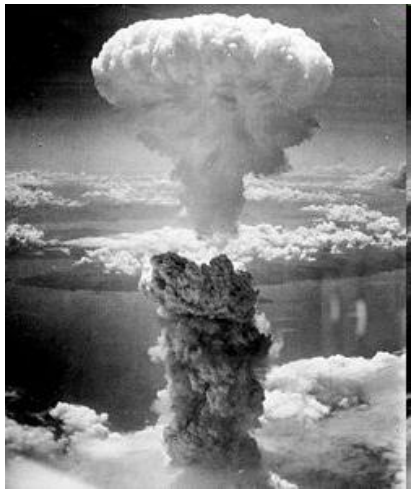
Kazakhstan in global and regional nuclear cooperation

Dr. Baurzhan DUISEBAYEV

Head of Innovations and Science Division

Republic of Kazakhstan is located in the heart of EurAsia

Nuclear age beginning



- The first nuclear bomb exploded in USA July 16, 1945 in the Alamogordo desert (New Mexico).

- Test of the first Soviet atomic bomb was in August 29, 1949 at the Semipalatinsk test nuclear site (Kazakhstan)

Semipalatinsk nuclear test site

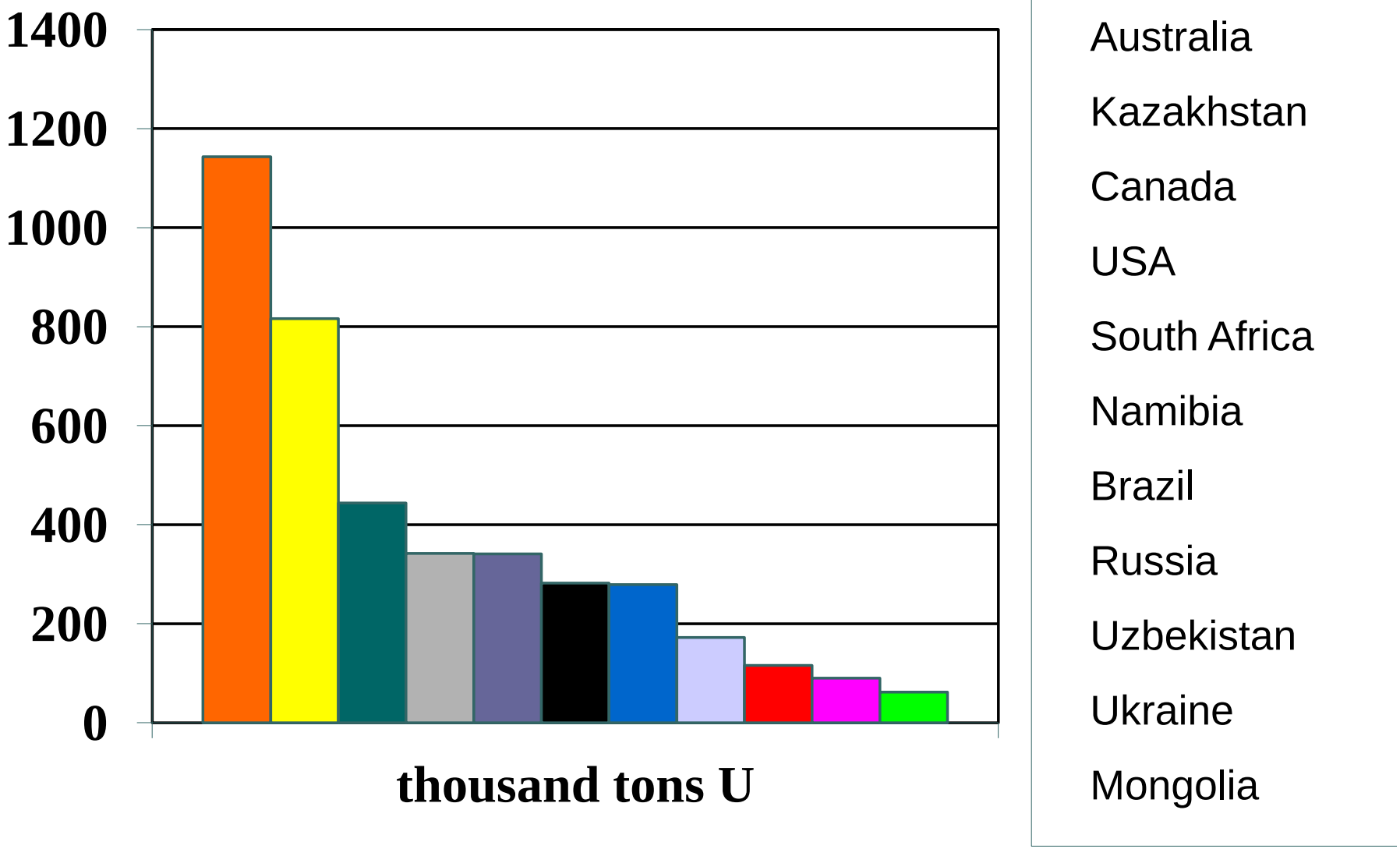
From 1949 to 1989 at the Semipalatinsk nuclear test site was 468 nuclear blast (616 nuclear devices)

