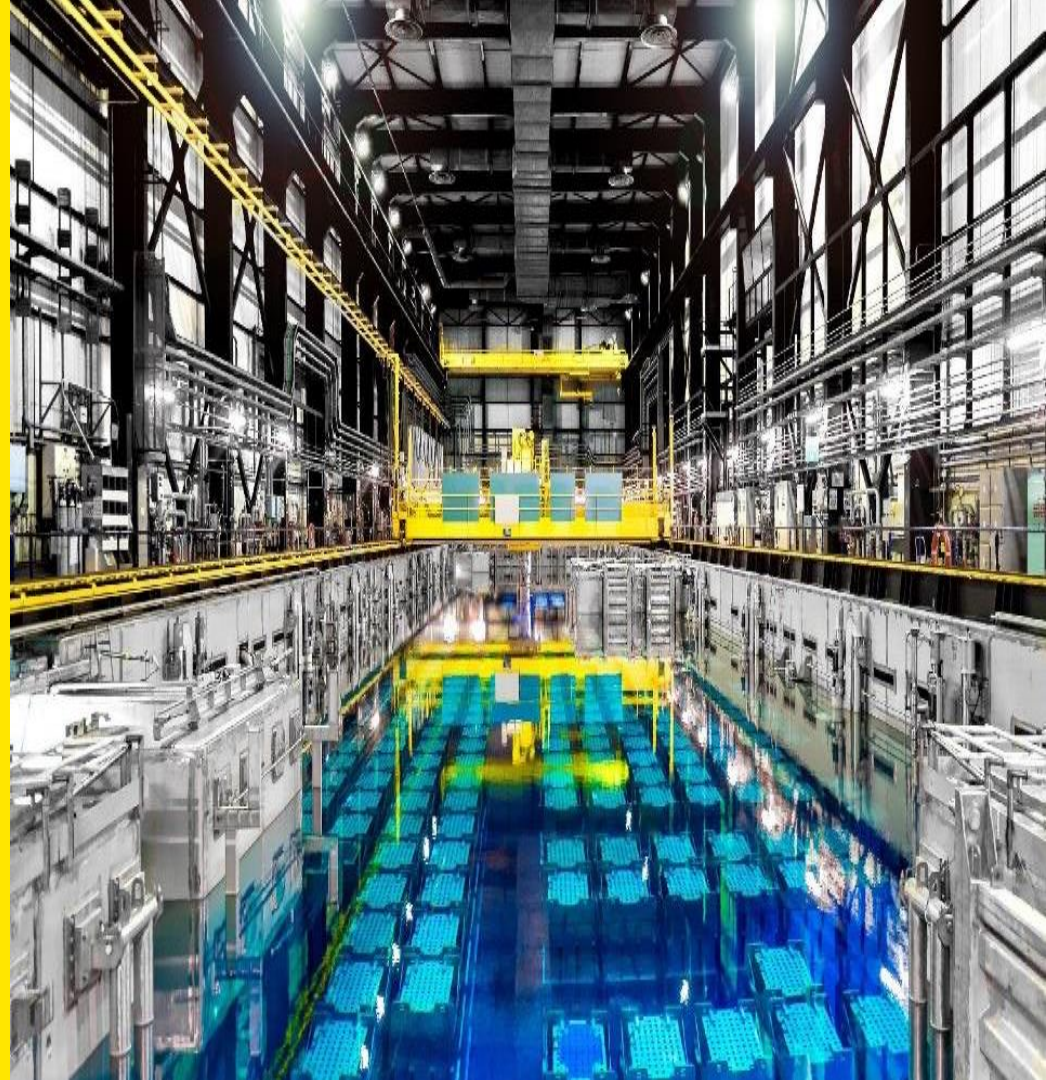
Diffusion Limitée Orano



orano

01

Orano, in few words



The Group as an international leader

€4.2 Bn
of turnover

