KAZATOMPROM
NATIONAL ATOMIC COMPANY




RESOURCE AVAILABILITY IN KAZAKHSTAN.

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Kazakhstan in the NFC of the world nuclear industry

PARTICIPATION IN ENRICHMENT

PRODUCTION OF URANIUM OXIDE POWDERS

PRODUCTION OF FUEL PELLETS

FABRICATION OF FUEL ASSEMBLIES

PARTICIPATION IN REACTOR CONSTRUCTION

RESEARCH REACTORS

U PRODUCTION

PARTICIPATION IN CONVERSION

TODAY

Program of development of nuclear industry in Kazakhstan

AREAS OF STRATEGIC DEVELOPMENT

1. **Retaining the lead position on the world uranium market**

2. **Development of uranium raw material base**

3. On the basis of Kazatomprom, build a multinational company with diverse presence in nuclear fuel cycle activities upstream of reactor operation (i.e., uranium mining, conversion, enrichment, fabrication of nuclear fuel, and construction of nuclear power plants), including through buying stock in foreign nuclear fuel cycle assets

4. Diversify Kazatomprom activities into allied hi-tech industries and take full advantage of science and technology achievements there.

URANIUM RESOURCES

- In the second half of the 60s, feasibility of Uranium production from low-grade ores by ISL was proved. This radically changed the situation in the raw material base in Kazakhstan.
