




AREVA



**Polyvalent fuel treatment
facility (TCP) : shearing and
dissolution of used fuel at
La Hague facility**

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INTRODUCTION

- ▶ AREVA's current La Hague facilities were originally designed to treat irradiated UOX fuels
- ▶ The past experience illustrates AREVA's ability to industrialize new processes and to treat specific fuels
- ▶ Today, the main challenges for AREVA is recycling significant quantities of LWR MOX and FR MOX fuel in existing facilities of La Hague without impacting significantly the overall capacity of the plant
- ▶ The future TCP facility will address the specificities of fuels at the shearing and dissolution step to answer customers' needs
- ▶ This installation represents an important step on the road to FR MOX fuels industrial treatment

From UOX to LWR and FR MOX fuels

Main specificities

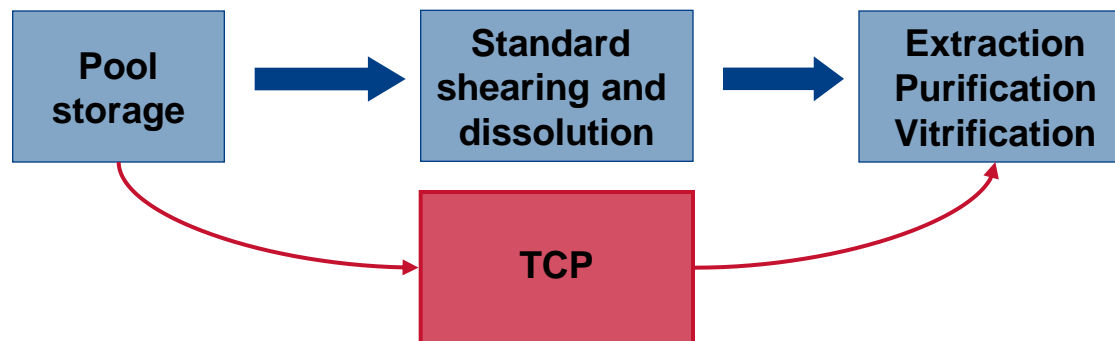
- ▶ In the case of LWR MOX fuels :
 - ◆ Same design as for UOX fuels
 - ◆ Potential PuO₂ rich clusters which lead to non soluble plutonium in nitric acid.
- ▶ In the case of FR MOX fuels, specificities induce more complexity for the definition of recycling conditions :
 - ◆ Quantity of plutonium in the fuel is even higher than in the LWR MOX fuels, up to 20-30%
 - ◆ Stainless steel cladding is much more subject to etching in nitric acid
 - ◆ From a mechanical point of view, FR assemblies differ from LWR configuration
 - ◆ The specific irradiation conditions lead to a restructuration phenomenon in the oxide
- ▶ In both cases, MOX fuels differ from our UOX reference mainly in the dissolution step management

The TCP (polyvalent fuel treatment) facility

- ▶ This new facility is a specific unit to be implemented at the La Hague plant, dedicated to shearing and dissolution of a wide range of fuels
- ▶ This installation will allow the treatment of irradiated and non irradiated fuels
- ▶ Today, three main fuel families identified as candidates for treatment via TCP:
 - ◆ Light water reactors MOX fuels
 - ◆ Research reactors used fuels
 - ◆ Fast neutron reactors MOX fuels
- ▶ TCP is planned to be put in operation in the next decade, after feasibility is demonstrated and engineering and construction steps are fully implemented

TCP: Process Overview

- ▶ The shearing and dissolution process in TCP is similar to the La Hague standard shearing and dissolution process. It implies the following steps:
 - ◆ Fuel transfer from the pool to the shearing hot cell
 - ◆ Shearing
 - ◆ Dissolution of the fuel in the dissolving unit
 - ◆ Transfer of the fuel solution to R2 hot cell



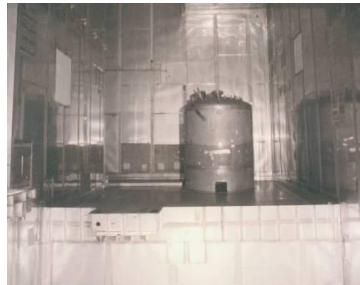
TCP: Process Overview

- ▶ Fuel with specific design:

- ◆ Modifications of the shearing tool and cutting process.

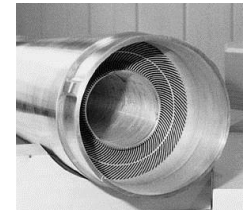
- ▶ Fuel with solubility issues:

- ◆ Adapted dissolution process and digestion step.

