



# History and Evolution of the OSL

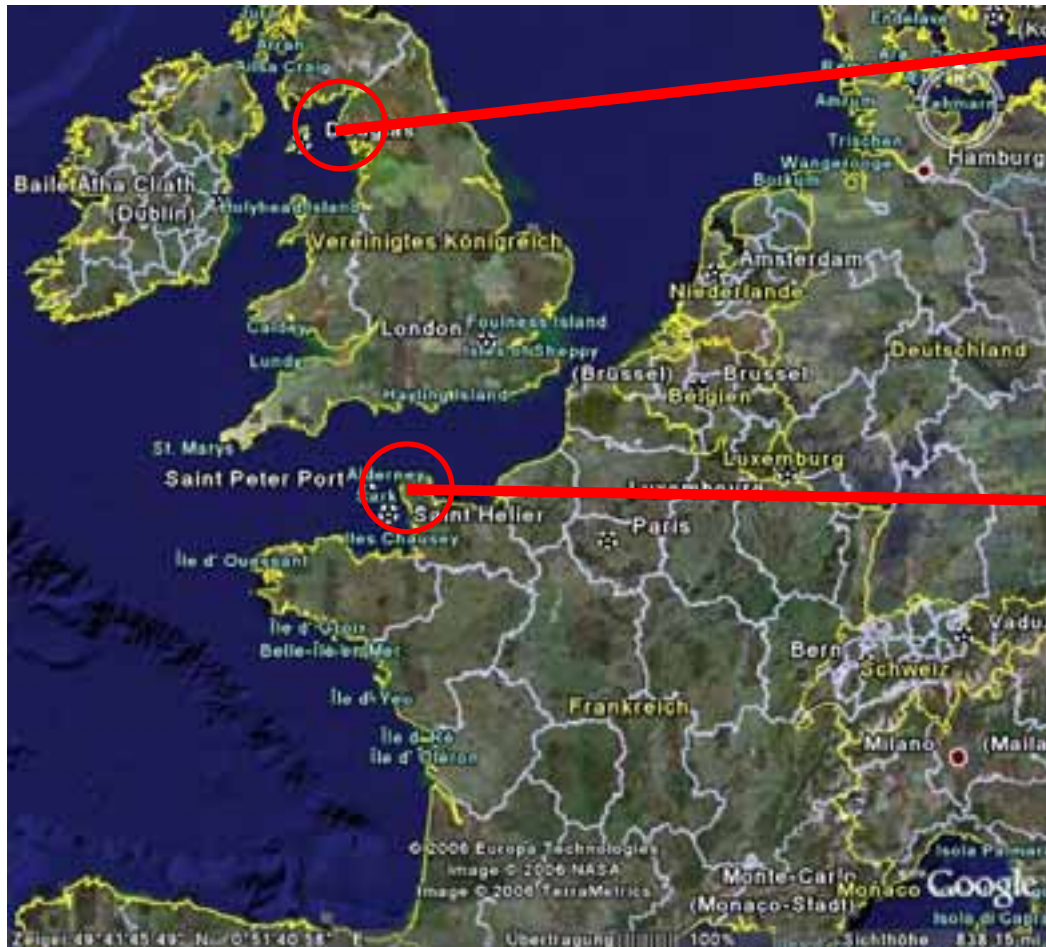
Dr. Roland Schenkel  
Director General

European Commission, Joint Research Centre



ITU Building

# Commercial reprocessing plants



Sellafield Limited,  
Sellafield, UK

On-Site Laboratory  
Start-up October 1999



Areva NC, La Hague,  
France

Laboratoire Sur-Site  
Start-up June 2000

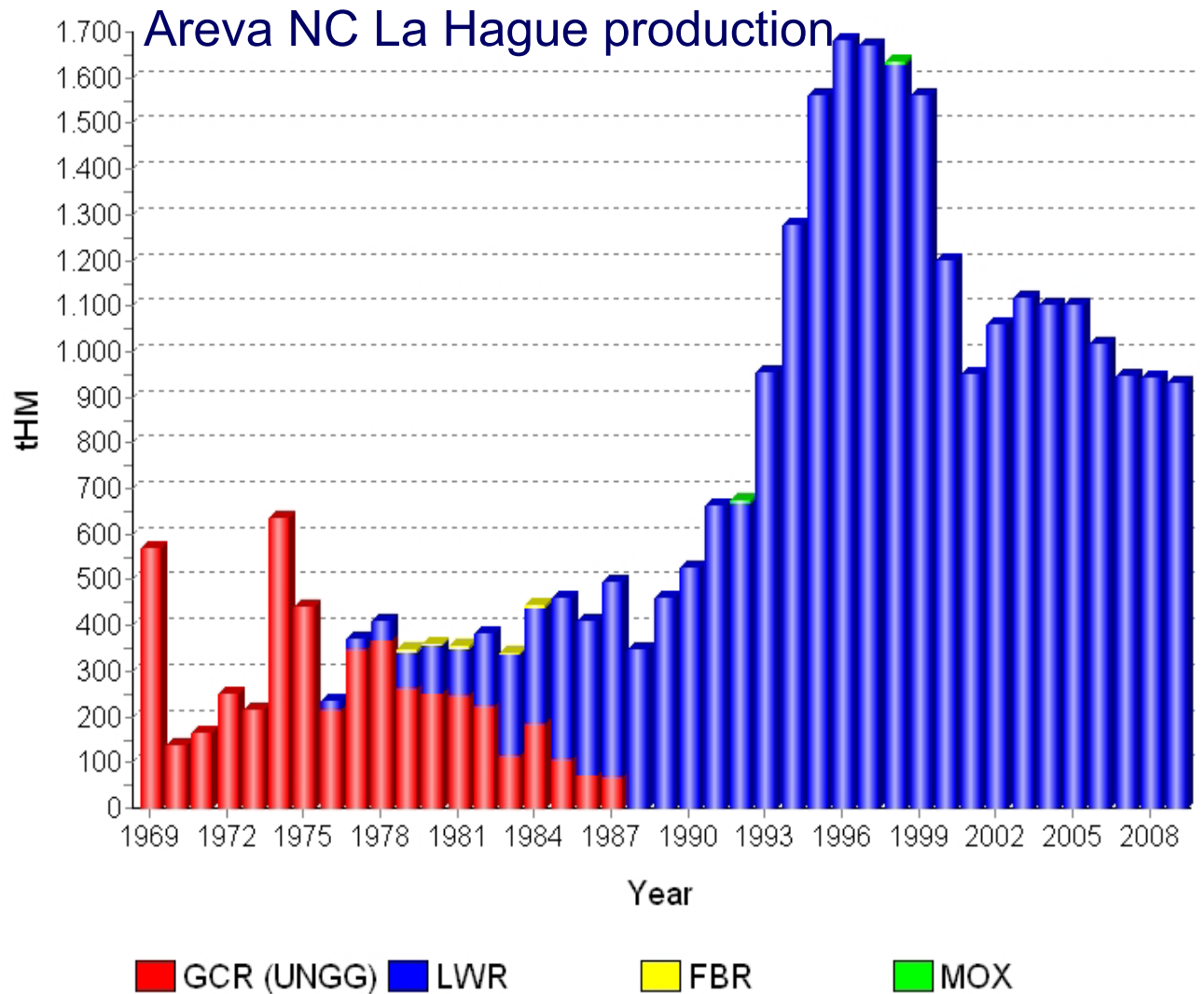


## Capacity (tHM/year)

UK	Magnox	1500
	LWR/AGR	900
France	LWR	1700
Total	LWR	3800
	All	5500

## Produktion (tHM)

UK	Magnox	45000
	2000-2009	4000
	THORP	6700
	2000-2009	5000
France	UNGG	18000
	LWR	25500
	2000-2009	10350
Total		95000
Discharged		290000



Source: Annual reports Areva + NDA; IAEA-TECDOC-1467, IAEA Sept. 2005

## Euratom Treaty

“The Commission shall satisfy itself that nuclear material is not diverted from intended use”

