AREVA’s Nuclear Processing Facilities: Commissioning & Startup Experience

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Overview

AREVA’s Vitrification & Reprocessing Experience
- Over 35 years of experience

AREVA's Experience in Commissioning and Startup
- Lessons learned for over 25 years

AREVA La Hague Performance and Reliability
- Operating for 25 years

AREVA’s International Experience
- Recognized experts in US, UK, Japan and France
AREVA’s Vitrification Experience

La Hague
Overview

AVM (UP1, Marcoule): 1978 - 2012

- First generation of reprocessing facilities, with in line vitrification capability added in 1978
- One HLW vitrification line
- 3,306 glass canisters produced
- 1,220 metric tons of HLW glass produced
R7 (UP2-800, La Hague): 1989 - Present

- First vitrification facility at La Hague commissioned in 1989
- 3 HLW vitrification lines
- Designed to be integrated into UP2-800 plant commissioned in 1994
- 10,055 glass canisters produced through 12/14
- 3,987 metric tons of HLW glass produced through 12/14

T7 (UP3, La Hague): 1992 - Present

- 3 HLW vitrification lines
- 8,904 glass canisters produced through 12/14
- 3,547 metric tons of HLW glass produced through 12/14
Over 35 years of industrial operation - 7,545 metric tons of HLW glass - 19,075 glass canisters
AREVA's Experience in Nuclear Facility Commissioning and Startup

La Hague
COMMISSIONING & STARTUP EXPERIENCE
AREVA’s Proven Commissioning Methodology

- Design
- Detailed Design
- Manufacturing Design
- Construction Permit
- Construction
- Manufacturing
- Test Plan Preparation
- Turnover Preparation
- Test Procedure Preparation
- Factory Acceptance Testing
- Operation - Maintenance Staff Training
- On-site Testing
- Test - Operation - Maintenance Staff Training
- Operation - Maintenance Document Validation
- Turnover to Operations
- Non-Radioactive Testing
- Commissioning
- Hot Startup
- Commercial Operation
- Ramp up to Full Capacity
COMMISSIONING & STARTUP EXPERIENCE
AREVA’s Proven Commissioning Methodology

Commissioning Turnover

- **Turnover of process units documentation from Construction to Operation testing teams**
  - Test teams start the non-radioactive on-site tests
  - Test procedures developed and test operators trained beforehand
- **Hot Commissioning**
  - *Nuclear safety authority approval obtained*
  - Radioactive materials can be introduced for hot tests
  - Radioactive start-up was prepared beforehand (operation, maintenance documentation validated, personnel trained to hot conditions)
- **Commercial operation**
  - Performance was validated
  - Ramp-up to full capacity
AREVA’s Proven Commissioning Methodology

Test Progression

- Progressive and parallel approach on both equipment and operating conditions
- From individual components to fully integrated systems
- With water, then representative simulants, then actual Tank Farm waste

Component Testing
Subsystem Testing
System Testing
Integrated Testing

Water Testing
Simulant Testing
Hot Testing
COMMISSIONING & STARTUP EXPERIENCE
AREVA’s Proven Commissioning Methodology

Identify & Correct Operability & Maintainability Issues before Hot Commissioning

Completeness

• Safety Related Tests
• Tests of Nominal and Bounding Conditions

Traceability of Tests & Results

Proven Test Methodology

• Developed and continuously improved through UP3, UP2-800, MELOX, R4, and ACC testing and commissioning
AREVA’s test methodology development started with the UP3 project:

- Performed the ramping-up of the nuclear fuel reprocessing plant safely, efficiently and on schedule in 1989
- Utilized lessons learned from ramping-up of the UP2-400 plant in 1976
- The methodology was continuously improved, as evidenced by the shorter ramp-up of UP2-800
Ramping up improvement is gained through maturity in two domains:

**Plant Performance**
- Facilities and equipment design
- Facilities and equipment operation performance
- Facilities and equipment maintainability
- Plant and equipment construction according to design
- Operating parameters tuning during tests

**Plant Operation Efficiency**
- Operation organization
- Operation team skills and experience
- Maintenance team skills and experience
- ESH&Q team skills and experience
- Production support
- Supplier and subcontractor performance
- Site services and infrastructure
- Relationships with stakeholders

Ramp Improvements achieved through plant performance and operation efficiency
R7 & T7
La Hague
HLW
Vitrification Facilities: Performance and Reliability

La Hague
AREVA’s Nuclear Processing Facilities: Commissioning & Startup Experience

LA HAGUE HLW FACILITIES

Vitrification Process

Process Differences w/ large JHM:
1) Separate calcination process (dry feed to melter)
2) Smaller bottom-pour induction-heated melters

Reaching nominal throughput was fast for both facilities T7 and R7 (one to two years)
R7 Upgrade from T7 Lessons Learned

Decrease of processing fuels
Priority shifts to canister preparation for shipment to foreign countries

Commissioning of the Cold Crucible Induction Melter line on R7

R7 : **10,055 glass canisters / 3,987 metric tons** of HLW glass produced through Dec. 2014

T7 : **8,904 glass canisters / 3,547 metric tons** of HLW glass produced through Dec. 2014
AREVA’s Experience in Nuclear Facility Startup and Commissioning Outside France

Rokkasho-Mura
AREVA’s Experience Outside France
Nuclear Facility Startup & Commissioning

- M&O of the Savannah River Vitrification Facility
  - DWPF production improvements
  - On-going Construction and Startup of a MOX Fuel Fabrication Facility
  - Commissioning and Operation Preparation

- Sellafield Site M&O
  - Vitrification Assistance Program

- Rokkasho-Mura Partnership
  - Technology and Operational know-how transfer for the fuel reprocessing plant
  - Assistance for Commissioning and Operation Preparation

Vitrification
Commissioning and Operation Preparation
Thank You