

National Policy and Strategy in Radwaste Management in Slovenia

ARAO – Agency for Radwaste Management

Tomaž Žagar, Ph.D., tomaz.zagar@arao.si

Supporting small European Member States in responding to and reporting on
the EU Waste Directive, Luxembourg, December 4-5, 2013

Agenda

- Slovene nuclear program
- Legal framework
- Stakeholders in RW management
- Challenges
- Conclusions

Slovene Nuclear Program

Small nuclear programme



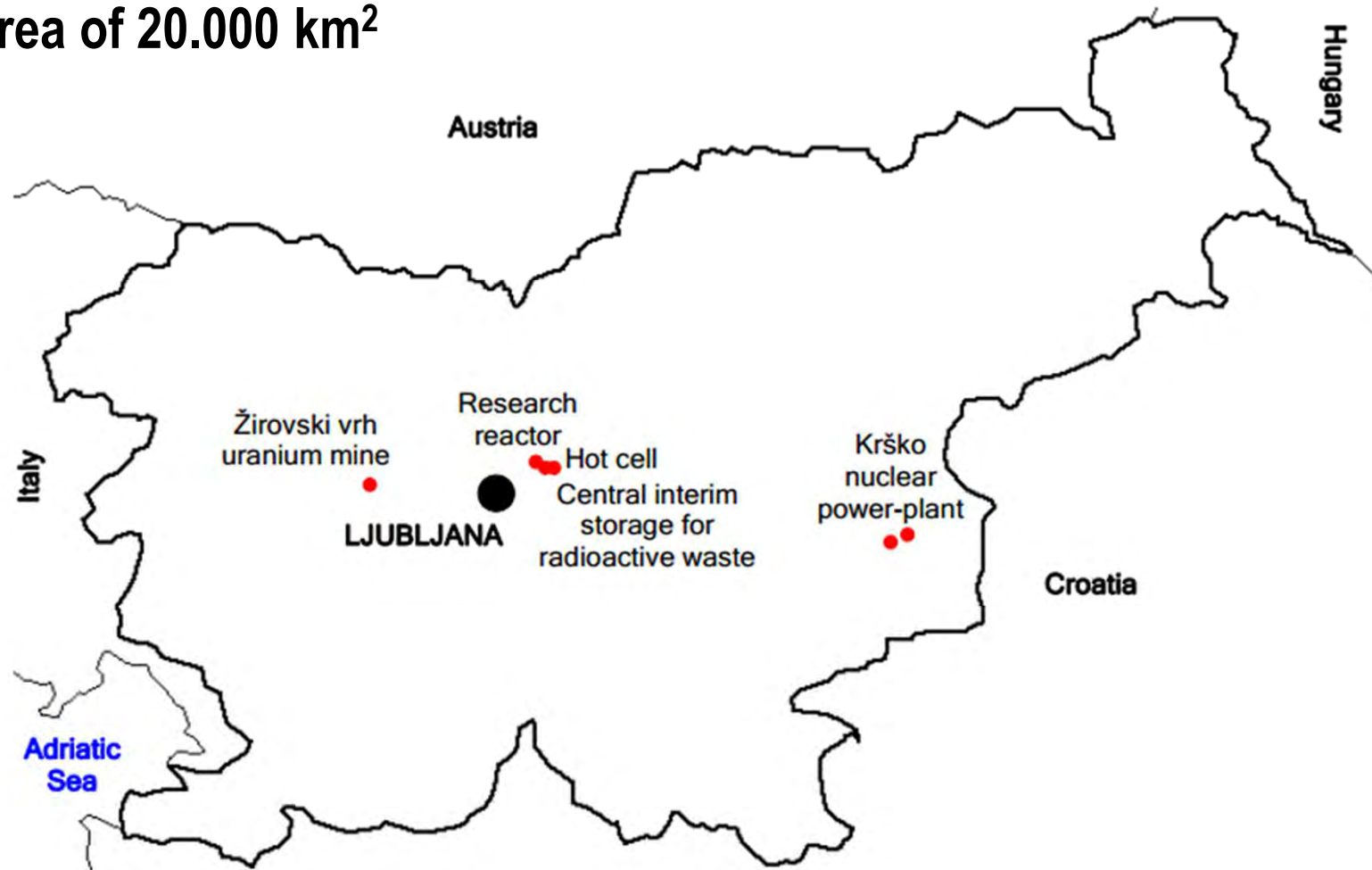
Current status

- **1/2 NPP, 727 MW – electric power (shared 50% - 50% between Croatia and Slovenia)**
- **1 research reactor; 250 kW_{th}**
- **1 closed, remediated uranium mine (operation period 1984 - 1990)**
- **1 central interim storage for institutional waste**
- **1 selected site for LILW repository with approved spatial plan**

Slovenian nuclear sites

2.050.000 inhabitants

area of 20.000 km²



Legislative Framework on national level

- **Constitution of the Republic of Slovenia:**
 - right to live in healthy environment
- **Competent legislative authorities:**
 - **Ministry for Agriculture and Environment (Nuclear Safety Authority)**
 - Regulator (SNSA carries out administrative and professional tasks and regulation procedures)
 - **Ministry for Infrastructure and Transport (Energy Directorate)**
 - Implementer
- **Environmental Protection Act:**
 - radioactive waste management is defined as compulsory public service on national level
 - other nuclear issues are excluded
- **Ionising Radiation Protection and Nuclear Safety Act**
- Second level legislation (decrees and rules)

Bilateral treaty

- **2001 Treaty between the Government of the Republic of Slovenia and the government of the Republic of Croatia on the regulation of the status and other legal relations regarding investment, exploitation and decommissioning of the Krško Nuclear Plant**

50%-50%:

- **Krško nuclear power plant ownership**
- **Supply of produced electricity**
- **Responsibility for generated radioactive waste**

Multilateral treaties

