Radioactive Waste Management Program in Ukraine

Yuliya Balashevska
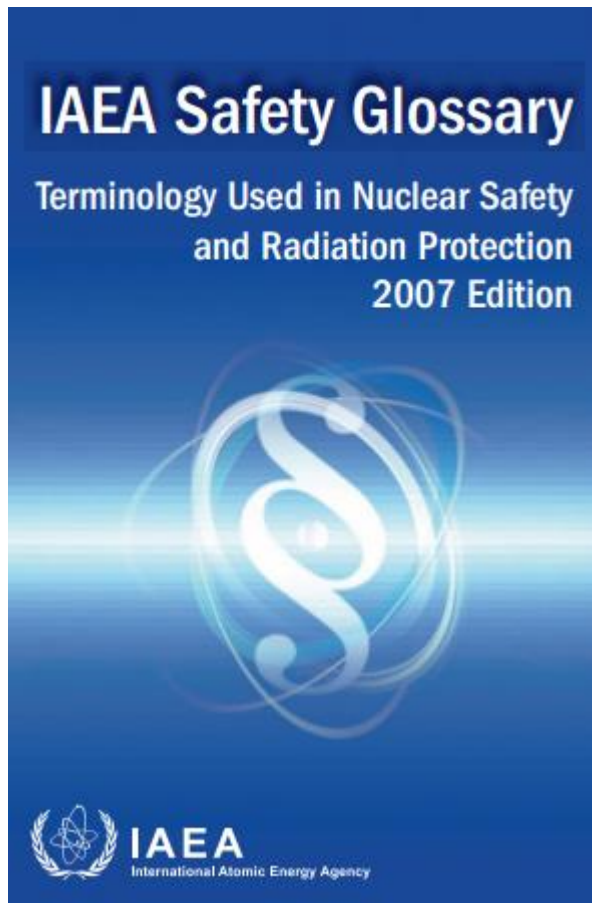
SSE "Ecocentre"

Chornobyl

- Why can Ukrainian RAW experience be useful for Japan?

- What is a national RWM program?

- Why good policies are sometimes not very effective?

Radioactive Waste

IAEA Safety Glossary

Terminology Used in Nuclear Safety and Radiation Protection

2007 Edition

IAEA
International Atomic Energy Agency

waste, radioactive

Material, whatever its physical form, remaining from practices or interventions and for which **no further use is foreseen** that **contains or is contaminated with radioactive substances** and has an activity or activity concentration **higher than the level for clearance** from regulatory requirements**.**

3

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Radioactive Waste Management Program

A system/plan offering decision-makers and waste handlers specific solutions for the systematic management of radioactive waste and to reduce their amounts in a country.
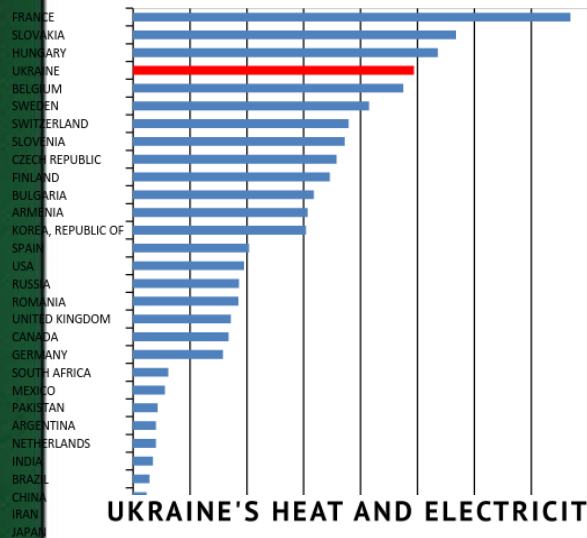
Elements:
- Policy
- Inventory & Classification
- Responsibilities
- Financing scheme
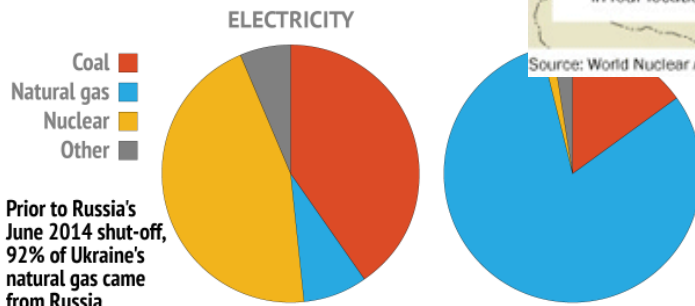- Research

Successful RWMP = RAW disposed of safely

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Ukraine

Nuclear Share by country in 2014, % of total

FRANCE
SLOVAKIA
HUNGARY
UKRAINE
BELGIUM
SWEDEN
SWITZERLAND
SLOVENIA
CZECH REPUBLIC
FINLAND
BULGARIA
ARMENIA
KOREA, REPUBLIC OF
SPAIN
USA
RUSSIA
ROMANIA
UNITED KINGDOM
CANADA
GERMANY
SOUTH AFRICA
MEXICO
PAKISTAN
ARGENTINA
NETHERLANDS
INDIA
BRAZIL
CHINA
IRAN
JAPAN