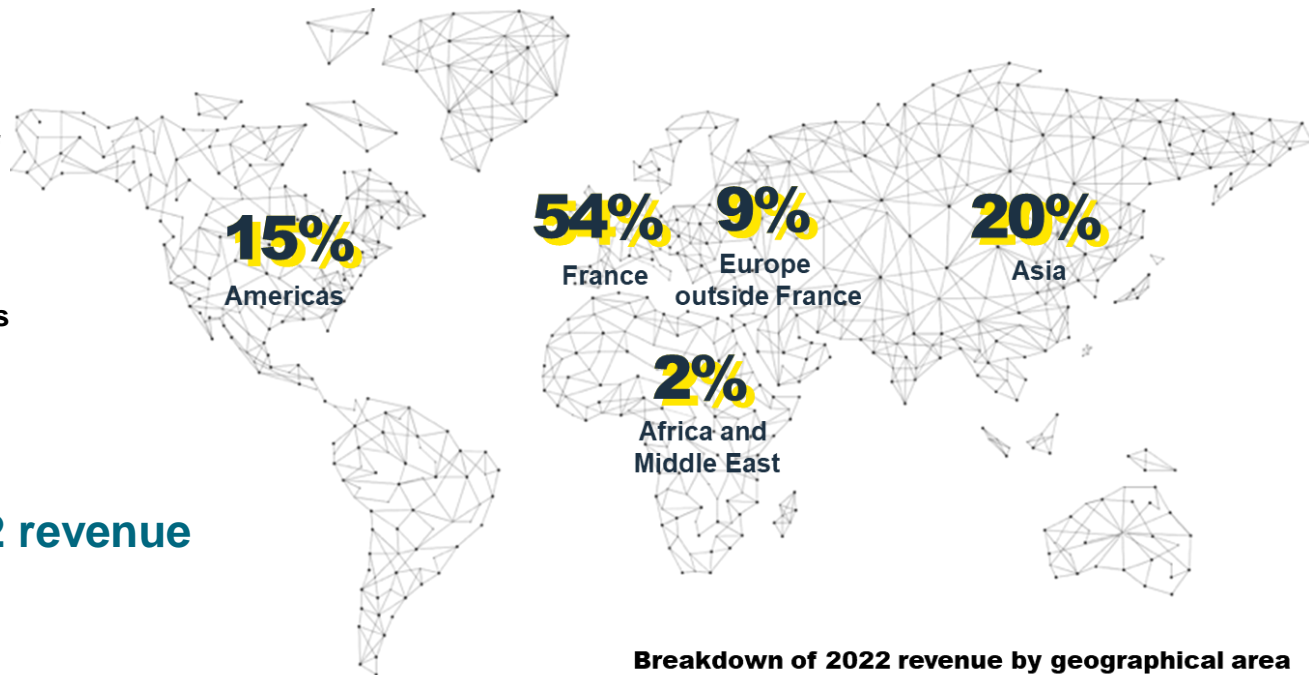
€26.1 Bn
of firm orders (over 6 years of
turnover)

In the top 3
worldwide in its core activities

17,000
employees

Breakdown of 2022 revenue by activity:

