

AREVA's Nuclear Processing Facilities: Commissioning & Startup Experience

Waste Management 18 MAR 2015

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VP Operational Integration

& Strategic Development

AREVA Inc.



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

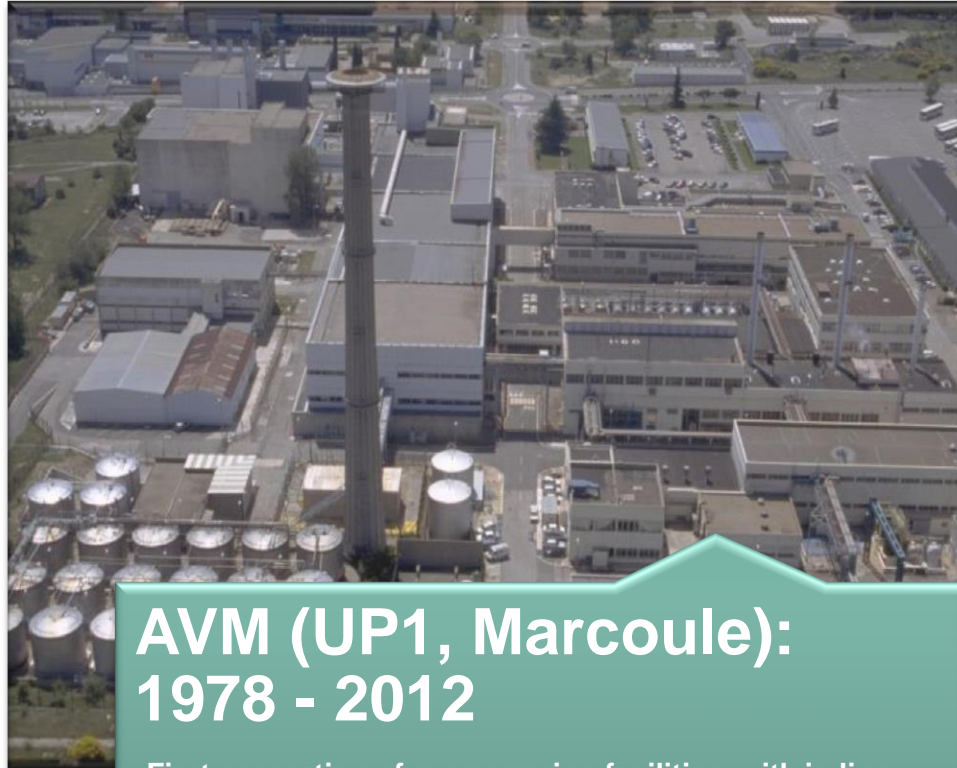
- **Recognized experts in US, UK, Japan and France**



AREVA's Vitrification Experience

La Hague

VITRIFICATION EXPERIENCE 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

VITRIFICATION EXPERIENCE Overview



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

VITRIFICATION EXPERIENCE

French Experience in HLW Vitrification



Pilot Units

1st VULCAIN
(Saclay)

