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Fuelling an Expanding Nuclear Future

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Foreword

In this paper, a number of important issues will be presented that demonstrate the need to develop new sources of uranium production if we are to meet future demand as secondary sources of supply are depleted. Main points advanced include:

- We are dependent on finite, secondary uranium sources in the short term to meet demand.
- The severity of market price fluctuations for uranium will be determined by the pace at which we move to discover new sources of primary uranium production to supplant the secondary supplies.
- It is in the long-term best interest of the market to reach a balance in which the price of uranium reflects the cost of production of the next pound of uranium.
- Saskatchewan will remain a long-term stable supplier of uranium to the market.
- The Government of Saskatchewan is working to maintain and improve a competitive investment climate for uranium exploration. Our large, high-grade deposits together with a competitive investment environment mean that the Province offers an attractive destination for development of new uranium deposits.

The Uranium Market: Past, Present and Future

The following are some quotes from past editions of the Canadian Minerals Yearbook with respect to uranium:

- 1) “Uranium continued to be in oversupply in world markets...and events did little to encourage Canadian producers for the short-term. Indeed one producer ceased operations altogether...”¹

- 2) “World markets softened further...as continued overproduction and intense competition continued to force uranium prices to an all time low...In response to the gloomy short-term outlook, world uranium exploration declined almost everywhere...”²
- 3) “The uranium industry marked time...although some developments occurred in the marketplace which will tend to ease the oversupply situation during the next few years...”³
- 4) “...there were signs of revival in the uranium industry. The world uranium market grew active with several contracts being announced, and consumers appeared to be taking more interest in where their next pound of uranium was coming from...exploration activity remained at a low level.”⁴
- 5) “Uranium was in short supply...for the first time in almost twenty years and prices increased sharply from their recent low levels. As surplus inventories became exhausted production capacities became fully committed, producers firmed up plans for expansions and several new developments materialized...”⁵
- 6) “Evidence of expanding markets, improved prices and the short supply of uranium became abundantly clear...providing much-needed impetus for widespread activity in all phases of uranium operations.”⁶
- 7) “The tight supply situation remained which, with the considerably higher prevailing prices, gave impetus for companies to search for uranium...The shortage of skilled miners continued to plague the industry...”⁷

Although one might think these quotes are from recent editions, they were, in fact, a sequential series taken between 1970 and 1976 as the markets approached the period of extremely high uranium prices that occurred shortly thereafter. Broadly, this suggests that the uranium market may now be facing a supply squeeze similar to that which occurred about 30 years ago when prices spiked for a sustained period.

How extensive the impending problem may be, and the ultimate level at which uranium prices peak, will very much depend on how we act over the next few years. It may already be too late to avoid some of the impacts of shortages of U₃O₈ supply, but we can still do much to offset how extreme the shortages ultimately become.

It has been said that those who ignore the lessons of history are condemned to repeat it⁸. We have seen what has happened in the markets in the past. Up to now I believe we have been ignoring the fact that current sources of supply of uranium are not sustainable in the long-term. There is a reason for this short-term supply situation in the markets. It stems from three key factors:

- 1) changes to inventory practices by electrical utilities, as a result of deregulation and increased competitiveness in the market;

- 2) uranium produced as a by-product from other mineral production or secondary sources that remained in inventory for many years in the form of weapons-grade material are not sensitive to the market price of uranium; and
- 3) once a uranium mine is in operation there is much more latitude in terms of selling price and true cost of production.

Mike Connor of Nuclear Resources International (NRI), in a recent Paper⁹, contends there is a coming crisis in the supply of U₃O₈ to the market. While he suggests that the current “perfect storm” relates to current issues around the supply of conversion services and UF₆, he also notes the more fundamental and long-term issues around U₃O₈ supply. However, I would also argue that the disruption of production associated with the water inflow at McArthur River contributed to that “perfect storm” that triggered the current run up in prices.

