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Uranium production in Kazakhstan as a potential source for covering the world uranium shortage

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Dear colleagues, Ladies and Gentlemen!
Let me thank you for the opportunity to speak to such a respectable audience. My report is about Kazakhstan and its potential in natural uranium production. In my report I am trying to prove that Kazakhstan can and should be one of the key sources for supply of the world nuclear energy with natural uranium.
It is not the first time that I am speaking to the respectable world nuclear community. My previous reports (Reports presented at WNA and WNFM symposiums in 2001, 2002 and 2003) were devoted to global problems of natural uranium market development. And I tried to draw an attention of the world uranium community to three very important and quite evident facts:
Firstly, natural uranium mining capacities cannot satisfy requirements of reactors.
Secondly, cumulative uranium resources will be exhausted sooner or later.
Thirdly, the spot price does not reflect the actual problems and on the contrary is capable to mislead all of us regarding the urgency of investments to be made in the development of new mining properties.
Judging by these facts the conclusion is evident: one day nuclear power plant will face the natural uranium shortage and it is not required to be a prophet to foresee it.
Nowadays development of the uranium producers potential obviously is a key to solution of the major problems of the uranium market.
What are we experiencing in the natural uranium market at this time? The price has gone up a bit, the owners of resources have somewhat halted the sale and the price has gone up a bit more. Michael Connor called this situation "The Perfect Storm". May be somebody is pleased to think that the situation in the natural uranium market is an accidental coincidence of many factors. But who knows what we will have after the storm? Brightly shining sun? Or may be the storm is so perfect only because it is caused by anticipations of uranium shortage? And may be "the real storm" based on the actual uranium shortage has not yet come? I am afraid that "the real storm" may be ended with the Ice Age.
To answer the above question we estimated capacities of all major uranium mining centers. Based on the published materials and conversations with our colleagues we tried to estimate the mining volumes, which are possible under the most favorable conditions. This estimate is provided in the table below.

Table 1

Forecast of Uranium Production at the Mines

		2004	2007	2010	2015
Australia	Ranger-Jabiluka	4,308	3,846	3,846	3,846
	Olimpic Dam	3,000	6,923	6,923	6,923
	Beverly	615	615	615	615
Canada	Cigar Lake	0	3,077	6,923	6,923
	McArthur River	5,808	6,923	7,192	7,192
	McClean Lake	2,308	2,308	2,308	2,308
	Rabbit Lake	2,269	0	0	
Other	France	0	0	0	
	Spain	38	19	19	
	Others	769	385	538	500
Africa	Gabon	0	0	0	0
	Niger	3,154	3,154	3,154	3,154
	Namibia	2,038	0	0	
	South Africa	769	577	385	300
USA	Crow Butte	317	154	0	
	Cotter	0	0	0	
	IUC	0	0	0	
	IMC-Agrico	0	0	0	
	Rio Algom	18	0	0	
	Highland	462	700	950	1,950
	URI	0	0	0	
	Malapai	0	0	0	
Total for West:		25,873	28,681	32,854	33,661
	China	769	769	769	769
	India	500	500	700	1,200
	Czech Republic	431	180	0	
	Hungary	10	10	10	10
	Kazakhstan	3,300	6,465	8,300	9,300
	Romania	81	81	81	81
	Russian Federation	2,800	2,800	2,500	2,500
	Uzbekistan	2,000	2,300	2,300	2,300
	Ukraine	500	500	500	500
Total for East:		10,391	13,605	15,160	16,660
TOTAL:		36,263	42,286	48,014	50,321

Canada: It is expected that under the high price scenario, all Canadian mines, including Cigar Lake ready for operation, will be optimally operating. We suppose that Cigar Lake will start providing output in 2007. According to our model, production at McArthur River and Cigar Lake is coming up to the maximum licensed output.

Australia: The Ranger deposit can produce 3,800 tones, its reserves would be exhausted by 2010, and this deposit should be smoothly replaced by putting

Jabiluka deposit into operation. The Olympic Dam mine will achieve the annual output of 6,900 tones of U by 2010. It is maximum provided by the operational license. ISL Australian deposits, especially Beverly, are not in the position to produce over 1,000 tones of uranium per year due to the lack of necessary reserves.

Production in Russia would most likely not exceed 2,500 tones, as well-known Russian deposits would not be able to replace the reduction of output at the biggest Russian operating uranium deposit Streltsovskoye.

Ukraine: Production in Ukraine will most likely be ceased by 2010.

Uranium production in Niger is relatively high-cost and would not allow the expansion of the production capacities. Increase of the output above 2,700 tones in Niger is not expected in near future.

Namibia: Production at Rossing deposit was announced to be shut-down in 2007.

Currently, the total production of other countries (Czech Republic, Hungary, Romania, Argentine, Brazil, and Pakistan) is 1,840 tones. Having moderate reserves, by 2010 they will keep their production at a level of 1,900 tones at best.

Thus, we assume that mining of natural uranium will be increased more than 1.3 times by 2010. But will it be enough to meet the requirements of nuclear power plants? In the following diagram we combine our forecasts of natural uranium production, which are higher than officially available ones, with IAEA's forecasts of requirements in uranium and other possible sources.

