The LEU conversion project of IRE

^{99}Mo Topical Meeting.

Santa Fe. December 4 -7, 2011

Menu

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2. Supply performance.
3. LEU Conversion.
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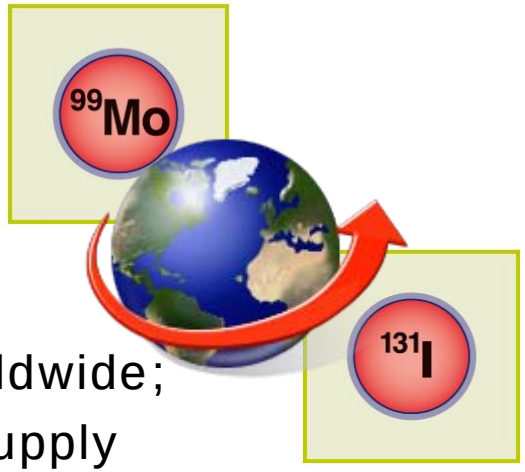
ire_en.flv

SUPPLY PERFORMANCE

Radiochemical productions

- > 95% exports; approx. 50% EU.
- Unique producer of I-131 in EU
- Share the EU Mo-99 production:
  - approx. 50/50 with Covidien
- Other Isotopes: Y-90, Re-188, Xe-133 ...



- Customer base: all generator manufacturers worldwide;
- Partnerships: NTP – ANSTO (LEU conversion & Supply chain management), SCK/CEN (R&D), INVAP (Engineering), ANL (Long term solutions).