Operator obligation

declare basic technical characteristics  
account for nuclear material

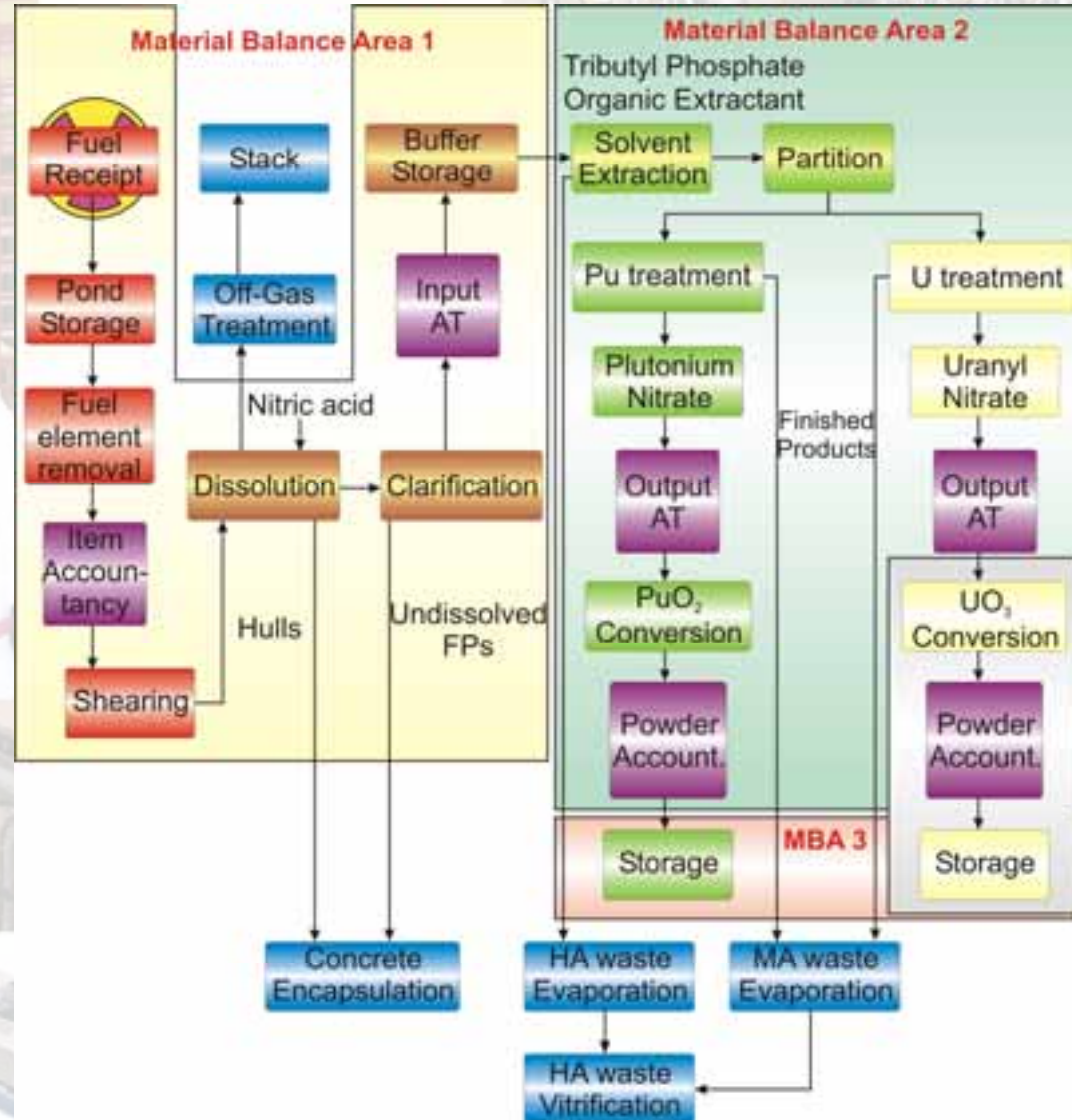
Commission's right

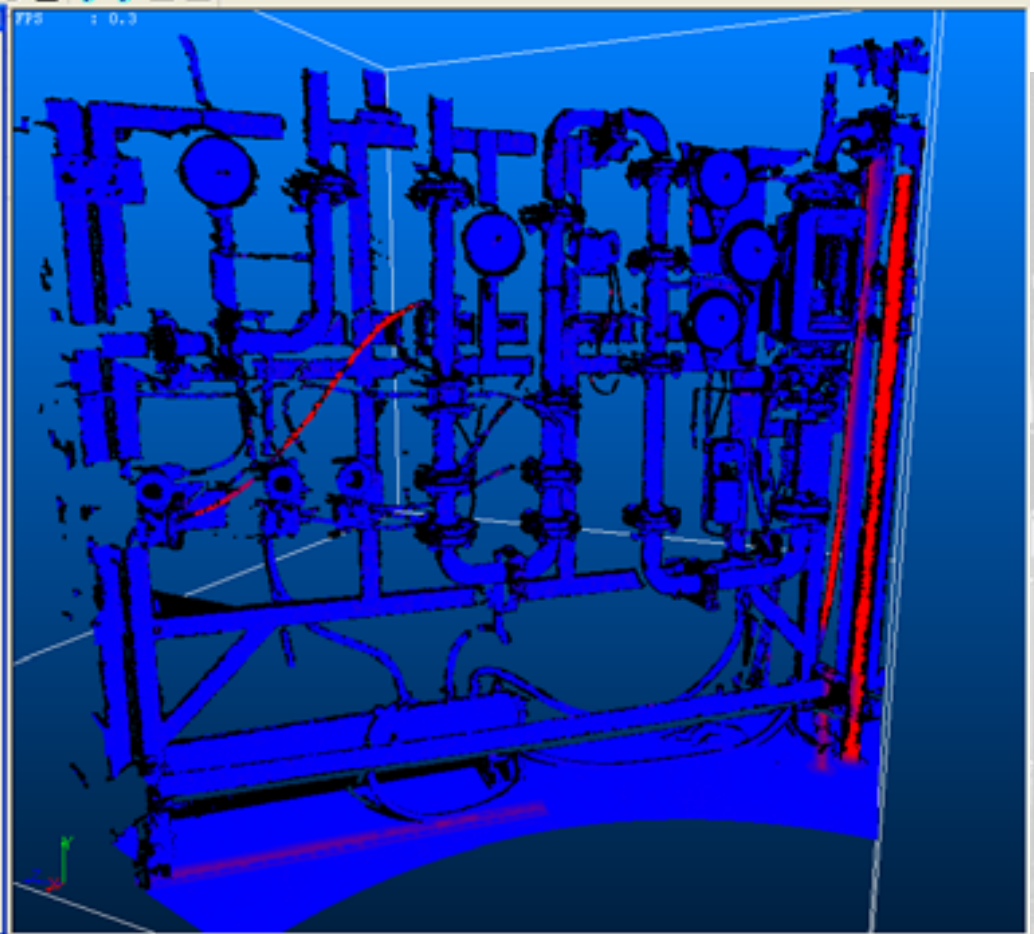
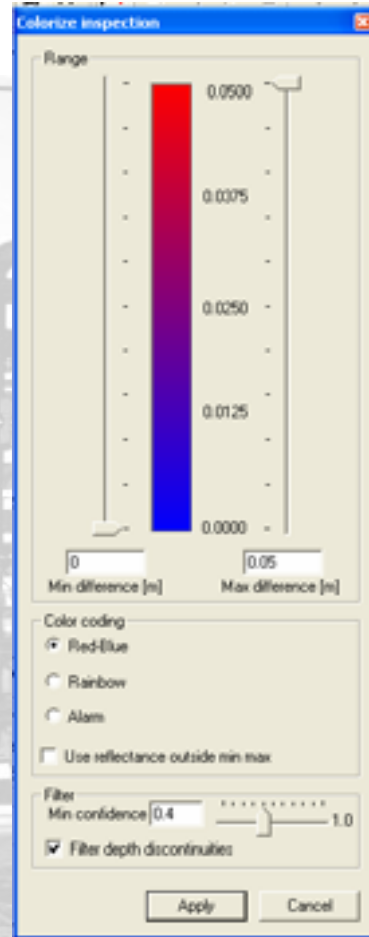
send inspectors

compliance, performance, credibility control

enforce

- Tamper indication devices seals
- Containment and Surveillance cameras
- Radiation Monitors passive or active
- Nuclear materials sampling
- Process Monitoring
- Design Information Verification
- Physical Inventory Verification
- Key Measurement Points





Differences (with mm accuracy) detected by laser scanning, with JRC-IPSC developed change detection algorithms

## Compliance control

- Accountancy checks
- BTC declarations verifications

## Performance control

- NMAC system quality auditing (what – where – when)

## Credibility control

- Physical verifications

### On-Site Laboratories relevant

- Verification input/output is a key element
- Sample taking from various stages of the process stream is mandatory
- Several key measurement points
- Large amount of samples of various nature



## OSL

1992: Decision of the Commission  
1993: Safety Report  
1995 - 1997: Construction  
1997: Installation on site  
1999-2000: Active commissioning  
October 13, 1999: Official opening  
2000: Operational phase

## LSS

1992: Decision of the Commission  
1994: Start of the LSS project  
1994 - 1997: Construction  
1999: Installation  
2000: Active commissioning  
June 6, 2000: Official opening  
August 2000: First input sample

