

# The European Commission's science and knowledge service



Overview of nuclear decommissioning activities

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□ JRC as a nuclear decommissioning operator

□ JRC "added value" in Nuclear Decommissioning and

Waste Management (NDWM)







## □ JRC as a nuclear decommissioning operator

### **JRC ''added value'' in NDWM**







### **Nuclear power reactors in the EU**



- Operational
- Shutdown Dismantling
- Fully Dismantled
- Long Term Safe Enclosure



129 NPPs in operation 90 in permanent shutdown In total 219 NPPs = 153 Gwe (ref. PINC – 2016)



### **Aging of the EU reactor fleet**







## **Estimated costs for D&WM**

Decommissioning costs = estimated 15% construction costs~0.6 G€/unitor ~ 0.8 G€/GWebut with large variations in EU countries:0.3 ÷ 1.3 G€/unit0.3 ÷ 1.4 G€/GWe

Waste management costs = estimated av. 3 €/MWh (0.6 ÷ 10)

Expected market volumeDecommissioning123 G€Waste Management140 G€





### Waste repositories in EU







### □ JRC as a nuclear decommissioning operator

## **JRC ''added value'' in NDWM**







**JRC mission:** 

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

#### 3000 staff

Almost 75% are scientists and researchers. Headquarters in Brussels and research facilities located in 5 Member States.





The Decommissioning and Waste Management Programme was launched in 1999 (COM(1999)114, Council and European Parliament).

# The programme aims to eliminate both historical and future liabilities at all nuclear sites of the JRC.



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### **Historical and Future liabilities at JRC-Ispra**

The historical liabilities at JRC-Ispra include:
1) obsolete irradiated and non-irradiated nuclear materials
2) 7 main nuclear facilities, including two reactors
3) low and intermediate level waste of various sorts







## □ JRC as a nuclear operator

## □ JRC "added value" in NDWM







## Synergy between operation and R&D



The European Parliament, during its debates on the future Euratom research programme, requested that:

"JRC builds upon its experience with the decommissioning of JRC nuclear facilities and further reinforces its research to support safe decommissioning in Europe."

**Opportunities for a research organisation with a programme on operational NDWM:** 

- Direct transfer of user needs to researchers
- Real-life samples
- Possibility of full scale in-field trials of prototypes
- Immediate feedback from end-users



## Major technological challenges in ND&WM

Does the current technology allow to perform

ND&WM in a satisfactory way?

Is there a need for R&D in decommissioning?



What JRC can do in NDWM

### Metrology for characterisation & clearance

ANTECH







### Decontamination: water/metal/soil/ concrete/graphite





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### **Site remediation**







Remote controlled or automated operations Geological repository





## Past and ongoing R&D on ND&WM at JRC

- NDA techniques for the characterisation of waste packages
- Standardisation of free release (clearance) measurements
- Removal, conditioning and remediation of degraded, damaged or nonconventional fuels
- Spent fuel management: storage, verification, disposal; long-term behaviour of in geological repository
- Testing of novel techniques, mapping of contaminations in high-activity environments or decontamination
- 'Hard to measure' nuclides: experimental validation of activation calculations; analytical tools applicable in-field
- Development of reference materials
- Improvement of nuclear data
- Networking, knowledge management, education and training





## **E&T on ND&WM at JRC**

## **ELINDER:** "European Learning Initiatives for Nuclear Decommissioning and Environmental Remediation"

#### **Purpose:**

Stimulate vocational training in nuclear decommissioning and waste management in the EU, by:

- creating a European 'pool of training initiatives' offering at different locations a series of courses, visits and practical studies;
- presenting complementing modules, reducing duplication;
- harmonizing the learning outcomes;
- offering an EU 'quality label' or 'endorsement' to those initiatives contributing to qualitative competence building in ND&WM.