USSR nuclear legacy

- Kazakhstan gained independence and voluntarily gave up its military nuclear potential In 1991
- Nuclear potential of Kazakhstan ranked 4-th in the world

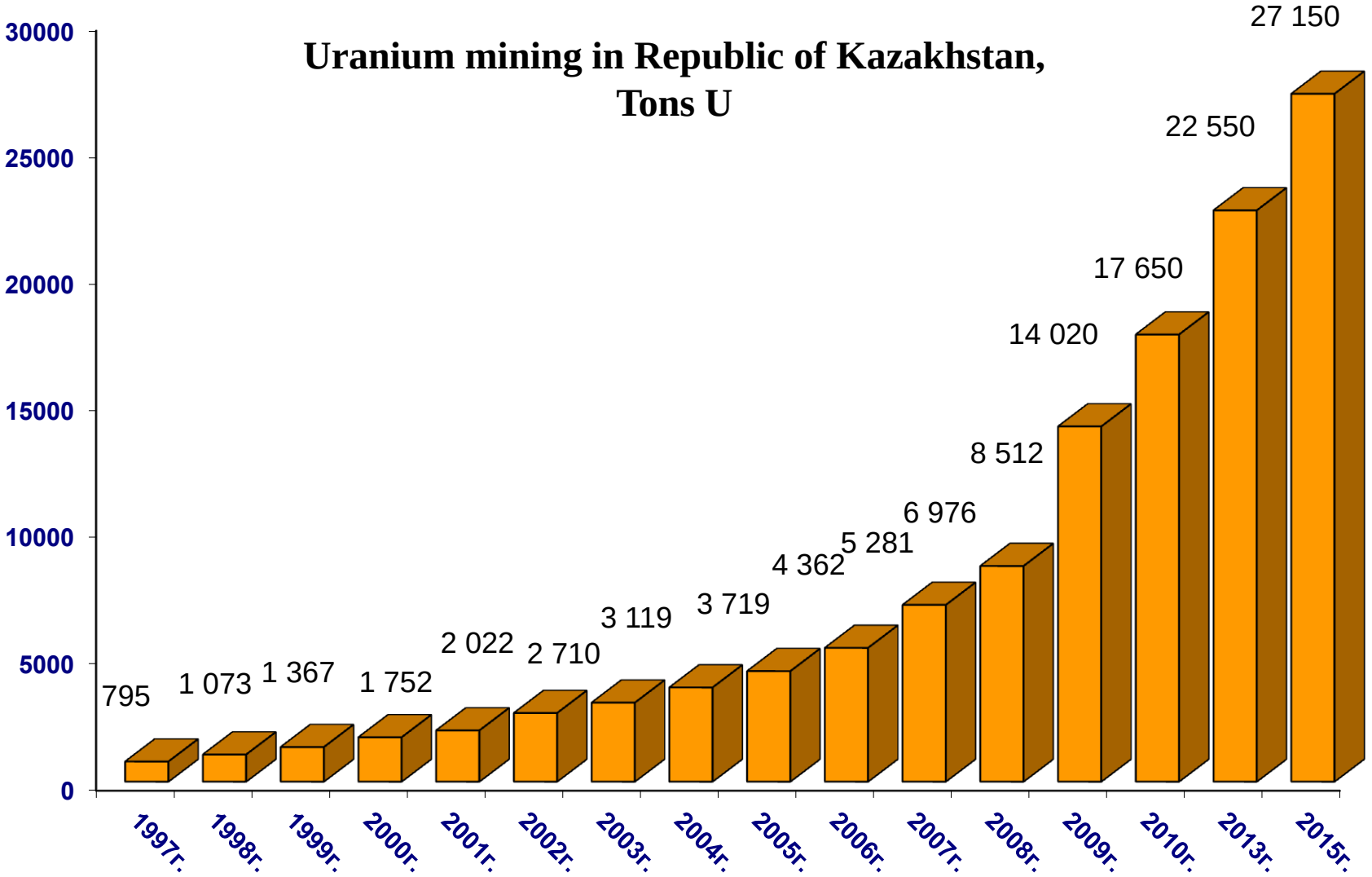
Kazakhstan Nuclear Industry Components

World Uranium resources (cheaper than $ 130/kg U)