- **EURATOM treaty** establishing the European Atomic Energy Community
- **JOINT CONVENTION** on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- **COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011** establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste

National strategies

- **Spatial Development Strategy 2004**
 - Defines basic procedure for LILW construction
- **National Energy Program 2004**
 - Defines nuclear energy as one of energy sources also in future
 - New National Energy Concept (up to 2050) “under preparation”
- **Resolution on the 2006-2015 National Program for Managing Radioactive Waste and Spent Nuclear Fuel**
 - Required by Environmental Protection Act
 - A separate part of Resolution on National Environmental Action Plan 2005-2012
- **Resolution on Nuclear and Radiation Safety in the RS**
- for the period 2013-2023

Stakeholders in RW management

- **Government of Slovenia**
 - Ministry for Infrastructure and Transport (implementer)
 - ARAO
 - Ministry for Environment (regulator)
 - SNSA
- **License holders in Slovenia (NPP Krško, TRIGA, ARAO, ...)**
- **Government of Croatia**
- **Financial Funds for Decommissioning of the NPP Krško (RS, RH)**
- **Gen energija 50 % NPP Krško owner**
- **HEP (hrvatska elektroprivreda) 50 % owner of NPP Krško**
- **Research institutes**
- **Universities – education and training of experts**
- **Small producers of RW**
- **Citizens**

Nuclear Power Plant Krško



Ownership: 50 % GEN energija, 50 % HEP

Westinghouse PWR, 2 loop, commercial operation from 1983

2000 MWt, 727 MW (696 MW net)

LILW: 2262 m3

SF: 1041 FE stored in WSFP

ARAO-Agency for Radwaste Management



- **Slovenian agency for radioactive waste management**
- **Founded in 1991 by the Slovenian government**
 - **Acting as the agent of the Ministry for Infrastructure and Transport**
- **A professional organization specialized**
in the field of radioactive waste management
- **Financed mainly through decommissioning fund, partially**
through state budget and partially from service fees for small
producers