32% mining
26% front end
42% back end

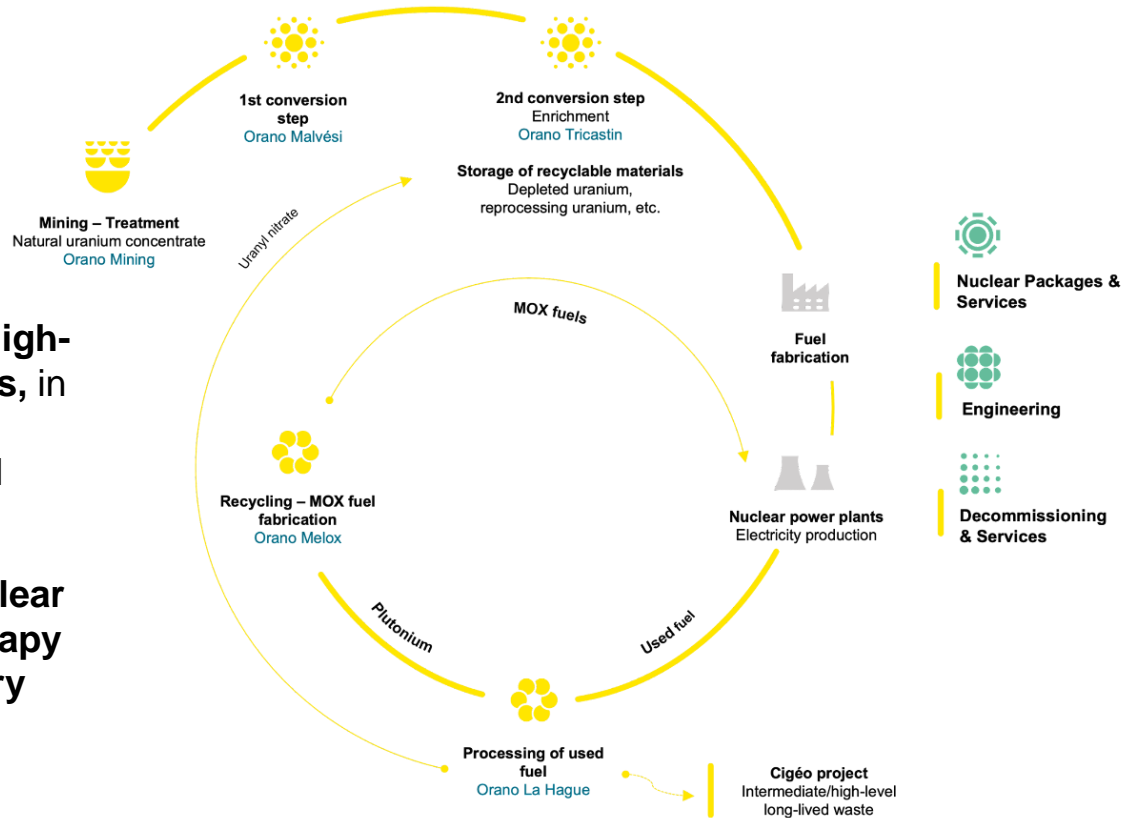


Breakdown of 2022 revenue by geographical area

World expert in the nuclear fuel cycle

The Group offers its customers high-performing products and services, in mining, conversion, enrichment, recycling, logistics, engineering and decommissioning.

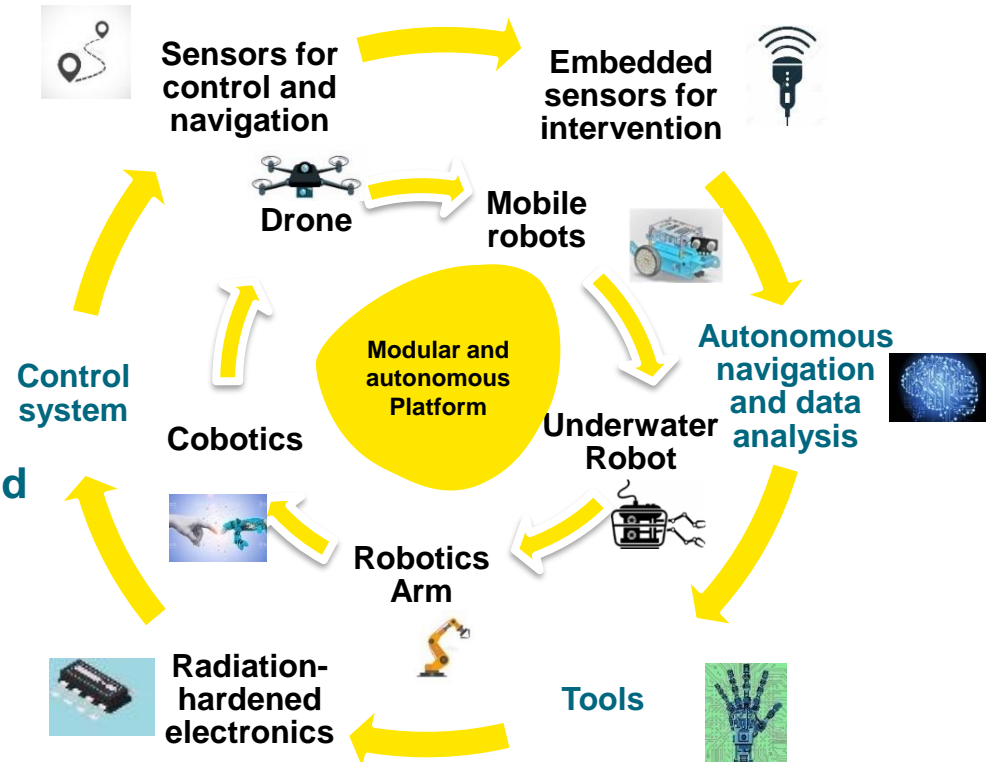
Orano is also a major force in nuclear medicine and targeted alpha therapy using ^{212}Pb , through its subsidiary Orano Med.



