^{99}Mo Topical meeting 2013, Chicago

Progresses on IRE's LEU conversion program

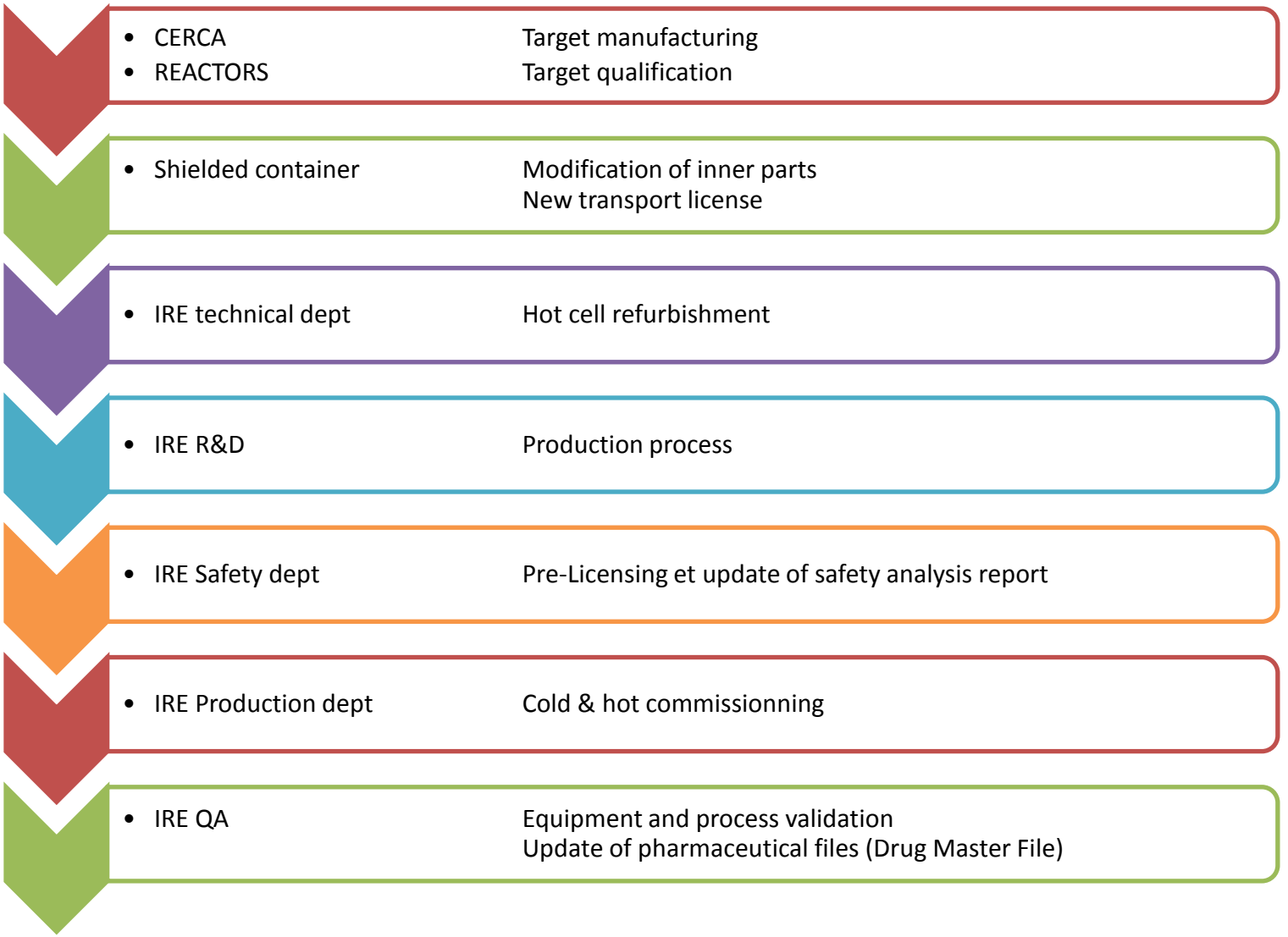
Valery HOST
R&D Manager

Strategic considerations

LEU process challenges

- Increase overall process safety
- Reduce gaseous releases
- Minimize the changes and the losses at all level
- Same production capacity (2500Ci/week – 6D calibration)
- No interruption of HEU process
- Modified hot cells according to stress tests