Table 2

World Demand and Supply

	2004	2005	2006	2007	2010	2015
Demand	**66,658**	**68,400**	**69,600**	**70,800**	**74,800**	**79,400**
HEU	10,700	10,600	10,700	11,100	12,400	
US DOE Inventories	385	1,192	1,192	1,192	2,154	2,346
Commercial Inventories	7,876	7,000	7,000			
Russian Inventories	2,900	3,500	3,800	3,900		0
MOX	2,500	2,500	2,600	2,800	3,000	3,600
Rep. U	1,500	1,500	1,700	1,700	2,000	2,000
Tails reprocessing	4,250	3,650	3,300	3,000	1,500	
Production	**36,263**	**36,575**	**36,094**	**42,286**	**48,014**	**50,321**
Total supply	**66,374**	**66,517**	**66,386**	**65,978**	**69,068**	**58,267**
Uranium Shortage	-284	-1,883	-3,214	-4,822	-5,732	-21,133

It follows from this data that in 2010 the market would receive 5.7 thousand tones of uranium less than the reactors requirements in the same year. Total uranium shortage from 2004 to 2010 will be about 16,000 tones of uranium.

The disappointing conclusion follows that if the efforts are not made, then "the perfect storm" can grow into a real one with nuclear power plants facing the actual natural uranium shortage.

In my previous speeches I emphasized that I am not be pleased with uranium shortage situation. Mining enterprises do not have any other consumers but nuclear power plants and the problems of nuclear power plants will finally become our own problems as well. Natural uranium producers will have to increase their production, because otherwise in order to balance out demand and supply the nuclear power plants will have to reduce power output, and least of all would we want it.

Then let us look at the potential of Kazakhstan, since I believe that this potential is enough to cover the oncoming shortage.

Figure 1

I would like to tell you about Kazakhstan, the third country in the world for uranium production volumes and about Kazatomprom, the forth uranium producer in the world, as well as about what role they can play in the crisis regulation.

At present, economy of Kazakhstan, based on power generation and metallurgical industry, is going through a production growth, foreign investments and currency reserve increase. Positive economic development of Kazakhstan is closely tied to the steady banking system with the deposit insurance mechanisms, effective structural reforms, fiscal policy and improved budget planning quality. National Fund was created with a basic function to decrease the Kazakh economy dependence on the impact of negative external factors caused by variations of the world prices for raw material resources.

By the end of 2004, the total public debt is estimated to remain at rather acceptable level of 12.3% of GDP and within the next several years continues to be decreased by 1.5-2.0% of GDP annually. At the same time, macroeconomic

stabilization will go on, and in 2004 the price increase will comprise 6.4% and economy growth rate will be 8.8%.

The fact that in May 2004 the International Rating Agency "Standard & Poor's" awarded Kazakhstan the second rating of investment class is a confirmation of state financial position strengthening, improvement of management and business spheres and acceleration of structural reforms. In September 2002, the International Rating Agency "Moody's Investors Service" increased sovereign rating of Kazakhstan up to the investment level. Kazakhstan is the first state among CIS countries, which obtained investment rating from two international rating agencies.

Kazakhstan is situated in the centre of Eurasian continent and it has an area of more than 2.7mln. sq. km. It is among the ten richest countries in the world in natural resources.

Table 3

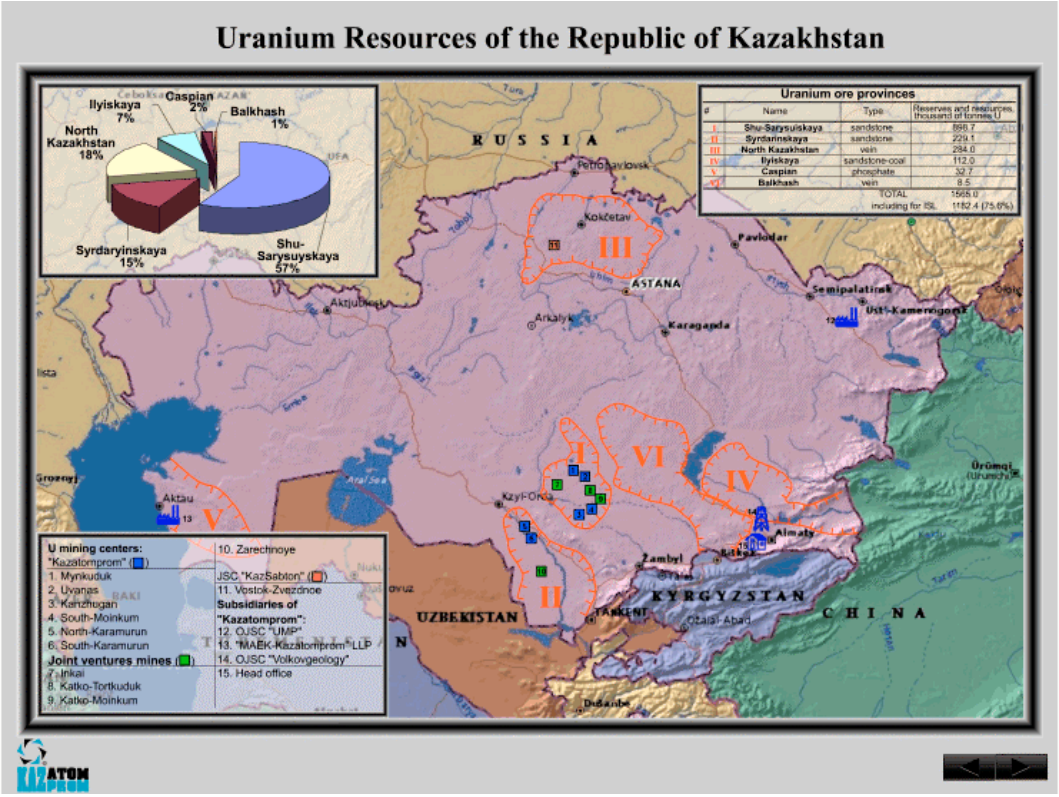
Major Mineral Resources of Kazakhstan

		Known reserves	World place
1	Chromium	350 mln tones	1
2	Lead	14.8 mln tones	1
3	Zink	34 mln tones	1
4	Uranium	900,000 tones	2
5	Copper	40 mln tones	4
6	Oil	2.7 bln tones	7
7	Iron	17 bln tones	7
8	Gold	1,900 tones	9
9	Natural Gas	1.830 bln m^3	15