UKRAINE'S HEAT AND ELECTRICITY

ELECTRICITY

- Coal
- Natural gas
- Nuclear
- Other

Prior to Russia's June 2014 shut-off, 92% of Ukraine's natural gas came from Russia

Source: IEA

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Nuclear reactors in Ukraine

BELARUS
POLAND
RUSSIA
Rivne
Kiev
Kharkiv
Khmelnitsky
UKRAINE
Dnieper
Luhansk
South Ukraine
Donetsk
Rebel held areas
MOLDOVA
Zaporizhzhya
ROMANIA
Odessa
Sea of Azov
RUSSIA
CRIMEA (DISPUTED)
Sevastopol
Black Sea

⚓ Nuclear reactor
Ukraine has 15 reactors in four locations

Source: World Nuclear Association, Energoatom

Sources of RAW in Ukraine
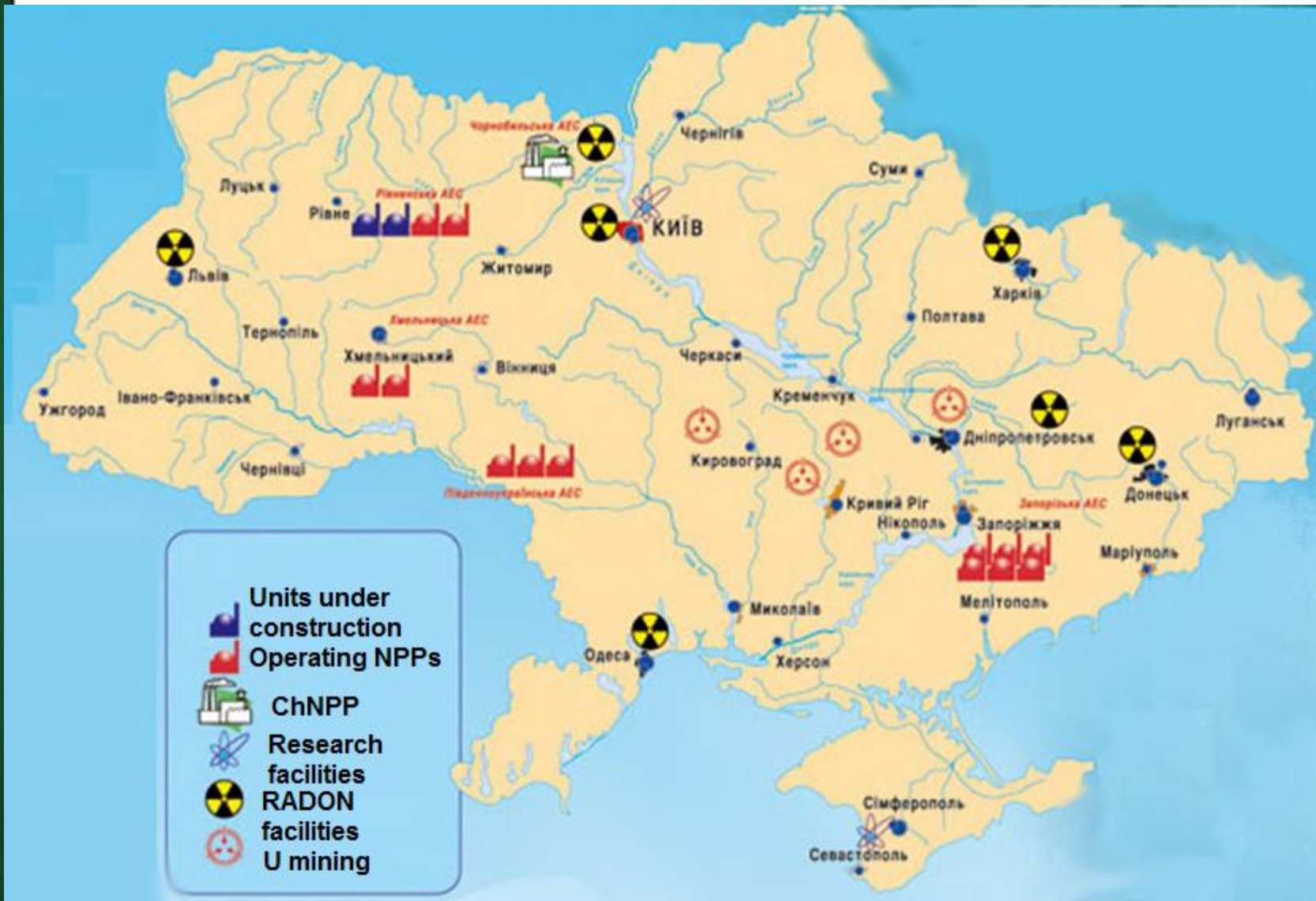
Units under construction
Operating NPPs
ChNPP
Research facilities
RADON facilities
U mining

6

Element 1 - Policy

Element 1 - Policy

- **Law on Use of Nuclear Energy and Radiation Protection** #40/95-ВР, 08 February 1995
- **Law on Radioactive Waste Management** #256/95-ВР, 30 June 1995
- **Radioactive Waste Management Strategy of Ukraine** #990, 19 August 2009
- **National Targeted Ecological Program for Radioactive Waste Management** #516-VI, 17 September 2008
- **National Program for Chornobyl NPP Decommissioning and Shelter Transformation into an Environmentally Safe System** #886-VI, 15 January 2009

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National Targeted Ecological Program for RAW Management, 2008-2017

❑ Waste from Nuclear power production (by NNEGC 'Energoatom')

❑ Legacy waste from Chornobyl accident

❑ Waste from small generators managed by Ukrainian NC RADON

❑ Legacy waste from military programs of former Soviet Union

RAW Management Strategy of Ukraine

Aim: ensuring development of an effective RAW management system for the arising, legacy and future waste, including:

- Effective regulations;

- State regulatory and state administration bodies;

- Specialized enterprises for RAW transportation, conditioning, storage and disposal;

- Technologies and facilities for RAW handling and treatment;

- Storage and disposal facilities;

- Funding and financing mechanisms.