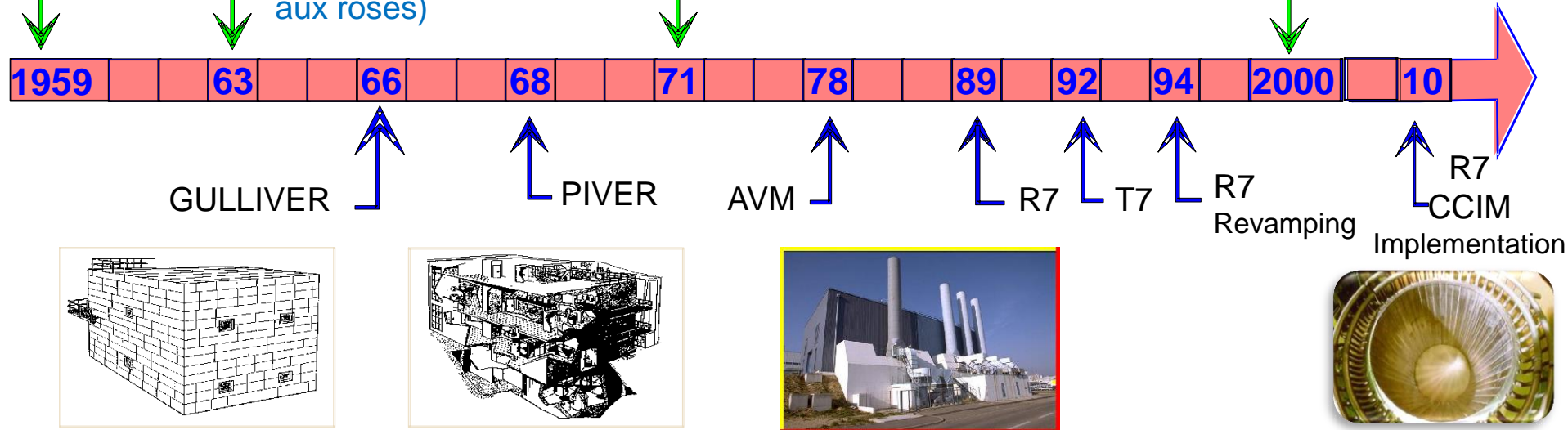
2nd VULCAIN
(Fontenay
aux roses)

3rd VULCAIN
(Marcoule)



Hot Laboratories

ATALANTE-DHA



Over 35 years of industrial operation - 7,545 metric tons of HLW glass - 19,075 glass canisters