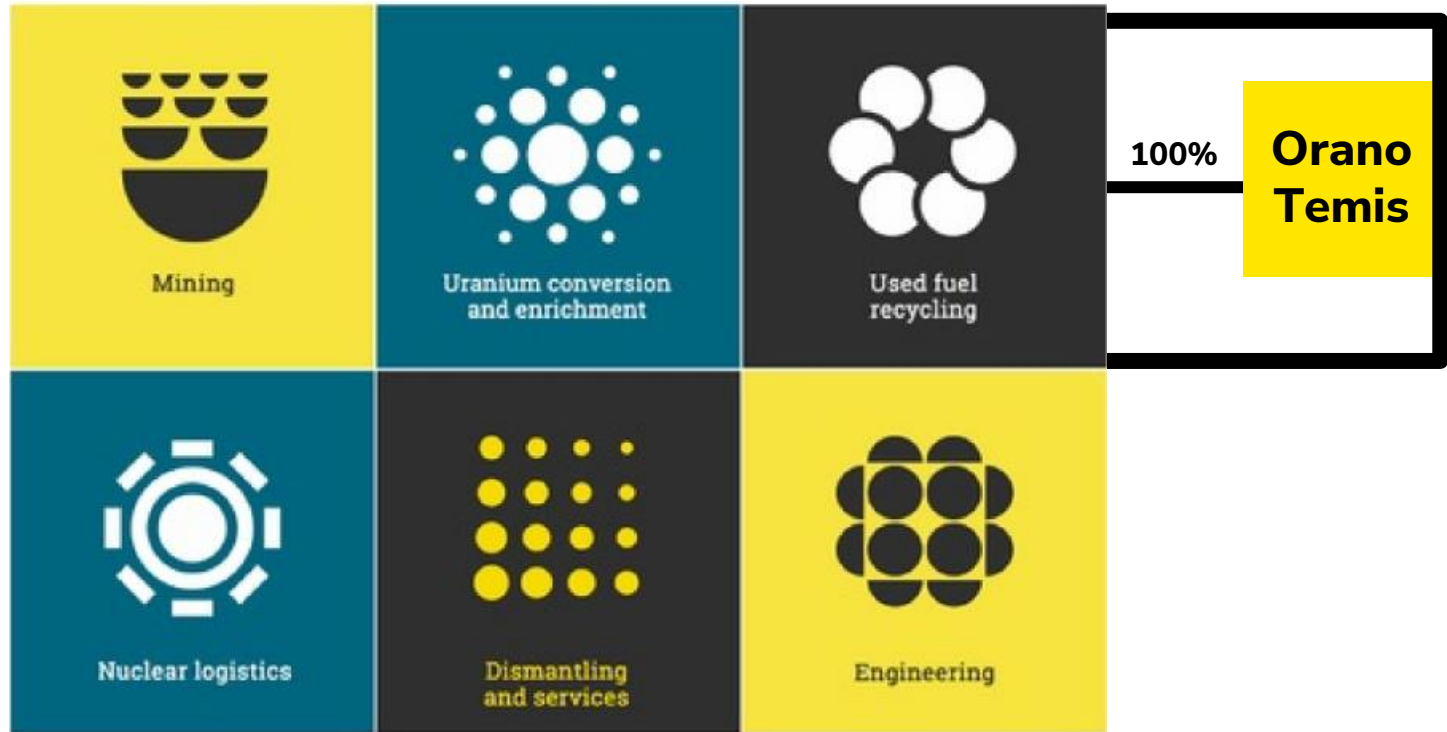
Robotics@Orano, to support operation

Goals
Operate Nuclear facilities, protect working people and improve overall performance
Strategy
Develop robotics solution to support remote operation, maintenance and dismantling activities

Robotics@Orano based on a community of robotics expert spread in the group to develop and implement **modular and hardened robotics solution for Nuclear activities.**



Orano Organisation



02

Robotics @ Orano Temis

Robotics Activity @ Orano Temis, the 3Rs ...