Figure 2

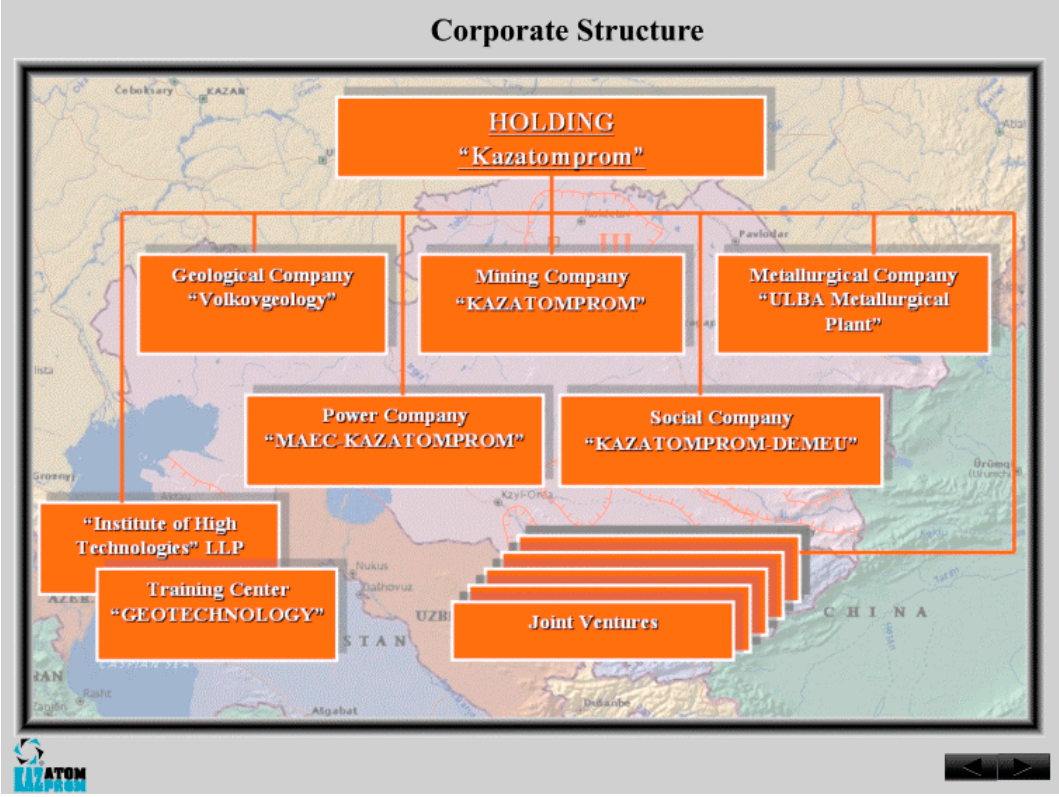
Approximately one fifth of the world uranium reserves is deposited in Kazakhstan. Total resources and reserves of uranium are over 1.5 million tones, over 1.1 million tones of which can be mined by the in-situ leaching method.

Figure 3



National Nuclear Company KAZATOMPROM mines uranium on the territory of the Republic of Kazakhstan. Company shares are owned by the Government of the Republic of Kazakhstan. Today Kazatomprom is a Holding Company with the following structure:

Figure 4



Kazatomprom's head-office performs a general management, determines the long-term strategy and policy, carries out marketing work and supervises the activities of joint ventures.

1. Geological Company "Volkovgeology" carries out a geological survey and drilling as well as a radiation monitoring.
2. Mining Company is engaged in natural uranium mining.
3. Metallurgical Company is presented with three large plants of OJSC "UMP" as follows:
   - **Uranium production:** production of natural uranium concentrates, dioxide powders and fuel pellets for VVER, RBMK and BWR reactors and other services of nuclear fuel cycle. The plant has unique capacities for hard uranium materials processing and it is certified for up to 20% enriched uranium.
   - **Beryllium production:** It is one of three plants in the world, which has a full cycle of processing, starting from ore concentrate to beryllium metal, alloys, master alloys and products therefrom.

- **Tantalum production:** Processing of tantalum-niobium raw materials according to the full technological cycle with production of wide range high quality products including capacitor powders.

4. Power Company "MAEC-Kazatomprom" supplies the "oil west" of Kazakhstan with electricity, heat and drinking water. There are three gas fuel power plants and the largest sea-water desalting plant in the world operating here. The company performs decommissioning of the first commercial fast breeder reactor in the world called BN-350 with the assistance of US Department of Energy.
5. Social Company –"Kazatomprom-Demeu" will develop a social infrastructure in the areas of Kazatomprom activities.
6. Research-and-Development Center "Institute of High Technologies" is engaged in research and development projects in the industry.
7. Joint ventures for production of natural uranium established with our respectable partners such as Cameco, COGEMA, TVEL and TENEX are also included in the structure of Kazatomprom.

More than 15 thousand employees work for the Company and its total annual turnover is more than $ 300 million.

At present natural uranium is mainly mined in two uranium ore provinces.