- Rapid development of uranium mining by ISL in Kazakhstan caused by factor of availability of large sandstone type uranium deposits.
- A tremendous advantage Kazakhstan and Kazatomprom have over other participants of the uranium market is that, at around 1.7 million tonnes uranium, Kazakhstan has the world's second-largest explored resource of natural uranium.
- 77% of uranium resources in Kazakhstan in sandstone deposits are available for low-cost ISL production, environmentally friendly manner.
- Kazakhstan's uranium deposits can be classified as residing in six uranium-mining provinces: Shu-Sarysu (58%), Syrdariya (18%), North-Kazakhstan (16%), Caspian (2%), Balkhash (1%), and Ili (5%).

URANIUM RESOURCES

Uranium provinces

URANIUM RESOURCES

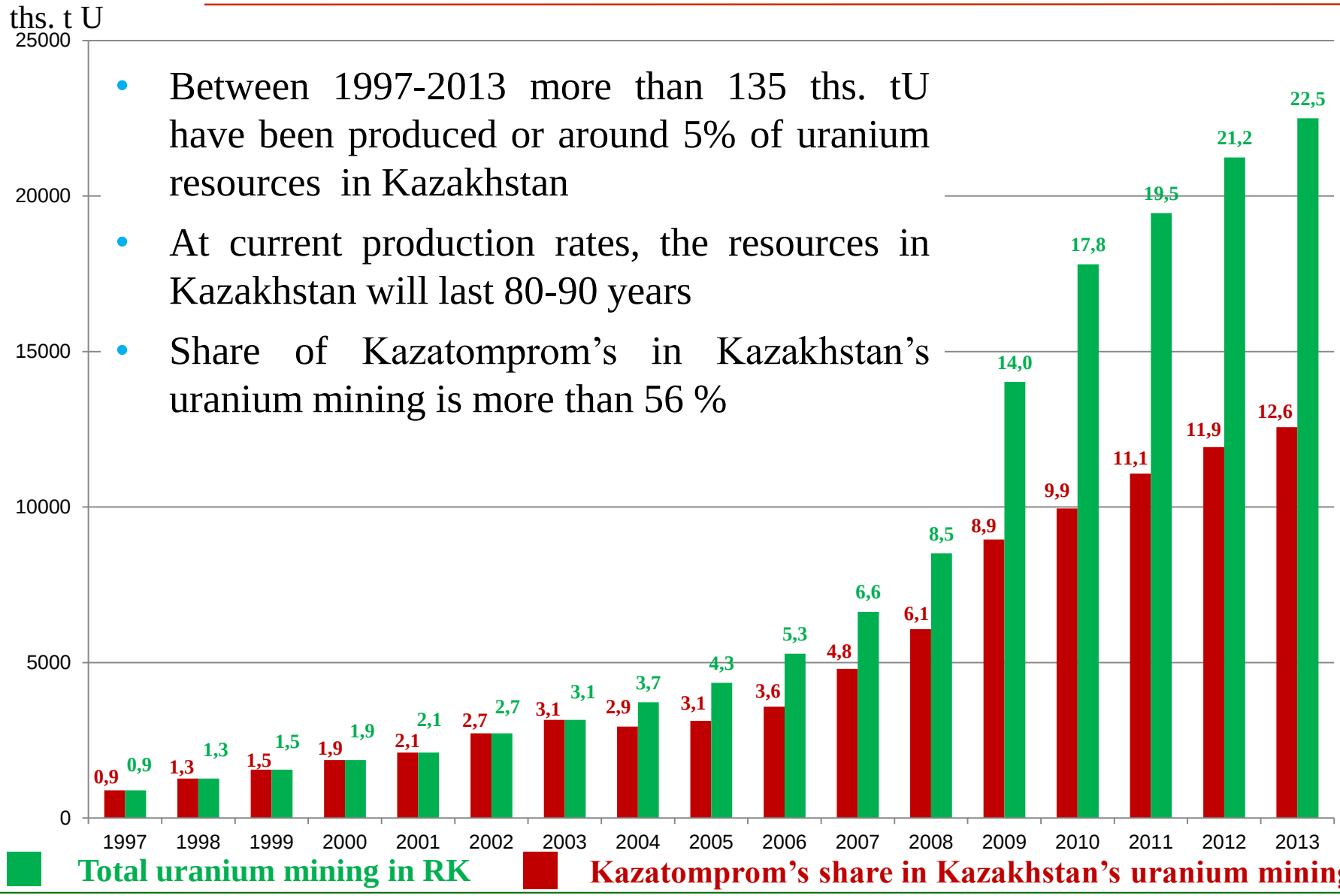
- The lion's share of uranium deposits (roughly 76%) is concentrated in the country's southern provinces
- Roll-front type deposits are distributed in the Shu-Sarysu and Syrdariya provinces, vein-type and basal channel deposits – in the North-Kazakhstan province, organogenic phosphate deposits (uranium-bearing tap detritus) - in the Caspian province, uranium-coal deposits - in the Ili province, vein-type deposits - in the Balkhash province.
- About 58% of identified uranium resources in Kazakhstan are recoverable at <USD 80/kgU.