Source: IAEA

The first place in the world on uranium production



Kazakhstan strategy in world nuclear industry (2009 and 2015)

RECEIVING OF URANIUM DIOXIDE

ENRICHMENT ON URANIUM 235

MANUFACTURING OF FUEL PELLETS

CONVERSION TO URANIUM HEXAFLUORIDE

MANUFACTURING FUEL ASSEMBLAGES

Today

Plans

URANIUM MINING

REACTORS & NPP

Kazakhstan strategy in world nuclear industry (2009 and 2015)

URANIUM MINING

19,6 %

30%

In 2015 world – 85 458 т, РК – 25 720)

CONVERSION TO URANIUM HEXAFLUORIDE

0 %

18 %

n 2015 world – 66500, РК – 12000)

ENRICHMENT ON URANIUM 235

0 %

9%

(In 2015 world – 64 million EPP, РК 6 million EPP)

RECEIVING OF URANIUM DIOXIDE

26%

(In 2015 world – 7800 MTU, РК 2000 т)

= 1500+500 УМЗ

6%

(In 2008 РК 260т)

MANUFACTURING OF FUEL PELLETS

3%

(In 2008 РК 175)

24%

(In 2015 world – 6240 MTU, РК 1500 т)

=в assemblages 400 AREVA, 800 BURL (WEC?)

+в tablets to China 300

MANUFACTURING FUEL ASSEMBLAGES

0 %

19%

(In 2015 world – 6240 MTU, РК 1200)