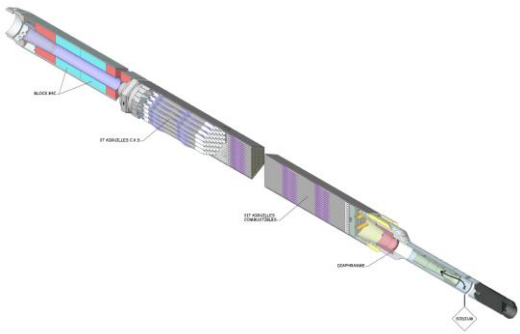


- ▶ RTR:

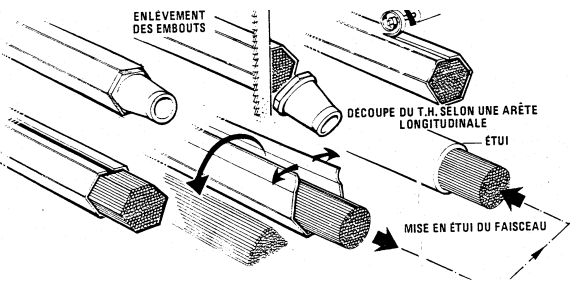
- ◆ No or minimal cutting.
- ◆ Dissolution process similar to T1B La Hague RTR dissolution process