ARAO's main activities

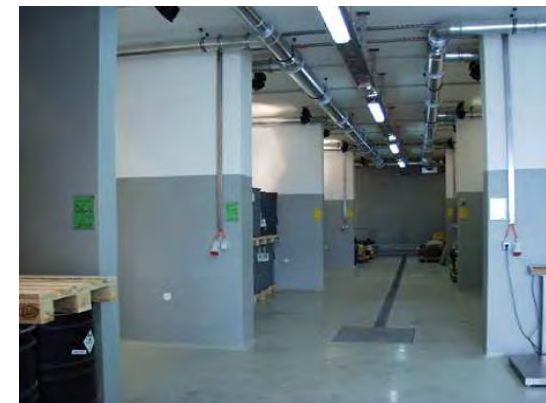
Public service of management of radioactive waste from small producers (research, medicine, industry):

- Collection (Takeover)
- Transport
- Processing and preparation
- Storage and disposal



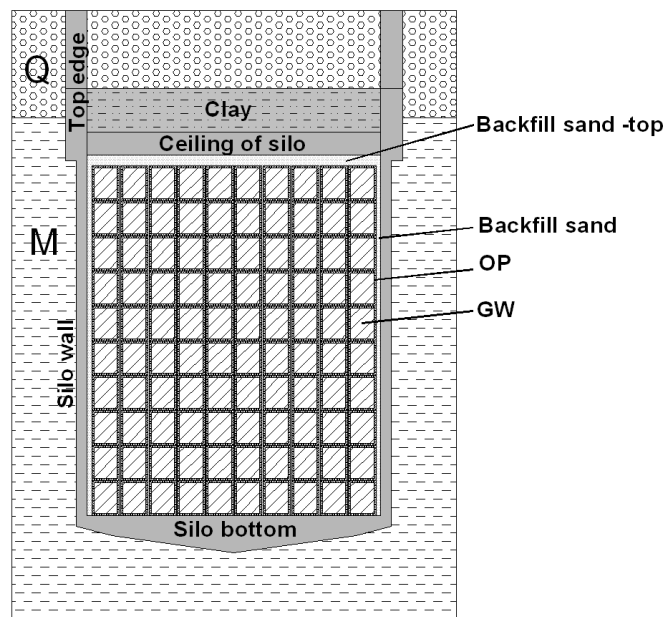
Central Storage Facility history

- 1986 storage constructed by the „Jožef Stefan“ Institute
- 2003/2004 Reconstruction of the CSF
- 2005: License for the trial operation
- 2008: License for regular operation
- Volume of stored waste: 89,1 m³



Approved location and type for LILW disposal site

- Urbina near NPP Krško
- Near surface, **natural** and **engineering** barrier repository
- 2004 – 2010 mixed-mode approach for LILW repository siting, involving local community and considering social acceptability as an important factor
- Construction permit is expected before 2017



Closed mine and disposal site of mine and hydrometallurgical tailings (Žirovski vrh)

- Jazbec site: 1.198.000 m³



SF and HLW management

■ Strategic documents:

- National Program for Managing Radioactive Waste and Spent Nuclear Fuel
- Decommissioning program for NPP Krško and Management of RW&SF

