Issues in Developing a New Uranium Mine in Canada – Paper # 10579

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ABSTRACT

Uranium has been recovered from mineral resources around the world for more than 70 years. During this time, the uranium mining industry has experienced several boom and bust cycles. In particular, the widespread concerns over the safety of nuclear power following the Three Mile Island incident in the United States and the Chernobyl accident in the Ukraine greatly dampened the interest in nuclear power and the demand for uranium. The resurgence of interest in nuclear power as reflected in the current plans for new nuclear reactors has spurred demand for additional uranium supply. This demand has resulted in extensive exploration for new uranium deposits and proposals to develop previously identified ones. In turn, this has resulted in a major increase in public opposition to uranium resource development, often manifested by incorrect or misleading information provided to local groups by highly motivated national and international NGO's warning of the dangers of mining and resource development. Energetic anti-uranium mining groups have arisen around the world but are particularly noticeable in Canada, United States and Australia –countries with significant uranium resources. This paper discusses challenges associated with uranium mine development in the Canadian context with a focus on the concerns of local communities.

1. INTRODUCTION

Uranium has been recovered from mineral resources around the world for over 70 years. While the initial interest centred on the production of radium from uranium mineral concentrate (in the 1930's), military requirements resulted in the first "boom" in the uranium mining industry beginning in the early 50's. Uranium was produced in many countries but the United States, Canada and the former Soviet Bloc countries produced the largest amounts.

The 50's boom was followed by a "bust" in the late 60's when military requirements diminished. Another boom and bust cycle in the 70's and 80's was driven by the demand for fuel for nuclear power plants (NPP) and the subsequent cooling off of the rate of construction of NPP's world wide. The widespread concerns over the safety of nuclear power following the Three Mile Island incident in the United States and the Chernobyl accident in the Ukraine greatly dampened the interest in nuclear power. The demand for and the price of uranium dropped to historical lows and exploration for new resources dried up. Only those mines and in-situ recovery (ISr) facilities with permits in place, good resources and low costs survived.

The current resurgence of interest in nuclear power as indicated by the current interest in refurbishing and re-licencing of existing reactors and in the building of new nuclear reactors in Canada and world-wide, has spurred demand for additional uranium supply. This demand has resulted in extensive exploration for new uranium deposits and proposals to develop those previously identified.

Historical production of uranium in the western world is shown in Figure. 1.

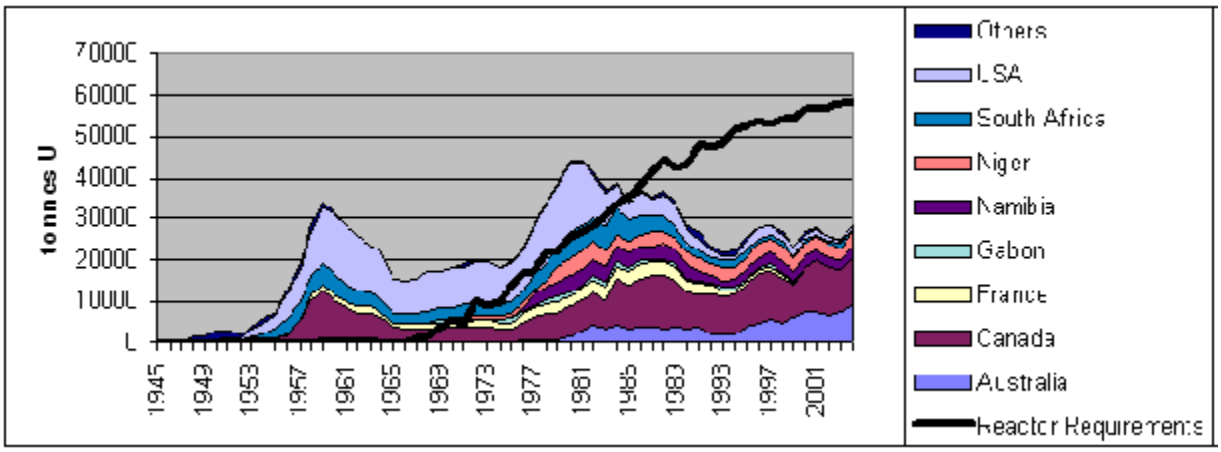

Figure 1. Western World Uranium Production 1945-2004[1].

The earliest mining practices included minimal environmental control measures and radiation protection for workers. However, based on evidence of environmental and health effects – especially the increase in lung cancer of underground miners caused by exposure to high levels of radon and its decay products, industrial practices were dramatically improved, particularly in the ventilation of underground mine workings as well as the management and disposal of wastes. Modern uranium open pit or underground mining facility and in situ recovery ISR facilities can demonstrate low health risks to workers and to the general public as well as eliminating any significant long term legacies.

2. THE NEED FOR ADDITIONAL RESOURCES

As shown in Fig. 1, the production of uranium has fallen well short of reactor fuel supply needs. This shortfall is being made up by reduction of uranium stockpiles and the conversion of weapons materials to reactor fuel. The combination of the reduction of these fuel sources and the projected 50% worldwide increase in nuclear reactor installations led to a spike in uranium prices to over \$120 US/lb U_3O_8 (\$224/kg U), a historical high even when factoring inflation. However, prices have since declined to a "spot price" of \$50/lb U_3O_8 (\$130/kg).

The increased demand and sustaining good price for the uranium concentrate has led to yet another exploration boom with over 500 exploration and mining companies recently listed on major worldwide stock exchanges with uranium as the principle target.