Robotics development to Products

- By developing, at an industrial scale, Remote Controlled systems to answer the needs of highly demanding applications with no market equivalent.

Robotics engineering

- By integrating robotics solutions into projects right from the preliminary evaluation, to the Basic Design or and Detail Design.

Robotics Integration,

- By supplying global turnkey solutions integrating on the shelf tried-and-tested systems and remote controlled means.



Robotics Workshop (400m²)

30 years of experience in telerobotics mean

In the 90's, Orano choose the industrial robots of STAUBLI company for remote handling operations in hot cells for La Hague plant

- Electrical technology
- A proven range of product in industrial field
- A closed and tightness structure easy to decontaminate
- A very limited electronics on board easy to harden against radiation
- A french company opened to specific developments

In 2005: RX170 is the first model qualified and used in hot cell in december 2005



In 2015: Qualification of RX160 TAO system hardened up to 1MGy and called TEQ600



In 2021: Need to develop a new solution for Telerobotics system

TEΩ600 Rad-hardened telerobotics solution

An Industrial Solution for Robotics in a Hostile Environments

TEΩ600

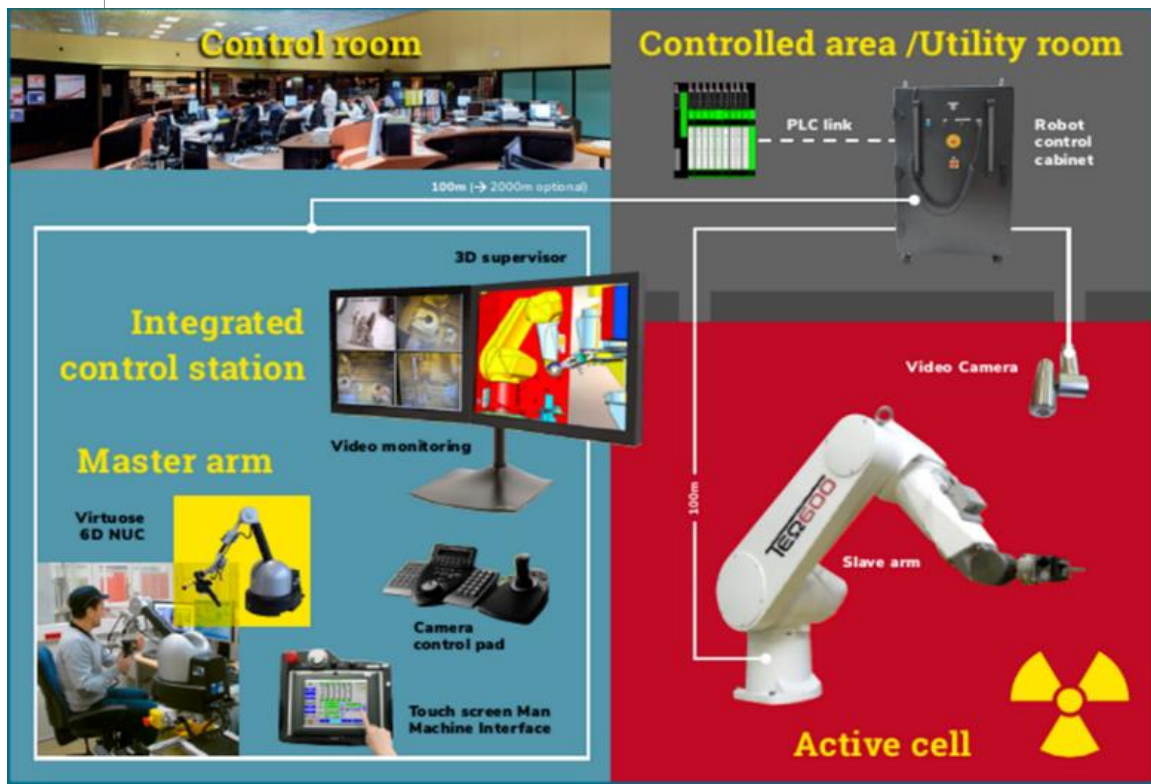
