The Uranium Industry

Worldwide Uranium Supply and Demand

The uranium market supply and demand fundamentals remained strong in 2008, indicating a need for more primary mine production over the coming decade. During the past 23 years, uranium consumption has exceeded mine production by a wide margin, with the difference being made up from various types of inventory and recycled products, often collectively referred to as secondary sources. Based on Cameco’s 10 year supply and demand outlook, cumulative uranium consumption requirements are expected to reach about 2.0 billion pounds. Total existing mine supply and secondary supplies are expected to meet approximately 80% of this demand. The remaining 20% (approximately 400 million pounds) must come from new supplies, which may include expansions of existing mines, and new mines starting production.

World Uranium Production and Consumption

(Sources: World Nuclear Association ^ and Cameco estimate *)

Uranium Demand

Overall, nuclear power trends support moderately growing demand for uranium and conversion services in the next 10 years, with the potential for more rapid growth thereafter.

Cameco estimates the world uranium consumption totalled about 172 million pounds in 2008, similar to 2007. In 2009, we expect world uranium demand to increase to about 181 million pounds. We estimate annual world uranium consumption will reach 226 million pounds in 2018, reflecting an annual growth rate of almost 3%.

Growth in demand could be tempered as uranium price increases encourage utilities to utilize more enrichment services and less uranium. Uranium demand is affected by the enrichment process, which is one of the steps in making most nuclear fuel. Utilities choose the amount of uranium and enrichment services they will use depending on the price of each. Utilities may to some extent substitute enrichment for uranium, thereby decreasing the demand for uranium and increasing the demand for enrichment. For example, when uranium prices rise, utilities tend to use more enrichment, assuming enrichment prices remain constant. If enrichment prices increase, utilities would likely use less enrichment and more uranium. The tails assay (percentage of U-235 left in the waste stream after processing) is an indication of the mix of uranium and enrichment used. At different prices for uranium, conversion and enrichment services there is a combination that minimizes the fuel cost, which is called the optimal tails assay. The lower the tails assay, the less uranium is being used.

At December 31, 2008, the uranium price had increased in excess of 250% since December 31, 2003. Over the same period, enrichment prices had increased by only 47%. Thus, utilities, where permitted, are choosing lower tails assay under their enrichment contracts, using less uranium and more enrichment services.
Based on current demand, a 0.01% decrease in tails assay would decrease uranium requirements by 2%, or about 3 million pounds of uranium per year, and increase the demand for enrichment services by 2%. It is important to note that there is a limit to the enrichment capacity that is currently available. In addition, enrichment contracts generally limit the ability to substitute enrichment for uranium. In the past, enrichers offered a wide range of tails assay, much like volume flexibilities on uranium contracts. Currently, enrichers are offering tails assays ranging from 0.25% to 0.30%, thus, over time, as old enrichment contracts expire, we expect that the average tails assay will move to this range.

**Uranium Supply**
World uranium supply comes from primary mine production and a number of secondary sources.

**Mine Production**
We estimate world mine production in 2008 was about 115 million pounds U₃O₈, up 7% from 107 million pounds in 2007. We expect world production to total in the range of 125 to 130 million pounds in 2009. However, production targets are not always easily achievable.

We expect that, with higher uranium prices, new mines will continue to start up, but the lead time before they enter commercial production may be lengthy, often up to 10 years, depending on the region. As a result, primary supply will be less than world consumption in the near-term. The level of increase in primary mine production is dependent on a number of factors, including:
- the strength of uranium prices,
- the efficiency of regulatory regimes in various regions,
- the quality and size of the mineral reserves,
- the availability and sufficiency of required infrastructure and skilled workforce,
- currency exchange rates in producer countries compared to the US dollar,
- prices for other mineral commodities produced in association with uranium (i.e. byproducts or co-products), and
- the availability of financing for exploration and mine development.

**2008 World Uranium Production by Country**
(Cameco estimate)

- **Canada** 21%
- **Australia** 19%
- **Kazakhstan** 19%
- **Namibia** 10%
- **Russia** 8%
- **Niger** 7%
- **Uzbekistan** 5%
- **US** 4%
- **Other** 7%
Secondary Sources

Secondary sources of supply consist of surplus US, Russian and other military materials, excess commercial inventory and recycled products. Recycled products include reprocessed uranium, mixed oxide fuel and re-enriched tails material. Some utilities use reprocessed uranium and mixed oxide fuel recovered from used reactor fuel. In recent years, another source of supply has been re-enriched depleted uranium tails generated using excess enrichment capacity. We estimate these recycled products will account for about 5% of world requirements over the next 10 years. With the exception of recycled products, secondary supplies are finite. Currently, most recycled products are a high-cost fuel alternative and are used by utilities in only a few countries.