National Program for Chornobyl NPP Decommissioning and Shelter Transformation into an Environmentally Safe System

20+ objectives:

- Removal of NF
- Construction and commissioning of SFS, LRWT Plant
- re-construction of existing SFS
- decommissioning of cooling pond
- Dismantling of equipment
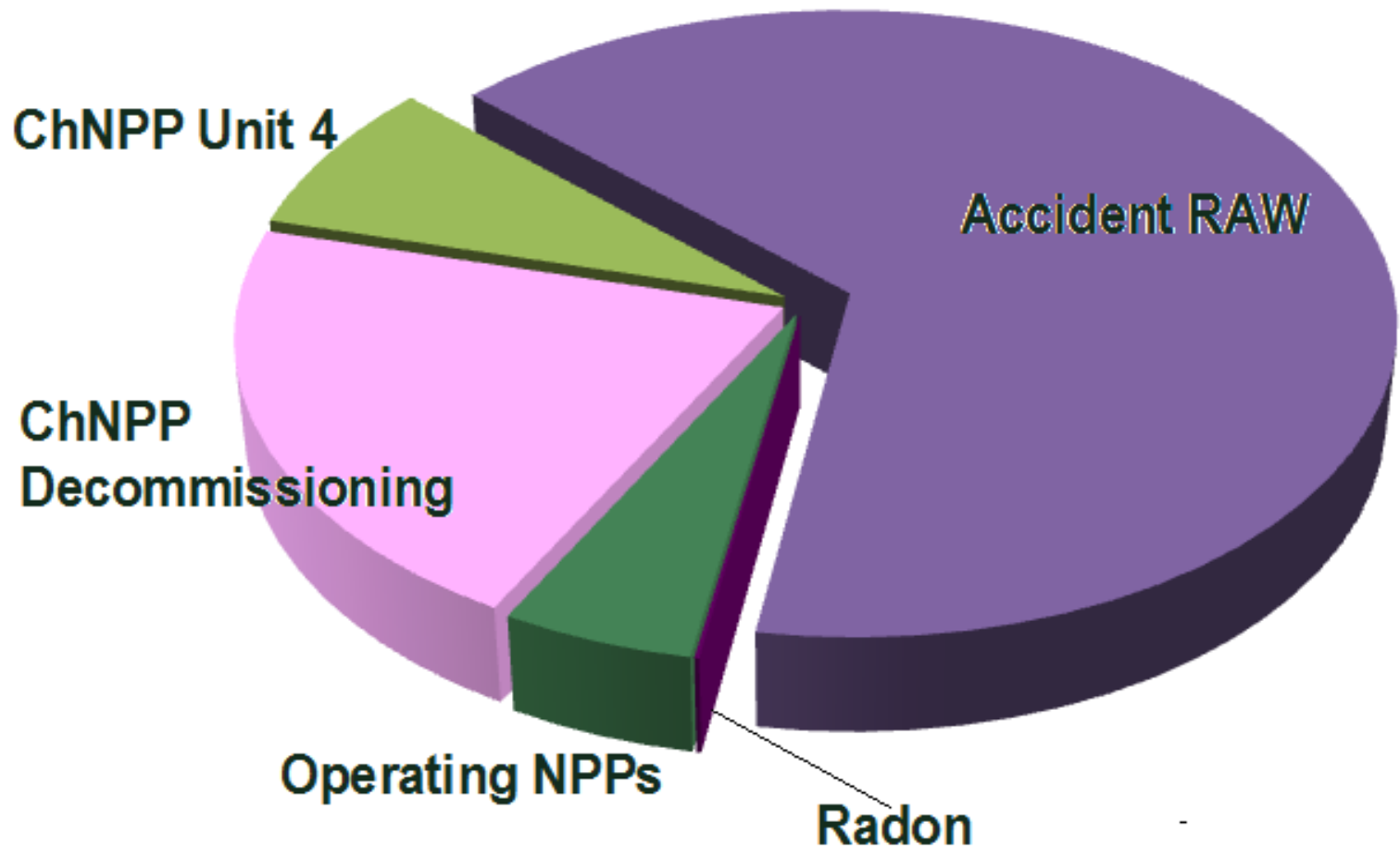- Social Guarantees
- Preservation, modernization, investigation…