NUCLEAR POWER STATION BUILDING

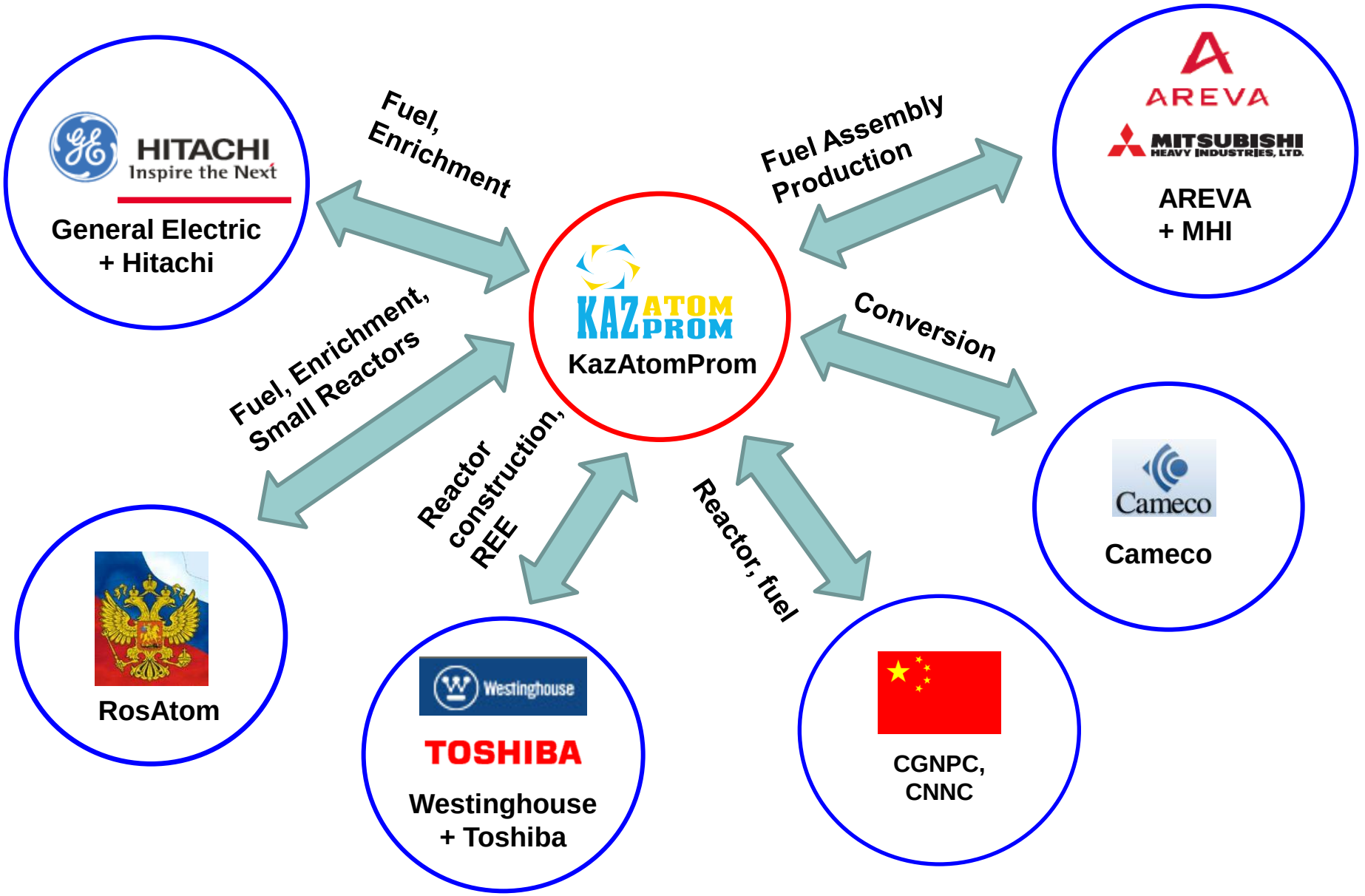
0 %

10 % from actions Toshiba/WEC + Rosatom

Today

Plans

Technology and knowledge transfer



New aspect – to force activity in the areas of safety of spent nuclear fuel and RW management.

Nuclear Technology Safety Center (NTSC, 1998-2011) .

NTSC
Activity Direction

Scientific-technical support for Atomic Energy Committee of Ministry of the Republic of Kazakhstan for Energy and Mineral Resources (KAEC MINT RK)

- ✓ Project management in the area of nuclear safety and non-proliferation
- ✓ Independent review of the nuclear related projects and safety analysis reports
- ✓ Development of the regulations drafts in the area of nuclear safety and technologies
- ✓ Management of designing of nuclear units
- ✓ Management of decommissioning of nuclear units
- ✓ Education and trainings in the area of non-proliferation and nuclear safety, including organization of international conferences

Main Activities

BN-350 decommissioning related projects:

NTSC – Responsible Executor of the Plan of Priority Measures (PPM) in the part of "Management of liquid-metal coolant "- budget RK.

- Cleaning of Sodium from Cesium Isotopes
- Drainage of Sodium from the Vessel and Circuits of the Reactor
- Development of Facility for Processing of Sodium into Sodium Hydroxide (SPF)
- Development of Facility for Processing of Alkaline Solution into Geocement Stone
- Development of Project for Sodium Residual Removal from the Vessel and Circuits of the Reactor

Works were mainly implemented under financial support of USA (contracts with NDF of Department of State and DOE through National Laboratories (ANL, Battelle), ISCT projects). Partial financing of SPF from budget RK.

Works were implemented jointly with KAEC MEMR RK, IAE NNC RK, NNC RK, Kazatomprom, MAEC-Kazatomprom.

ISTC Projects

K-437 «Study of physical-mechanical properties of irradiated materials of BN-350 for prolongation of life of light-water reactors", EDF, France, EU – completed

K-512 "Cleaning of sodium from cesium isotopes. Cesium trap disposition" part 1, ANL, USA – completed

K-512 "Spent Cesium Traps Handling for Further Disposal", UK,NUVIA – in progress.

K-513 "BN-350 decommissioning plan for international peer review" ANL, USA – cmpleted

K-969 , K-1006 "SPF Development. Automation System and Off-Gas System" ANL, USA – completed

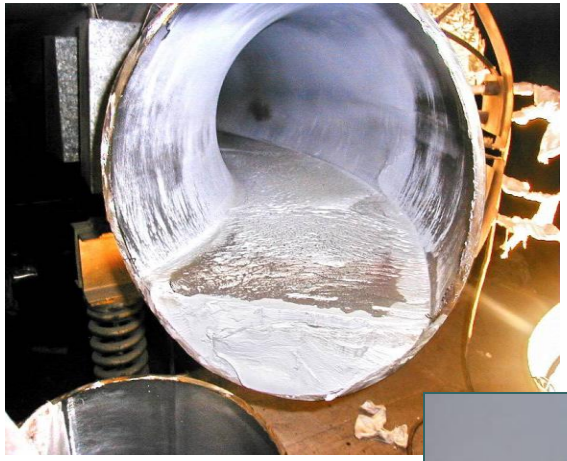
K-970 "Development of experimental-industrial technology for radioactive waste processing into geocement stone. Geocement Stone Facility" UAS, ANL and UK, NUKEM\NUVIA -completed.