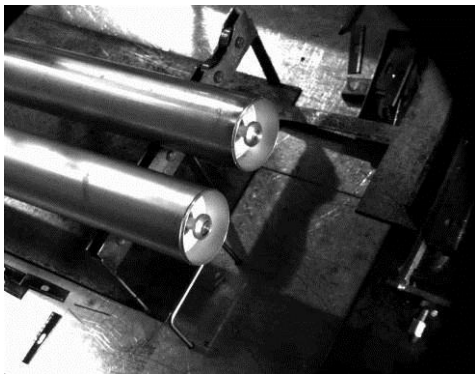
FR MOX SPENT FUEL at La Hague



Mechanical dismantling



Packaging for transport



La Hague Plant

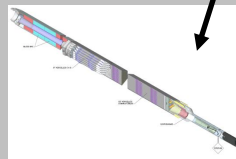


TCP – SHEARING / Dissolving

UP
2

U-Pu / PF separation

Cladding,
space wire, plugs

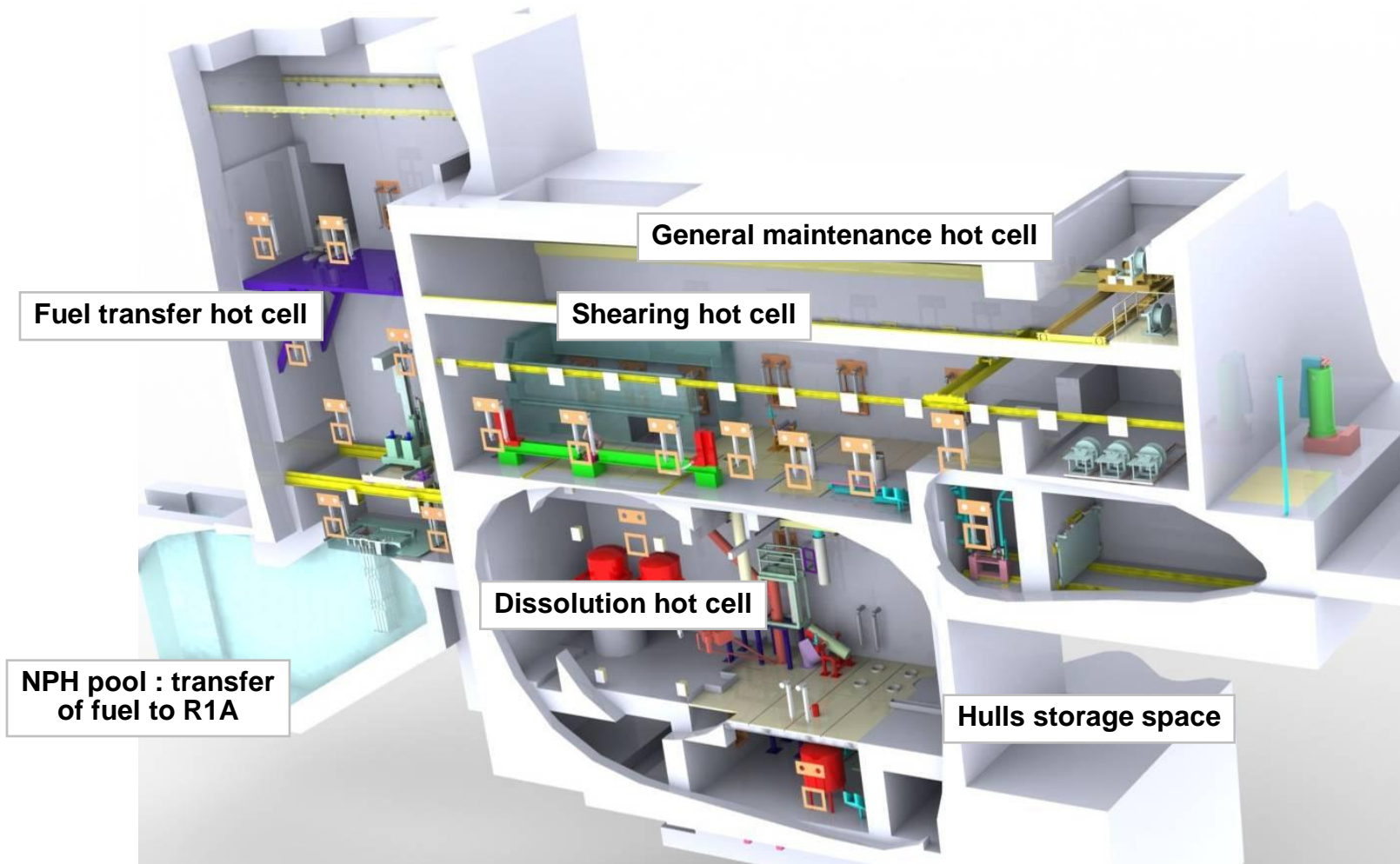


MOX LWR or SFR

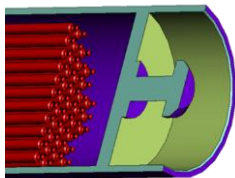
CSDV

CSDC

Overview of TCP in UP2 R1A Hot Cells



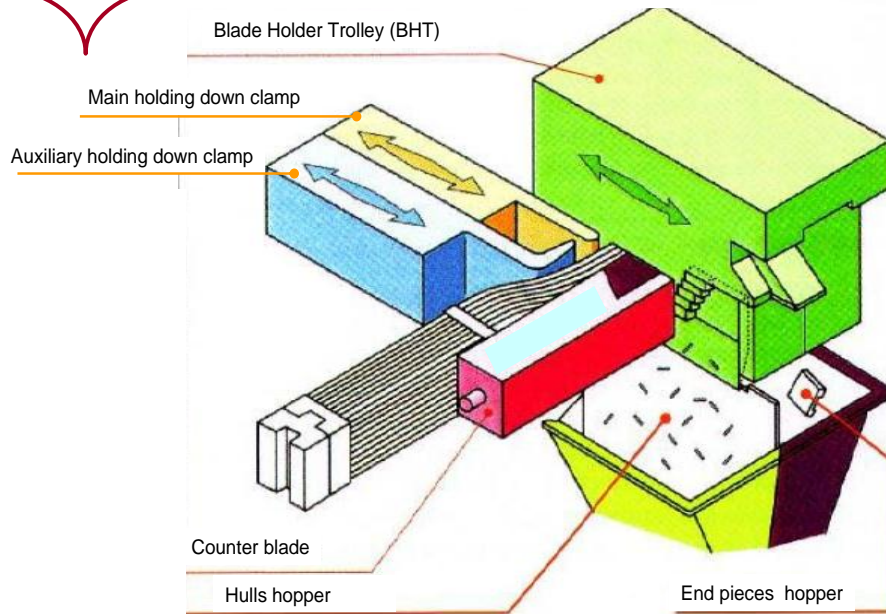
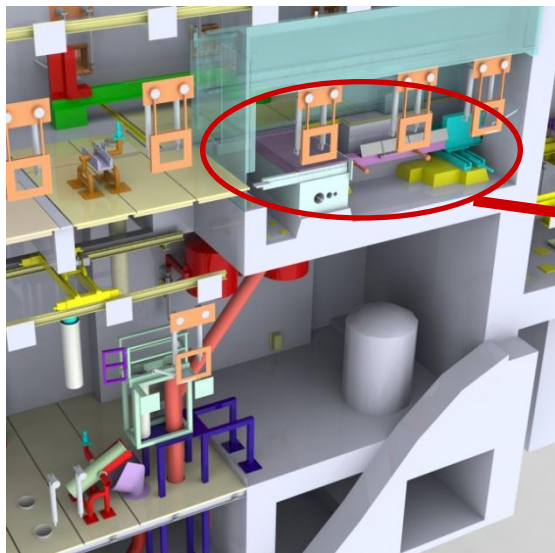
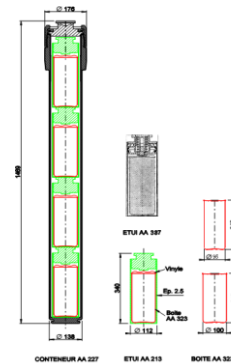
TCP – Polyvalent shearing