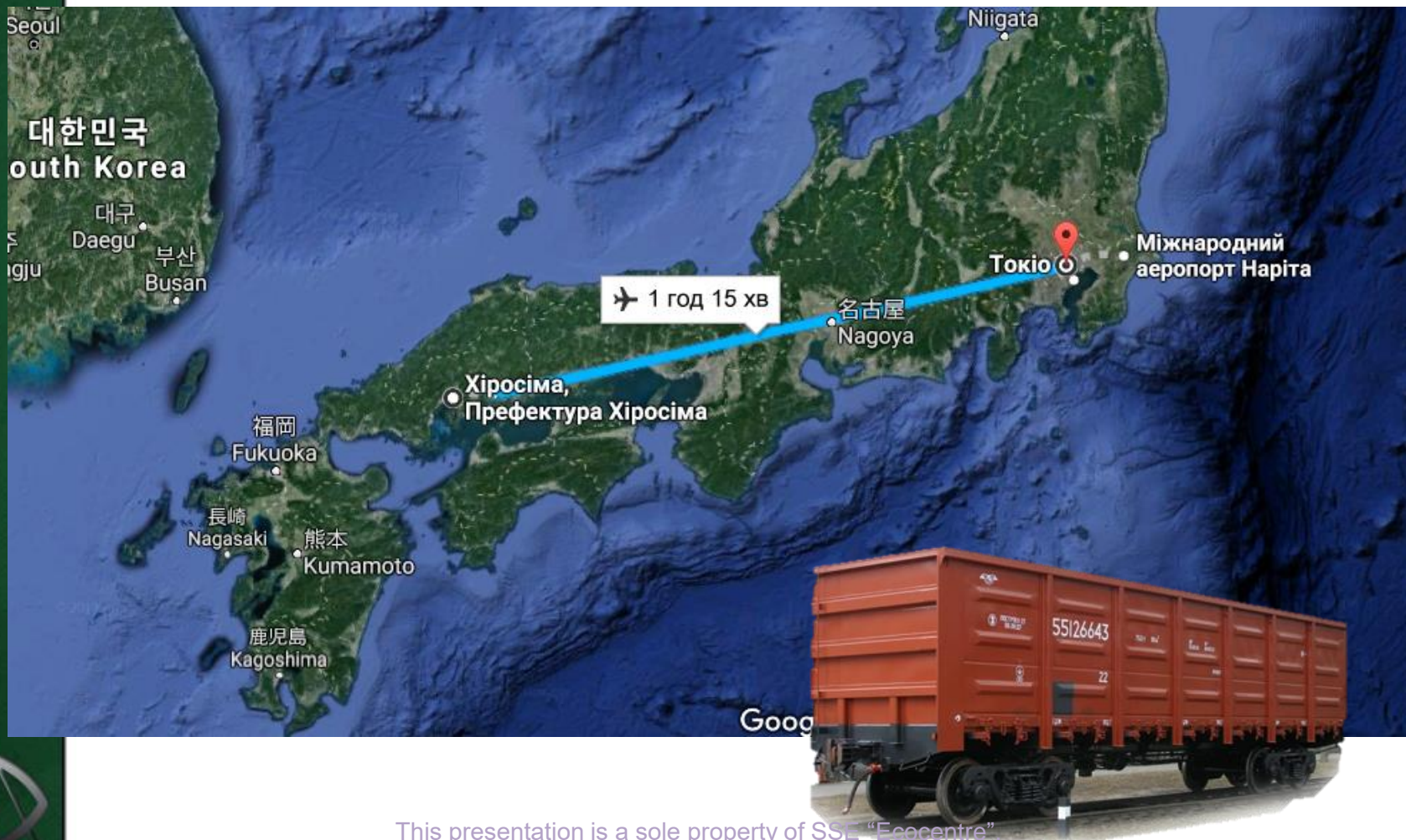ДСП «ЕКОЦЕНТР»

Element 2 – Inventory and Classification

Element 2 – Inventory and Classification

ChNPP Unit 4

ChNPP Decommissioning

Accident RAW

Operating NPPs

Radon

ДСП «ЕКОЦЕНТР»

Element 2 – Inventory and Classification

Element 2 – Inventory and Classification

Current classification

Protection of personnel

Specific activity

Low-level waste

Intermediate-level waste

High-level waste

10 kBq/kg

What you need to do to protect yourself when handling the waste

10 MBq/kg

100 GBq/kg

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Element 3 – Responsibilities

Element 3 – Responsibilities

SAEZ
- Integrated approach to RAW management
- Organization of RAW management process (transportation, conditioning, long-term storage, disposal)
- RAW Inventory

ME&CM
- Safe operation of RAW treatment facilities at its subordinate enterprises
- Physical protection of RAW
- Pre-disposal RAW management

SNRI-U, MH
- Development of norms and standards
- Licensing
- Inspections and supervising

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Element 4 – Finance

Element 4 – Finance

- State Fund for RAW Management (within the State Budget of Ukraine) – "Polluter Pays" principle

- Present waste producers pay a fee to the State Fund that should cover **the future costs** for the RWM Program

- Largest payer – NNEGC "Energoatom"

- Legacy RAW - paid for **directly from the national budget**

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Element 5 – Research

Element 5 – Research

INSTITUTE FOR SAFETY PROBLEMS OF NUCLEAR POWER PLANTS
NATIONAL ACADEMY OF SCIENCES OF UKRAINE

National Science Center
Kharkov Institute of Physics and Technology

National Academy of Sciences of Ukraine

Institute for Nuclear Research

The National Academy of Sciences of Ukraine

UIAR

UKRANIAN INSTITUTE
OF AGRICULTURAL RADIOLOGY

So, how effective the Program is?