URANIUM PRODUCTION

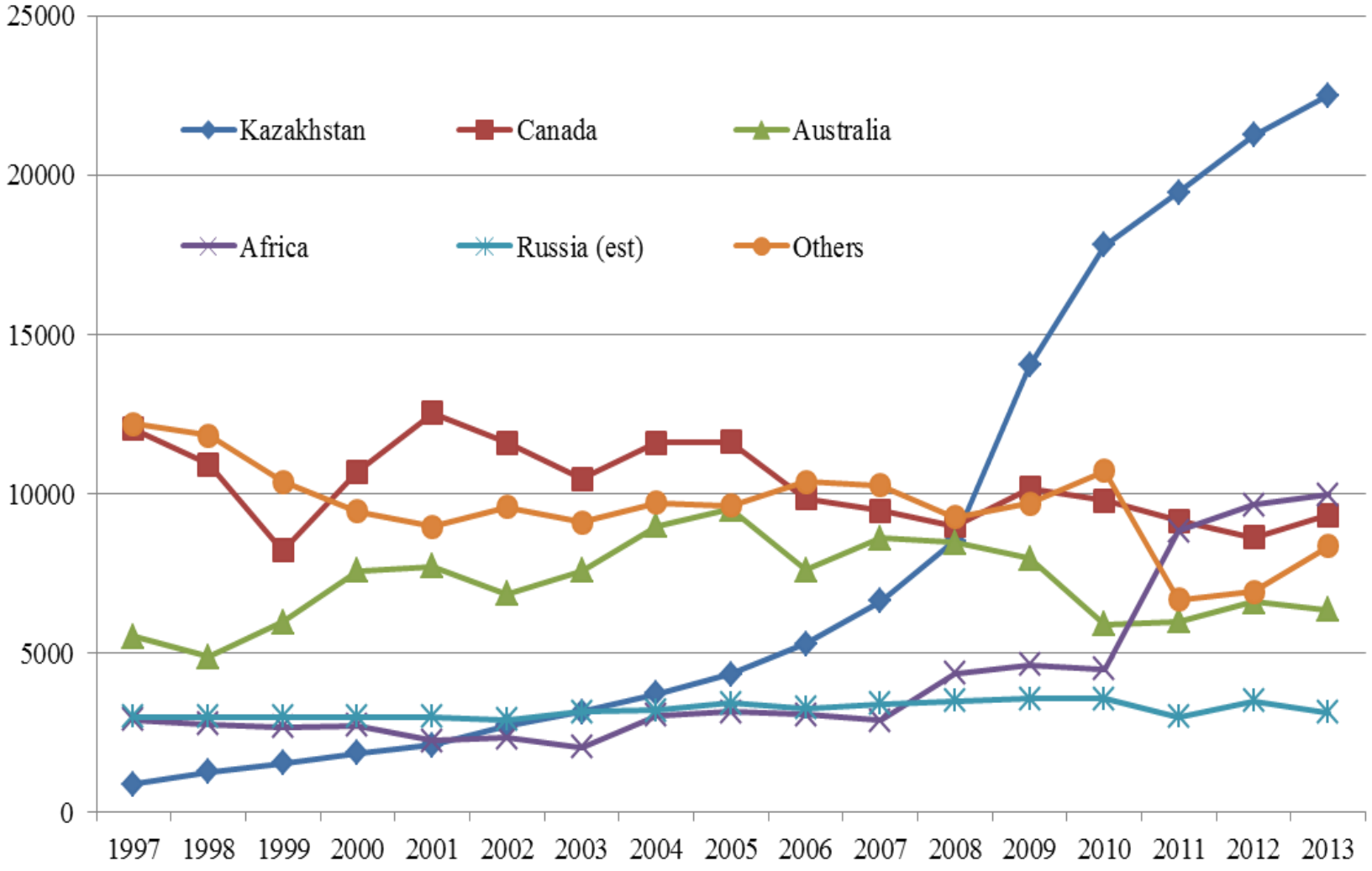
- Kazakhstan became the world leader in uranium ISL mining technology. Uranium production in Kazakhstan is conducted on 14 deposits of Chu Sarysui, Syrdarya and North Kazakhstan uranium provinces (21 licenses), at 22 sites by the 14 companies.
- During last 10 years, uranium production in Kazakhstan has increased 6 times and reached 22 500 tU in 2013. Today, Kazakhstan provides about 38% of natural uranium in the world. Own share of Kazakhstan's production in 2013 is more than 12 500 tonnes of uranium

URANIUM PRODUCTION IN KAZAKHSTAN, tU

- Between 1997-2013 more than 135 ths. tU have been produced or around 5% of uranium resources in Kazakhstan
- At current production rates, the resources in Kazakhstan will last 80-90 years
- Share of Kazatomprom's in Kazakhstan's uranium mining is more than 56 %