We have not yet reached a crisis in the market and one should not see only doom and gloom with respect to uranium supply. There are positive signs that the market is beginning to adjust to the need for new production. There are new developments in Kazakhstan, along with new and expanded production in Australia. In Saskatchewan, the move by uranium producers to bring the Cigar Lake deposit into production is certainly positive.

But this is not enough. Even if all the deposits that are close to production are brought on stream, we still will not supplant our reliance on secondary supplies.

Bridging the Gap

We are absolutely dependent on secondary sources of uranium in the short-term. These supplies should be sufficient for the short-term, but they only provide a grace period that we can utilize constructively or ignore at our peril.

Secondary supplies of uranium are subject to their own uncertainties. The changing relationship between TENEX and Global Nuclear Supply Services (GNSS) has raised questions on the security of supply of down-blended highly enriched uranium (HEU). While the uncertainty between TENEX and GNSS was somewhat reduced by recent statements, there are clear indications that secondary supplies associated with down-blended HEU may not be as plentiful as initially believed. Recent negotiations between TENEX and Cameco, Areva and RWE Nukem resulted in amendments to the UF₆ Feed Component Implementing Contract, reducing the amount of uranium feed available to these companies.

It appears that a fundamental shift in perspective is beginning to occur in the marketplace – the realization that any secondary source of uranium is finite and we must look ahead to primary production to meet future demand.

New uranium mines are not easily or rapidly brought into production. First, a potential deposit must be located through an exploration process that can last for many years. When we hear the announcement that a new deposit has been found, it may be the result of seven to ten years of investment in mineral exploration

activity. Some of Saskatchewan's mines are the outcome of exploration programs that date back decades.

What we do not hear is all the exploration projects companies undertake that do not come to fruition. Exploration is a high-risk business. Only about one in one thousand projects progress to advanced exploration and development, and the nine hundred and ninety nine do not make it into the news.

Following discovery of a deposit that may be feasible to develop, a further period prior to production is required for development. Development timing is dependent on the nature of the mining operation, the regulatory requirements of the jurisdiction in which the deposit is located and, of course, the market price for uranium that controls the fundamental economic feasibility of development.

Development periods vary substantially, from a few years to decades. The Cigar Lake deposit, discovered in 1981, is now forecast to commence production in 2007 – a quarter-century later. To receive an appropriate return on investment in exploration and development in such a case is very difficult.

Even with a deposit that moves reasonably rapidly from discovery to development, the investment involved – often in excess of half a billion dollars – for a conventional mine and mill complex requires sustained high prices to provide a company with an adequate return on capital. Given the high level of risk in the mining industry, companies are looking for a significant return on their investment in order to make their company attractive to investors. Generally, the hurdle rate for a deposit to move forward to development is a rate of return in the range of 15%. Companies that do not find deposits that generate this level of profit are soon abandoned by their investors, like any business that does not meet investor expectations.

An interesting picture emerges from an examination of world primary uranium production and demand over the past ten years. Uranium demand increased by approximately 7000 tU¹⁰. This was more than three times the rate of increase of primary production of uranium over the same period. By failing to match increases in new production with increases in demand, we have increased our dependency on secondary supplies.

While reasonably assured uranium resources in the world have increased by approximately 13% between 1991 and 2001¹¹, this includes all resources that would be economically feasible to mine at prices up to US\$80/kgU. There are substantial uranium resources awaiting development, but we are also a long way from US\$80 prices in the market. Measuring those reasonably assured resources on the basis of current prices, would reduce those estimates.

It is also interesting to examine the sources of production increases in recent years. Taking an arbitrary five-year period from 1999 to 2003, and the five largest uranium producers in 2003 (Canada, Australia, Kazakhstan, Niger, and Russia – in order), one can see that production in these countries increased by 7168 tU¹². However, world production in this same period only increased by

4772 tU¹³. Therefore, one-third of the production increase of the major producers is simply offsetting production decreases elsewhere in the world.

