International Symposium on Uranium Raw Material for the Nuclear Fuel Cycle: Exploration, Mining, Production, Supply and Demand, Economics and Environmental Issues - IAEA CN-216

Contribution ID: **46** Type: **Oral**

Worldwide ISL uranium mining outlook

Wednesday, June 25, 2014 11:30 AM (30 minutes)

ISL uranium mining technology was developed independently in the USSR and USA in the early 1960s. The Soviets adopted the acid while the US alkaline leaching system. The major advantages of ISL over conventional mining are: little surface disturbance, no tailings or waste rock, economical mining of lower grade ores, minimal radiation exposure, lower capital and operational costs. The principal geological and technical criteria of ore hosting sediments which determine mineralisation amenability for ISL are: ground water static level above mineralisation, water abundance, hydraulic conductivity or permeability above 1m/day, carbonate content below 2% for acid ISL, water confining horizons above and below mineralisation, ore productivity above 1 kg/m2, easy leachable uranium mineralisation.

The worldwide ISL production has been steadily increasing during the last decade from 7,926t in 2005 to 26,304t in 2012 which is 45% of the world total. Kazakhstan has increased ISL production during this period from 3,603t to 20,900t U which is a 35% of the world total. Other six ISL producing countries produced 5404tU in 2012. Acid technology contributes 95% of the total. The main advantages of acid ISL are higher uranium recovery, lower leaching period and possibility of natural attenuation for aquifer restoration.

Most of ISL mines demonstrate low capital, operation and production costs. Nine from eleven operating uranium producing centers with production cost below 80/$kgUarerepresentedbyISLmines.TheapproximateCAPEXfora1,000tUcapacityI$

The major technical parameters which determine production cost are: uranium concentration in pregnant solution, acid consumption, wells flow rate, wellfield drilling and construction costs. The selection of wellfield development pattern configuration and wells spacing depends on the ore body geological setting and sediments permeability.

The main areas of ISL effectiveness increase and cost reduction are: uranium resources, hydrology and leaching systems 3D modeling, leaching intensification by adding specific oxidants, wellfield and pumping systems optimization, wells design.

The ISL production is expected to grow to the level of 37,000t in 2020 and after that will decline to 30,000t in 2030 due to resources depletion. Sandstone type ISL amenable uranium resources amount 26% of world total Identified resources and 24% of the most economically viable cost category <80/$kgU.Aggregateduraniumproductionduring2012-2030isestimatedat1,5MtUandwilldeplete40Themethodologyforrollfrontsandstonetypedepositrequiressystematicmultistage$

Primary author: Dr BOYTSOV, Alexander (Uranium One Inc.)

Presenter: Dr BOYTSOV, Alexander (Uranium One Inc.)

Session Classification: Uranium production based on in situ leaching

Track Classification: Uranium production based on in situ leaching (ISL)