Uranium production in the world leading uranium-producing regions

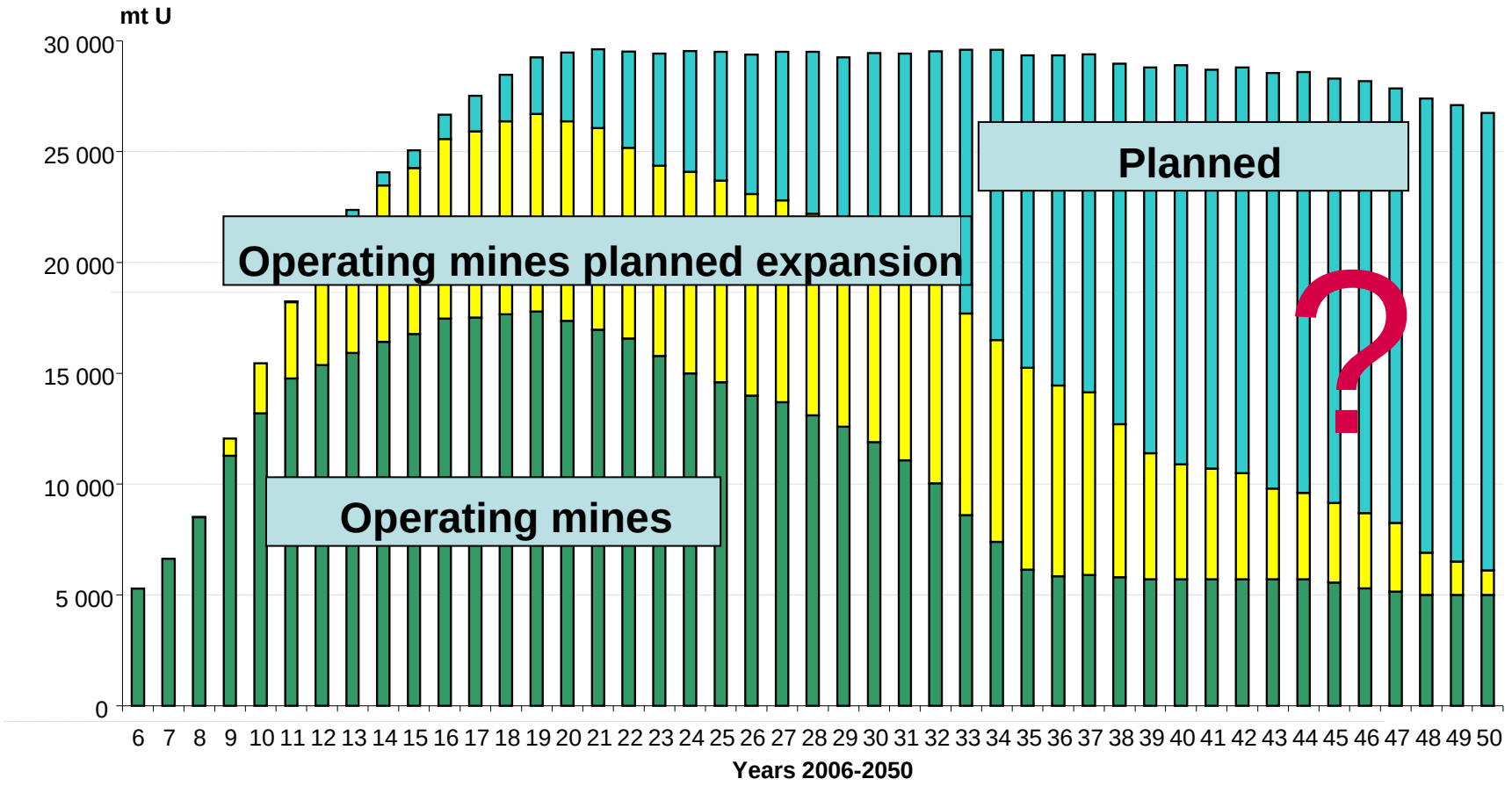


FOREIGN PARTNERS

There are 10 joint ventures for uranium production in Kazakhstan:

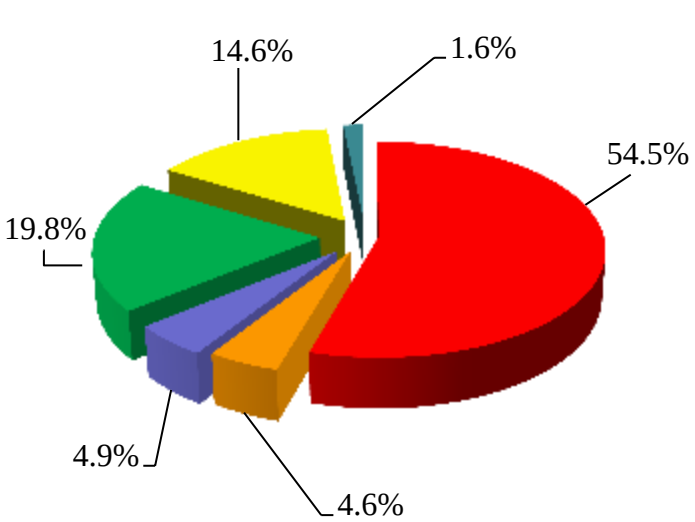
- Kazakhstan-Japan-Russia (Canada) – Kyzylkum LLC;
- Kazakhstan-Russian (Canada) – JV Betpak Dala LLC;
- Kazakhstan -Canada – JV Inkai LLC;
- Kazakhstan -Russia-Kyrgyzstan – JV Zarechnoye JSC;
- Kazakhstan -Russian – Karatau LLC;
- Kazakhstan -Russian – JV Akbastau JSC;
- Kazakhstan -France – JV KATCO LLC;
- Kazakhstan –China – Semizbai-U LLP;
- Kazakhstan -Japan – APPAK LLP;
- Kazakhstan -Japan – Baiken-U LLP.