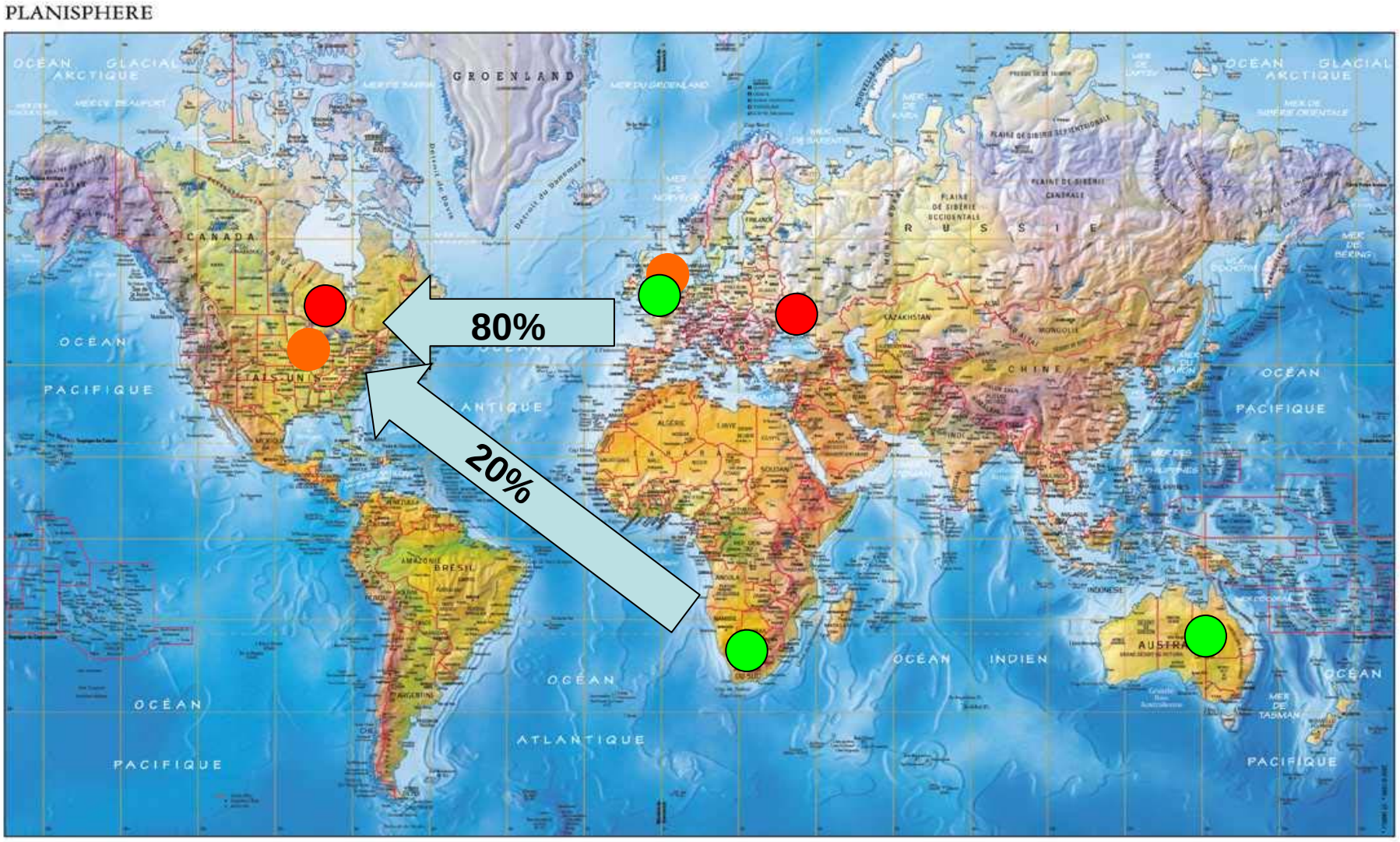
National Institute for Radioelements

- Licensing
  - 24 targets / week
    - ✓ + reserve capacity +12 targets/week
- Capacity
  - 2500 Ci/W 6 day cal
  - + Reserve capacity + 50%
- Current process
  - Annular targets 93% U5
  - Alkaline dissolution