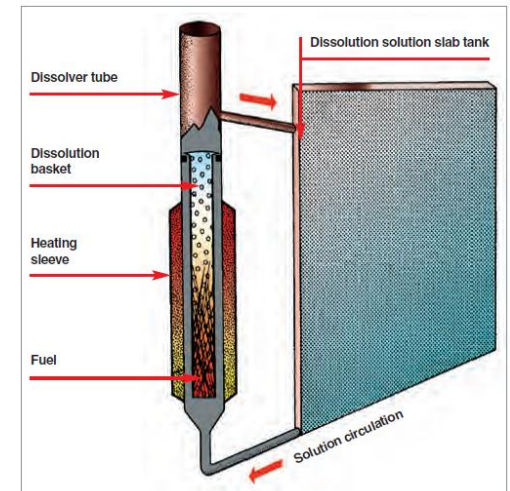
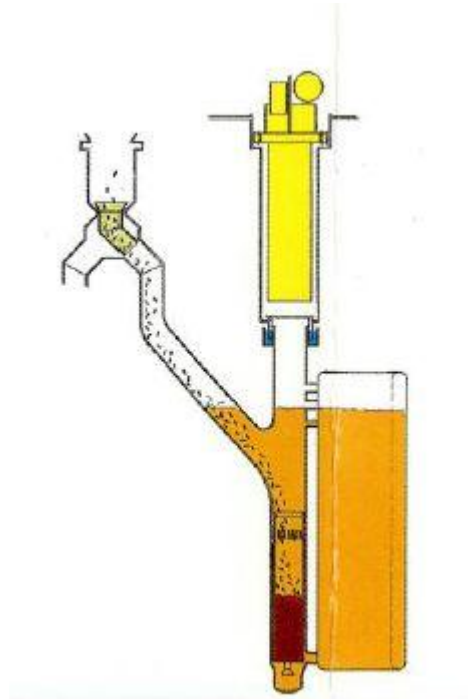
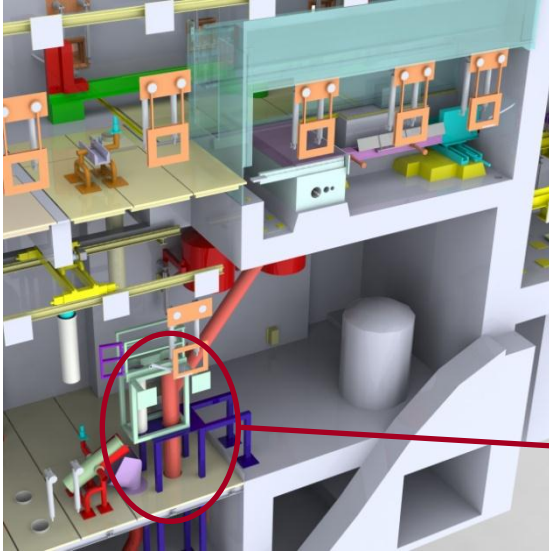
FR MOX



LWR MOX and FR MOX



TCP - Dissolving



Optimized batch type dissolver

- Specific concepts
- Innovate dissolution (fines)
- Criticality risk management

Conclusion

- ▶ AREVA has already demonstrated that specific fuels recycling is a reality within its current facilities
- ▶ To go further and ensure a greater capacity without impacting UOX fuels treatment, AREVA plans to implement a new TCP facility dedicated to fuels requiring adapted shearing and dissolution conditions
- ▶ TCP design will greatly benefit from AREVA and CEA feed-back and optimizations, making it an innovative and industrial step towards the recycling of the future.
- ▶ The design is in progress and is on time to include customers' needs in terms of type and quantities of fuel

Thank you for your attention, any questions