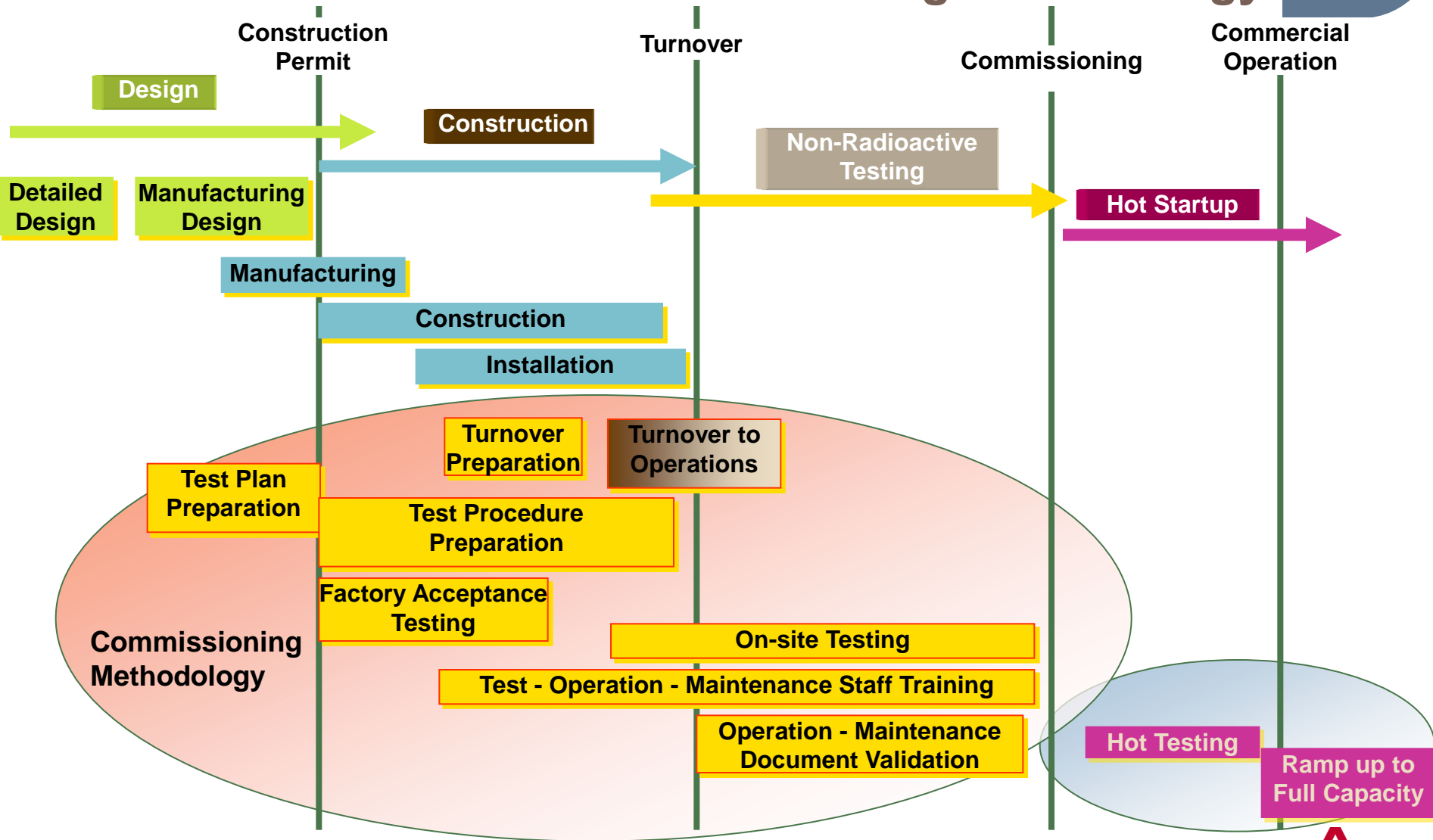


AREVA's Experience in Nuclear Facility Commissioning and Startup

La Hague

COMMISSIONING & STARTUP EXPERIENCE

AREVA's Proven Commissioning Methodology



COMMISSIONING & STARTUP EXPERIENCE

AREVA's Proven Commissioning Methodology

Commissioning Turnover

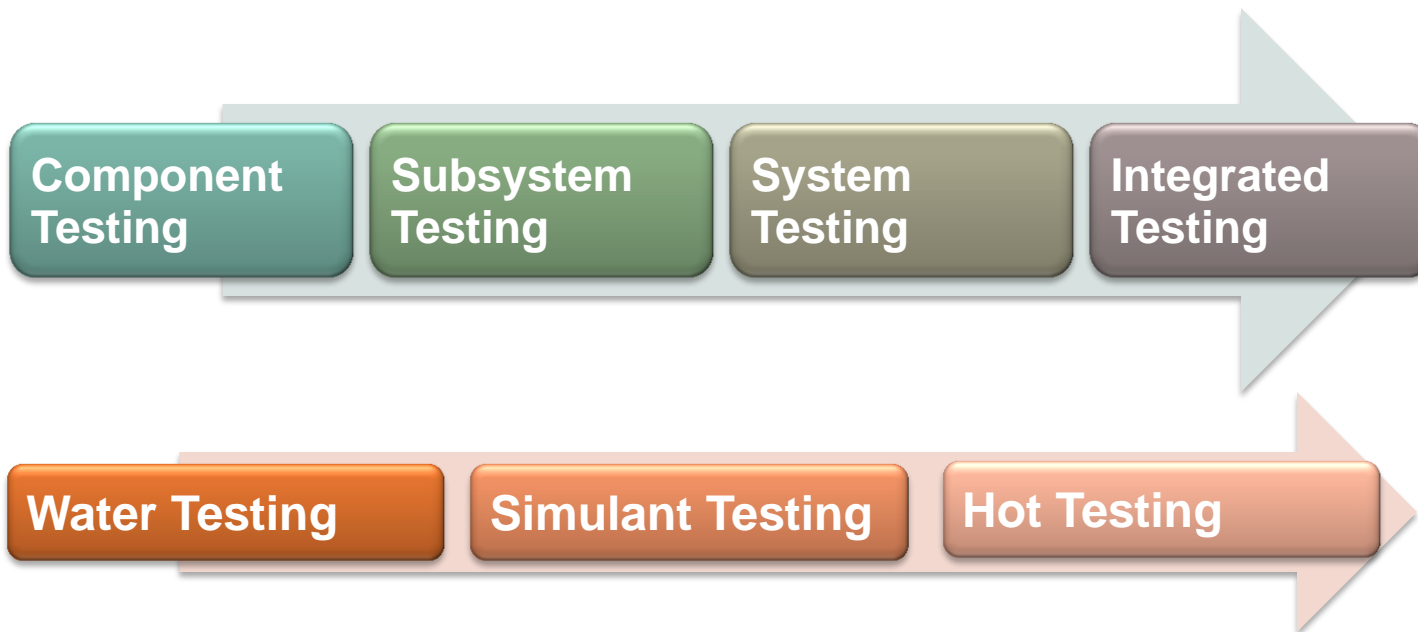
- **Turnover of process units documentation from Construction to Operation testing teams**
 - Test teams start the non-radioactive on-site tests
 - Test procedures developed and test operators trained beforehand
- **Hot Commissioning**
 - ***Nuclear safety authority approval obtained***
 - Radioactive 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