These figures also point out a secondary impact of the recent period of low prices. Production is now being concentrated in the jurisdictions with the lower-cost operations that can survive extended periods of low prices. If past production history is any measure of future potential, exploration spending in these jurisdictions should be a measure of how seriously the market views the possibility of looming production shortfalls.

Saskatchewan: The World's Largest Producer

Why would Saskatchewan, a uranium-producing jurisdiction, be concerned with the potential for uranium supply shortfalls and associated possible rapid price increases or a price spike in the market? Uranium production does generate revenue for the Province of Saskatchewan, and as a general rule higher prices mean more revenue.

In fact, large price swings are beneficial for neither the nuclear industry nor the Province. At very low prices, marginal mines are shut down, there is little or no investment in exploration and mine capital, and there is a corresponding downturn in the economic spin-offs associated with this activity. Very high prices result in a rush to develop primary resources. They reduce the competitive advantage associated with new reactor development, they result in labour force shortages, and often result in new production overshooting demand – triggering a subsequent price collapse. The inelasticity of both production and demand can lead to a market out of sync between these two fundamental price drivers.

As the largest uranium producer in the world, Saskatchewan knows from direct experience that market downturns can come with very high social costs for the Province. A case in point is Uranium City in northern Saskatchewan. During the peak of the uranium demand of the 1950's, Uranium City was one of the largest cities in Saskatchewan. The subsequent drop in demand and closure of the mines in the vicinity meant a collapse in economic activity in the area, loss of value of families' investments in housing, and other associated social disruptions.

Saskatchewan's goal is price stability, which avoids the social and economic costs that come with boom and bust resource development. Given Saskatchewan's position in the market as one of the lower-cost producers, it is also in the Province's interest to see world markets achieve a balance at which the price of uranium reflects the incremental cost of production of that next pound of uranium.

Investment in new Saskatchewan production in recent years is arguably the largest capital investment in uranium production in any jurisdiction in the world. This can be attributed to the nature of our large, high-grade resources, a stable regulatory regime, a positive investment climate, high levels of public support for the uranium industry, good infrastructure, and a well-educated and dedicated workforce.

However, it should be noted that comparing production capacity before and after this investment, actual capacity increased by less than 16%. While a number of

new, world-class operations were brought on-stream in the 1995 to 2000 period, these were largely replacements for existing mines nearing the end of their recoverable resources.

We will not see a significant capacity increase until Cigar Lake begins production and a planned expansion to the McArthur River mine is approved. These represent the most significant production increases forecast to occur in Saskatchewan, but even a portion of the Cigar Lake capacity will simply offset reduced production at Rabbit Lake.

Midwest, the other well-known deposit awaiting development, will largely be a life-extension for the McClean Lake operation rather than a capacity increase. Based on the capacity of the previous generation of mines, the capacity increase associated with the new generation of mines will be in the range of 16 million pounds annually, a 33% increase. Thus, while Saskatchewan is securing its future as a stable long-term supplier to the world, it is experiencing only moderate growth in its supply capabilities.

It is, however, instructive to quickly review where some of this growth will occur.

Saskatchewan uranium deposits are generally one or two orders of magnitude richer than deposits found elsewhere in the world. As a result, Saskatchewan uranium production is among the lowest-cost in the world. Saskatchewan continues to attract investment in uranium exploration and we have seen a number of new developments in the past few years.

At McClean Lake, the Sue E deposit, recently discovered and currently in the environment assessment review process, will complement the A and B deposits awaiting development as early as 2006. These three deposits, which are accessible by open pit mining, represent 10.9 million pounds U_3O_8 and have an estimated average grade of 0.9% U_3O_8 . It is estimated that the A, B, and E deposits will extend the operating life of the McLean Lake mine by approximately three years. As well, in conjunction with the development of the Cigar Lake deposit, the mill at McClean Lake will receive an estimated \$58 million upgrade and the annual capacity of the operation will be increased to 10.8 million pounds U_3O_8 as it processes production from the Cigar Lake mine. Additional exploration associated with the McClean Lake operation is underway at the Caribou Lake project.

