

SG Symposium

Safeguarding Pyroprocessing facilities in the ROK

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IAEA

International Atomic Energy Agency

Introduction

Pyroprocessing:

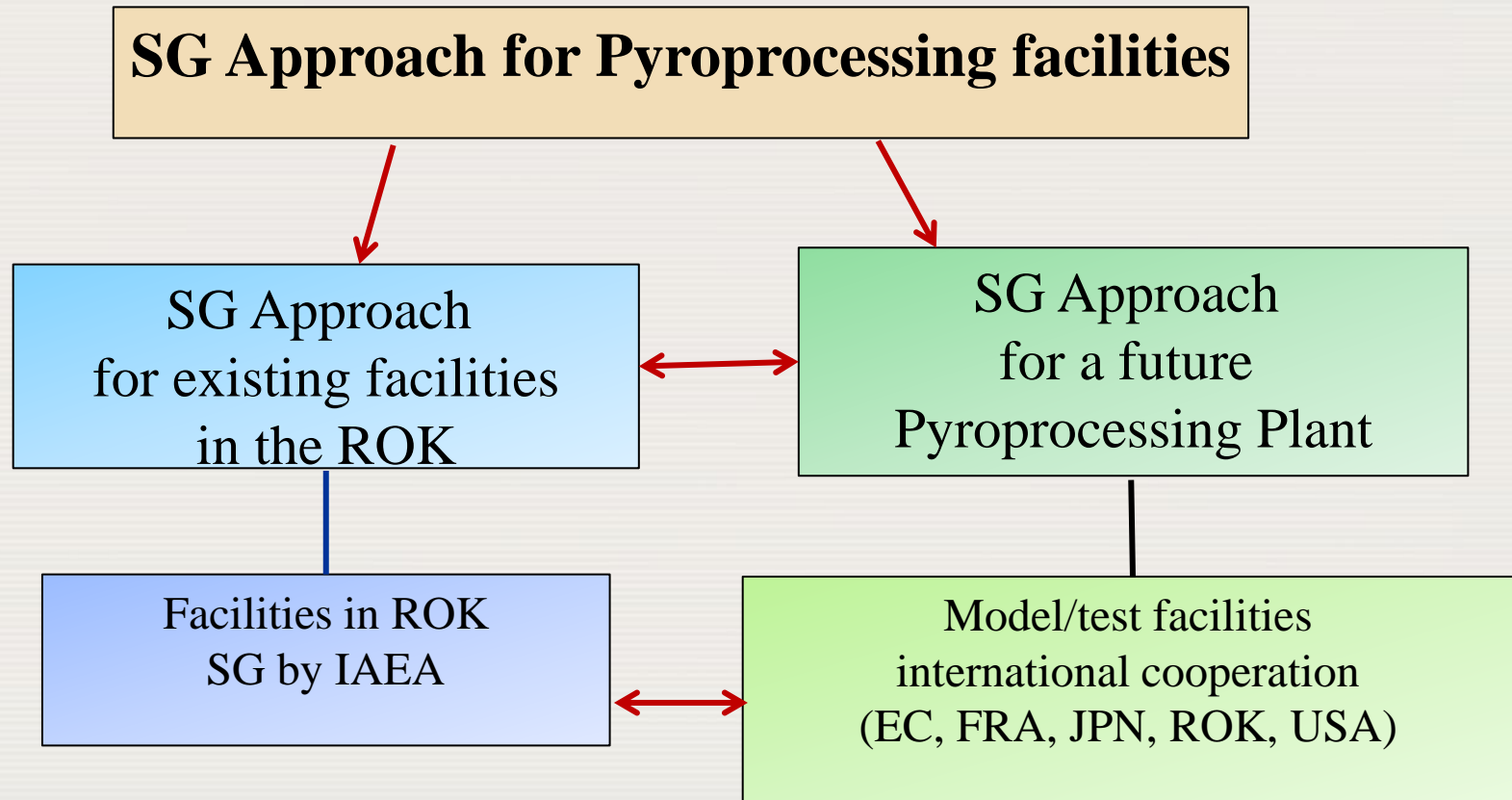
- Uses molten salt/molten metal at high temperature and electrochemical method to separate actinides from fission products
- Not yet implemented on an industrial scale
- Flow sheets and equipment may vary depending upon purposes (no standard equipment or flow sheet)

The demands for a robust safeguards approach applied to pyroprocessing requires that the IAEA needs to:

- Measure/verify Pu and U inventories at strategic points
- Keep the continuity of knowledge of Pu and U during the pyroprocess flow
- Develop new measures/techniques to complement the more traditional safeguards measures such as containment and surveillance (C/S) and nuclear material accountancy



IAEA Safeguards Approach for Pyroprocessing Facilities



IAEA Safeguards Approach for Pyroprocessing Facilities

General Principles of Safeguards Implementation:

- Nuclear material accountancy as a basis for non-diversion
- Implementation of safeguards based on a State-level approach and application of safeguards measures at the State, site and facility level
- Comprehensive evaluation of all safeguards relevant information about a State

IAEA Safeguards Approach for Pyroprocessing Facilities (cont.)

