Direction générale de l'énergie et des transports

COMMISSION EUROPÉENNE

European Commission Safeguards at modern MOX Fuel Fabrication Plants

European Commission
DG Energy & Transport
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Presentation at JAEA-IAEA Workshop on Advanced Safeguards Technology for the Nuclear Fuel Cycle at the Techno Community Square, Ricotti, Tokai-mura, Ibaraki, Japan, November 2007

Purpose of this presentation

- Legal Background of European Commission (EC) Safeguards scheme
- General overview on EC Safeguards scheme for MOX Fuel Fabrication Plants (FFP)
- Feedback on safeguards experience gained from industrial sized MOX FFP
- Outlook on further developments planned

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Legal Basis

- EURATOM Treaty 25.3.1957
  - » No diversion from intended use
- NPT 5.3.1970

  INFCIRC/193 (NNW EU MS, Euratom and IAEA)
  INFCIRC/263 (United Kingdom, Euratom and IAEA)
  INFCIRC/290 (France, Euratom and IAEA)
- Additional Protocol INFCIRC/540
- Commission Regulation 302/2005

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Commission Regulation 302/2005

- Basic Technical Characteristics (BTC)
- Programme of activities
- Nuclear Material Accountancy
- Particular Safeguards Provisions (PSP)
- Reporting formats

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Nuclear Safeguards in the European Union

- 27 Member states
- Regional Safeguards System
- Interface and support to IAEA
- About 1000 active Material Balance Areas (MBA) in more than 900 installations in the EU
- About 120 European Commission Safeguards inspectors performed nearly 1500 inspections in 2006

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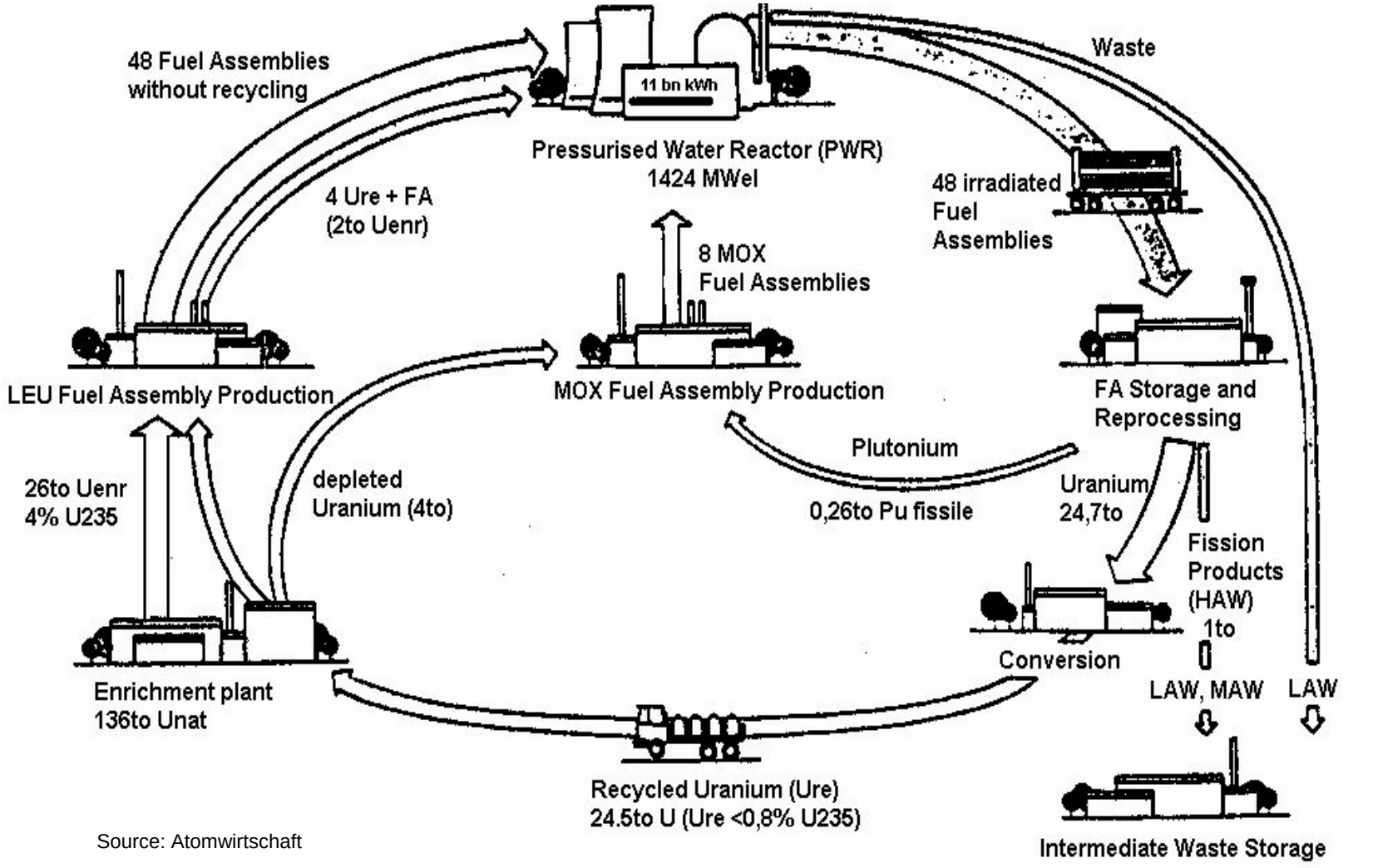
MOX FFP in Nuclear Fuel Cycle