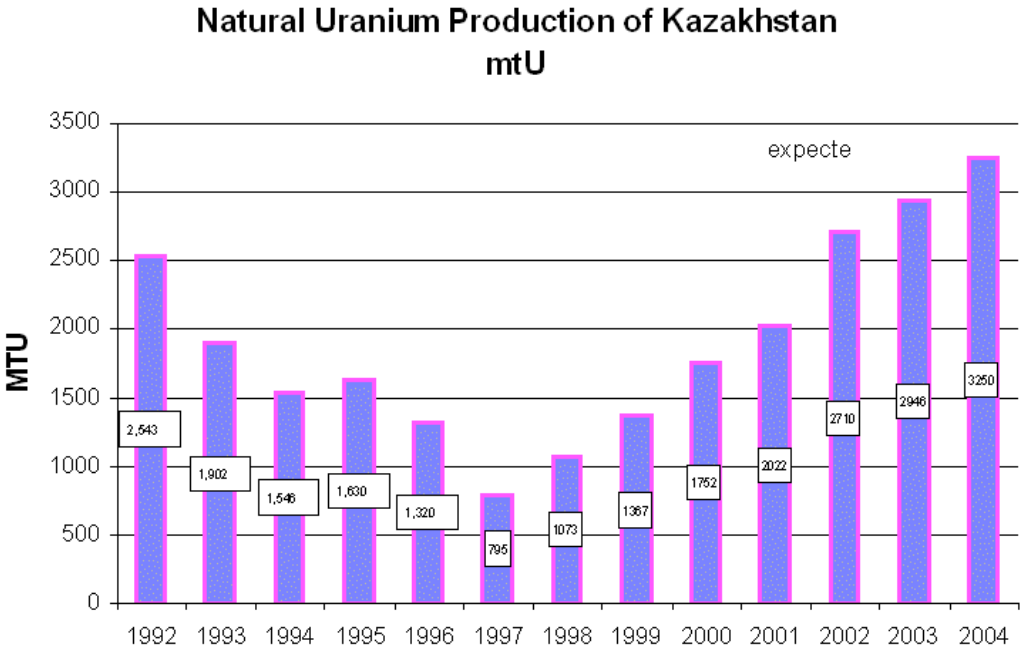
Figure 5

Shu-Sarysuiskaya uranium ore province with uranium reserves of RAR, EAR-I and EAR-II categories of about 900 thousand tones. The uranium production in the **Shu-Sarysuiskaya uranium ore province** is carried out in Uvanas, Eastern Mynkuduk, Kanzhugan, Southern Moinkum deposits by Kazatomprom, and at Inkai and Moinkum deposits – by our joint ventures with our Canadian and French partners correspondingly.

Syrdarinskaya uranium ore province with uranium reserves of RAR, EAR-I and EAR-II categories of about 230 thousand tones. In this uranium province Kazatomprom mines uranium in Northern and Southern Karamurun deposits and a joint venture with our Russian partner is starting its work at Zarechnoye deposit.

Dynamics of uranium production at our mines is as follows:

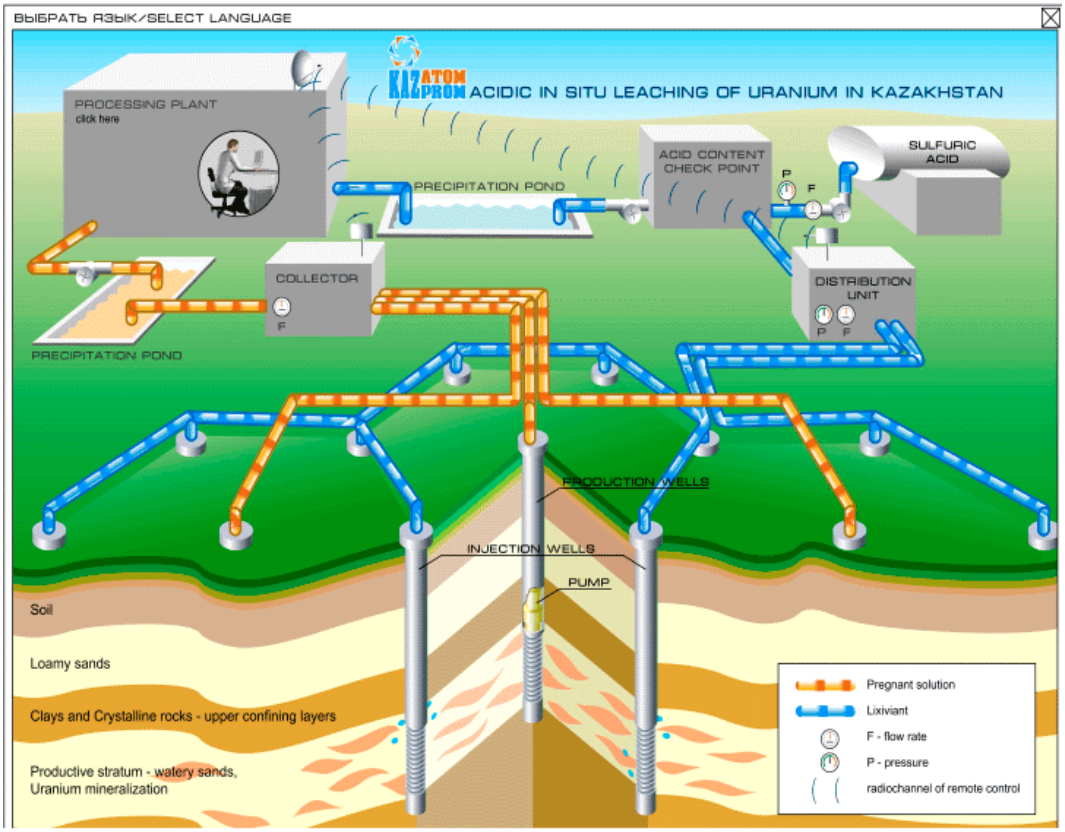
Figure 6



After the crisis in 1996-1997 we managed to stabilize the situation and to provide sustainable production growth. As you see we succeeded in increasing production volumes in spite of deep fall in prices, the minimum point of which was in 2000. We owe these achievements mostly to one of the most advanced mining technologies – to the In-Situ –Leaching method.