Successful RWMP = RAW disposed of safely

Ukraine (2013)				View: **Expand All**
Waste Class	Storage Unprocessed (m3)	Storage Processed (m3)	Disposal Unprocessed (m3)	Disposal Processed (m3)
▶ **HLW***	870.0	0.0	3,960.0	0.0
▶ **ILW***	11,216.5	56.9	6,918.9	0.0
▶ **LLW***	1,110,430.4	5,637.4	684,969.6	2.0

Note that Volume "as Dispo" includes Volume "as Is" if there is no data projection provided.

Data source: NEWMDB except for the Nuclear Power Production chart: PRIS

*) includes Estimate (data projections)

HLW = High Level Waste
ILW = Intermediate Level Waste
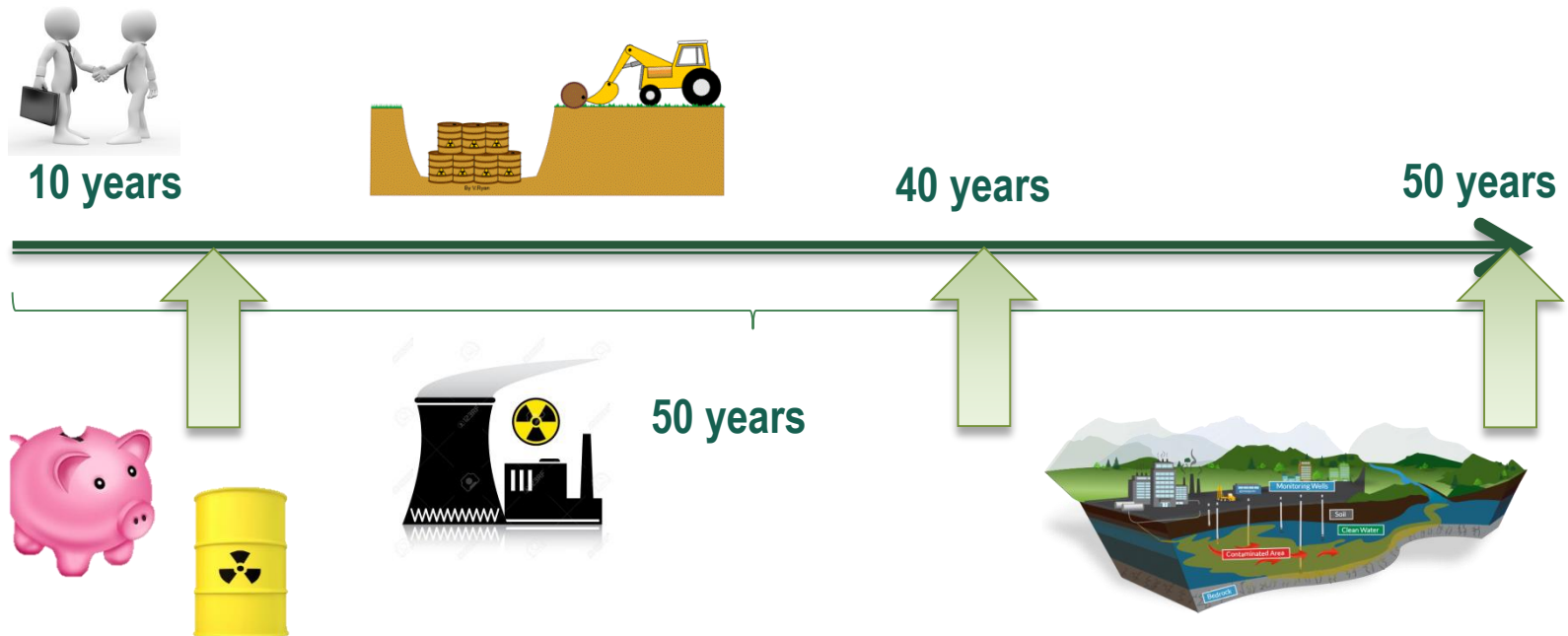LLW = Low Level Waste
VLLW = Very Low Level Waste