Read **TEO MEGA 600**

TEO for **TEl**er**O**botic system

MEGA for **1 MegaGray** radiations withstanding

600 for **600N** of payload

TEO600 Rad-hardened telerobotics solution



System based on the use of industrial robot in nuclear environment for :

- **Remote controlled operations with force feedback**
- **Automatics operations with programmed cycles**
- **Hybrids operations combining teleoperation actions and automatics operations**

Use in Operation,
Dismantling, Maintenance...

TEO600 Example of use



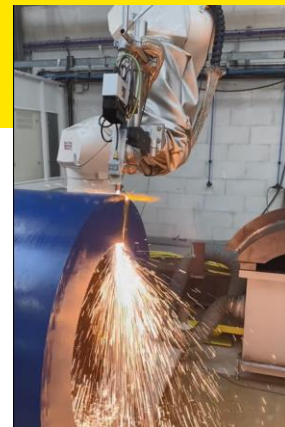
Grinder



Saber saw



Plasma cutting



Oxycutting



Welding TIG



Laser cutting



**Dexterous operation:
Valve opening**



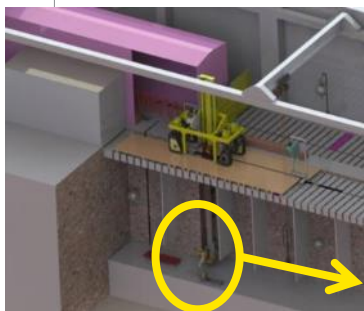
**Concrete breaking
by Chiselling**

TEΩ600 system

Integrated solution design

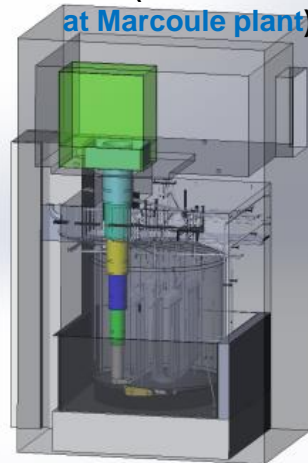


On travelling crane for clean up and waste volume reduction (AD1 facility at La Hague plant)



On a mobile carrier and telescopic mast for waste retrieval (Russia)

On telescopic mast trough a containment enclosure for access by the cell's roof (hot cells dismantling at Marcoule plant)



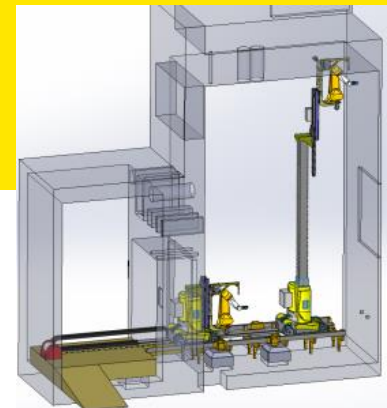
Dual mode (UKAEA)



On a mobile crawler (Fukushima)



On a mobile crawler and a lifting table (HADE La Hague plant)