Source: Atomwirtschaft

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EC Safeguards in MOX FFPs

- More than 30 years experience with MOX Fuel Fabrication Plants in Europe using separated Plutonium from LWR reprocessing
- Among most complex plants in the nuclear fuel cycle with respect to safeguards
- Highly automated, limited human access
- Adapted Safeguards approaches needed

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Main MOX Fuel Fabrication Plants in Europe

- **MELOX**
  Marcoule, France
  - Throughput 195 t HM/y (license to increase from 145 t HM/y received in April 2007)
  - Operational since 1994

- **SMP**
  (Sellafield MOX Plant), UK
  - Throughput ramping up (originally foreseen 120 t/HM)
  - Operational since 2002

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Specificities of a MOX Fuel Fabrication Plant

- Direct use material
- Material in parts of the plants handled in bulk form
- Strategic facilities in nuclear fuel cycle
  - » Preferred location for Fuel Assembly verification instead of at reactor site
  - » Last chance for high quality material verification in fuel cycle until reprocessing

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Construction and Commissioning phase

- Early inspectors' involvement ensured comprehensive plant knowledge
- Safeguards awareness at all plant levels
- Shared project documentation as common reference for all stakeholders
- Stability of inspection team and interfaces with the operator ensures consistency and maintains knowledge

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GENERAL PRINCIPLES AND CRITERIA

- Plant complexity and production targets require tailored Safeguards concepts
- Plants run continuously and normally not stopped for routine safeguards verifications
- Automated plant designs do not allow for human interventions in many areas
- Dose uptake for operators and inspectors to be minimised

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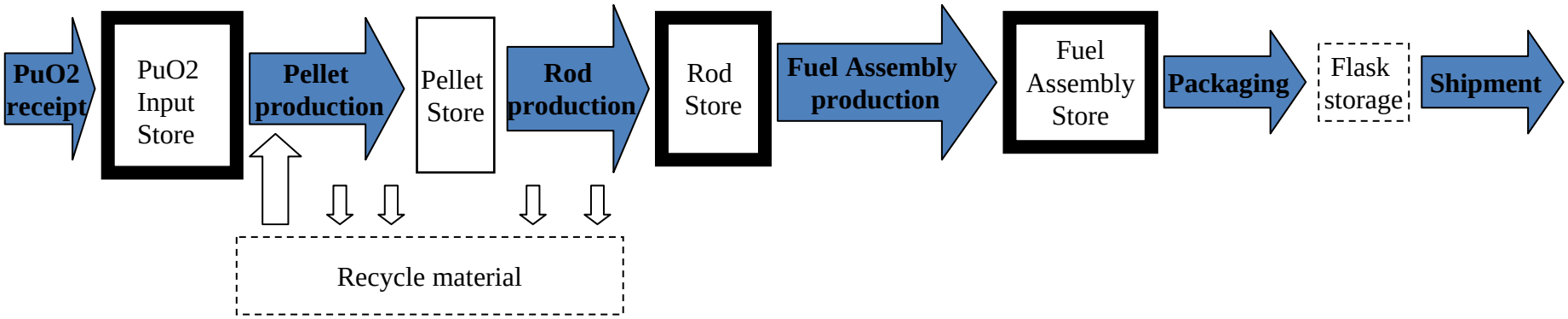
Main Process areas