Element 1 - Policy

RAW Management Strategy of Ukraine

10 years   **40 years**   **50 years**

50 years

PROBLEM 1: political sensitivity

Element 2 – Inventory and Classification

RAW Inventory

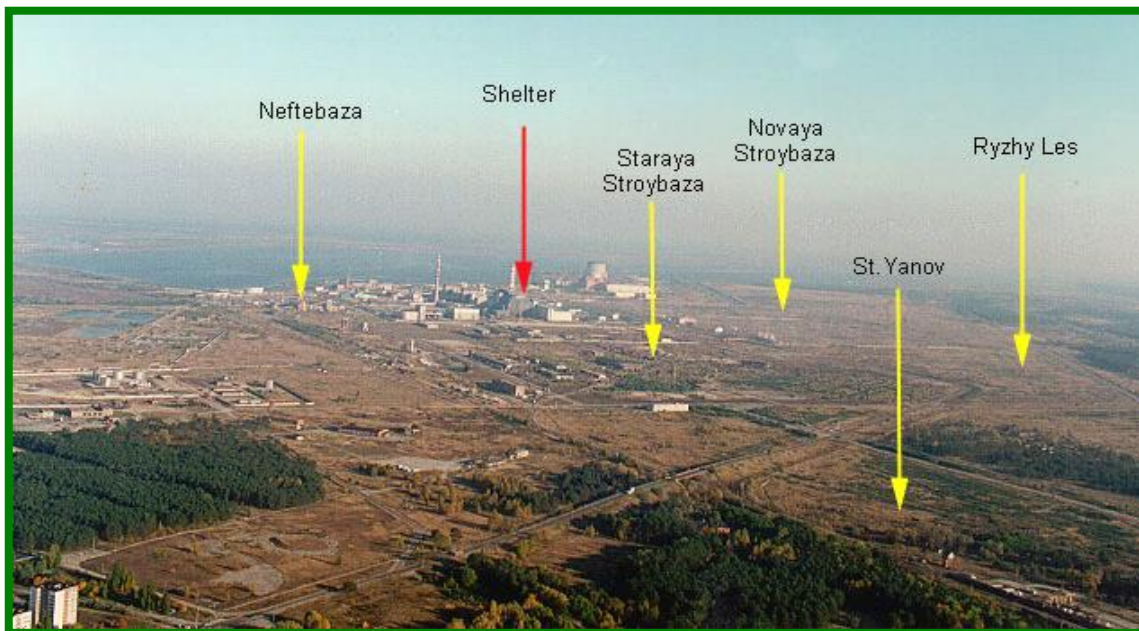| Source	Amount	Comment
Operating NPPs	198000 m³	
ChNPP	800 000 m³ (Units 1 – 3) 300 000 m³ (Unit 4) 80 000 (After NSC construction)	Solid Something
Accident Waste	2 500 000 m³	
RADON facilities	45 000 sources 13 RITEGs 5000 m³ (solid + liquid)	
Military facilities	?	Unaccounted

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CEZ

Temporary storage Facilities

RWSF"Pidlisny"

ChNPP

Shelter

Vector Complex

RWSF

Buriakivka
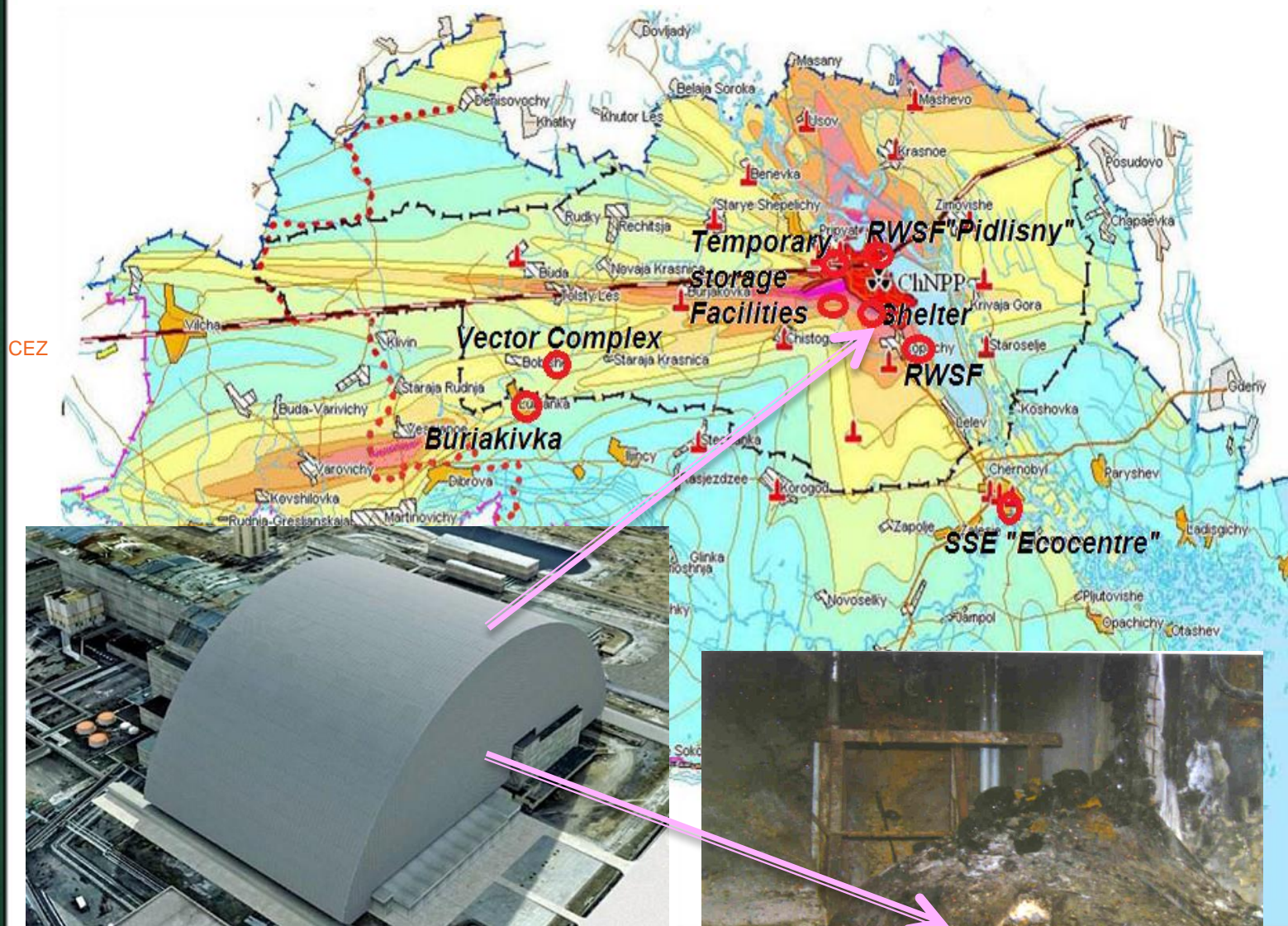
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Non-operated temporary storage facilities in ChEZ