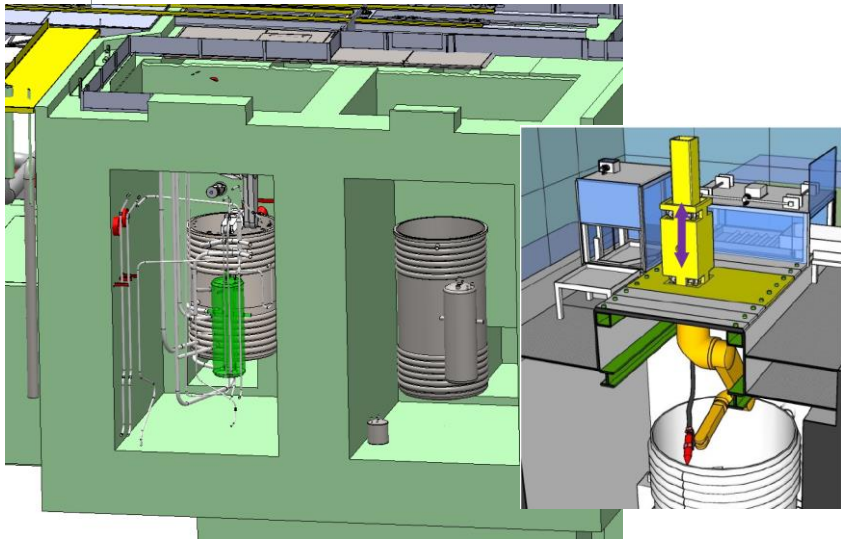
On a lifting crane (R7 facility La Hague plant)

Project in progress

Dismantling in HADE facility at La Hague

Dismantling of 2 hot cells with TEQ600 system hanging on a telescopic mast and a laser cutting tool

- **2024: Inactif tests to qualify the laser cutting process with a TEQ600**
- **2025: Operation in active cell at HADE facility**



UdD Project - TEΩ V2

Context

- **RX160 STAUBLI Robot is no more marketed since 2021**
 - **New generation of STAUBLI robot use electronic components difficult to rad harden**
 - **Orano have several hot cells to dismantle in the next 10 years**
- **Necessity to define a new solution for the TEΩ system**

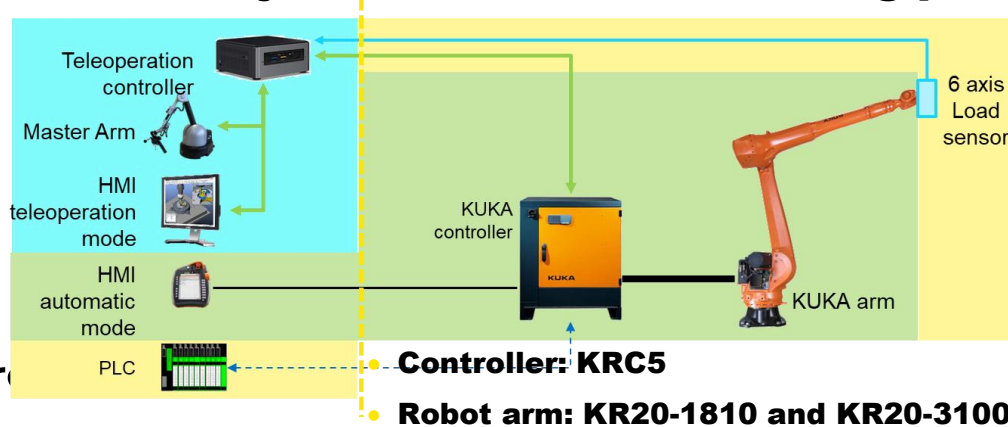
03

Our objective

UdD Project - TEΩ V2

Objective

- **Orano choice to use KUKA robots for the future version of the TEΩ system because KUKA meets main Orano requirements:**
 - A solution without onboard electronics (without RDC card easy to deport)
 - Use of brushless motor technology and resolver with a good radiation withstanding
 - A large panel of robot solution in payload, and operation range
 - A control unit able to be coupled with a telerobotic controller
- **Orano objective is to have a working prototype in 2024**



UdD Project - TEQ V2

Orano needs

- **To qualify KUKA robot arm up to 100kGy at least**
- **To be able to protect KUKA robot arm against contamination**

CERN feedback in KUKA robot use in nuclear environment will be very usefull for Orano

- **Robot arm used in CERN facilities (ref product) and conditions of use**
- **Radiation withstanding: Arm modification, components replacement, special design, material analysis, ...**
- **Contamination protection**
- **...**



orano

Giving nuclear energy its full value