One of the largest sources of secondary supply is the uranium derived from Russian highly enriched uranium (HEU). As a result of the 1993 HEU agreement between the US and Russia to reduce the number of nuclear weapons, additional supplies of uranium have been available to the market. Under the 20-year agreement, weapons-grade HEU is blended down in Russia to low enriched uranium capable of being used in western world nuclear power plants. We estimate that uranium derived from Russian HEU could meet about 6% of world consumption over the next 10 years based upon deliveries under the current Russian HEU commercial agreement. All deliveries are scheduled to be made by 2013, when the 1993 HEU agreement expires. In parallel, the US has made some of its military inventories available to the market, although in quantities much smaller than those derived from the 1993 HEU agreement. We expect about 3% of world demand through 2018 will be met from this source.

With respect to non-military excess inventories, we believe most of these have been consumed. In recent years, some utilities have been purchasing uranium to rebuild strategic inventories. Over the next 10 years, with new mines under development such as Cigar Lake and Inkai, this shortfall between consumption and production is expected to narrow slowly. The production response is expected to remain challenged, while demand is expected to continue growing due to better reactor operations, reactor uprates, life extensions and the construction of new units. There are a number of potential new mines and planned mine expansions that are expected to help meet this shortfall, but the timing and production rates are uncertain.

Uranium production in 2008 met about 67% of global uranium requirements. Secondary supplies (such as recycling and blended down HEU) continue to bridge the gap and this is expected to continue in the near future.

Uranium Markets

Utilities secure a substantial percentage of their uranium requirements by entering into long-term contracts with uranium suppliers. These contracts usually provide for deliveries to begin two to four years after contracts are finalized. In awarding contracts, utilities consider the commercial terms offered, including price, and the producer’s record of performance and uranium mineral reserves.

There are a number of pricing formulas, including fixed prices adjusted by inflation indices and market referenced prices (spot and/or long-term indicators). Many contracts also contain floor prices, ceiling prices and other negotiated provisions that affect the amount ultimately paid.

Utilities acquire the remainder of their uranium requirements through spot purchases from producers and traders. Spot market purchases are those that call for delivery within one year. Traders and investors or investment funds are active in the market and generally source their uranium from organizations holding excess inventory, including utilities, producers and governments.

Uranium Spot Market

The industry average spot price (TradeTech and Ux Consulting (UxC)) on December 31, 2008, was $52.50 (US) per pound U₃O₈, a 41% decrease from the December 31, 2007, price of $89.50 (US). Spot market volume in 2008 more than doubled to about 43 million pounds U₃O₈ from 20 million pounds U₃O₈ in 2007. The 2008 volume exceeded the previous high of 42 million pounds recorded in 1995. Historically, the volumes traded in the spot market have ranged from about 10% to 15% of annual consumption.

The main spot sellers in 2008 were traders and financial players. The financial players liquidated volumes late in the year as a result of the world financial turmoil. As a result of the lower spot price in 2008 relative to 2007, utilities returned to the spot market and represented slightly less than half of all spot purchases. Since the utilities’ average inventory levels have increased over the last several years and financial restraint is likely, we expect more price volatility in 2009.
Spot and Long-term Uranium Contract Volumes
(Sources: Ux and Cameco)

Long-Term Uranium Market
The industry average long-term price (TradeTech and UxC) on December 31, 2008, was $70.00 (US) per pound U₃O₈, down 26% from $95.00 (US) at December 31, 2007.

We estimate long-term contracting in 2008 to have been about 130 million pounds U₃O₈, approximately half the volumes contracted in 2007, but still above the annual average levels prior to 2005.

The increased volatility in the spot market, the large differential between spot and term market prices, as well as the fact that most utilities are well covered for the next several years contributed to the lower contracting level when compared to 2007. We estimate the 2009 long-term contracting volume will be comparable or lower than the 2008 level, but this is highly dependent upon supply developments, market expectations and market prices.

The Fuel Services Industry
Our activities in the fuel services industry include participation in uranium refining, conversion and fuel manufacturing.

The industry practice for measuring conversion services is kilograms of uranium (kgU) rather than pounds of U₃O₈. For example, 66 million kgU is equivalent to about 172 million pounds of U₃O₈.

The following sections discuss the conversion services market only, as information on the other segments of the fuel services industry is not publicly available.

Conversion Services Demand
World demand for UF₆ and natural UO₂ conversion services was estimated to be about 66 million kgU in 2008. Western world demand accounted for about 58 million kgU, with the remaining 8 million kgU coming from the non-western world (Russia, China and eastern Europe).