



National Overview on Decommissioning Strategies for Nuclear and Non-Nuclear Installations in the Czech Republic

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Virtual event

Overview of Nuclear Installations (1/3)

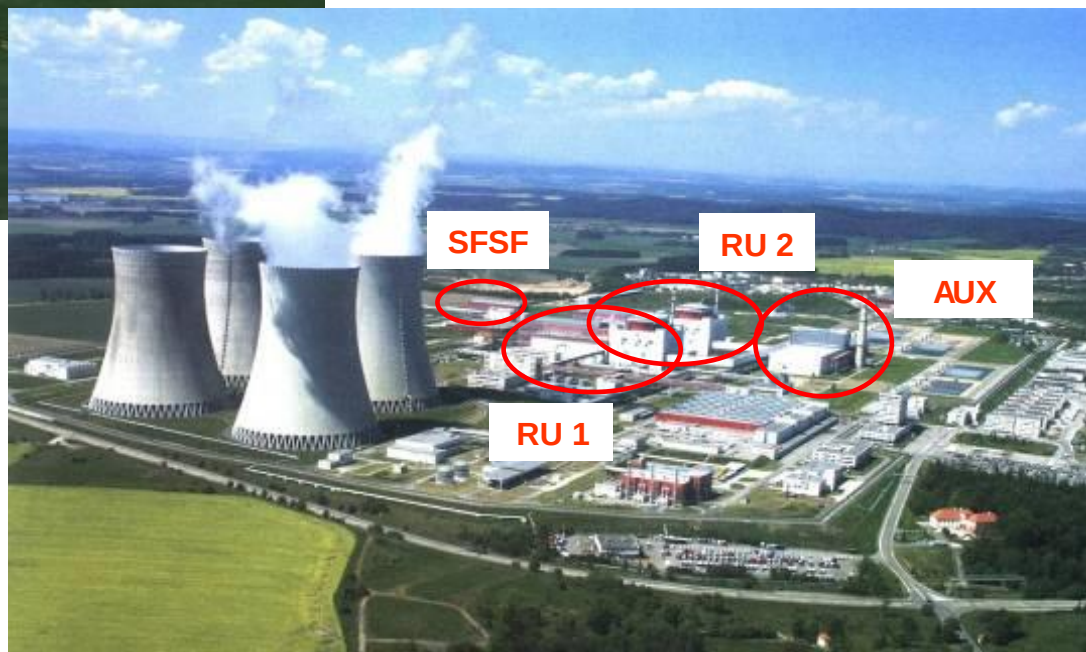
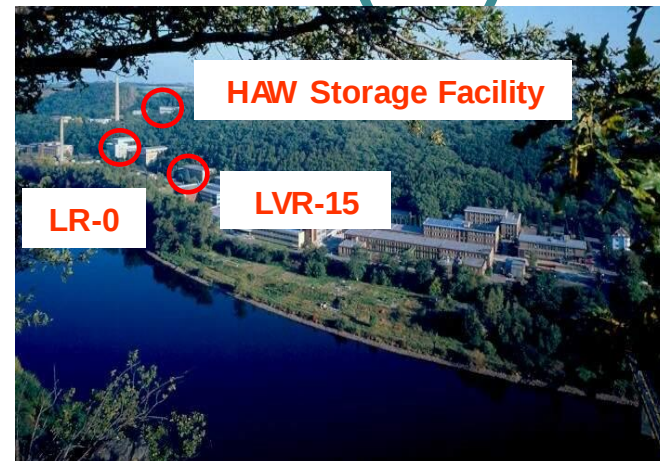
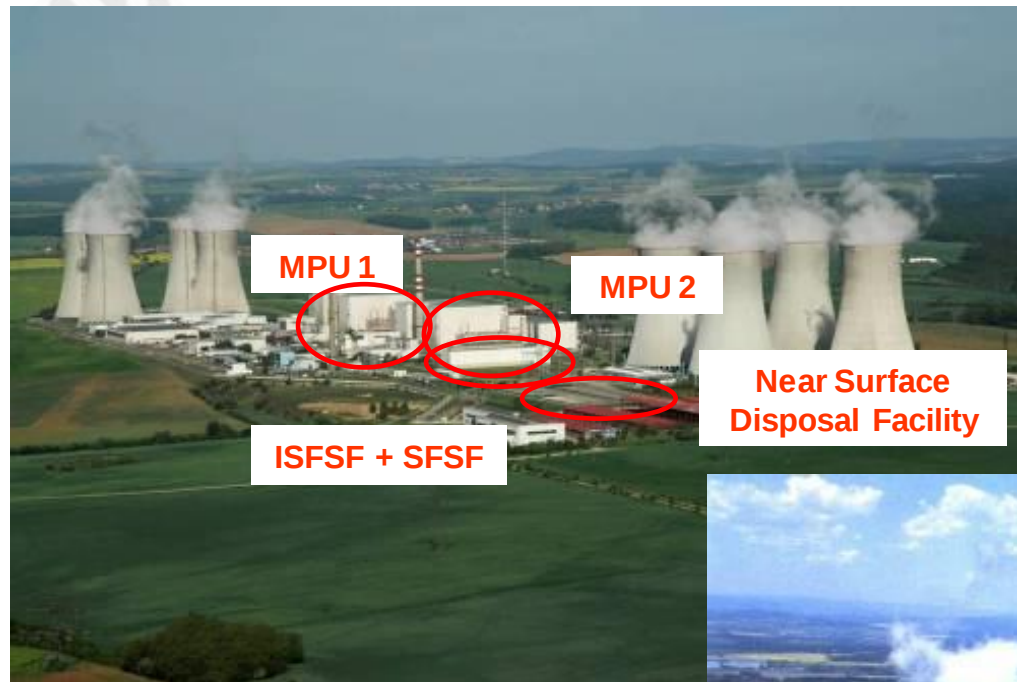
- There are two NPPs with six power and three research reactors in operation in the CZ:
 - Dukovany site - 5 declared NIs:
 - 2 main units with 2 x 2 WWER 440/213 reactor units (4x500 MW_e, in operation since 1985 - 87)
 - ISFSF + SFSF
 - Near surface disposal facility for operational L+ILW + selected categories of institutional RAW
 - Temelín site - 4 declared NIs:
 - 2 reactor units with WWER 1000/320 reactors (1009 and 1019 MW_e)
 - SFSF Temelín + FF store