# On-Site Laboratory Sellafield



- Two active laboratories  
One cold laboratory
- Glove box environment
  - Glove boxes
  - Shielded enclosures
- (Hot cell environment at THORP)

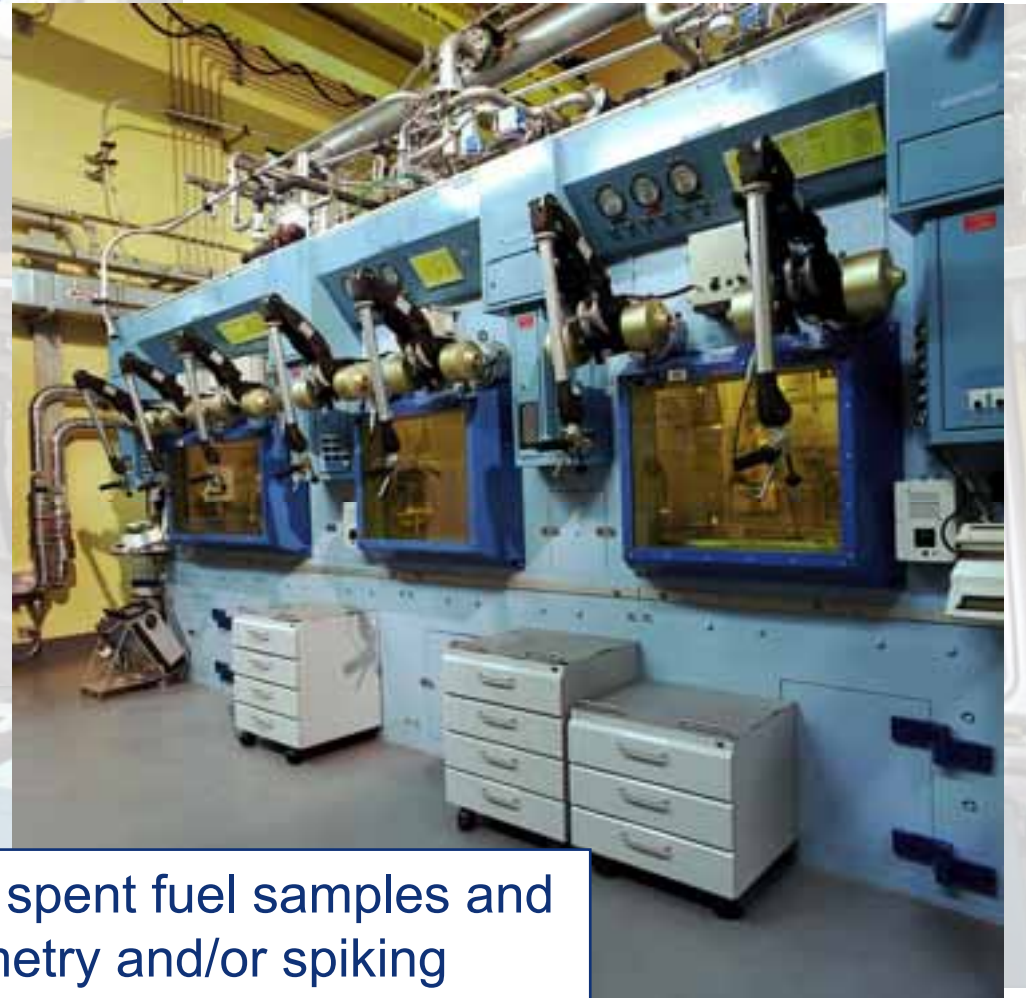
Robotised glove box for separation chemistry and alpha counting



# Laboratoire Sur-Site La Hague

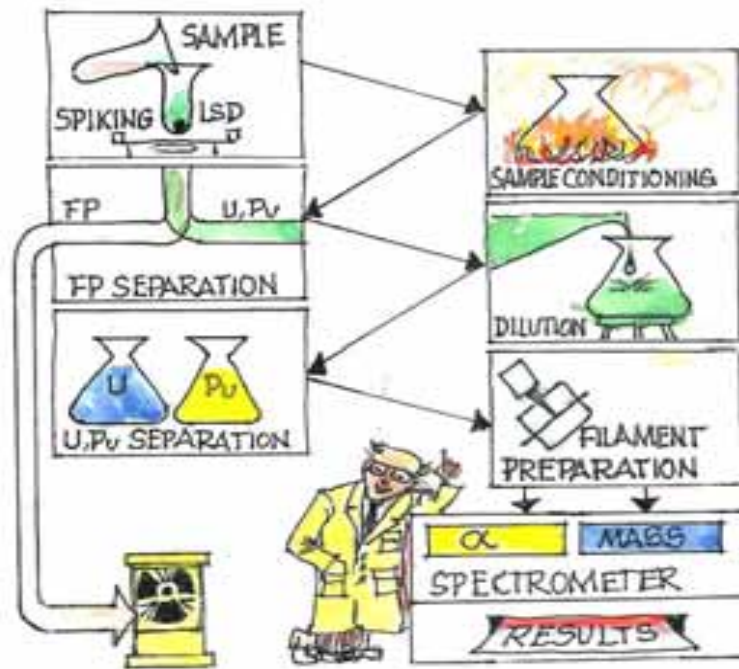


- Three active laboratories
  - Hot cell facilities
  - Product laboratory
  - Mass Spectrometry laboratory
- Hot cell environment plus glove boxes for low activity work



Hot cell suite for handling of dissolved spent fuel samples and their assay by Hybrid K-edge densitometry and/or spiking

## Measurement techniques for plutonium and uranium analysis in reprocessing input solutions and products



© H. Ottmar

### Isotope Dilution Mass Spectrometry (IDMS)

- Primary reference method
- Highest accuracy, but sophisticated
- Analysis not completed within 1 day