COMMISSIONING & STARTUP EXPERIENCE

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



COMMISSIONING & STARTUP EXPERIENCE

AREVA's Proven Commissioning Methodology

Identify & Correct Operability & Maintainability Issues before Hot Commissioning

Completeness

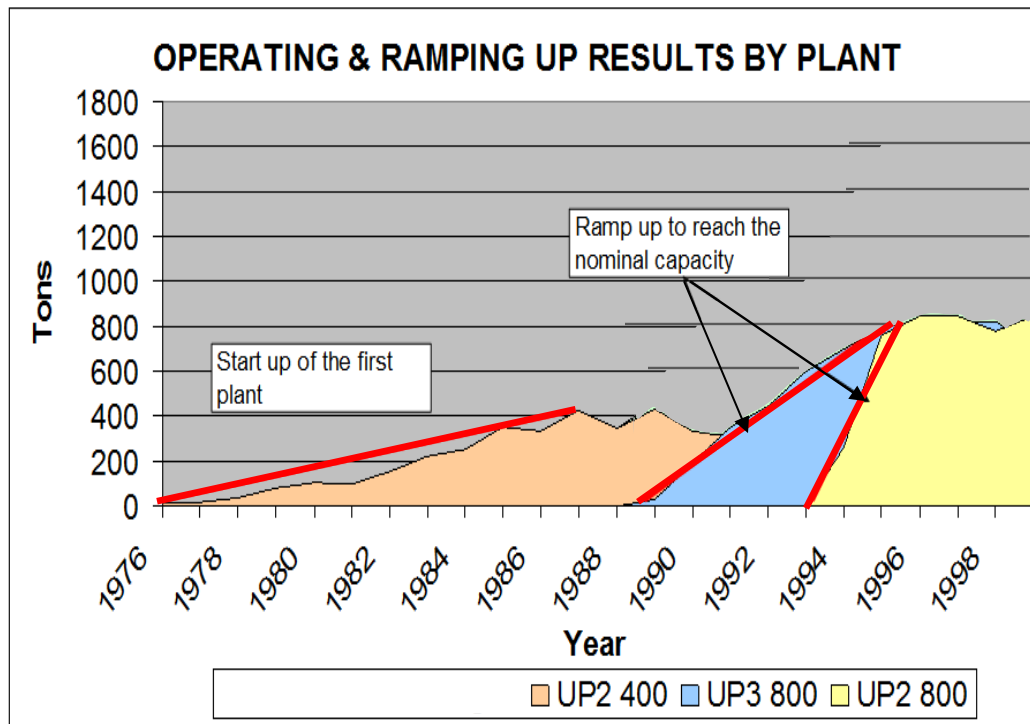
- **Safety Related Tests**
- **Tests of Nominal and Bounding Conditions**

Traceability of Tests & Results

Proven Test Methodology

- **Developed and continuously improved through UP3, UP2-800, MELOX, R4, and ACC testing and commissioning**