Number of facilities	**about** 1000
Waste	short-lived LLW and ILW **in the bulk form**
Volume	1 400 000 m^3
Activity	$1,9 \times 10^{15}$ Bq

Ref = [Sobotovich,2005], [Antropov,2005], [NNC,2001]

Non-operated disposal facility in ChEZ (Pidlisny)

In operation   XII 1986 – XI 1988
Waste   HLW and LL-ILW, bulk
Volume   11000 m^3
Activity $2,6 \times 10^{15}$ Bq (?)

PROBLEM 2: Historical and legacy waste

RAW Classification

Current classification	Future classification
Protection of personnel	Disposal options/protection of future generations
Low-level waste	Very low level waste
	Low level waste
Intermediate-level waste	Intermediate level waste
High-level waste	High level waste

Specific activity

Depth
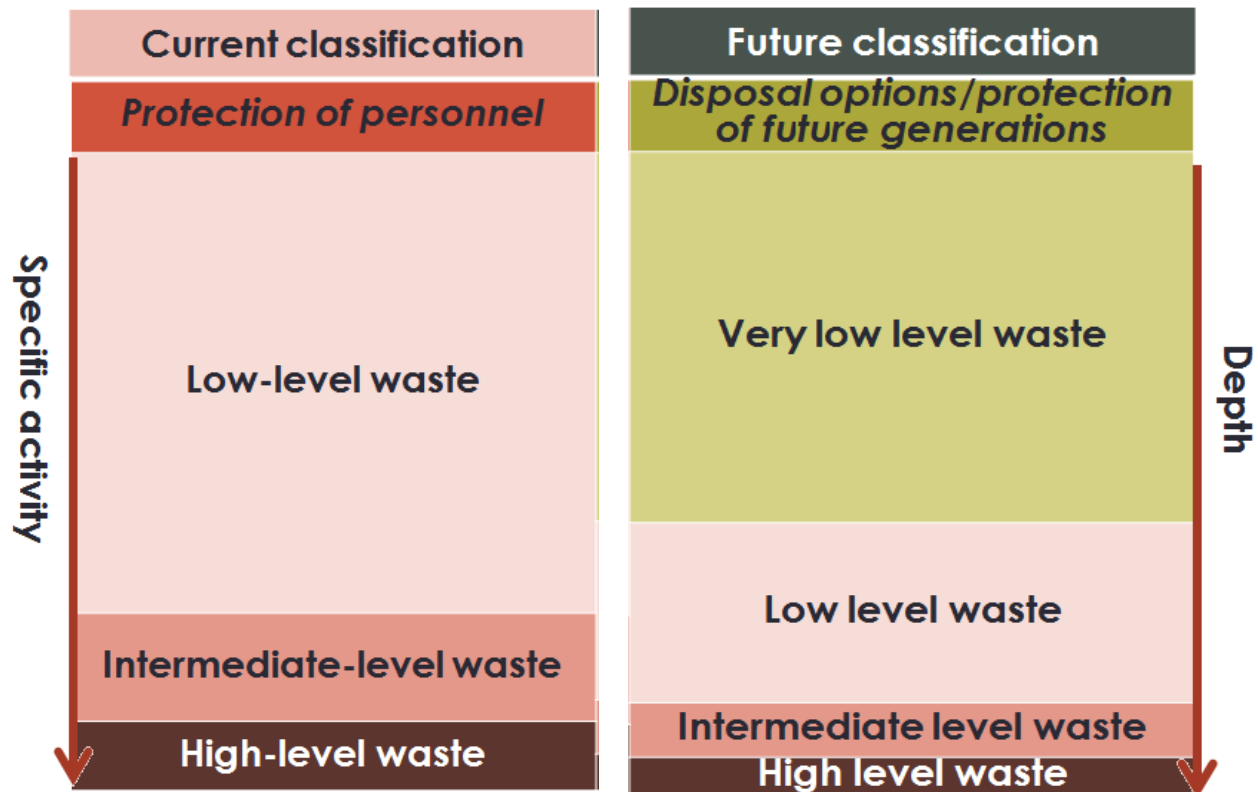
What **you** need to do to **protect yourself** when handling the waste

What **we** need to do to with RAW to **protect future generations**

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RAW Classification – End-states