In-Situ Leaching is a method of ore deposits development without having to bring up the ore to the surface by selective transfer of natural uranium ions into the pregnant solution in place.

Figure 7



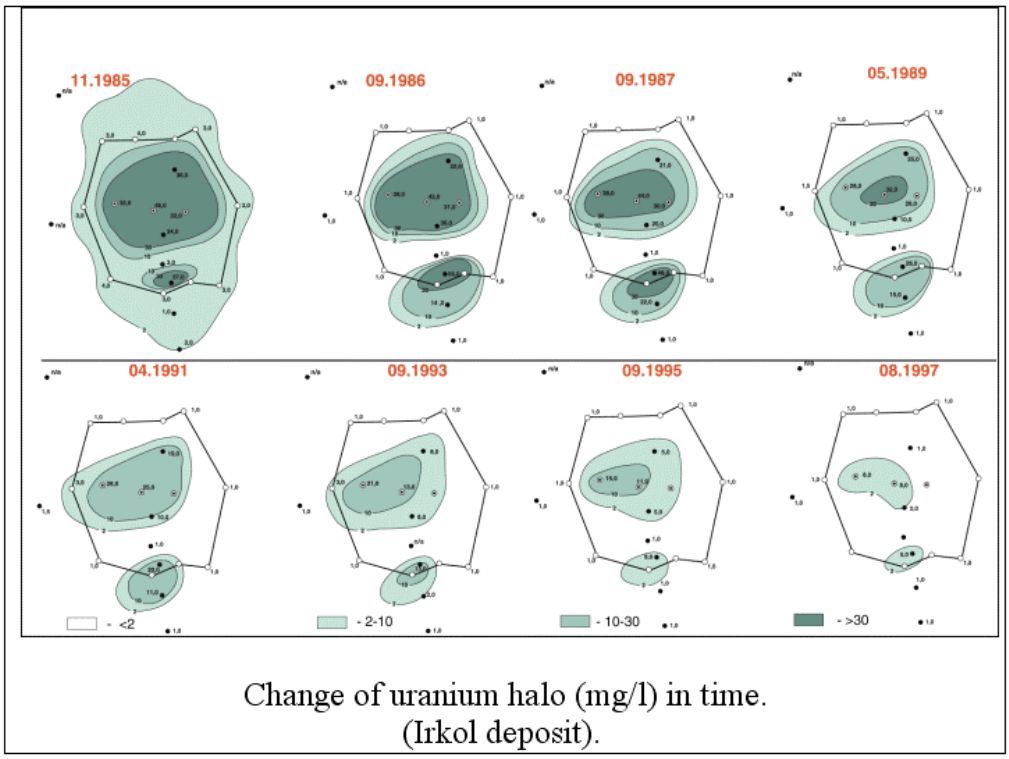
This method is implemented through drilling wells through the uranium ore bodies, injecting leaching solution into the ore bodies, bringing the uranium loaded solutions to the surface and extracting uranium in the sorption IX (Ion-Exchange) vessels, then adding acid to the barren solutions and their injection back in the ground.

In-Situ Leaching is the most attractive method of uranium production from the standpoint of operational simplicity. In-Situ Leaching does not affect geological conditions of the subsurface resources since the ore mass is not extracted. Total area of an ISL facility with processing plant for 500mtU3O8/year, is 3-4 times less than the area of a standard hydrometallurgical plant of the same capacity.

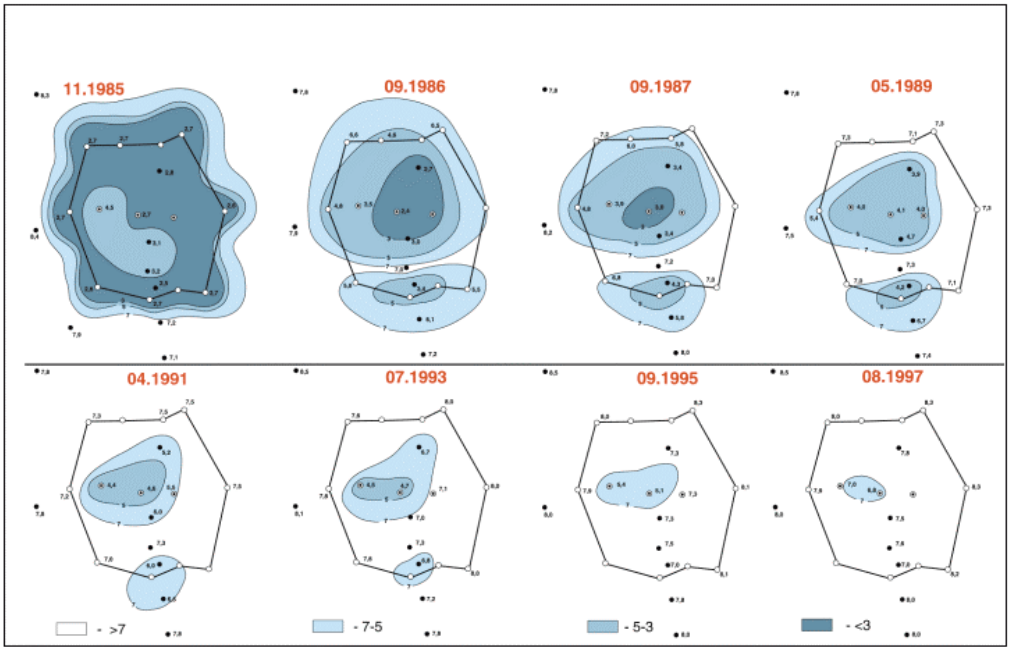
In the course of the In-Situ Leaching process, less than 5% of radioactive elements are mobilized and moved out to the surface, compared to 100% in the conventional uranium mining. Therefore, it is not necessary to build tailing ponds to store high level radiation waste. It has been unambiguously determined that natural hydrogeochemical environment in the South Kazakhstan uranium deposits has a unique capacity of self-restoration from the industrial impact. Due to the gradual restoration of natural oxidation-reduction conditions, groundwater of the ore-bearing aquifers are slowly but irreversibly restored to the pre-production state. We have also developed a method of substantial intensification of this process, which would accelerate the restoration ten times.