At McArthur River, the Province was pleased to see the skill and success of the measures implemented by Cameco to control the water inflow problem last year. Despite this setback, Cameco was able to resume production ahead of schedule and McArthur River is on schedule to operate at full capacity this year. As well, the Province recently issued approval for a production capacity increase for McArthur River to 21 million pounds U_3O_8 annually. Cameco and its partner, AREVA, are currently awaiting regulatory approval from the Federal Government for the expansion. Of Saskatchewan's remaining known uranium reserves of approximately 757 million pounds U_3O_8 , more than half are contained in the McArthur River deposit, with remaining reserves of 437 million pounds U_3O_8 at an average grade of 24.7% U_3O_8 . As the Key Lake mill requires a feed of 4%

U₃O₈, this is one of the few mines in the world that actually dilutes its ore for processing. At current rates of production, McArthur River has a remaining life of approximately 24 years.

The Cigar Lake mine which, next to McArthur River, will be the world's second largest high grade mine, will soon enter its final construction phase. Cameco, AREVA and their Japanese electrical utility partners hope to see the first production in early 2007.

At the Eagle Point Mine at Rabbit Lake, Cameco reports identifying additional uranium resources. In addition to processing Cigar Lake ore, the Rabbit Lake mill will continue to process this additional ore.

The Midwest deposit, operated by AREVA, will extend the life of the McClean Lake operation rather than add to the Province's production capacity. At present, alternate mining methods for this small but rich deposit are being investigated. The final development plan will determine whether the project will undergo an environmental assessment prior to commencing production.

Other exploration programs are in less advanced stages. Some examples are:

- AREVA reported hitting intersections of up to 40% U₃O₈ in its Maybell River exploration project where the Athabasca Basin extends across the border into Alberta.
- JNR Resources acquired 25 000 hectares along the northern margin of the Athabasca Basin for uranium exploration. They have also reported hitting higher-grade uranium intersections varying from 1% to 7% U₃O₈ in their drilling program at the Moore Lake property, a joint venture with International Uranium.
- It is reported that UEX, a uranium exploration company held by Pioneer Metals and Cameco, recently raised \$11 million on the markets for uranium exploration activities.
- Denison Mines raised \$10 million for exploration in May 2004.
- As of June 2004, there were 3918 exploration dispositions covering 2.6 million hectares in Saskatchewan. Of those, there are 37 companies actively exploring for uranium with 812 dispositions covering 1.4 million hectares in the Athabasca Basin.
- The Department of Industry and Resources is aware of other companies, not traditionally associated with exploration in the Athabasca Basin, that are expressing an interest in Saskatchewan.

Another interesting development in exploration involves an innovative project developed in cooperation between the uranium mining industry, the Federal and Provincial Governments and the universities in Saskatchewan. This program, called EXTECH IV, involved applying seismic mapping technology used in oil

and gas exploration to uranium exploration. Using the known McArthur River deposit, research was undertaken to determine if the reflection pattern of induced shock waves could be used to determine the location of unconformity-type uranium deposits. Final analysis of the results of this research is presently underway and we hope that new exploration opportunities will result.

Saskatchewan's Climate for Growth

Regulatory Regime

Saskatchewan is and intends to remain a long-term sustainable supplier of uranium to the world. However, we are fully aware that the future for uranium production in our Province will largely be influenced by issues that impact the long-term sustainability of the industry, and over which we have little or no control. We will continue to address those matters we can influence, which means continuing to work towards providing a positive climate for investment and economic growth.