### Hybrid K-Edge Densitometry (HKED)

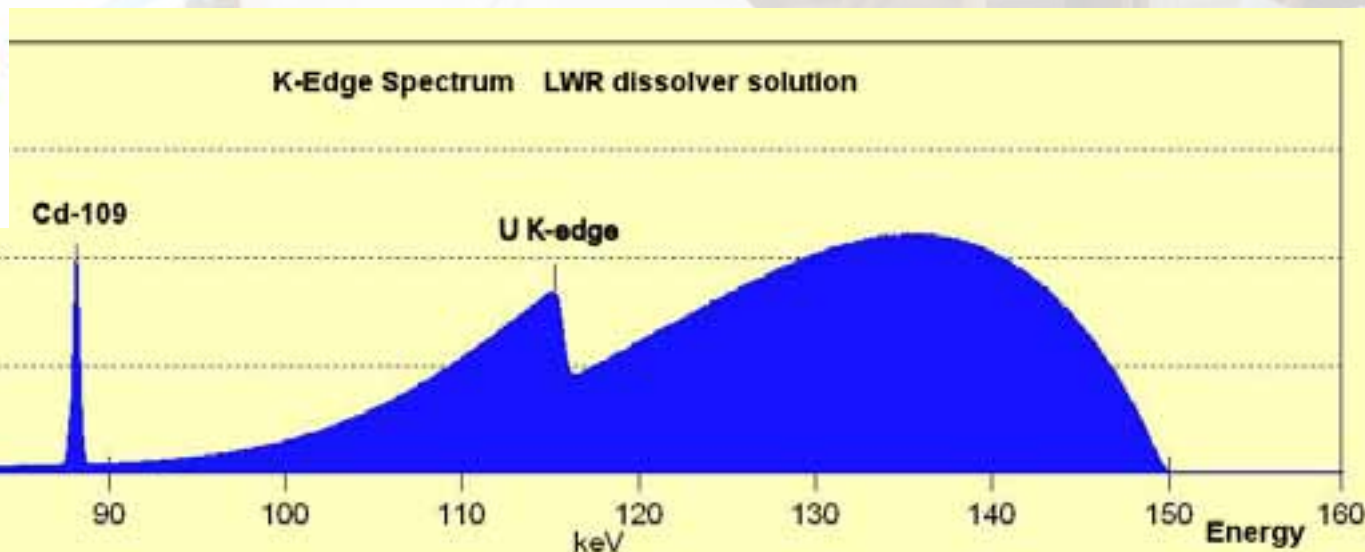
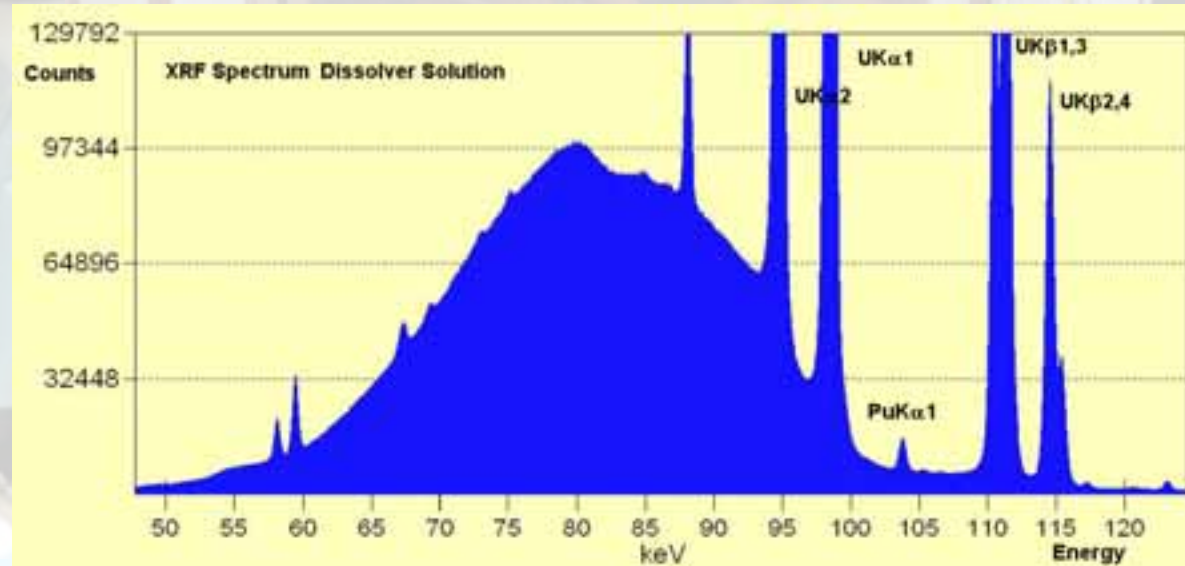
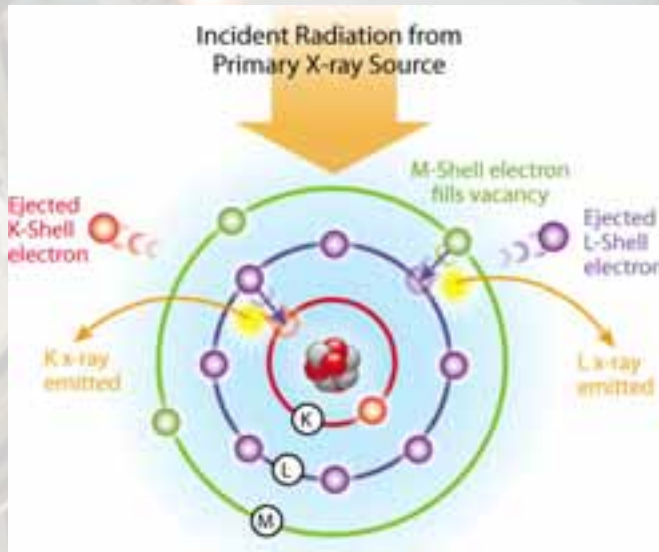
- An alternative X-ray technique
- Not as accurate as IDMS, but simple
- Analysis completed within 1 hour