First commercial LEU production January 2016



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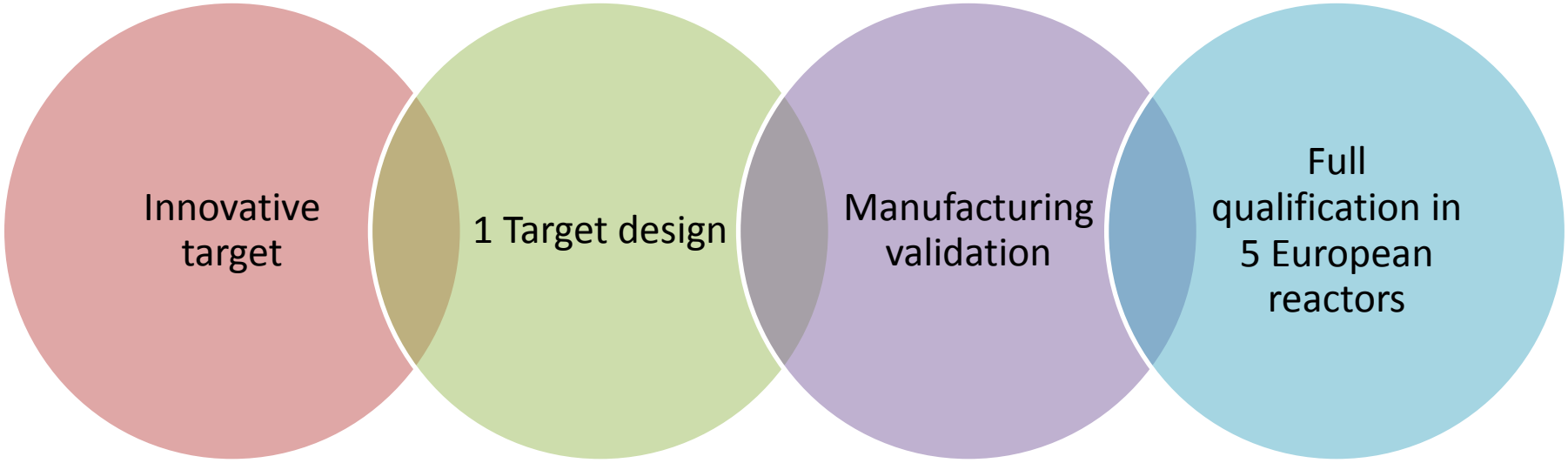
Target specification

Parameter	HEU	LEU
Meat	UAl_x	U-Al dispersion
Cladding	Al	Alloy
Geometry	Tubular	Plate
Enrichment	HEU	19.75
Uranium loading increase		x 4.6
U-235 loading (g)	At least maintain	

Target specification



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Target qualification

B R 2

- Neutronic calculations performed
- Thermohydraulic calculations performed
- Post-irradiation examinations is defined
  - Non destructive tests
  - Destructive tests

B.Ponsard / S.Kalcheva CONFIDENTIAL BR2/RFA/BP/SK-05/07/2012/LEMOTARD-IRE ♦ 1/6

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To:

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☐ S.Kalcheva (BR2)	
☐ L.Sannen (LHMA)	
☐ S.Van den Berghe (LHMA)	
☐ E. van Walle (BR1)	

BR2 Reactor – RSP - RFA

Bernard Ponsard / Silva Kalcheva
Reactor Physicists

PROJECT LEMOTARD-IRE : Preliminary neutronic calculations made by MCNPX 2.7.0 in the frame of the conversion of HEU tubular targets into LEU plate targets for production of Mo-99 in the BR2 reactor

1 Introduction

The BR2 reactor is routinely irradiating highly enriched uranium (HEU) targets for IRE to produce Mo-99. Dedicated irradiation devices (PRF's) have been designed for this purpose. They allow the loading/unloading of up to 9 HEU tubular targets during reactor operation.

In the frame of the LEMOTARD-IRE Project aiming the conversion of the current HEU tubular targets into low enriched uranium (LEU) plate targets, neutronic calculations have been initiated using the MCNPX 2.7.0 code [1].