K-1199 "Alternate Waste Form" UK, NUKEM\NUVIA –completed.

K-1345 "Residual Sodium Reaction" UK, NUKEM\NUVIA – will be complete in the end of 2011 .

K-1583 "BN-350 Hot Cell Repository Survey", UK,NUVIA – will be complete in the end of 2011 .

Total 9 projects



Main Activities

Projects on technical support of regulator in the framework of cooperation between Nuclear Regulatory Commission (NRC), USA and Atomic Energy Committee of the Republic of Kazakhstan.

The following documents were developed:

- **Physical protection of radioactive sources**

  Categorization of radionuclide sources
- **Physical inventory of nuclear materials at item facilities**
- **Requirements for accounting and control of nuclear materials**

Development of regulatory documents related to radioactive waste management

Requirements for low/intermediate radioactive waste disposal

Requirements for low/intermediate radioactive waste processing

Development of regulatory documents for radioactive sodium handling

Safety Requirements for BN-350 Radioactive Sodium Processing

Works are implemented jointly with KAEC MEMR RK, IAE NNC RK, INP NNC RK, Kazatomprom, MAEC-Kazatomprom

Main Activities

Development of the regulatory documents for management of BN-350 spent nuclear fuel

Financing – Nuclear Regulatory Commission USA, AdSTM, JSC KATEP

- ✓ Requirements for dry storage of spent nuclear fuel
- ✓ Compliance with the Requirements for Physical protection of Materials and Requirements for Urgent Evacuation of Personnel in Case of Emergency at BN-350
- ✓ Description of Procedure for Approval of Design Documentation and Certification of TUK-123 in Authorities of the Republic of Kazakhstan
- ✓ Rules for Approval of Design of TUK. Compliance of TUK-123 Design Documentation Package with the Rules for Approval Designs of Radioactive Materials, Transportation Packages and Transportation conditions established in the Republic of Kazakhstan
- ✓ Special Technical Conditions at the SNF Storage and Reloading Sites

Works are implemented jointly with KAEC MEMR R
IAE NNC RK, MAEC-Kazatomprom.

Main Activities

PROJECTS ON TECHNICAL SUPPORT OF REGULATOR IN THE FRAMEWORK OF COOPERATION BETWEEN KAEC MINT RK AND NORWAY RADIATION PROTECTION ADMINISTRATION:

- ***DEVELOPMENT OF THE LEGISLATION FOR MANAGEMENT OF RW FOR LONG-TERM STORAGE AND FINAL DISPOSAL IN THE REPUBLIC OF KAZAKHSTAN, INCLUDING RISK ASSESSMENT***

FINANCING – RADIATION PROTECTION ADMINISTRATION, NORWAY (NRPA)

Future plan

- Continuation the work with NORWAY RADIATION PROTECTION ADMINISTRATION (NRPA) In the area of RW handling, Including long-term storage and final disposal.
- Continuation the work with US Department of State (DOS) for Na/NA-K processing using SPF facility at MAEC-Kazatomprom.
- Assessment of option study for handling the spent nuclear fuel from nuclear reactors of RK. (customer UT-Battelle, US)

Transportation of spent fuel from reactor BN-350 (Aktau) to Kurchatov city

Temporary storage of spent nuclear fuel (Aktau)

Special railway car

Storage of spent nuclear fuel (Baikal -1)