## Workhorses

Requires calibration

Uncertainty: element assay

U: 0.20 % Pu: 0.65 %

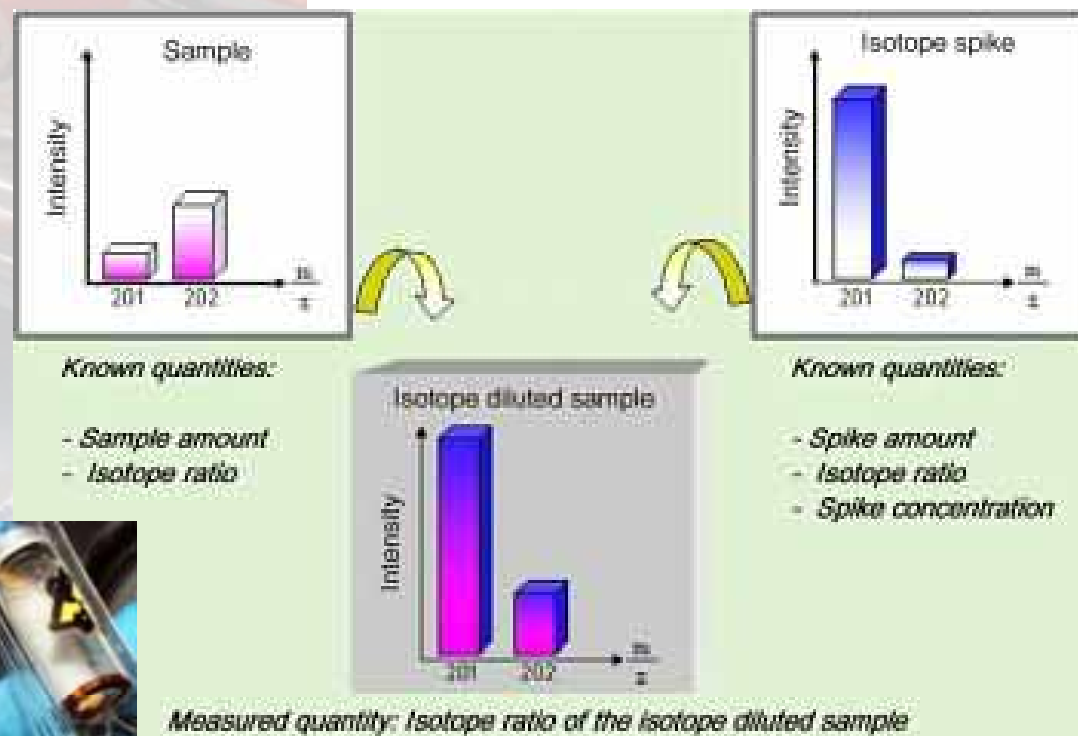
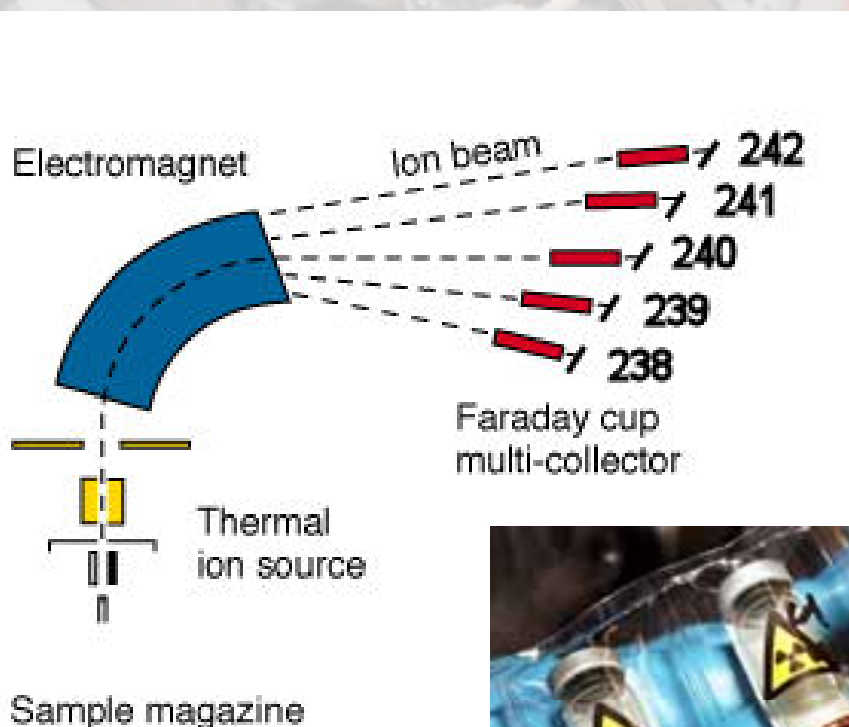


## Total Evaporation Thermal Ionisation Mass Spectrometry

### Isotope Dilution: LSD (JRC-IRMM)

Robust, Reliable procedure

Uncertainty: element assay  $U + Pu < 0.1 \%$



Reference materials for accurate measurements  
LSD: certified for U and Pu amount content and isotopic composition  
Provides traceability to the SI unit