This note presents – as already discussed with IRE at the SNM last June – a summary of the preliminary results of the calculations made at BR2 to evaluate the differences in neutronics between the irradiation of HEU tubular targets (4g ^{235}U/target) and LEU plate targets (^{235}U/target). For this purpose, the irradiation conditions currently provided in the existing PRF2 irradiation device have been considered (Fig.1).

Transport container

- Modifications of inner parts to fit plates
- Validation by IRE and reactors for remote manipulations
- Applying for a new transport license

Chemical process modifications

- The chemical process is designed
- A unique solution
- An additional barrier in the defense-in-depth system will be provided


Document Name: LEU BASED MO-99 PRODUCTION-CONCEPTUAL STUDY-A
Revision: A

LEU BASED Mo-99 PRODUCTION AT IRE - CONCEPTUAL STUDY

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2 August 2012

Page 1 of 43

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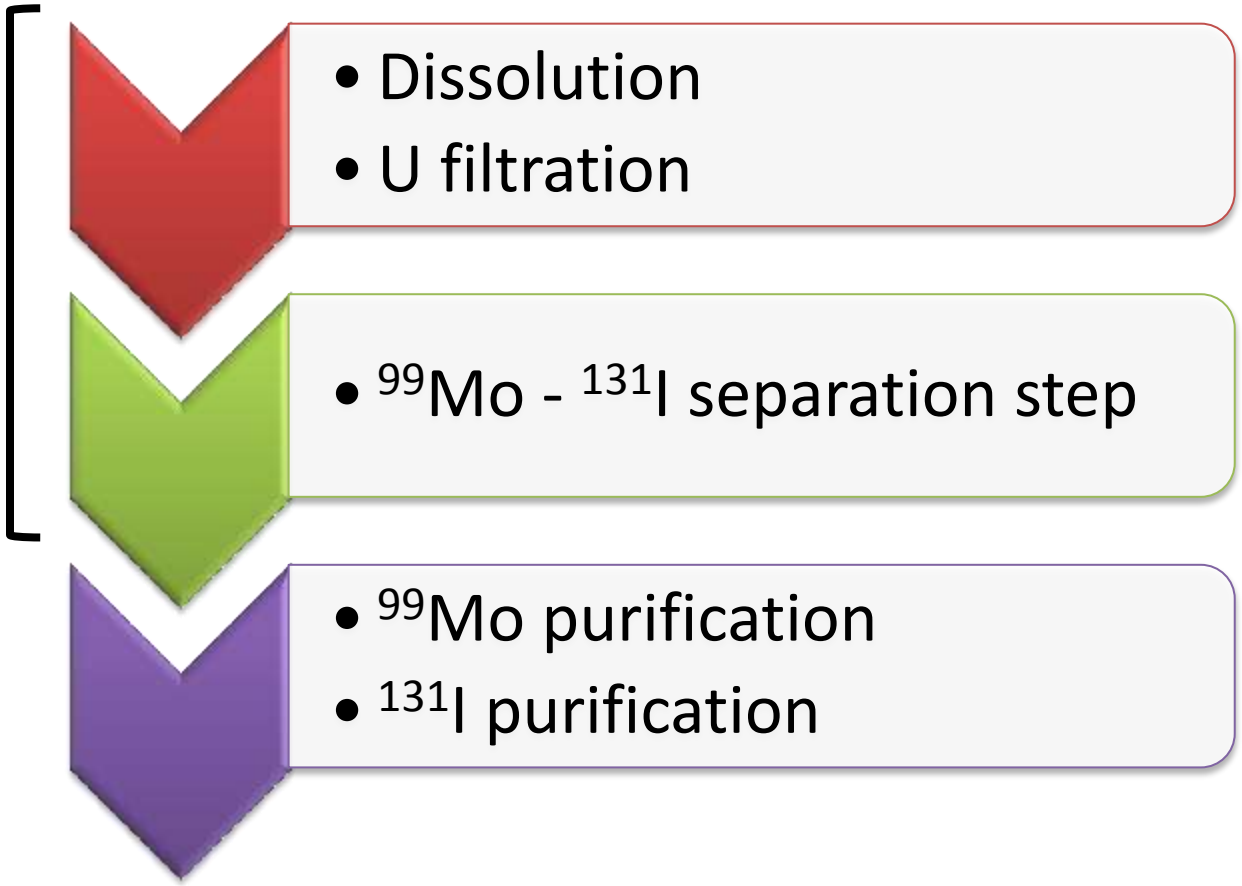
Process modifications for LEU