URANIUM PRODUCTION FORECAST IN KAZAKHSTAN TO 2050



- Based on favorable situation and actual needs of the nuclear energy sector in the short and long runs, Kazakhstan plans to maintain current production rates, and increase or decrease it as needed.

THE GEOGRAPHY OF KAZAKHSTAN'S NATURAL URANIUM SUPPLIES



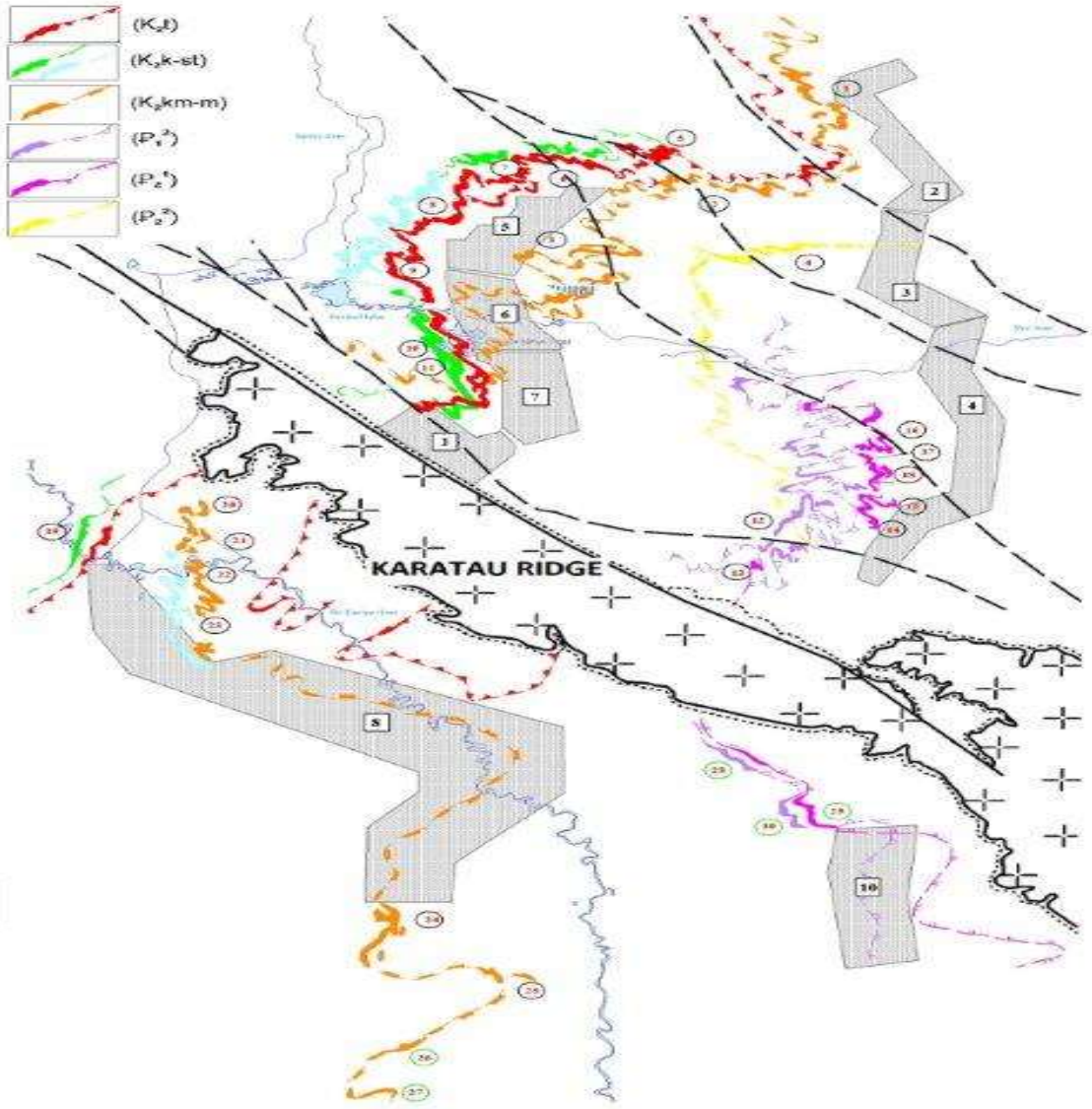
DEVELOPMENT OF URANIUM RAW MATERIAL BASE

- One of the strategic directions of the state in the development of the nuclear industry is the development of uranium raw material base.
- In Kazakhstan continuously carry out exploration and prospecting to expand the resource base of uranium.
- In 2011 and 2012 uranium resources increased by more than 110 thousand tU and 40690 tU was mined. Resource growth is 2.5 times higher than the depleting.