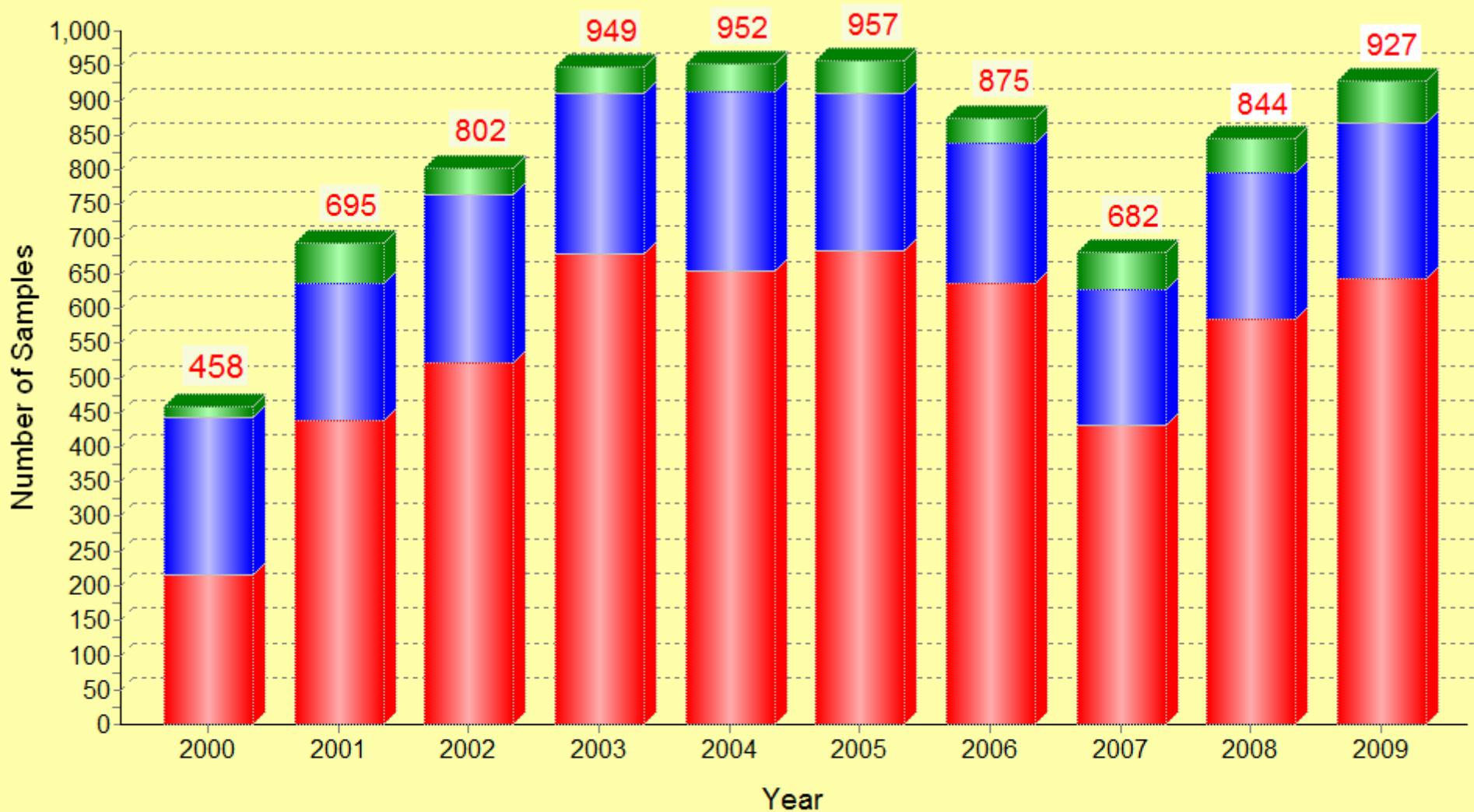
LSD mother solution



LSD dispensing with automated system



Large sized dried spike



About 8200 samples

21400 measurements

■ Input   ■ Product   ■ Other

## Logistics, organisational structure, human factor

- Weekly rotating teams with 2 – 3 analysts per week
- Around 270 mission-weeks a year which is equivalent to almost 50 years of on-site presence
- On average every analyst has been 4 years on-site distributed over 10 years
- Compared to off-site laboratory: analyst performs analytical work plus accountancy, maintenance, inspector relations, ...
- Extensive training: analysis methods plus site specificities

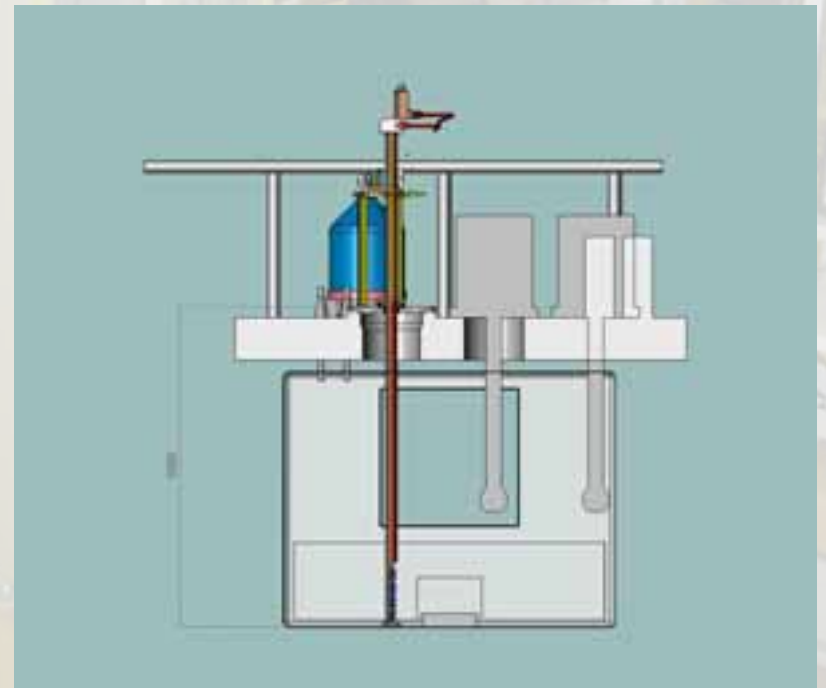
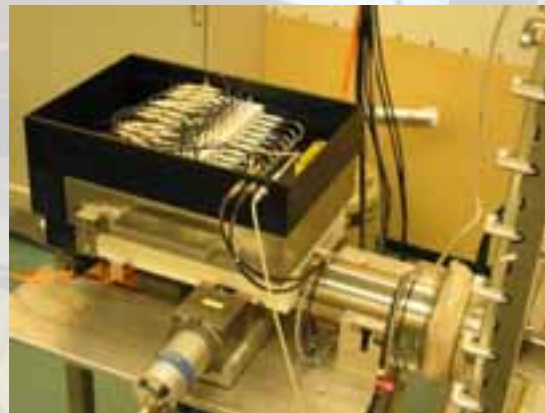
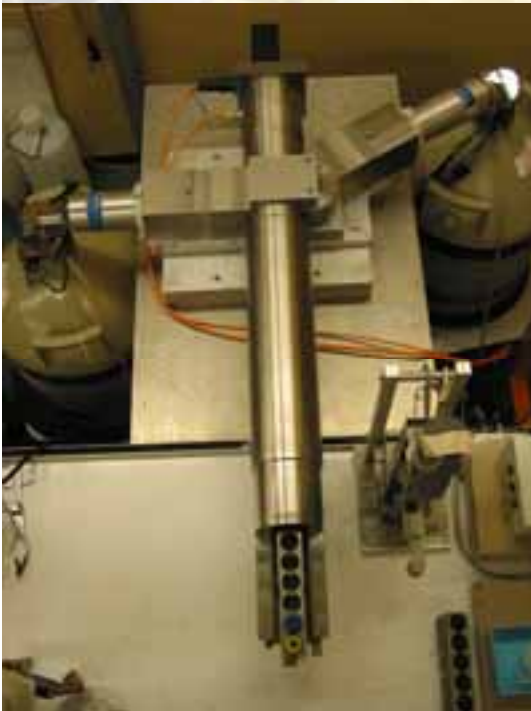
IAEA OSL Rokkasho-mura: copy of LSS La Hague