Target processing

LEU

HEU

Target dissolution

Filtration

Acidification

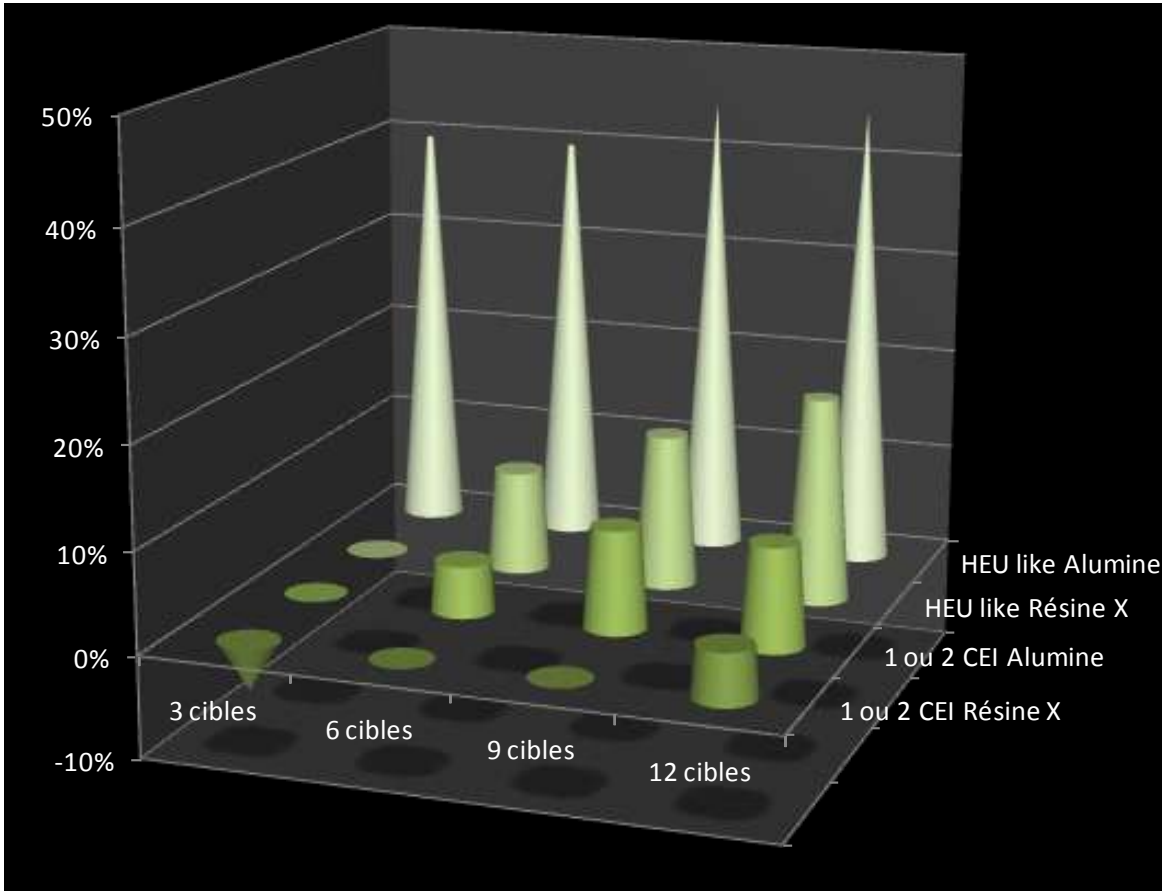
^{131}I trap

Ion exchange column

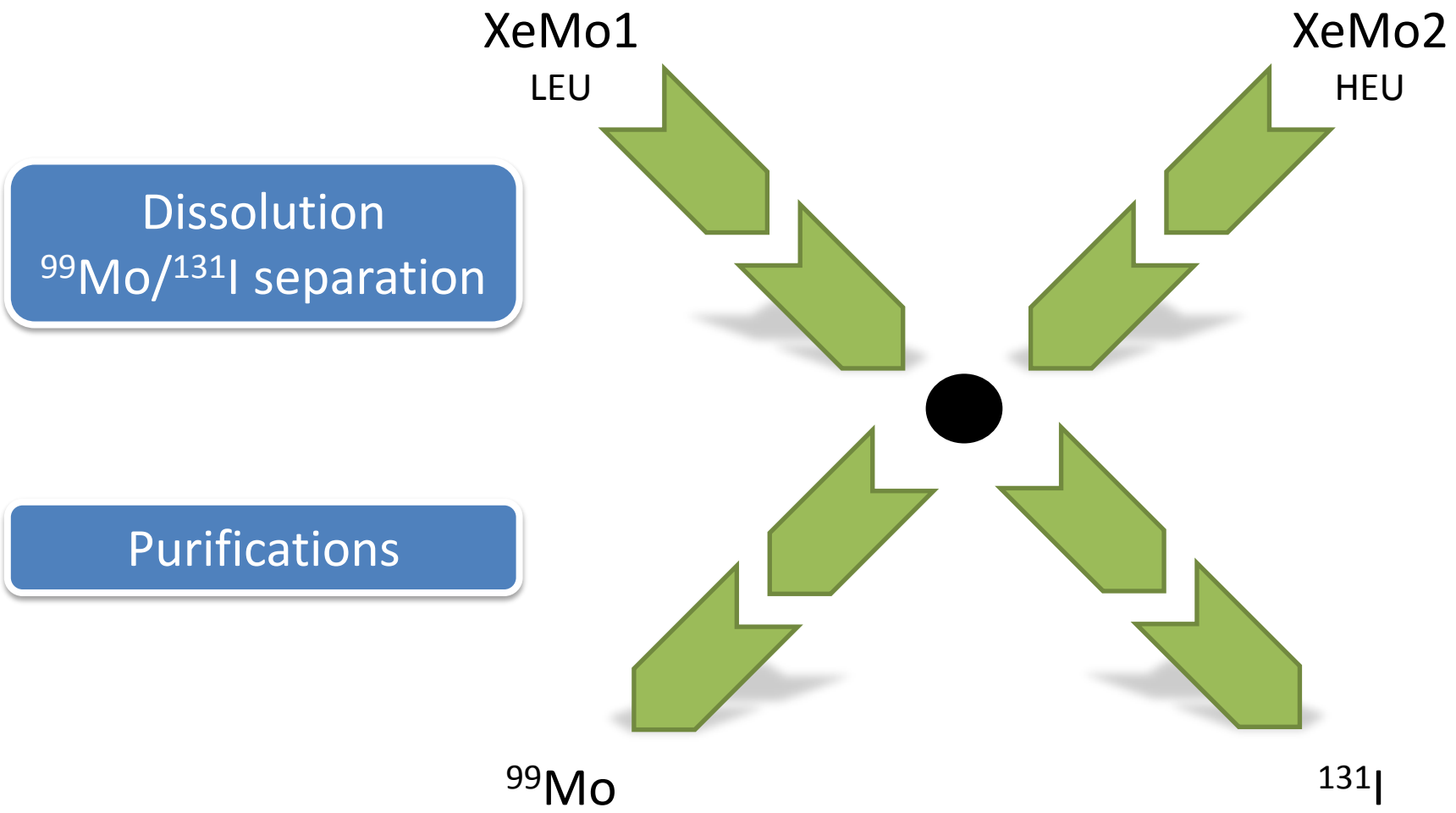
^{131}I solution

^{99}Mo purification

- Uranium waste: a capacity problem
- Liquid waste: a licensing and efficiency issue
- + 40% => new design of process required



Hot cell organization



XeMo1 refurbishment

- Experience feed back of the XeMo2 renovation
- Refurbishement XeMo 1 started (Oct. 2012)
- End of renovation of hot cells: Q1 2014