EXPLORATION AND PROSPECTING

- Kazatomprom, as the national operator, has set its sights on the independent development of uranium resource base, without the involvement of investors and major players in the uranium business. The Company has everything it needs to undertake projects on its own: there are no constraints in the amount of funds that can be attracted; all technologies have been tried and tested; well-trained personnel are readily available.
- Kazatomprom realizes the importance of having uranium resources for continuous operation of key production assets. Presently, exploration and prospecting activities are underway to identify new uranium resources.
- Since 2012, Kazatomprom is prospecting for new uranium sandstone deposits in southern Kazakhstan at its own expense by efforts Volkovgeologia. The program lasts until 2030. Prior to 2015, allocated more than 20 million U.S. dollars in prospecting works. In near future is expected discovery of new deposits are available for low-cost ISL production.
- It is planned to develop exploration and prospecting program for the search basal channel deposits in the North and East of Kazakhstan suitable for the ISL production, and a program of further geology-economical re-estimation uranium endogenous deposits for open pit and underground mining.
- Increase the price of uranium on the world market helps intensify exploration and prospecting programs

EXPLORATION AND PROSPECTING



1. Uranuim deposits
North node of deposit
1. Zholpak
2. Akdala
3. Sholpak-Espe
4. Uvanas
5. Minkuduk (West)
6. Minkuduk (Central)
7.Minkuduk (East)
8. Inkai (1,2,3 sectors)
9. Inkai (4 sector)
10. Budenovskoe (2 sector)
11. Budenovskoe (1,3,4 sectors)

East node of Deposits
12. Kanzhugan
13. Kanshugan (Kaynar)
14. Moinkum (South, Kazatomprom)
15. Moinkum (South, Katko)
16. Moinkum (Torkuduk)
17. Moinkum (Central, Katko)
18. Moinkum (Central, Kazatomprom)

West node of Deposits
19. Irkol
20. North Karamurun
21. Soutj Karamurun
22. North Harasan (1-sector)
23. South Harasan (2-sector)]

South node of Deposits
24. Zarechnoe
25. South Zarechoe

2. Contour of Prospecting uranium areas
1. Prikaratauskoe
2. Vostochno-Zholpakskaya
3. Vostochno-Uvanaskaya
4. Vostochno-Moinkumskaya
5. Vostochno -Inkayskaya
6. Kapkansorskaya
7. Vostochno-Budenoskaya
8. Vostochno-Kizilkumskaya
10. Prishimkentskaya

Unrecorded Deposits by programm
26. Asarchik
27. Zhautkan
28. Kizilkol
29. Lunnoe
30. Chayan