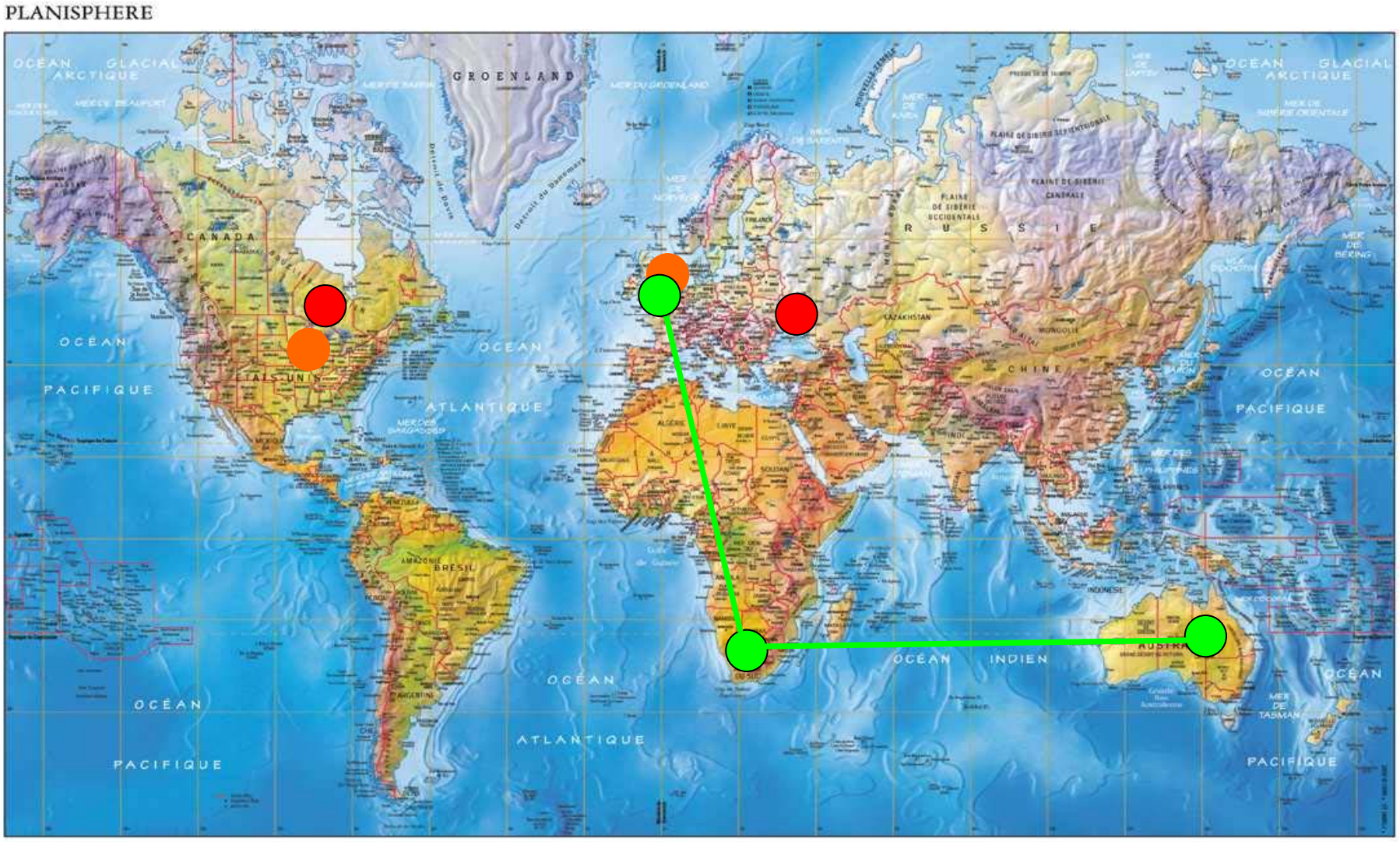
IRE key success factors

- Public Utility Foundation
- Operated as a private commercial entity
- Lean organization (140FTE / 42 M€)
- Priority: Highest Service Level and Quality for Health Care
  - … And a commitment to LEU conversion
- Strategic location for logistics
  - Transport routes
    - ✓ Road network
    - ✓ 5 int'l airports < 350km
- Multi-sourcing: a MUST !
  - Network of Research Reactors
    - ✓ 3 reactors < 300km
    - ✓ 1 reactor < 1000km
- Strategic alliances
- Innovation => Is ^{99}Mo is a mature or declining commodity product?
- Other companies on site
  - Cyclotron isotope production
  - Gamma sterilization
  - Transport