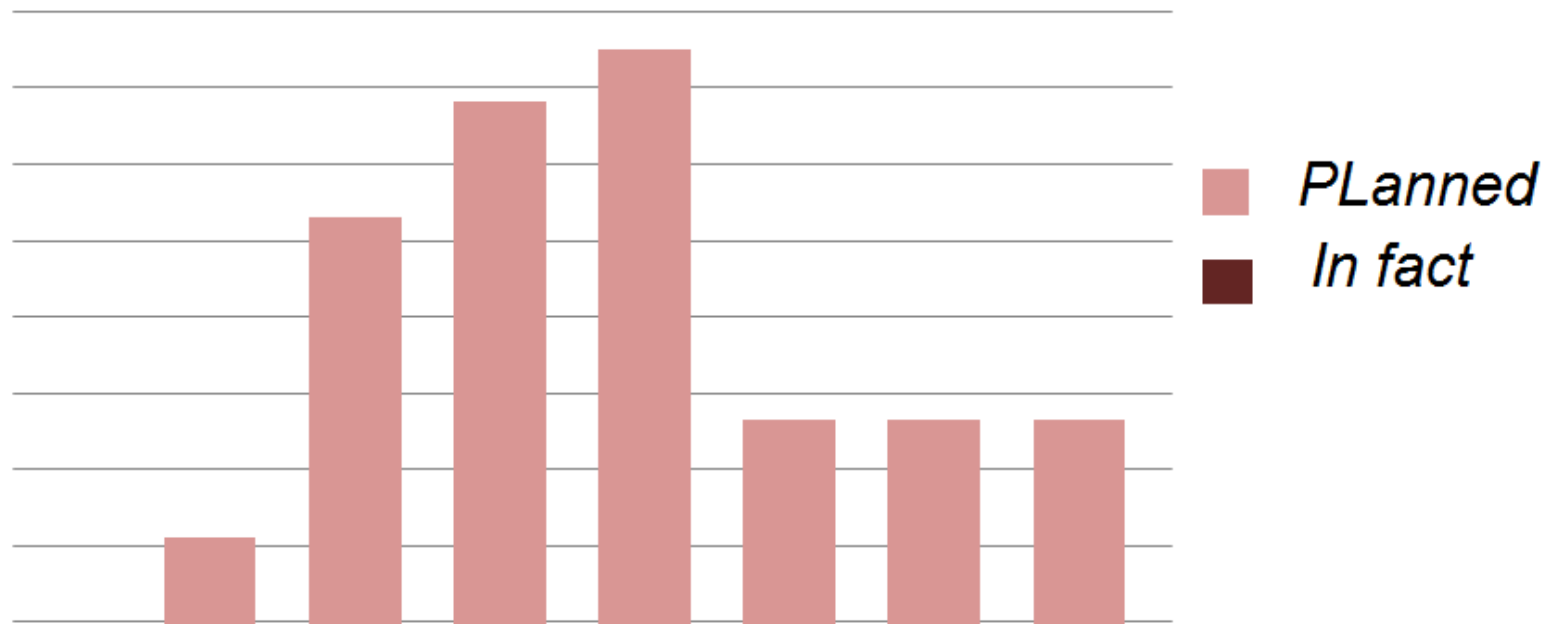| Class	Description	Disposal facility	
VLLW	Release after 70…100 years. 50…70% of short-lived RAW	Type 1 - Buriakivka	
LLW	Release after 300 years	Type 2 – Vector Complex	
ILW	Long-lived waste	Type 3 – intermediate depth	?

PROBLEM 3: Waste Classification

Element 4 – Finance

Finance & Funding

Use of Fund

PLanned

In fact

PROBLEM 4: Use of Fund

Element 5 – Research

- Absence of a specialized educational program to cover the needs in RWM since 2014;

- Loss of expertise;

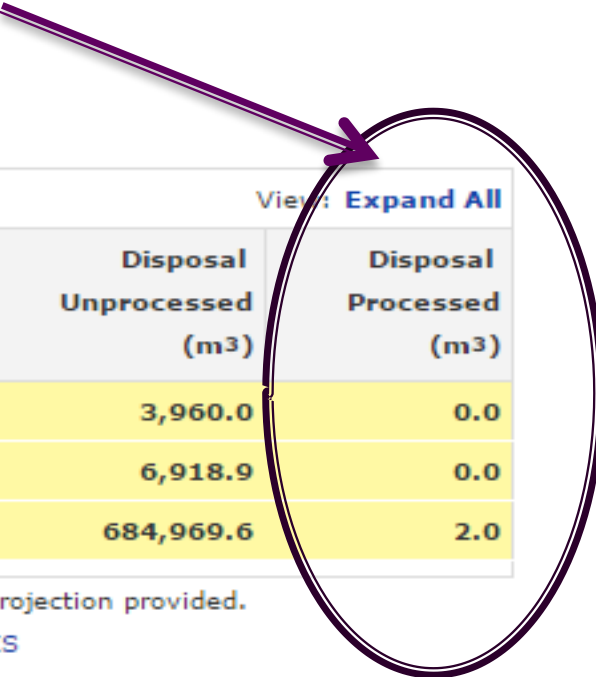- Little practical use of scientific achievements

PROBLEM 5: Weak link between science and practice in RWM

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So, what hinders the NRWMP?

- Political decisions;

- Lack of information about the RAW;

- Classification which doesn't meet current needs in RWM;

- Inefficient use of the Fund;

- Absence of adequate training and practical use of research

All the above explains this

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WHAT TO DO?

See the next presentation