Feedback on FBR fuel fabrication at ATPu facility, as a support to the design of a future facility

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Fast Breeder Fuel Fabrication experience was acquired between 1964 and 2000 when producing:

- Experimental fuels for R&D purpose
- Fuel for PFR reactor, on NDA Dounreay site

These fabrications have been performed under the responsibility of CEA and AREVA (COGEMA)
Fast Breeder Fuel Fabrication experience

Products

**Rapsodie : 1.6 tHM**
- 4.23 mm
- 30% PuO₂

**Phénix : 40 tHM**
- 5.42 mm
- 18-25% PuO₂

**SuperPhénix : 81 tHM**
- 7.14 mm
- 13-19% PuO₂
Fuels were produced using two processes. However, they only differ by the mechanical treatment of powders:

- **Rapsodie**
- **Fortissimo**
- **Phenix**
- **Superphenix** [1964 – 1991]

- **Phenix LWR MOX fuel** [1991-2005]
Fast Breeder Fuel Fabrication experience
Process evolutions

Pelletizing

From single die press…

…to rotary press
Fast Breeder Fuel Fabrication experience
Process evolutions

From RAPSODIE…

Sintering Furnaces

…to PHENIX…

…and SUPERPHENIX
Fast Breeder Fuel Fabrication experience
Process evolutions

PHENIX fuel
Manual insertion and crimping

Cladding
Insertion of spacer wire

SUPERPHENIX fuel
Automatic installation and welding
MOX Fuel Fabrication experience

- Millionth certified rod
- Governmental decree of April, 26th allowing production to be increased to 195 tHM/year
- 10th anniversary – 1,000th ton of MOX
- One-thousandth assembly fabricated
- Start-up of MELOX plant after gradual introduction of Pu in the production building
MOX Fuel Fabrication experience

- Improved safety through facility design

- Improvement of production and quality levels

- Development of new tools to reduce radiation exposure and to facilitate interventions
Conclusions

Within 40 years, AREVA and CEA gained a large experience in the domain of Fast Breeder fuel fabrication

- Standard and experimental fuels from different designs
- Throughput from 500 kgHM/year to 18 tHM/year
- Technological improvements all along the 120 tHM manufactured

MELOX plant operates industrial methods and technologies since 17 years

- 2000 tHM LWR fuels produced

The basic design of the workshop for ASTRID fuel fabrication is based on this large experience.