Transportation of spent nuclear fuel from science reactor FWR to Russia

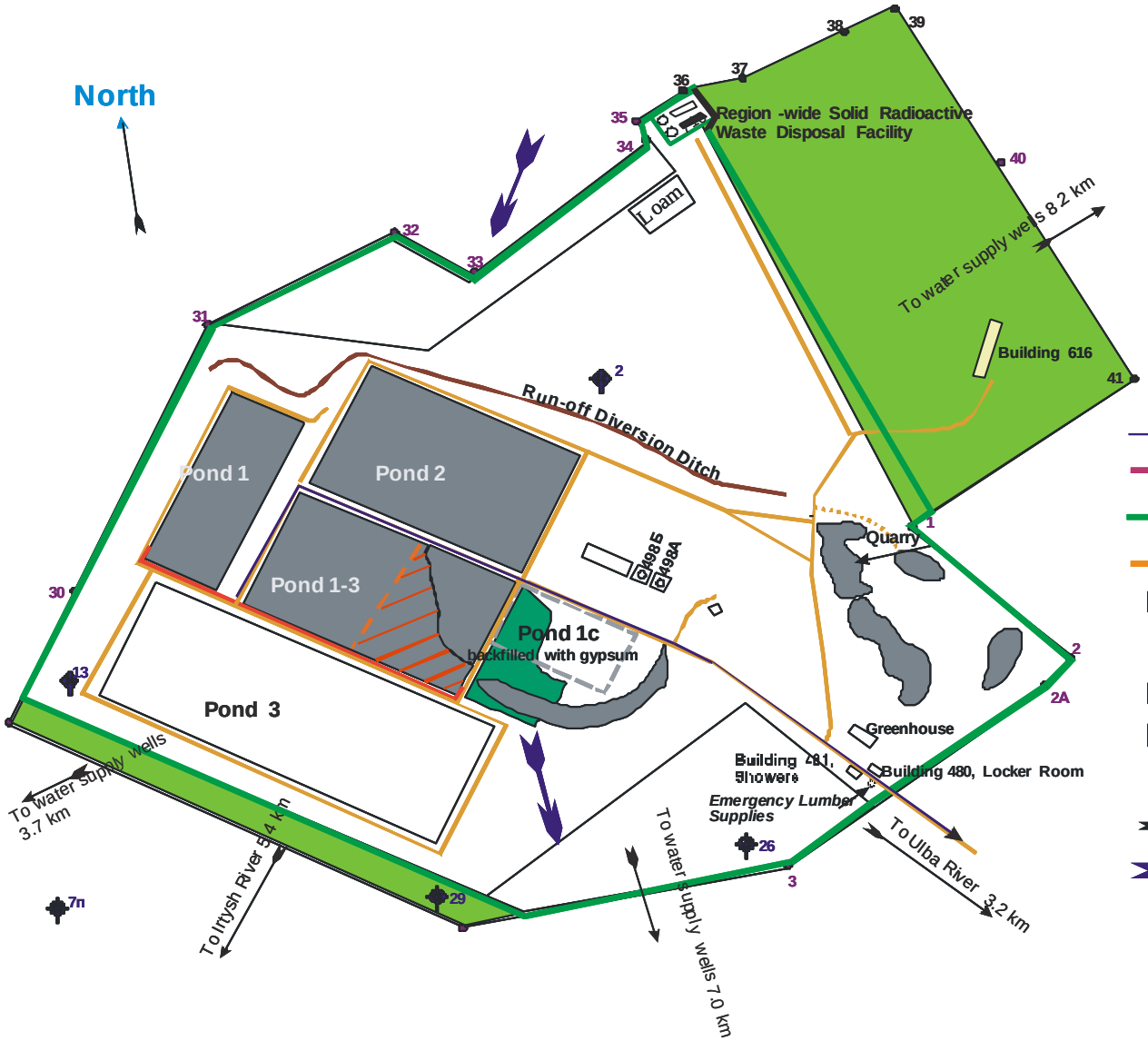
December 2008 - May 2009:
278 exhaust fuel assemblies
4 flights of special train compositions
70 transport packaging containers (TPC-19)

Very important issue : Storages for liquid wastes

Very important issue : Storages for liquid wastes

Project on Ulba plant (2002-2011)

Plan for storage of industrial waste
JSC Ulba metallurgy plant



Pond 1 - 3
Volume: 1.680E+6 m3
Status: decommissioned

Pond 1
Volume: 1.183E+6 m3
Status: decommissioned

Pond 2
Volume: 2.447E+6 m3
Status: decommissioned

Pond 1c
Status:decommissioned,
under administrative control

Pond 3
Status:under construction

Legend:

- Emergency Evacuation Route
- Most Vulnerable to Failure
- Facility Perimeter
- Roadways
- Effluent Waste
- Covered / Capped Solid Waste
- Revegetated/Reclaimed Lands
- Withdrawn Land Buffer
- Wells (and well number)
- Direction Off-site
- Groundwater Flow Direction (water table is 9 to 30 m below the ground surface)