A result of 13-year monitoring at the Irkol deposit may serve as an example of natural demineralization of residual solutions.

Figure 8



Change of uranium halo (mg/l) in time.
(Irkol deposit).



Change of groundwater pH in time.
(Irkol deposit).

Thus, In-Situ Leaching method, which we use in the Southern Kazakhstan, literally is the most low-cost and environmentally safe mining technology among all known.

Reserves in-place and effective technologies are potentialities of Kazakhstan. Is it possible to realize them in order to reduce the natural uranium shortage in the

world market? Let me turn from our potentialities to our plans. Especially as before starting realization of our plans, we should get the appraisal of the world community in respect of their urgency.

The main point of the plan is rather simple –to increase production by another 7 thousand tones by 2010. For this purpose we plan to cut our best deposits, Mynkuduk and Budenovskoye, into several claims approximately with 30 thousand tones of uranium reserves in each. We than will plan to have a mine at each claim with the capacity of 1,000 tones, similar to the one, which we are already building at the eastern flank of Mynkuduk deposit. We also plan to set one more plant in the southern flank of Inkai deposit. You can see the scheme of sites location on the slide.

Figure 9

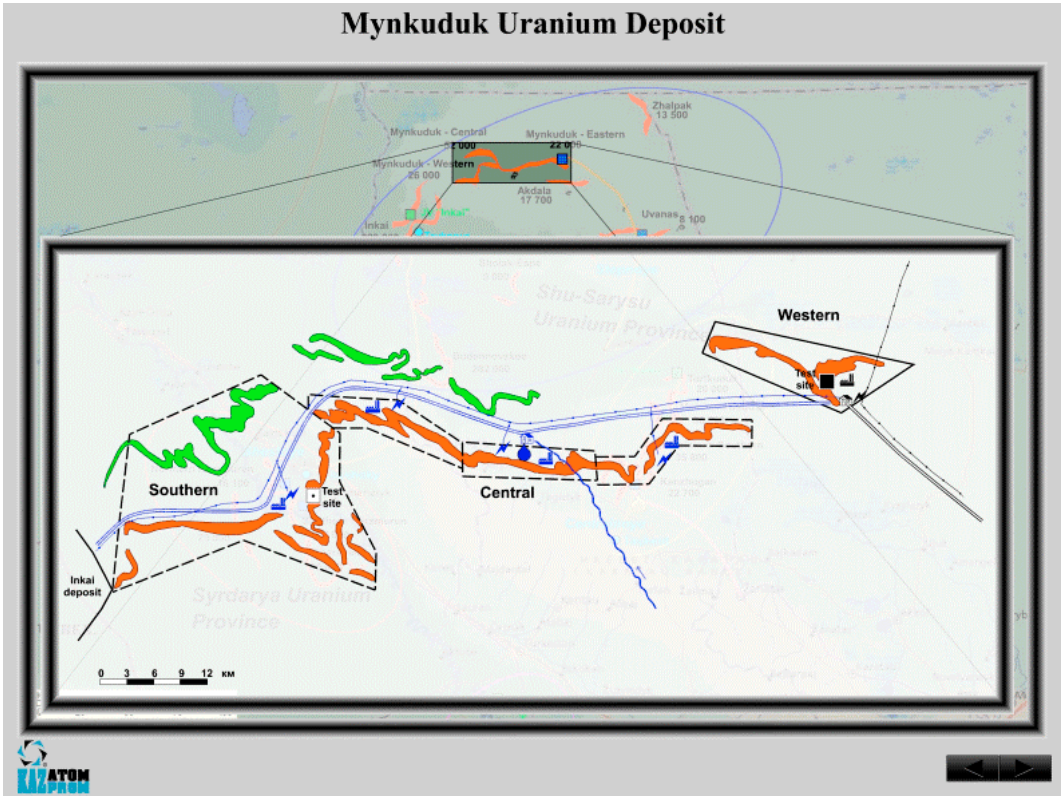


Figure 10

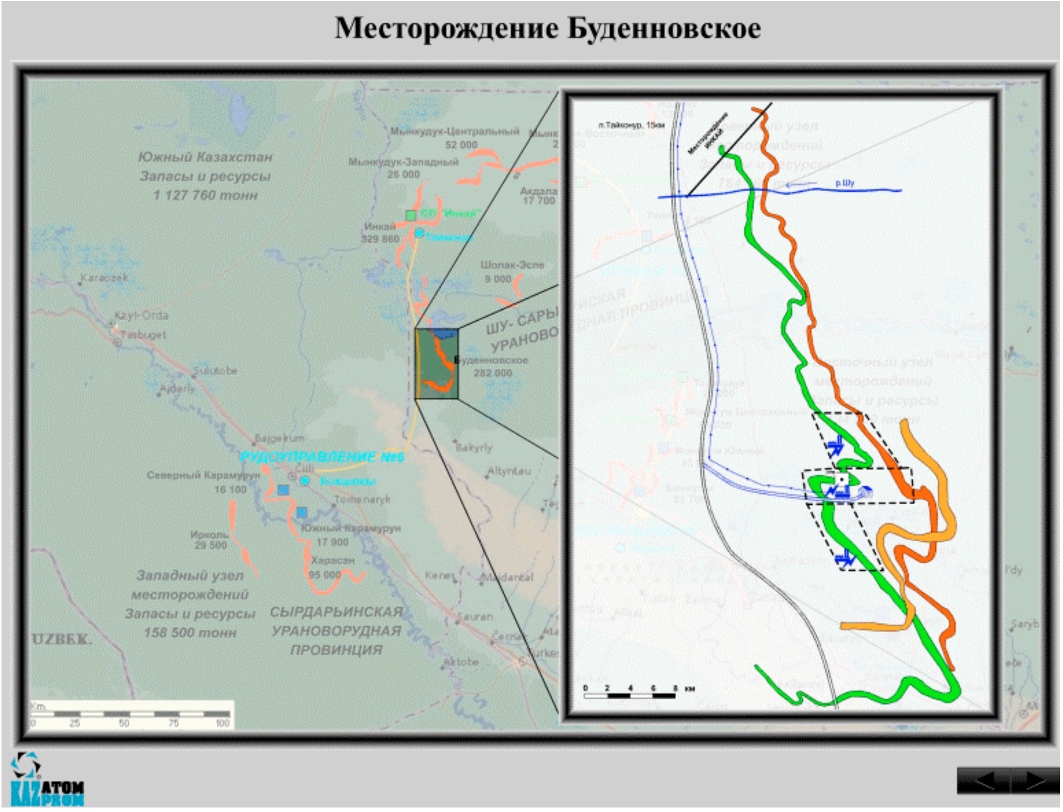
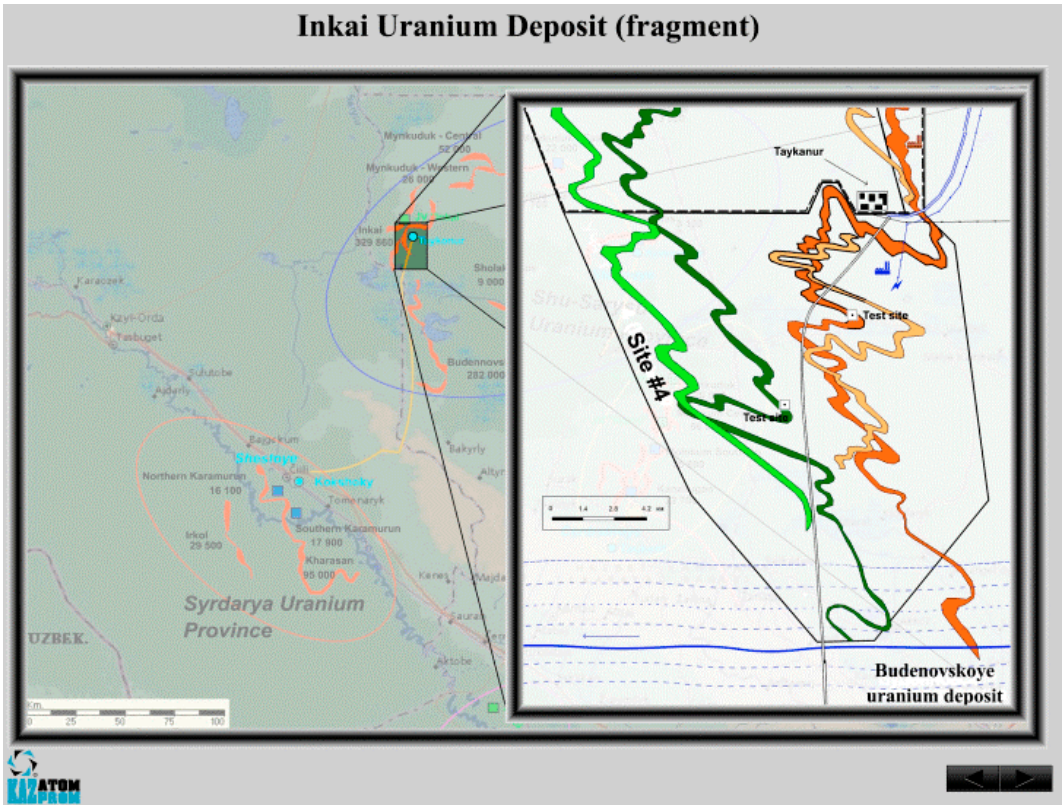

Месторождение Буденновское
Южный Казахстан
Запасы и ресурсы
1 127 760 тонн
Мынкудук-Центральный
52 000
Мынкудук-Западный
26 000
Акдала
17 700
Инкай
329 860
Шолак-Эспе
9 000
ШУ- САРЫ
УРАНОВО
Буденновское
282 000
Karaozek
Kzyl-Orda
Tasbuget
Suutobe
Aydarly
Bajgekum
РУДОУПРАВЛЕНИЕ №6
Северный Карамурун
16 100
Южный Карамурун
17 900
Ирколь
29 500
Харасан
95 000
Западный узел
месторождений
Запасы и ресурсы
158 500 тонн
СЫРДАРЬИНСКАЯ
УРАНОВОРУДНАЯ
ПРОВИНЦИЯ
UZBEK.
Km
0 25 50 75 100
п.Тайконур, 15км
р.Шу
0 2 4 6 8 км

Figure 11



Each of the above claims is an independent unit for investing. Geographical closeness of the properties makes it possible to adjust the number of employees, to maintain a general service centre and to divide the costs of infrastructure and logistics between investors. Development of all seven claims will reduce the investments to be made into construction of electric power lines, water lines and into construction of roads, refinery plants, etc.