COMMISSIONING & STARTUP EXPERIENCE RAMPING UP THE LA HAGUE FACILITIES



La Hague Facility Startup

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**

COMMISSIONING & STARTUP EXPERIENCE

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



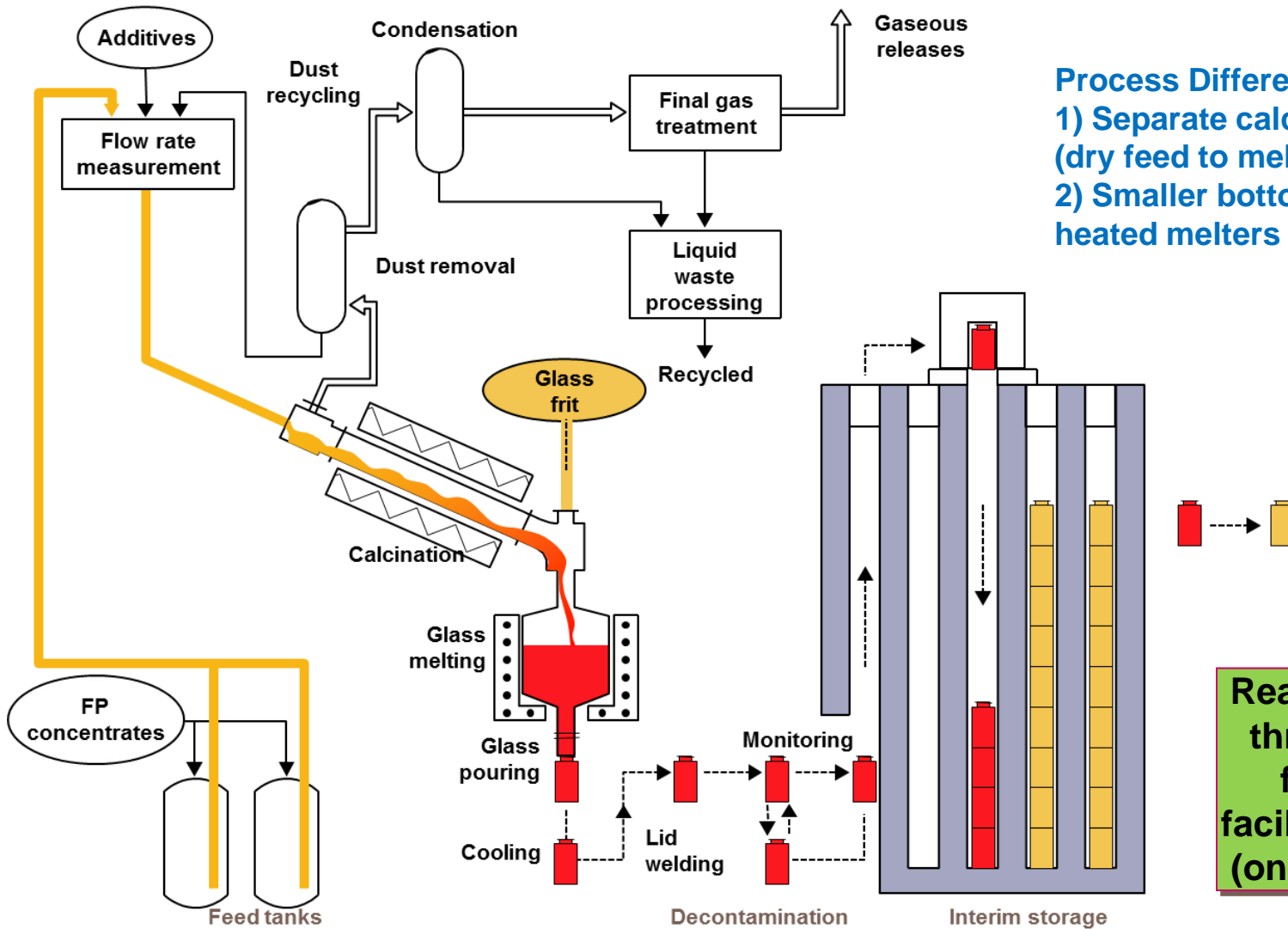
Ramp Improvements achieved through plant performance and operation efficiency