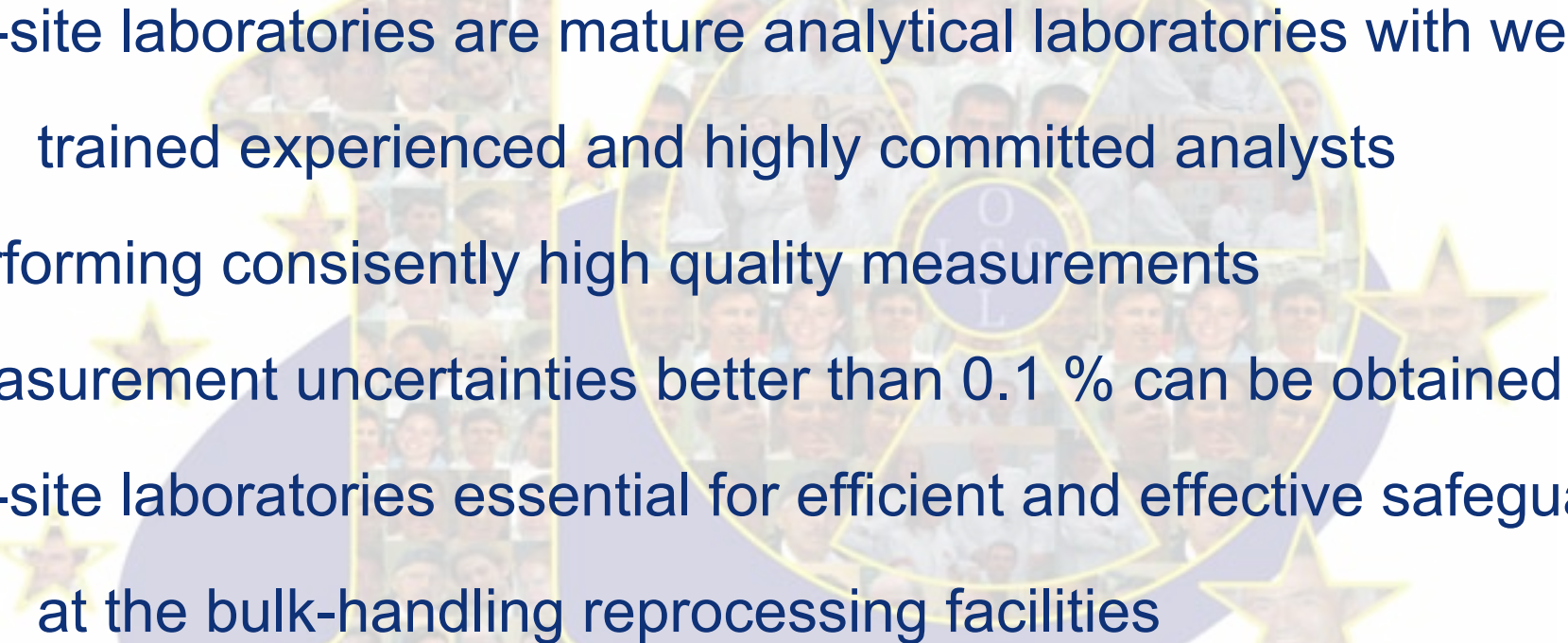
Support to IAEA: delivery of 2 HKED systems  
assistance acceptance tests + calibration  
training IAEA inspectors

Mayak: delivery HKED system

Rokkasho, Japan

Mayak, Russia



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- On-site laboratories are mature analytical laboratories with well trained experienced and highly committed analysts
  - Performing consistently high quality measurements
  - Measurement uncertainties better than 0.1 % can be obtained
  - On-site laboratories essential for efficient and effective safeguards at the bulk-handling reprocessing facilities

A strong nuclear safeguards and nonproliferation regime is vital for the application of nuclear technology to prevent

- ▶ clandestine production of fissile material
- ▶ diversion of fissile material from the civil fuel cycle

Effective safeguards and Non-Proliferation will continue to require cutting edge and highly sensitive detection techniques for nuclear material:

GenIV initiative & safeguards of advanced fuel cycles