- Production split in process and storage areas
- Parallel production lines in most process steps
- Front End: Bulk Handling Facility
- Back End: Item Facility

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Detection probabilities

- **Basis: IETS**

  (Implementing Euratom Treaty Safeguards)

- **General guide for direct use material**

  Detection Probability 60 – 95 %

  - **Under normal circumstances DP 60% at PIV**
  - **Depending on Commission's confidence in operator and his NMAC system**

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Inspection frequency

- **IETS: Annual PIV plus 6 – 11 inspections**
  - » **Major reduction of inspection effort and frequency in comparison to original scheme**
  - » **Instrumentation and software applications need to be adapted**
  - » **Sensitivity, complexity and operating mode of plants require tailored safeguards concepts using unattended instrumentation**
  - » **Remote data transmission (RDT) essential to attain DP with reduced inspection scheme**
- **Bi-weekly inspections until RDT fully established and instrumentation with related software working reliably**

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Safeguards measures and tools

- **Required DP in industrial size facilities only achievable with unattended instrumentation installed at strategic points in the plants**
- **C/S in major storage areas**
- **Additional random verifications in process areas and stores without C/S**
- **Continuous review of operators‘ performance to be able to adapt Detection Probability to circumstances**

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Inspection activities

- **Principle:**

  Concentrate on necessary site activities

  - » BTC verifications
  - » Physical verifications / Sample taking
  - » Issue follow up
  - » Auditing of the operator's NMAC system

- **Use data transmission wherever possible**

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Verification of Basic Technical Characteristics (BTC)

- Detailed plant configuration and process verification at PIV or at dedicated inspection
- Frequent re-verification of plant changes during interim inspections
- Verification of operator's NMAC system
- Verification of operator's measurement system

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Physical inventory verification

- Scheduled to have minimum impact on plant operations
- Verification of operator's PIT
- Use of C/S in storage areas to limit re-verification
- Verifications include independent measurements and sampling for external analysis

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Interim inspections

- BTC re-verification if necessary
- Verification of operators NMAC system
- Physical verifications
- Issue follow up
- Data collection for HQ evaluation if Remote Data Transmission not implemented