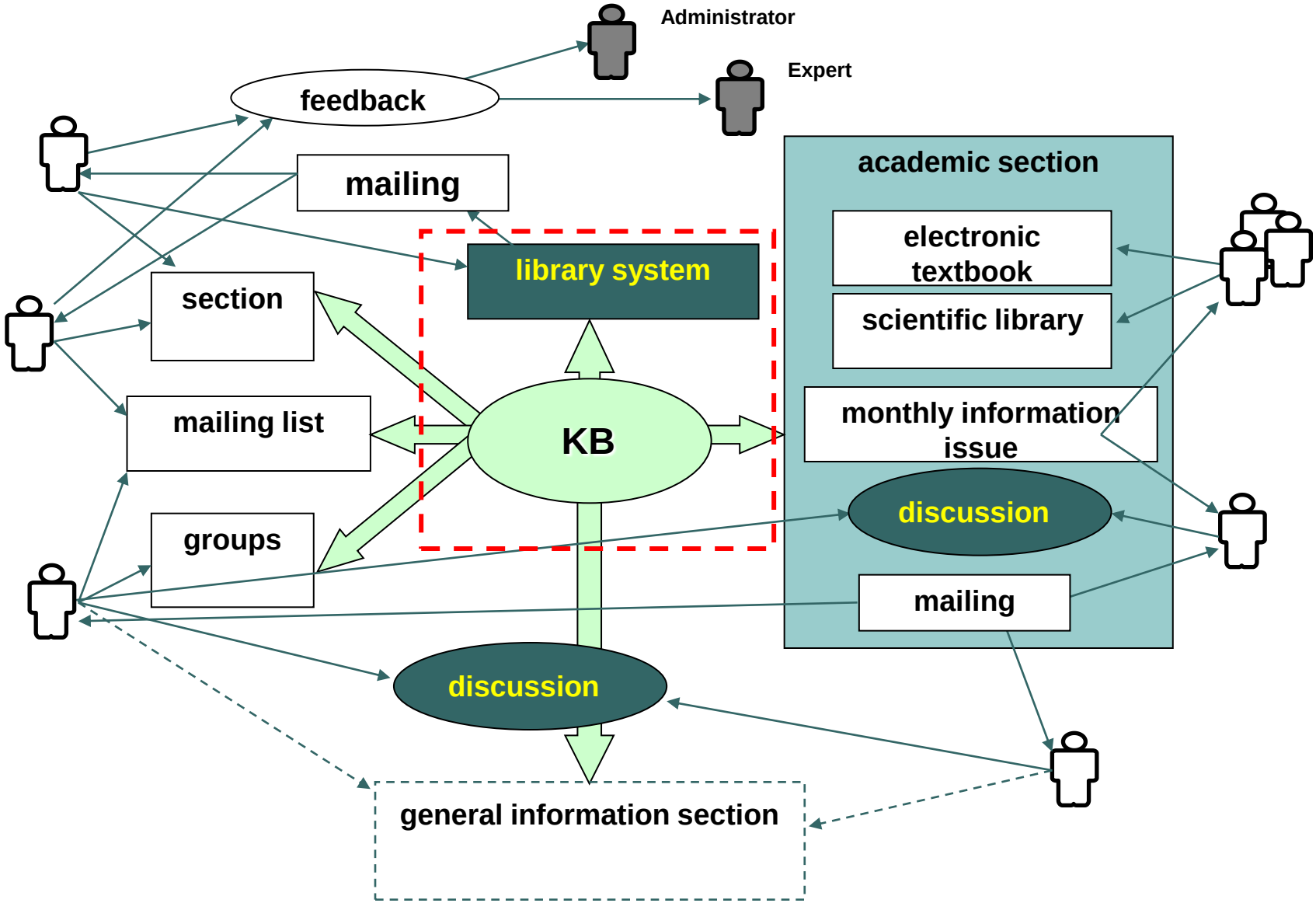
New pond construction

The digital Knowledge Base of «NAC Kazatomprom»

IAEA welcomed the KNOWLEDGE BASE Of «NAC KAZATOMPROM» as the only nuclear KB in CIS-countries

- **1. Regional Workshop on Managing Nuclear Knowledge Sevastopol Ukraine 19-23 June 2006 (RER0016-9023-01)**
- **2. Regional Workshop on Establishing Policies and Strategies to Preserve and Futher Enhance Nuclear Knowledge , Obninsk, Russian Federation, 26-28 June, 2007.**
- **3. Working Meeting to finalize a national concept of Nuclear Management, IAEA Vienna, Austria, 3-6 December, 2007 (KAZ/0/003-9003-01)**