Selected measures for SG implementation:

□ In-Field Verification Activities:

- **Routine inspections:** e.g. **Physical Inventory Verification (PIV)** and **Random Interim Inspection (RII)**; Nuclear Material Accountancy, utilisation of containment and surveillance measures (C/S), DA and NDA measures
- **Design Information Verification (DIV)**
- **Complementary Access (CA)**
- **Environmental Sampling (ES)**

□ HQ Activities:

- **Material Balance Evaluation** (at the facility and State level)
- **Analysis of all available information:** e.g. information collected during field activities, Design Information Evaluation (DIE), advanced declarations, operational facility information, Additional Protocol (AP) declarations, open source information, satellite imagery, etc.



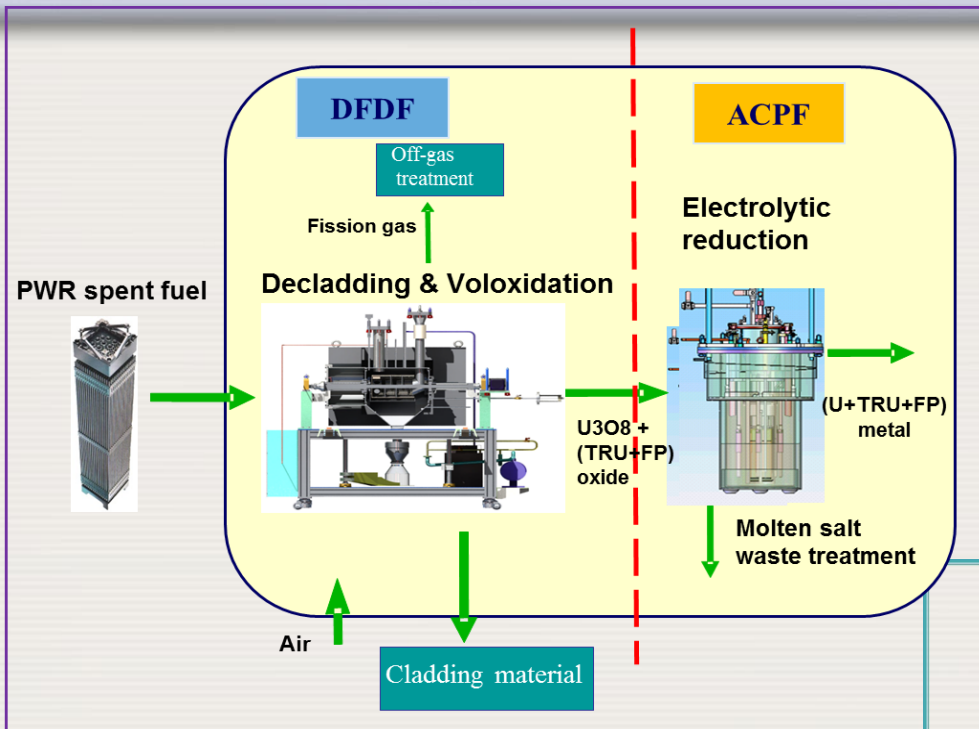
Pyroprocessing facilities in ROK

There are three pyroprocessing-related facilities at the KAERI (Korea Atomic Energy Research Institute) Site:

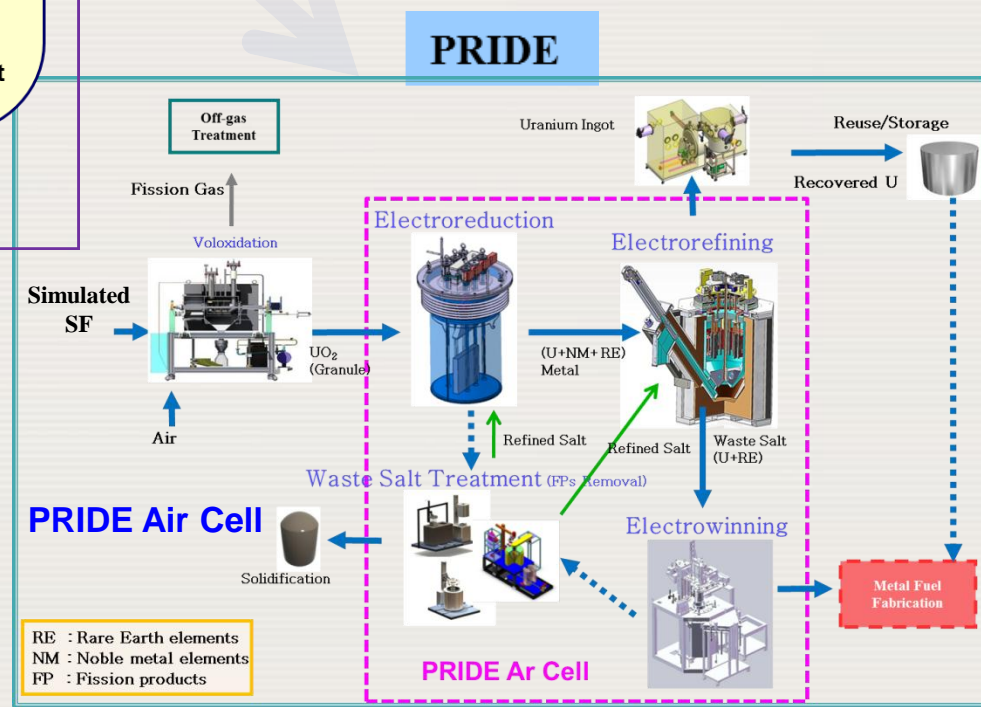
- ❑ **PRIDE** – Pyro-process Integrated Inactive Demonstration Facility (KOV2)
- ❑ **ACPF** – Advanced Spent Fuel Conditioning Process Demonstration Facility (KOV1)
- ❑ **DFDF** - DUPIC Fuel Development Facility (KOY-)

Additionally, there are several KMPs of KAERI R&D (KOQ-) (e.g. KMP R – Pyroprocessing research laboratory) conducting pyro-related research and development activities.

Pyroprocessing facilities at KAERI Site



TRU : Transuranic elements
 NM : Noble metal elements
 FP : Fission products

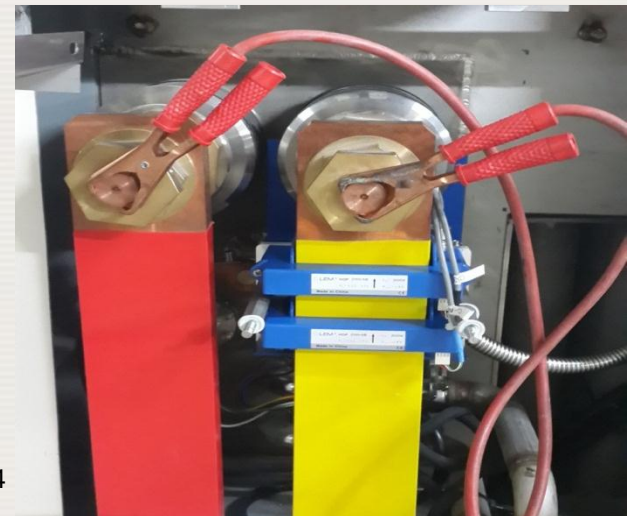


RE : Rare Earth elements
 NM : Noble metal elements
 FP : Fission products



Equipment development: UMS Bus Bar Monitoring System

- Installed in the PRIDE facility to support evaluation of the facility operators' declaration
- Function:
 - monitoring the electrical current supplied to the electro-reduction and the electro-refining equipment
 - neutron detection
- Local data collection with Radiation Data Logger
- Remote data collection direct to HQ Vienna
- No computer required



Other Equipment Application: UMS Portal Radiation Monitors

Portal Radiation Data Loggers are:

- Installed in the PRIDE facility to support evaluation of the facility operators' declaration (absence of irradiated nuclear material)
- Function: neutron detection
- Local Data collection with Radiation Data Logger
- Remote Data collection direct to HQ Vienna
- No Computer required



Summary

- The Republic of Korea (ROK) has established three pyroprocessing-related facilities at the Korea Atomic Energy Research Institute (KAERI) site.
- The basic principles of safeguards implementation have been applied to pyroprocessing-related facilities in the ROK which takes into account the specific nature of the process and the nuclear materials involved.
- The demands for robust safeguards applied to pyroprocessing facilities require the IAEA to develop new measures/techniques : a bus bar system has been designed and developed to support evaluation of the facility operators' declaration by monitoring the electrical current supplied to the electro-reduction and the electro-refining equipment.
- The IAEA's safeguards system provides the international community with credible assurances regarding a State's fulfilment of its safeguards obligations.