Approximate costs for each mine on average will be USD 70 million. About USD 420 million will be required to put mines into operation and additional USD 70 million will be needed for infrastructure development – construction of roads, electric power lines, etc. The approximate pay-back period is 8 years.

Analysis of economy and our financial possibilities as well as risk assessment show that we should not start these programs with no guarantee of sale. Before starting works we should know whether our customers are interested in it.

We suggest our potential partners choosing the type of financing:

- Prepayment of about 1,000 tones of uranium is paid back by uranium within 6 years. The loan interest rate is repaid due to the uranium price discount.
- The actual participation of customers in the mine's development through establishment of the Joint Venture; purchase of the participating interest and opening of a credit line.

- Long-term contract for purchase of uranium. If there is a guaranteed volume and a lower price limit in such a contract, then the deposit development will be financed by banks.

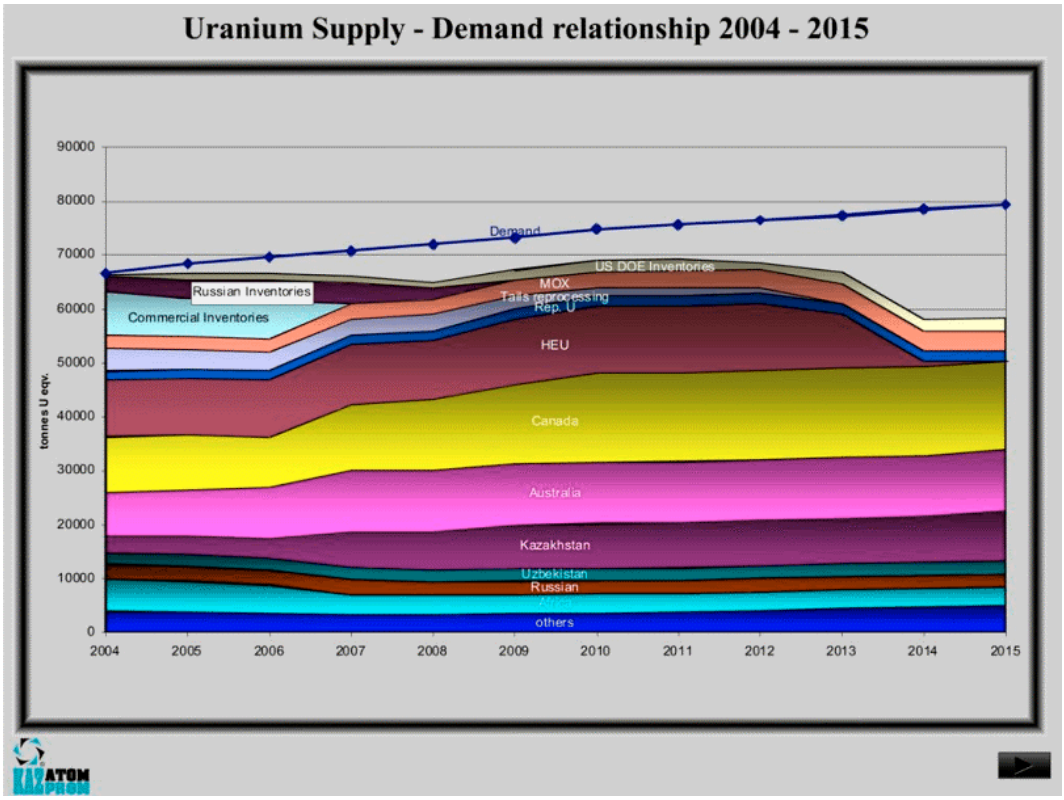
The question is quite logical: Why only 7 claims? You see that the potential of the developed deposits makes it possible to double and even to triple this figure. We closely analyzed our opportunities and can definitely say that for six years our opportunities of attracting human resources and purchasing materials as well as capacities of infrastructure does not let us expand any more.

I can also say that we are not limited in our financial resources. We plan to finance one claim from our own resources and the rest from our partners' funds and bank loans. Our partners are China, Russia, Korea as well as American and European companies. At the same time together with our partners we plan to develop a strategic partnership providing for joint development of nuclear fuel production at Ulba Metallurgical Plant.

Despite the fact that all mentioned claims have their owners I think that participation of other companies is also possible through establishment of pools with consent of our existing partners. While the potential production from the four mines already has their consumers, the uranium from the rest of the claims is still uncommitted. And as I repeatedly mentioned we do not have any confidence in the existing mechanism of spot pricing and I believe that we cannot start investing with no long-term contracts providing us with the estimated pay-back period.

On the last slide you can see how the uranium shortage will be reduced through our proposed program.

Figure 12



As you can see, by joint efforts we will be able to reduce the natural uranium shortage and I kindly ask you to consider this report not as a storm warning but a specific suggestion of joint development of the mentioned program. Its implementation, as you can see from this diagram, will enable to postpone the real uranium shortage until 2010-2012, so we will have some more time to stimulate uranium production at other deposits.

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