XeMo1 refurbishment

On going decontamination

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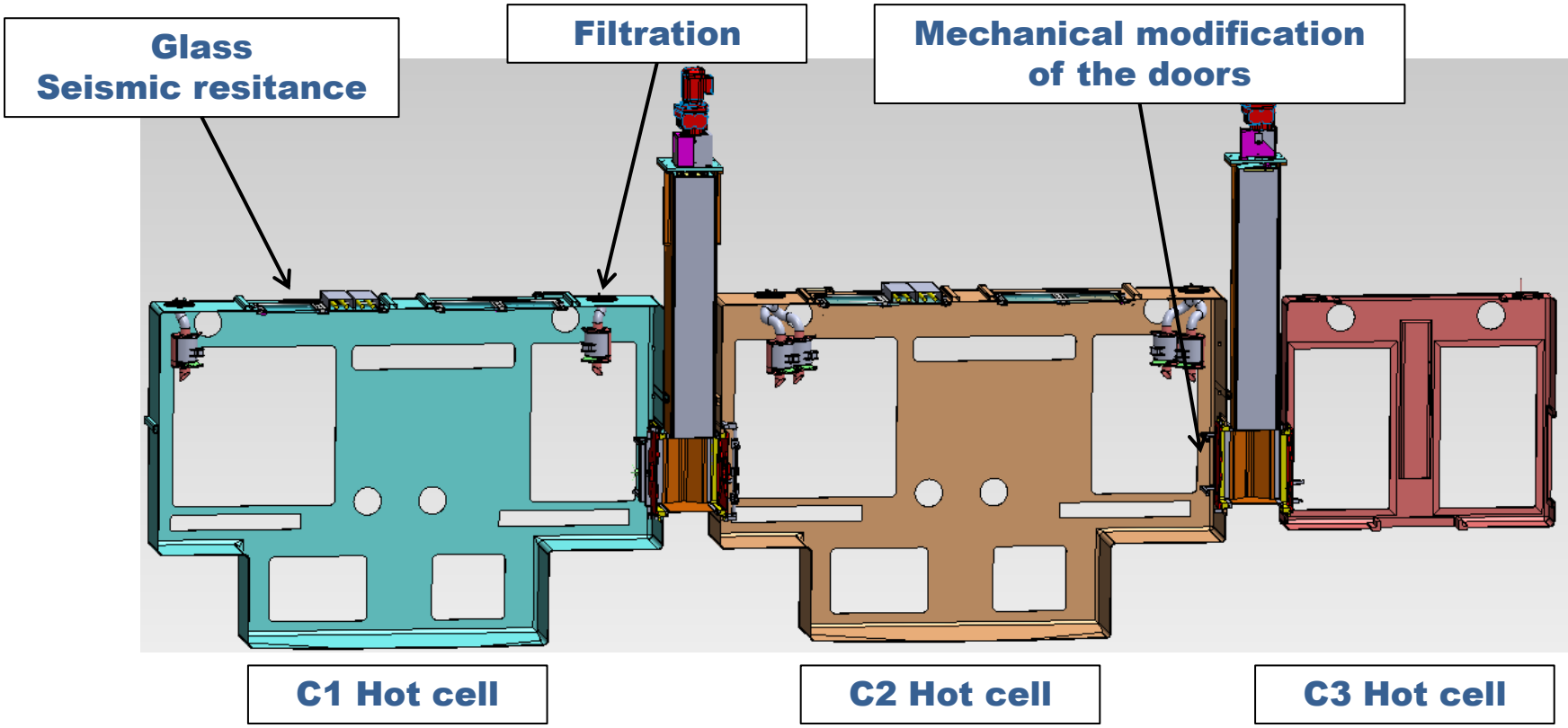
XeMo1 refurbishment



Safety analysis report update

- ✓ Pre-licensing done
- ✓ On going modifications of the safety report

Risk Assessment

Three critical paths:

- ✓ Target qualification
- ✓ Renovation XeMo 1 bench of hot cells
- ✓ Licensing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Quarterly report n°1 under BOA 188839: December 31 2012
LEU conversion project. IRE Belgium
Progress report N°3.
Q4 2012
LEU conversion project.
IRE. Belgium
(This document is the first quarterly report under the BOA 188839 contract)

Thank you for your attention

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