2009– 2010 – Spring 2012 …

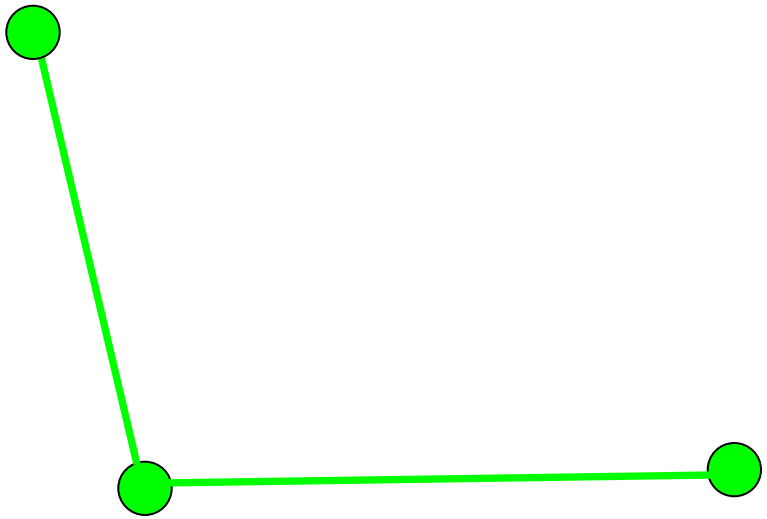


Strategic Alliance



Supply Excellence & LEU conversion

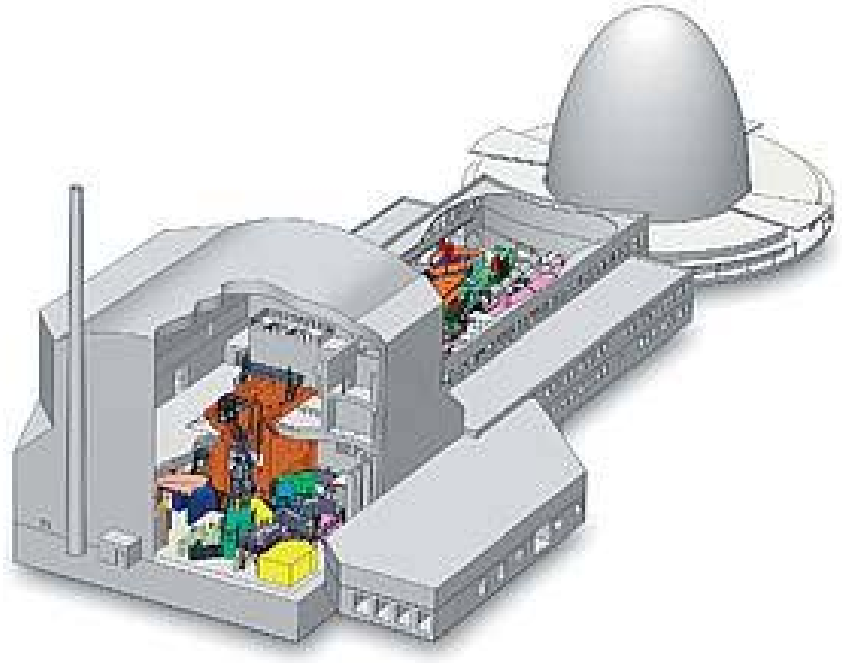
- *Mutual Back-up aiming at long term excellence in service level*
- *6 Reactors*
- *3 reactor projects + processing unit projects*
- *Technical cooperation*
- *Co-ordinated LEU conversion*



Reactor Projects

Project FRM II:

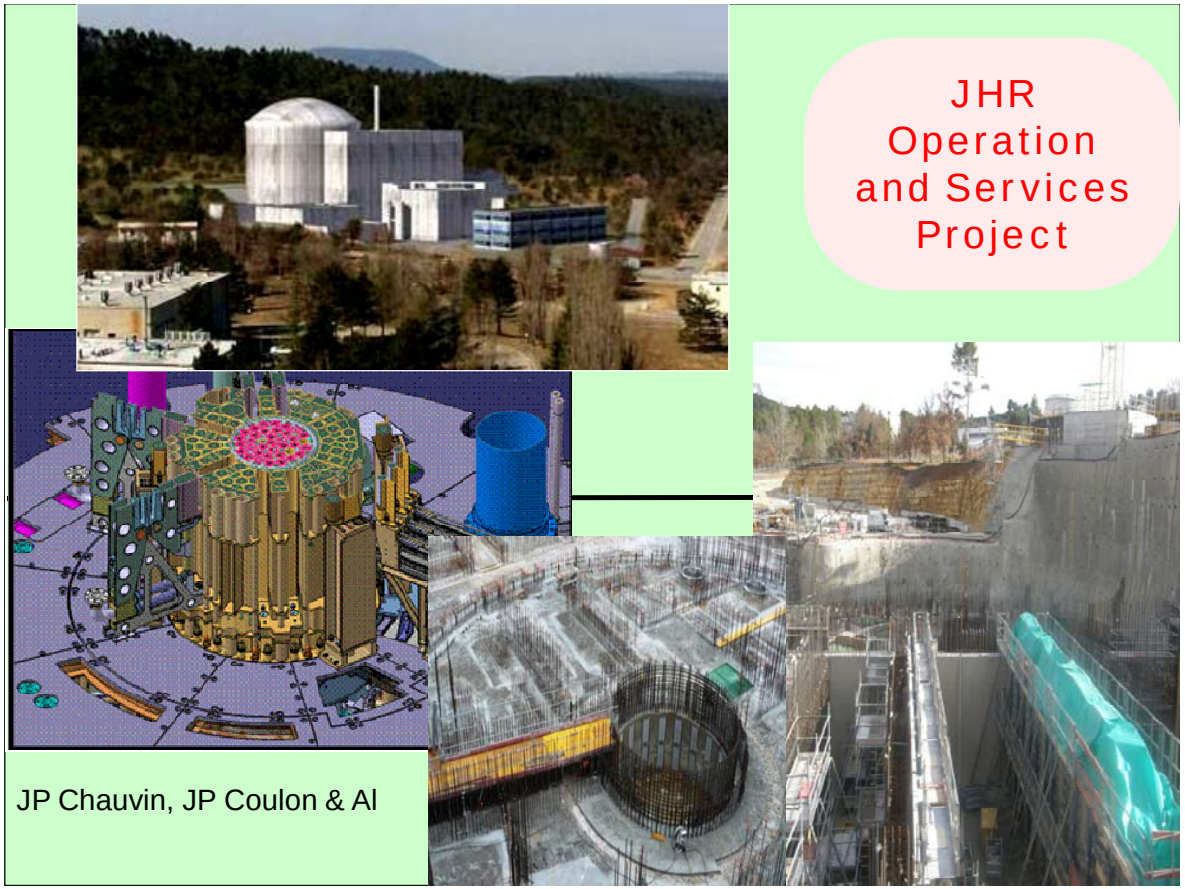
- *LEU project =>*
  - *New target design*
  - *Plate*
  - *Feasibility study*
  - *=> 2015*