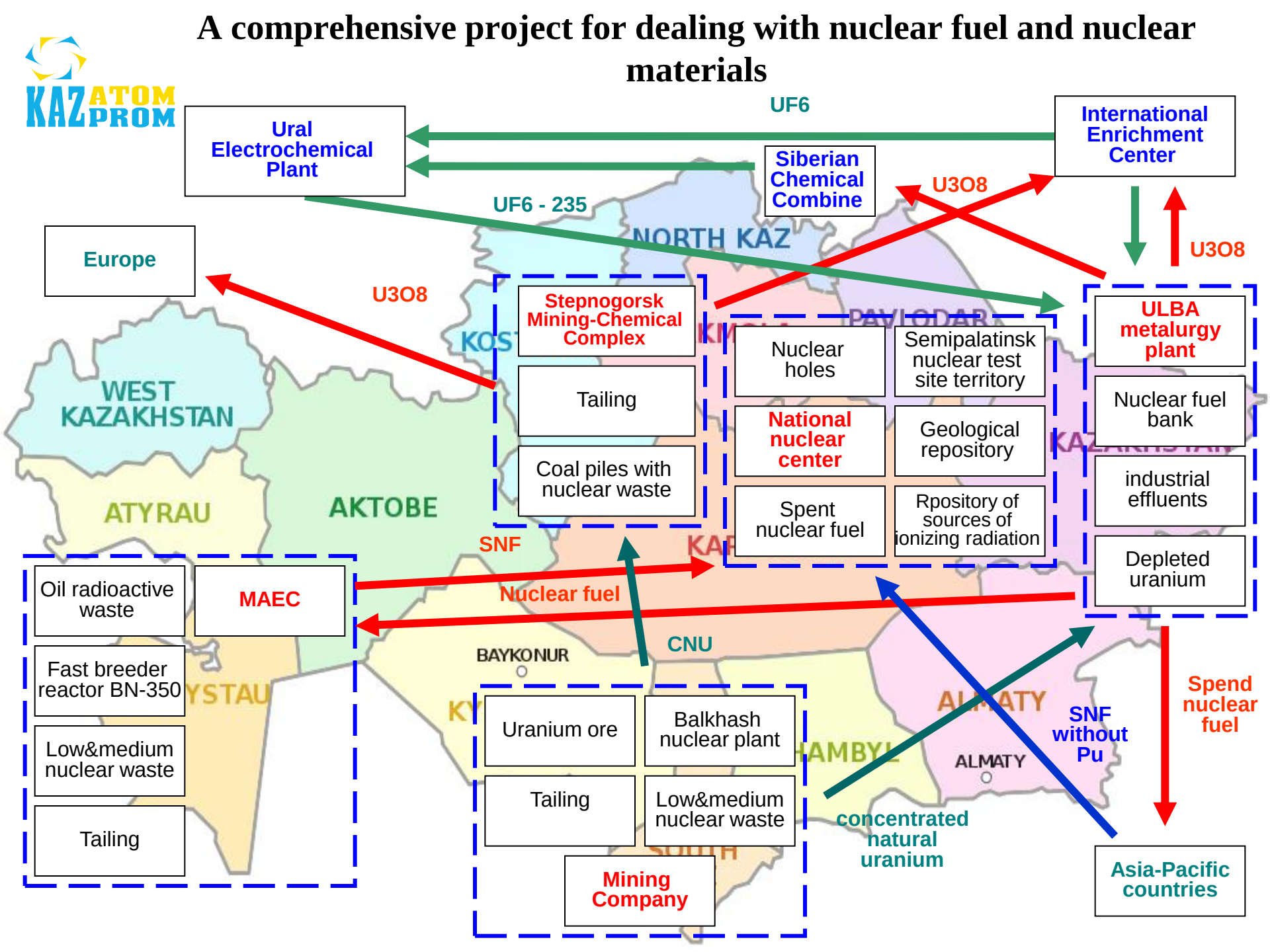
KNOWLEDGE BASE - STRUCTURE



Projects for Nuclear Cooperation

- International Nuclear Fuel Bank (Kazakhstan?)
- The International Enrichment Centre (Angarsk, Russia)
- Joint Environmental and Nuclear Safety Projects
- Joint Educational & Science projects and initiatives

A comprehensive project for dealing with nuclear fuel and nuclear materials



Past, Present and Future Cooperation with nuclear problems

Thanks for your attention!

Baurzhan DUISEBAYEV
bduisebayev@kazatomprom.kz