Overview of (Non-) Nuclear Installations (2/3)

- Řež site - 3 declared NIs:
 - RR LR-0 (limited power and time in operation; no SF generated)
 - RR LVR-15 (max. power 10 MW_t, fuel enrich. < 20% wt. ²³⁵U)
 - HAW Storage Facility (dry and wet storage of SF + RAW store)
- Training reactor VR-1 (FJFI Prague, limited power and time in operation)
- Non-Nuclear Installations - 83 cat. III workplaces (59 licensees):
 - DIAMO s. p. facilities (U ore processing facilities, remediation of chemical U mining facilities)
 - Svornost mine workplace (Spa Jáchymov)
 - workplaces where unsealed and sealed high activity radionuclide sources are produced or used (Eckert & Ziegler Cesio, ISOTREND, CMI, ÚJV Řež, CV Řež, Loma Systems, VF)
 - some nuclear medicine, radiotherapy and R&D workplaces.

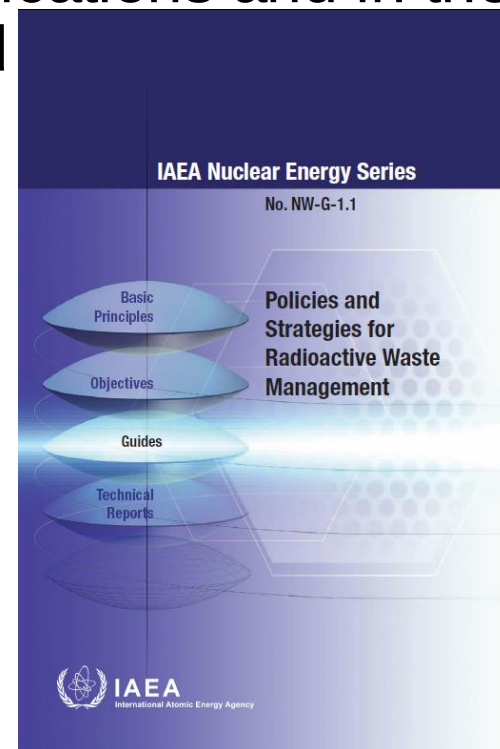
Overview of Nuclear Installations (3/3)



National Policy and Strategy on RAW and SF Management (1/7)