Reactor Projects (cont.)

Project JHR:

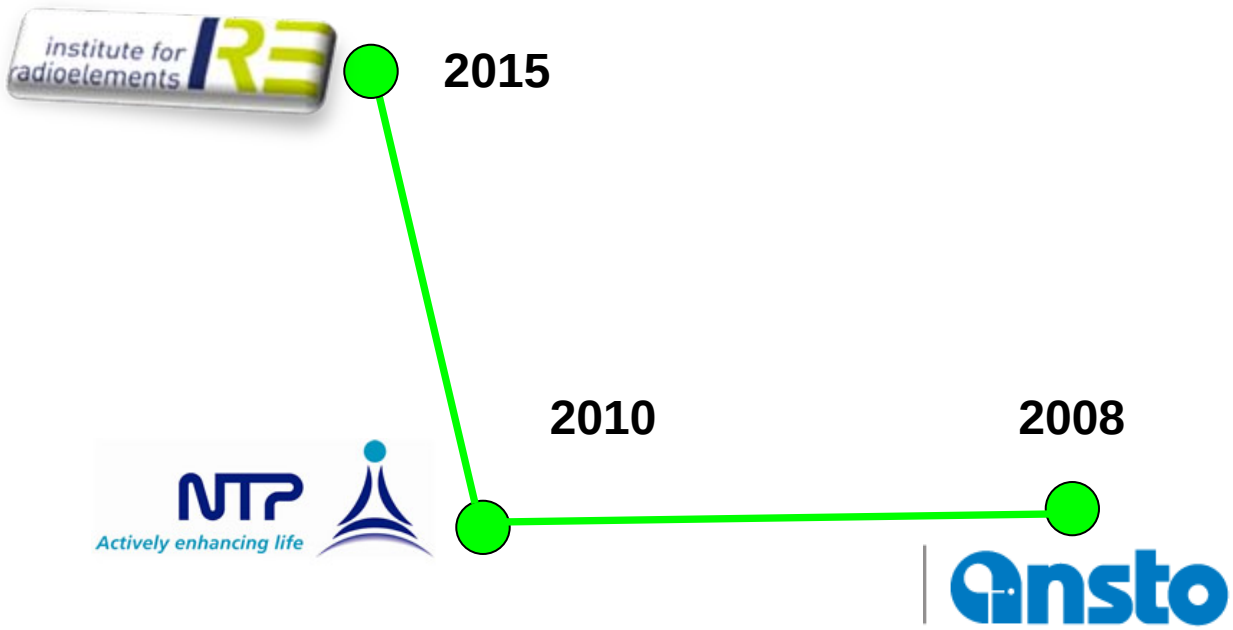
- *Non Binding LoI signed in 2010. (IBA – IRE – CEA)*
- *LEU production*
- *2016*