The Government of Saskatchewan's current policy on uranium mine developments was released in 1993. It states: "Accordingly, if additional proposed uranium mine developments receive approval under The Environmental Assessment Act, the Government of Saskatchewan will support their responsible development provided they meet the Province's stringent environmental protection and worker health and safety requirements, and provide the Province generally, and northerners specifically, with the maximum economic benefits possible."¹⁴

The uranium mining industry in Saskatchewan operates at very high standards. It has met, and exceeded, the regulatory requirements for the environment, as well as for worker health and safety, and operates with the goal of continuous improvement in these areas. Industry has developed innovative programs to increase access for local residents to high-paying jobs at the mines, and has helped feed the growth of new businesses in northern Saskatchewan that supply goods and services to the mines. Between 1980 and 2003, the uranium mining industry has invested more than C\$3300 million in capital, exploration and pre-development in Saskatchewan¹⁵.

Saskatchewan's uranium companies have been models of good corporate citizens. Indeed, many other jurisdictions in Canada, and internationally, have used Saskatchewan-developed programs as a model for their own resource development. These activities go a long way towards building public acceptance for uranium mining and building an industry with long-term sustainability.

Indeed, the Head of the Uranium Production Cycle and the Environment Unit of the International Atomic Energy Agency noted that Saskatchewan uranium mines are "a showcase for best practices" and that the industry has much to teach the rest of the world about health and workplace safety and environmental practices.

The Province of Saskatchewan is working to reduce any overlap and duplication of regulatory activity between levels of government. This is done on an ongoing basis. We are sensitive to industry's need for a regulatory process that is efficient

and stable. The uranium mining industry has never questioned regulatory standards that provide protection from a reasonable level of risk and that are based in science.

Taxation

Saskatchewan has also introduced a number of mineral exploration incentives in recent years to promote exploration for uranium and other minerals. These include:

- A remission of provincial sales tax on exploration equipment;
- A remission of fuel tax for fuel used in off-road mineral exploration activities and for power generation in remote locations;
- A tax credit applied to provincial income tax associated with flow-through shares issued by exploration companies;
- A mineral exploration incentive program that refunds a portion of eligible exploration expenses of prospectors and corporations; and
- Increased funding of geo-scientific research in the Province.

More general positive features of Saskatchewan's tax regime should also be noted:

- The lowest Provincial Sales Tax rate of the nine Provinces that have one;
- The highest exemption level on Corporation Capital Tax (CCT) of the nine provinces that charge CCT;
- Some of the lowest effective tax rates in the country on manufacturing and processing;
- A 50% reduction in the Corporation Income Tax rate for small business since 1991;
- The third lowest top marginal personal income tax rate in Canada;
- The only universal child tax credit in Canada; and,
- No High Income Surtax, Health Premium, or Payroll Tax.

We recognize that competitive taxation is a key ingredient in building a climate for growth. Saskatchewan has worked very hard to maintain a competitive business and personal tax regime.

The 2004 KPMG survey of business climates in Canadian cities and cities around the world showed Saskatchewan cities fared very well. Saskatoon ranked third out of cities of comparable size, and Regina fifth. Prince Albert – a key jumping

off point for the uranium industry in our province – ranked first out of all cities surveyed in the Canadian Prairies and the American Midwest.

A 2003 report from the Chartered Accountants of Saskatchewan concluded: “Saskatchewan has registered major improvement in its investment climate over the past decade.” We are building a climate for growth that we hope investors around the world will take note of.

Conclusion

New participants in the world manufacturing economy continue to emerge. The desire of nations to improve their economic output and standard of living for their residents continues unabated. The world’s appetite for energy, therefore, continues to increase rapidly.

We also are becoming increasingly aware that a major global energy source - fossil fuels - may have a significant impact on our climate and health. The demand for uranium can, therefore, be expected to increase as nuclear power continues to make an important contribution to the world’s future energy mix. Nuclear power’s ultimate role will depend on a number of factors including public acceptance, perceptions around waste disposal issues, and the availability of uranium to power the reactors.

It is in the interest of all stages of the industry that expansion is not limited by fuel shortages. Now is the time to work together to ensure uranium production will meet future demand.

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