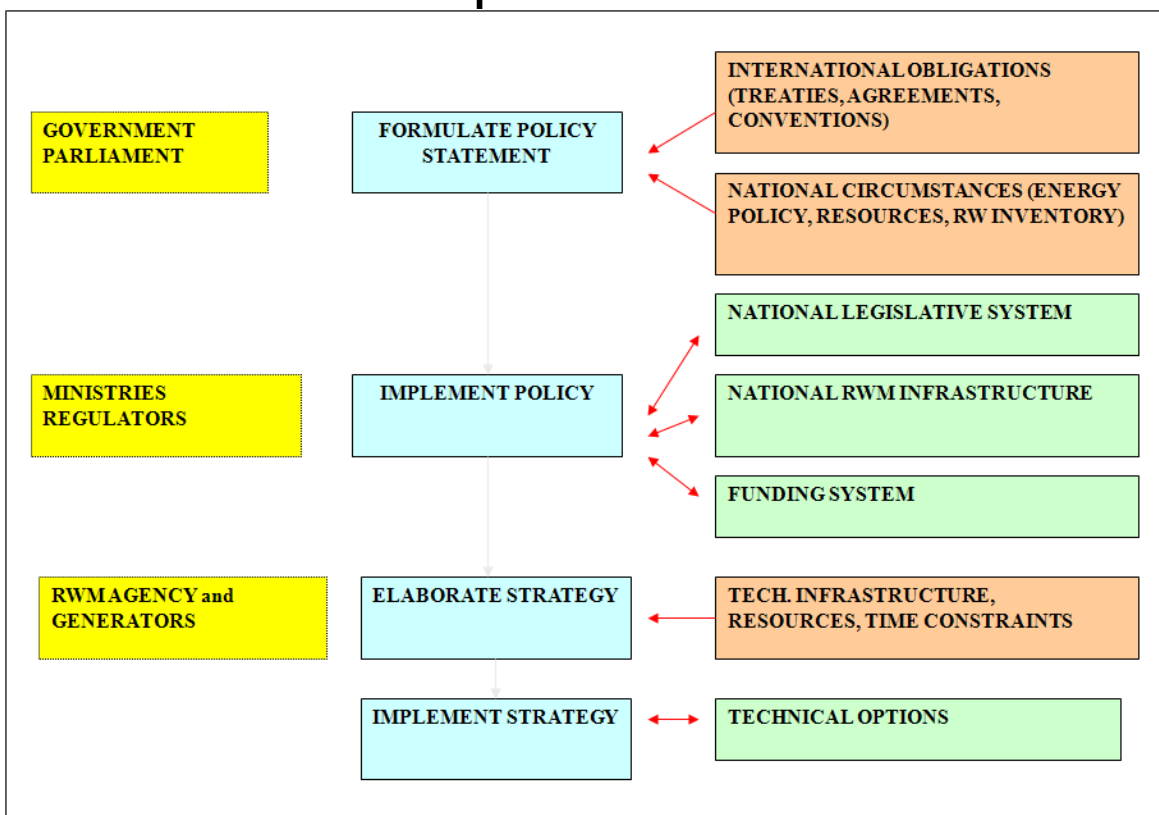
- Every country must have some form of policy and strategy for managing its spent fuel and radioactive waste
- Required/recommended in some IAEA publications and in the JC, but the contents of a national policy and elaborated in these documents
- In some MS's national P&S well established, in others exist but without explicit statement; in many developing MS's do not exist

=> A need to help in developing or upgrading the contents of national policies and strategies in numbers of MS's



National Policy and Strategy on RAW and SF Management (2/7)

- Policy is a set of established goals or requirements; they normally define national rules and responsibilities and are established by the national government.
- Strategy is the means (technical, organisational) for achieving the goals and requirements set out in the national policy.



National Policy and Strategy on RAW and SF Management (3/7)

- Typical policy elements:
 - Allocation of responsibilities
 - Provision of resources
 - Safety and security objectives
 - Management of spent fuel
 - Management of radioactive waste (incl. NORM + DSRS)
 - Public information and participation
 - Export/import of RAW
 - Waste minimization
- Prerequisites for strategy
 - Inventory of spent fuel and RAW, incl. RAW from decommissioning
 - Waste classification system
 - Waste stream characterization
 - Waste management strategies in other countries
 - Existing RAW management facilities
 - Availability of resources ...



National Policy and Strategy on RAW and SF Management (4/7)

- National Policy and Strategy of RAW and SF Management (Policy) was approved by the Government of the Czech Republic for the first time on 15 May 2002; latest revision from 26 August 2019
- The following is crucial for RAW and SF management:
 - adherence to a legal framework which does not permit any developments in RAW and SF management which would be inconsistent with the requirements for the protection of people and the environment
 - guaranteed compliance with and enforceability of legal regulations



National Policy and Strategy on RAW and SF Management (5/7)

- clear specification of the basic responsibilities of all legal entities and persons involved in RAW or SF management
- comprehensive coverage of all activities that might give rise to RAW or SF (incl. decommissioning) and the maintaining of records such materials
- Management of LILW:
 - disposal of LILW in near surface disposal facility(-ies)
 - if LILW does not comply with waste acceptance criteria then store; ongoing R&D programmes focussing on the advanced volume minimizing and RAW treatment technologies