LEU CONVERSION

Supply Excellence & LEU conversion

Co-ordinated LEU conversion



IRE Master Plan

- < 2008 : reluctance to LEU conversion
- Summer 2008: Commitment to LEU conversion.
- NAS: IRE to go for brown field conversion
  - 2 production lines XeMo II & XeMo I
  - Decision made to renovate XeMo II => HEU
  - Decision made to further renovate XeMo I => LEU

IRE Master Plan

- 2009 – 2010 : renovation XeMo II (3 M€)
  - Mitigation in the supply crisis
  - High volume but burning of HEU inventories
  - Transfer of production on XeMo II
  - Back-up NTP while converting to LEU
  - Off-Gas: record figures: - 75%
    - ✓ Award CTBTO
  - Safety – Economics – Financial: the recovery

IRE Master Plan

- LEU technology
  - 90's: B&W
  - < 2009: ADS: negative NPV
  - 2010: Foil
  - Summer 2011 after Fukushima: two phases
    - ✓ Phase 1: UAl_2: 2015
    - ✓ Phase 2: LEU long term solution in a new plant, "state-of-the-art" & stress test compliant.

Progress report N°1.
Q4 2011

LEU conversion project.

IRE. Belgium

IRE progress report. Phase 1

- Q4 2011: target geometry and size. (5 reactors + CERCA).
- Q1 2012:
  - target specification + design of dissolution process
  - Pre-licensing initiated.
- Q2 to Q4 2012: testing, + design and manufacturing of equipment, incl. rigs in reactors and containers.
- 2013, prototyping + renovation XeMo I line + waste.
- 2014,
  - Installation of new production equipment
  - Validation
  - Licensing
  - Testing. Revision of drug master files

Date – Participants	Subject	Output
15/06 – La Calhène	Modification of target transport container	Technical exchange on inner parts and transport licensing, date for quotation
30/06 – CERCA -BR2	Target geometry and specifications	Definition of preliminary target shape and size
11/06 – FRM2	Presentation of LEU conversion program	Exchange on preliminary target shape, specific requirements of reactor
24/06 - LVR-15 (Rez)	Presentation of LEU conversion program	Exchange on preliminary target shape, specific requirements of reactor
12/08 – HFR	Presentation of LEU conversion program	Exchange on preliminary target shape, specific requirements of reactor
25/08 – BR2	Update on last discussions on target shape	Technical information on target thickness
30/08 – La Calhène	First draft of container modification	Inner part modifications
12/10 – Federal Agency for Nuclear Control (FANC)	Periodical update on IRE projects including LEU conversion	Few chance to allow the use of current building for LEU conversion, impact on the planning
19/10 – FRM2-RJH-CERCA	Target shape	Feed back on last meeting
25/10 RERTR meeting	Exchange and comments on last evolution of preliminary target design with the partners	
31/10 INVAP (Argentina)	Discussion on possible technology transfer on LEU target processing (hydrogen management, xenon management...).	

Expenses

- Project cost phase 1: approx. 10 M€
- Current manufacturing cost estimate: + 20%

Risk Assessment

The LEU conversion is not an issue,

The supply performance is an issue:

- Higher safety requirements on Phase 1 than anticipated prior to Fukushima => delays,
- Supply of HEU until conversion,
- Statistically, we are likely to experience new major unexpected shortages in the next coming years,
- What if phase 2 is non profitable, ?,
- Full cost recovery not implemented globally / not accepted by the end-users,
- Supply chain management, quality and safety management are underestimated by new entrants to a large extent.

Thank you for your attention

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