ISL MINING

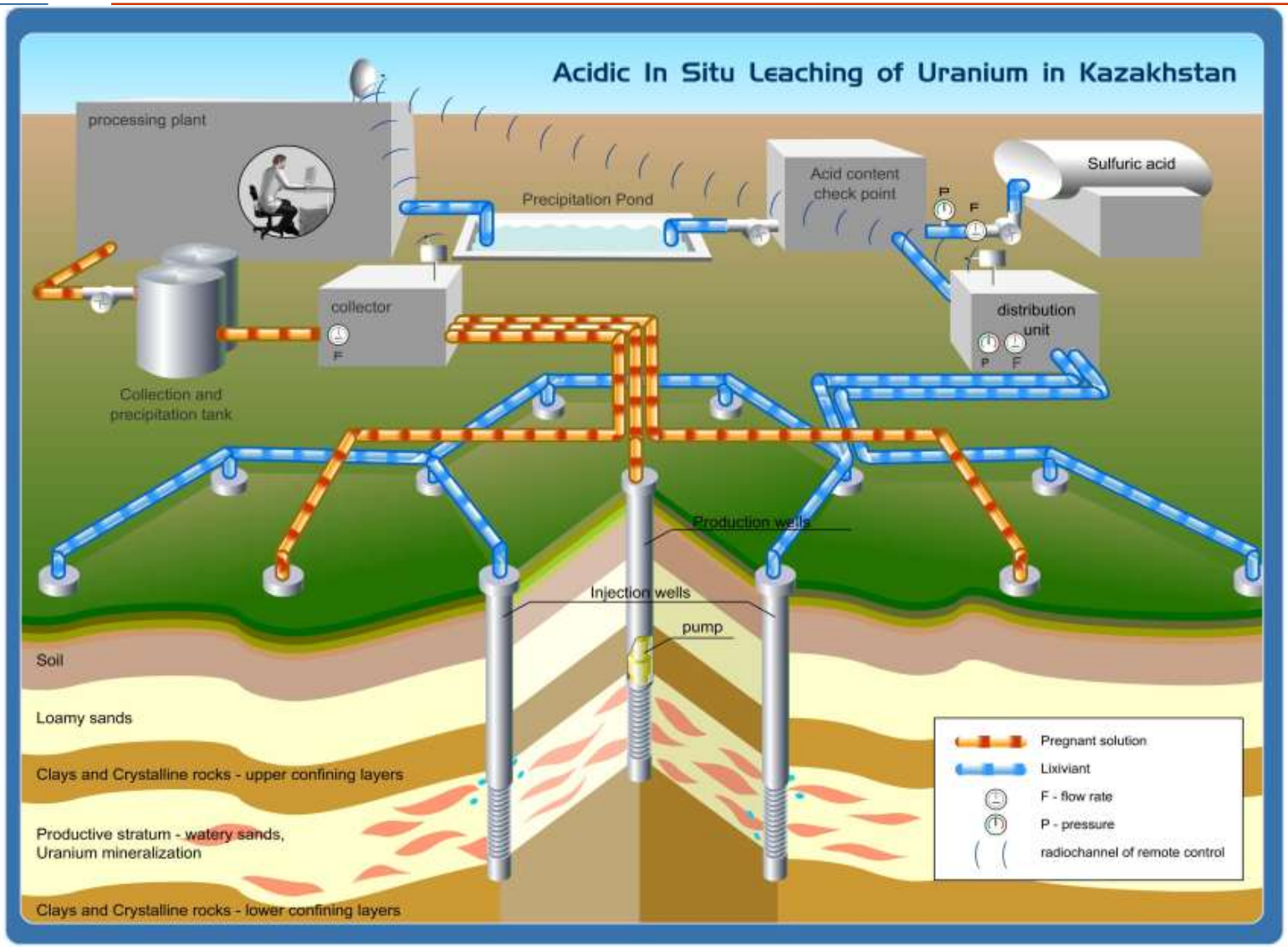
Kazakhstan became the world leader in the technology of ISL uranium production. This method does not give a negative impact on the environment, and today is the reference method for cleaner production of natural uranium.

In Kazakhstan Kazatomprom performs uranium production by sulphuric acid leaching method. ISL method is chemical treatment of ores weak-acid solutions (H2SO4) in place of their natural occurrence and transfer of useful component in another aggregate and chemical status, in this case into a productive (pregnant) solution containing uranium as uranyl sulphate salts (UO2(SO4)3).

Delivery of sulphuric acid solution is performed in ore body through a network of injection wells. Passing through the ore solution dissolves the uranium minerals, forming a pregnant solution. Then the pregnant solution is pumped up to the surface through the production wells.

Uranium-containing solution on the surface is processed to "yellow cake" and / or U3O8.

ISL MINING


Acidic In Situ Leaching of Uranium in Kazakhstan
processing plant
Precipitation Pond
Acid content check point
Sulfuric acid
collector
distribution unit
Collection and precipitation tank
Production wells
Injection wells
pump
Soil
Loamy sands
Clays and Crystalline rocks - upper confining layers
Productive stratum - watery sands, Uranium mineralization
Clays and Crystalline rocks - lower confining layers
Pregnant solution
Lixiviant
F - flow rate
P - pressure
radiochannel of remote control

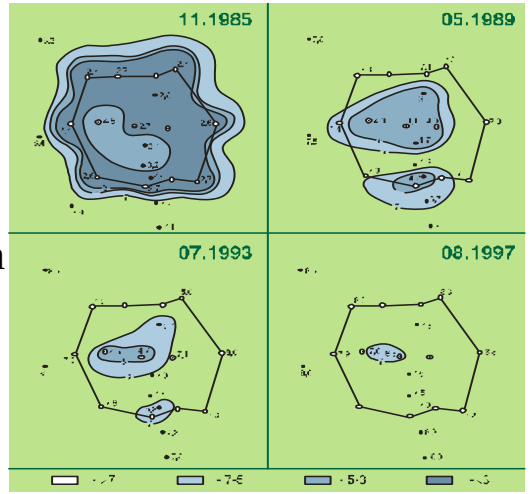
Environmental Aspects of Kazakhstan Uranium Production