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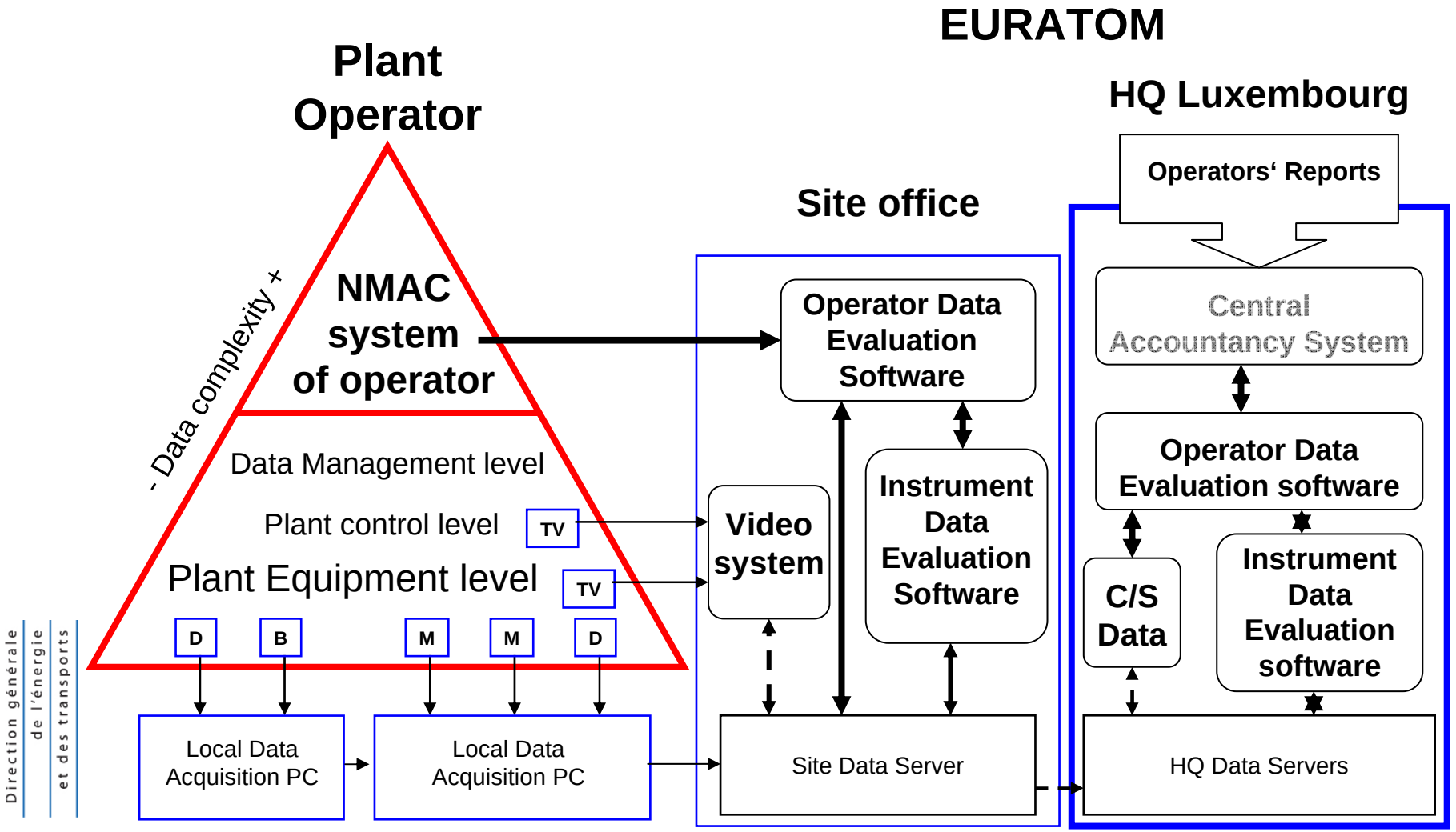
Safeguards IT concept for MOX FFP



Remote data transmission

- Processing of instrument and operators' data can be done at HQ
- More efficient and effective use of inspection resources, including standardisation effects
- Routine evaluation activities are more efficient at HQ where full infrastructure is available
- Technical interventions can be planned and prepared better if all necessary data are available for preparation
- Central archiving of data at HQ allows for better issue follow up and statistical analysis
- Security concerns need to be addressed

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Follow-up procedures and the installation file

- Structured inspection and issue follow up
- Reduced inspection frequency requires new modes of communication
- Regular review meetings with operators
- Central data repository in HQ to allow comparison of different material balance periods, installations, operators

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Annual review of activities and establishment of a work programme

- Regular evaluation of inspection results and findings
- Performance indicators to harmonise assessment
- Regular review of inspection scope and scheme depending on inspection results and related performance indicators
- Adaptation of detection probabilities and inspection frequencies depending on confidence in the operator and his NMAC system

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Future plans

- Full implementation of new IETS elements
- New working methods and interface modalities to be agreed with all stakeholders
- Software standardisation and further software and instrument development
- Installation of further secure network links
  - status of health of instrumentation
  - data review in HQ
  - remote software maintenance
  - access to HQ info

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JAHRE
Thank you