National Policy and Strategy on RAW and SF Management (6/7)

- Management of HLW and SF:
 - storage and transportation
 - treatment of SF and HLW before direct disposal (liquid HLW are vitrified and solid HLW cemented after fragmentation or will be disposed directly; SF will be placed into disposal casks and then disposed)
 - disposal of SF and HLW (most realistic option)
 - preparation of DGR will consist of four phases - evaluation of candidate sites including engineered barrier structure, selection of DGR site, design proposals, SA)



National Policy and Strategy on RAW and SF Management (7/7)

- Management of RAW from decommissioning:
 - NPPs operation and decommissioning generate RAW which cannot be disposed in operated near-surface disposal facilities (from decommissioning of NPPs activated measuring sensors, thermocouples, reactor surveillance samples, absorbers, in-core parts, serpentinite concrete, backfill ...)
 - this type of RAW will be processed during NPPs decommissioning so that it can be subsequently accepted by the DGR
 - special concrete packages featuring inner and outer steel cladding have been designed for the disposal of this RAW
 - further R&D is performed by SÚRAO



Decommissioning Activities

- No NI has reached the decommissioning stage, only small facilities (laboratories,...) were decommissioned
- Decommissioning of NPP Dukovany will not start before 2035 (2045) and NPP Temelín before 2050
- Currently decommissioning activities cover:
 - estimation of RAW generation from decommissioning for the purpose of periodical reviews of initial decommissioning plans
 - creation of financial provisions for decommissioning by the NIs operator
 - preparation for decommissioning concepts for new builds



Decommissioning Strategy (1/5)

- Decommissioning strategy is developed by the licensee for the operation of NI or other, non-NI
- The licensee shall select and justify his decommissioning strategy as required by Decree No. 377/2016 Coll.:
"A concept for decommissioning for a nuclear installation or a category IV workplace shall be aligned with the Policy for RAW and SF management, and contains the following:
 - a) decommissioning strategies, where immediate dismantling is always one of these strategies, and a justification of the proposed decommissioning strategy
 - b) the decommissioning time frame
 - c) a description of end-state of the site and SSCs once decommissioning has been completed..."



Decommissioning Strategy (2/5)

- The concept of decommissioning is a part of construction safety case and it is reviewed by the regulatory body within the licensing process for construction of NI or class III or IV workplace
- Decommissioning strategies for NPPs:
 - preferred is immediate dismantling
 - other decommissioning strategies as a deferred dismantling are assessed and developed on the same level within the initial decommissioning plans
 - release of the site without further restriction
 - commercial use of the site is planned

Decommissioning Strategy (3/5)

- Decommissioning strategies for RRs:
 - for non-zero RR deferred dismantlings is the preferred strategy (^{60}Co contamination)
 - for deferred dismantling decommissioning activities are divided into three stages - closure, preparation for dismantling and dismantling, where there will be a delay of 10 years between the preparation and dismantling
 - the strategy of deferred dismantling was chosen because of the expected decrease of induced activity by decay, which will reduce the dose rate at the workplace 4-7 times after 10 y of so called „protective closure“ (^{60}Co ; other nuclides like ^{55}Fe and ^{63}Ni are beta emitters)
 - for zero power RRs immediate dismantling is the preferred decommissioning strategy

Decommissioning Strategy (4/5)

- Decommissioning strategies for SF storage facilities, auxiliary installations of disposal facilities and other cat. I. – III. workplaces:
 - removal of stored SF and its disposal in DGR
 - removal of used sources of radiation and their return to the country of origin or safe storage and disposal in CZ
 - radiological monitoring of facilities and decontamination of the workplace, if needed
 - decommissioning of small installations of cat. III. workplaces is a licensed activity
 - once the workplace is decommissioned the site/facility can be released from regulatory control (so called complete decommissioning). Separate license is needed for cat. III. and IV. workplaces



Decommissioning Strategy (5/5)

- A part of the decommissioning strategy is the RAW management strategy for RAW arising from decommissioning
- RAW management principles:
 - RAW will be disposed in compliance with national Policy (i.e. near-surface disposal for LLW/ILW + deep geological disposal for LL RAW and SF, once declared as waste)
 - RAW will be processed by the standard field proven technologies which are currently available in NPPs
 - RAW volumes will be estimated based on their acceptability to the radioactive waste repository Dukovany
 - RAW that does not meet acceptance criteria for disposal in the Dukovany disposal facility will be disposed in a deep geological repository



Thank you for your attention!