- ISL eliminates any dust emission sources, and ten times reduces the allocation of radioactive substances into the atmosphere.
- The concentration of radioactive elements in pregnant solution is low. For example, an amount of radium in solution is not more than 2% of the total content of the ores. It migrates at short distances (a few tens of meters), because the presence of the SO42--ion in water leads to the formation of slightly soluble gypsum, and practically insoluble sulphate (barium lead, strontium), which causes the co-precipitation of radioactive elements.
- The sulphuric acid leaching of uranium cause least damage to groundwater. Working in balanced mode of ISL the halo of contamination reaches a distance of less than 50 m from the outer wells. Chemical interaction solutions with the rock minerals, neutralization, ion exchange processes, sorption, and diffusion lead to reduce the concentration of contaminants. All harmful components are deposited on the geochemical barrier at higher pH.

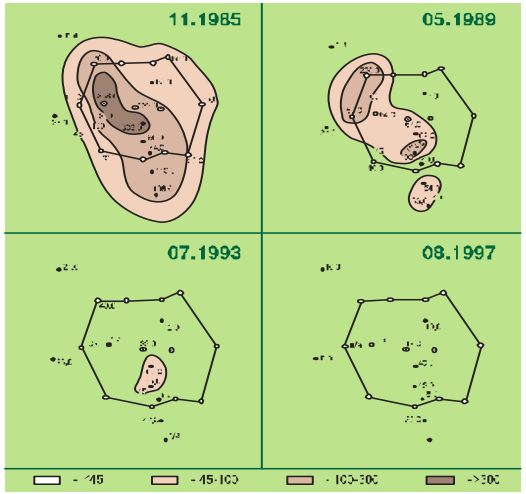
ISL MINING

- It has been unambiguously proved that the natural hydrogeochemical environment of uranium deposits of South Kazakhstan has a unique capability of self-restoration from man-caused impact.
- Due to the eventual restoration of natural oxidation-reduction conditions there is a slow but irreversible process of restoration of underground waters of ore-containing horizons.
- This self-recovery feature was determined in the course of long-time observations of underground water behavior at Irkol deposit as an example.

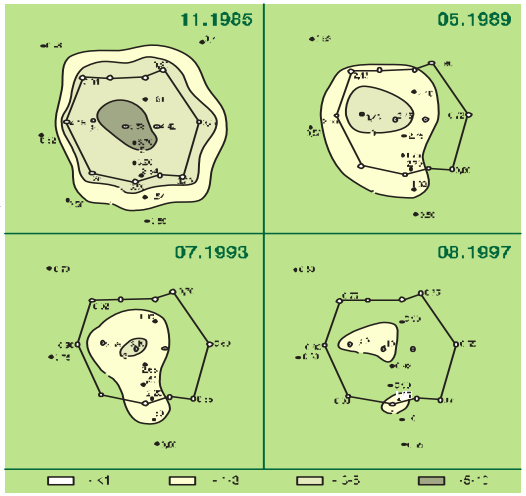
pH



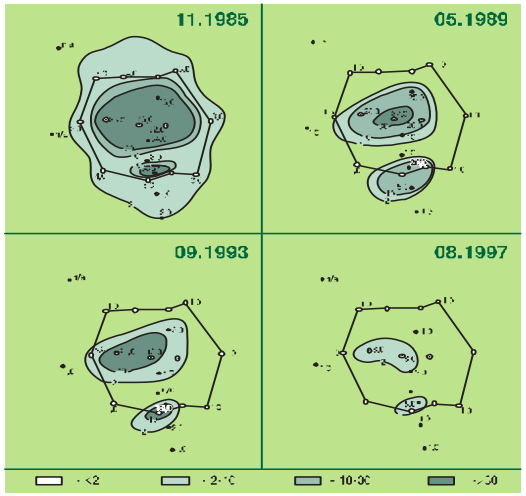
Nitrate



Sulphate



Uranium



Thank you for attention!

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