■ License holder (waste producer) is responsible for management before disposal

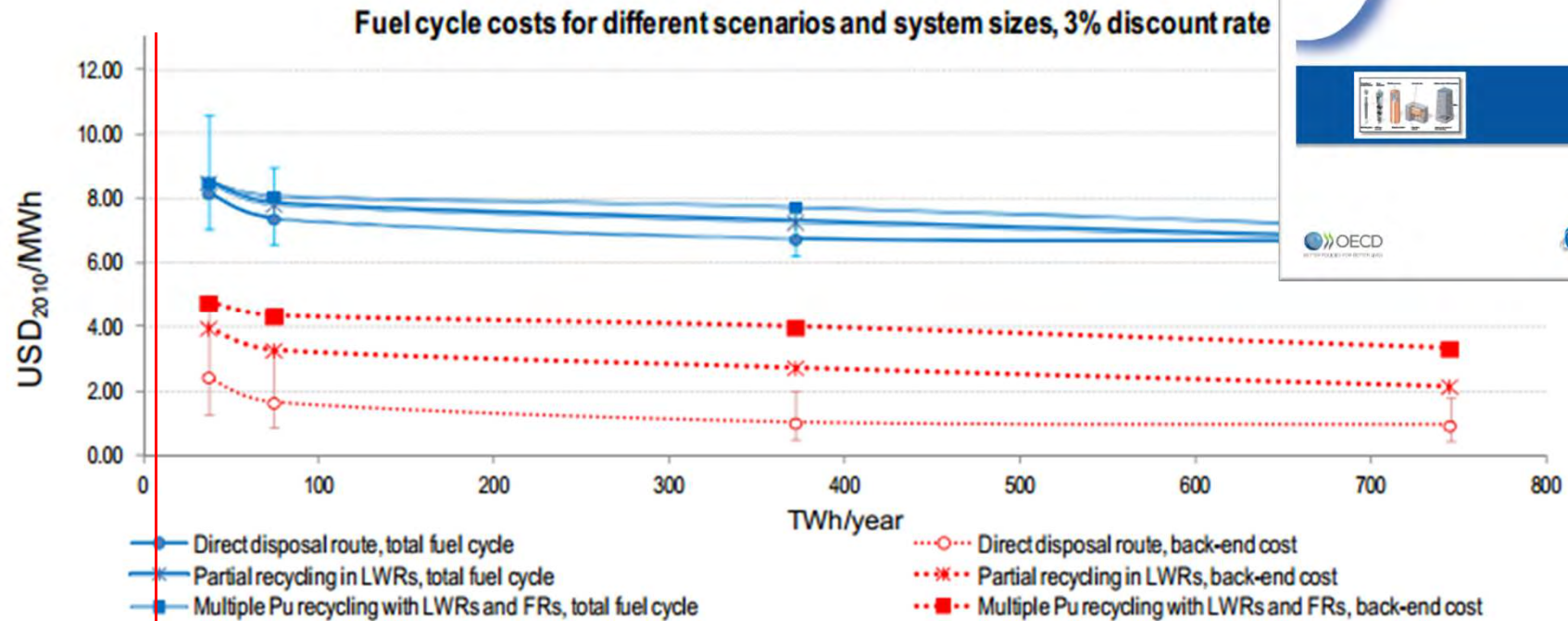
- NPP Krško: wet storage during operating phase, recent requirement to provide for dry storage as a consequence of stress tests
- Research reactor TRIGA: 1999 SF returned to USA, remaining SF can also be returned

■ Open scenarios:

- Intermediate storage (several versions of storage types and periods)
- National deep geological repository
- Investigation of regional repository work: ERDO, IGD-TP

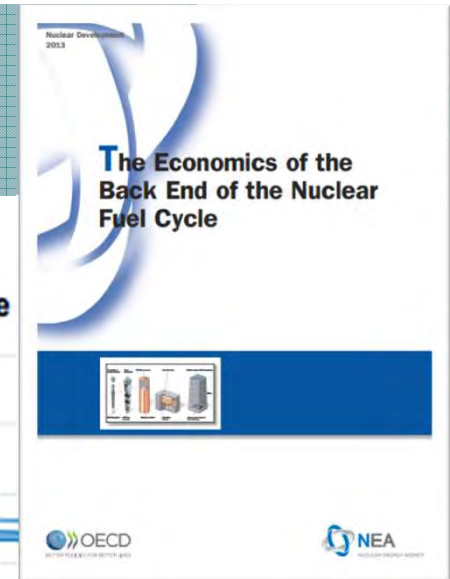
Any Challenges?

Cost of back-end fuel cycle?



? Slovenia: cca 2,5 to 3 TWh/year

Source: The Economics of the Back End of the Nuclear Fuel Cycle; 2013, OECD NEA 7061, Paris



Currently very low electricity prices

- Relevant electricity prices in EU very low (price for producers)
- Prices in €/MWh



2007

2013

Source: Bloomberg 2013, (EEX in Leipzig)

Conclusions

- Responsibilities are clearly defined
 - Government(s) with ultimate responsibility
 - License holders have prime responsibility
- Independence of regulator
- Transparency is practiced on regular basis
- Funding is assured through special fund and polluter pays principle
- Ongoing storage with all required licences
- Preparation for final disposal (LILW; shallow, engineering-natural barriers, HLW; several pathways)
- Research, planning and EU wide work (ERDO; IGD-TP)

- **How to build and support adequate RWM infrastructure to support small nuclear programme?**