R7 & T7 La Hague HLW Vitrification Facilities: Performance and Reliability

La Hague

LA HAGUE HLW FACILITIES Vitrification Process

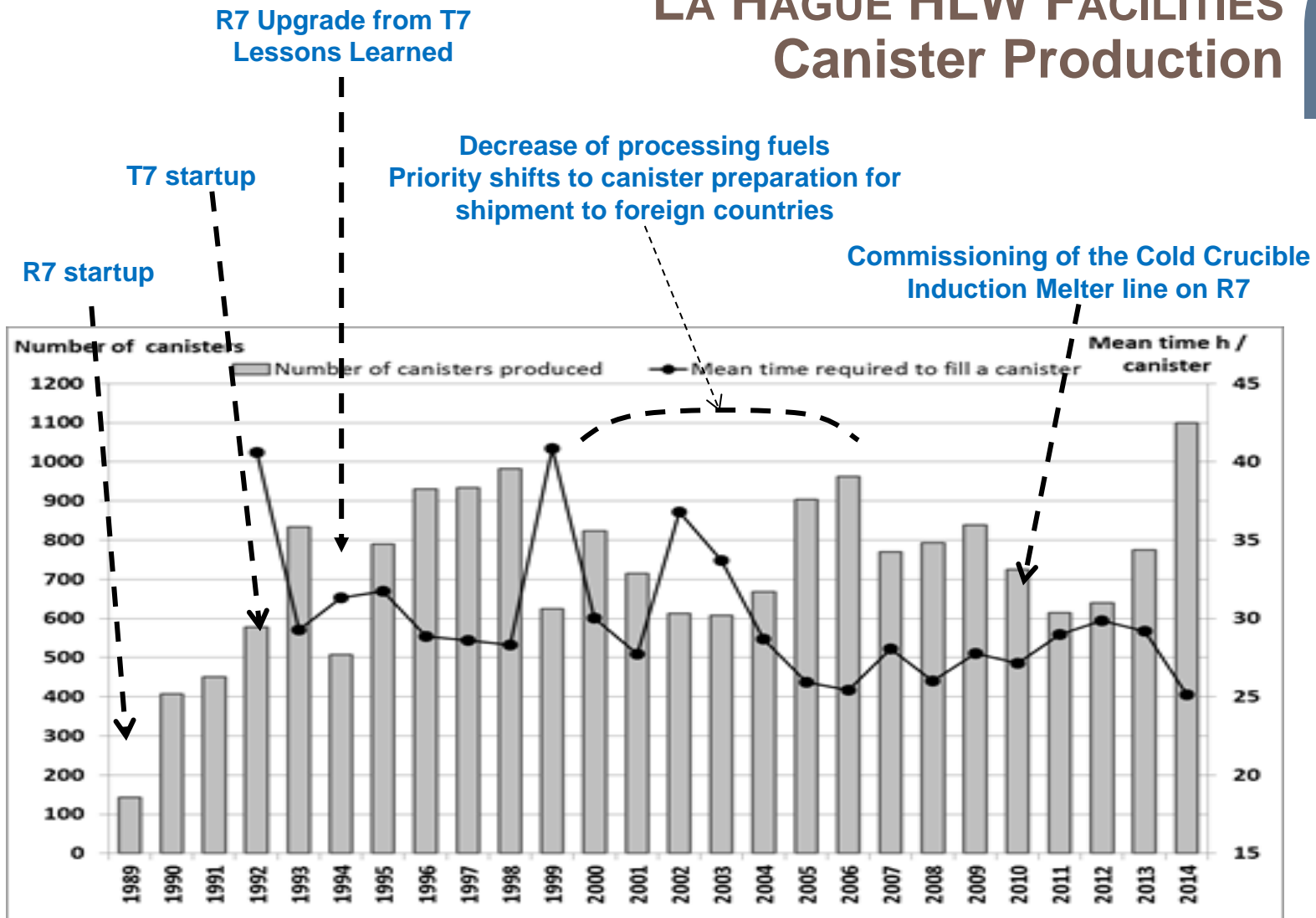


Process Differences w/ large JHM:

- 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)

LA HAGUE HLW FACILITIES Canister Production



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



Sellafield Site M&O



- ▶ Vitrification Assistance Program

United Kingdom

Rokkasho-Mura Partnership



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



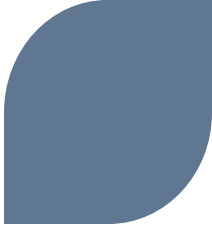
On-going Construction and Startup of a MOX Fuel Fabrication Facility



- ▶ Commissioning and Operation Preparation

 Vitrification

 Commissioning and Operation Preparation



Thank You