[1] World Uranium Mining, World Nuclear Association, 2008

3. EMERGENCE OF PULIC OPPOSITION TO URANIUM MINE DEVELOPMENT

In Canada, exploration activities are regulated by the 13 provinces and territories. In general exploration activities are subject to minimal environmental regulation and social review. Only when a mine development is proposed does the federal Canadian Nuclear Safety Commission's (CNSC's) regulations become applicable and typically a federal environmental assessment (EA) is prepared. Such assessments are comprehensive in nature and require evaluation of all aspects of the development from construction to closure. An integral component of an EA is public consultation which allows the airing of concerns of people who would live near potential new mines or mills.

However, it is at the exploration stage where public concerns have typically been initiated and vigorously expressed. These concerns are enhanced by comments from local, national and international NGO's, when the risks from mining are often overstated and indeed, misrepresented. Countering these concerns is frequently a challenge, particularly since experts who would be considered independent (are not associated with a resource development), and are able discuss evidence of very low risks, and infrequently get involved in public discussions.

In several Canadian jurisdictions, new developments have been blocked or postponed as the result of local concerns, including from aboriginal people who may express specific concerns related to the effect of uranium exploration and potential mine development on traditional life styles. The concerns are usually focused on two key areas: *will the radiation associated with the mining harm my family* and *will the mine wastes harm the environment now or in the future?* Expressed in another way, members of local communities often want the economic benefits of a mine but are concerned whether a family member, children of mine workers, future generations or the environment would be harmed by the radiation.

Many questions also arise concerning the effects of uranium mining and waste management in the local environment and on people who live nearby. In some ways, uranium tailings and waste rock are unique mine wastes. The tailings have been subject to chemical leaching and leach residues include some soluble materials and residues that host radionuclides which are principally the U-238 series daughters minus most of the uranium. Many of the negative impressions that people have today of uranium mines originate from reported historical practice and concerns over radioactivity escaping into the environment and harming plants, animals and people. It is this concern over radioactivity that fosters public concern that is frequently exaggerated, but earnestly believed. The reality is that tailings, waste rock and treatment sludges are managed in a way that provides absolutely minimal risk to local people and to the environment. At some high grade Canadian mines, highly engineered pit disposal of tailings and waste rock offers the additional advantages of minimal long term management and returning the land to unrestricted use. The level of diligence varies globally but is recently trending to very conservative management strategies in all countries. A challenge for the development of future deposits, especially those with lower grades and larger volumes of tailings, will be how to achieve the high level of safety expected for tailings management at an affordable cost. A significant challenge is providing an understanding of this reality in a context that is credible and not alleged to be uranium mining sector biased.

3. THE PROTEST OPPOSITION

While the global uranium industry may be in renaissance, this renaissance is being held back in many countries by protest and resistance movements. The situation in Canada has been is typical in this respect.

The Canadian anti-uranium mine development groups are usually composed of determined, passionate citizens who firmly believe in their cause, and are efficiently organised to distribute their message. They typically use well-spoken, skilled advocates (alleged to be "experts") to support their cause. There are many national and local organizations that oppose uranium mining and the use of nuclear energy in the Canada e.g., Mining Watch and others are national group with international linkages while groups such as CCAMU (Community Coalition Against Mining Uranium), focus on local issues which usually surround exploration and potential resource development. Recently, in eastern Canada local residents teamed up with medical doctors in opposing exploration for uranium, and as stated by them, uranium mine development. A December 2009 protest[2] is shown in Figure 2.

Figure 2. Civil Anti-Uranium Protest, Sept Isles, Quebec, Canada, December 2009

Specific aspects of the Sept Isle protest included the threat by local medical doctors to leave the area if the uranium-related activities were not forbidden by provincial authorities. This occurred even though the location subject to exploration was 20 kilometres from the population centre and exploration activity was focussed on a long-known very low grade (~0.01% U) anomaly.

International environmental activist groups such as Greenpeace and Sierra Club are also active in raising fears about uranium developments.

The key strategy used by the opposition groups is the magnification of fear focusing on the following:

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[2] http://www.cbc.ca/canada/montreal/story/2009/12/14/quebec-uranium-cp.html#socialcomments, Sept-Îles residents protest uranium exploration Protesters back doctors who threaten to quit region

(i) Spread of radioactivity resulting in health effects

Allegations range from radiation poisoned water and land to clouds of radon wafting over communities. The results of health effects in poorly-ventilated historical mines are typically magnified and incorrectly argued to apply to modern mines. The suggestions that mine waste – both tailings and waste rock cannot be safely managed are often presented. It is commonly stated that there is no safe level of exposure to radioactivity, and therefore any incremental exposure, no matter how small from uranium resource development, must be avoided.

(ii) Safety issues concerning nuclear power

Chernobyl and Three Mile Island incidents are often used as examples and factual accounts of the impacts are typically extrapolated and magnified.

(iii) Disposal of spent nuclear fuel

The half lives of long-lived fission products are used to illustrate that spent fuel would have to be isolated for hundreds of thousands of years.

(iv) Proliferation of nuclear weapons

Advocate groups frequently allege that all uranium concentrate production results in some use for weapons.

(v) Depleted uranium use by military

There are widespread allegations that the use of U-235-depleted uranium in military ordinance has resulted in sustained, negative health and environmental effects.

Although many, if not all, of the frightening positions held by the protesters and distributed to the public can be refuted by credible scientific evidence, the anti-uranium resource development movement has been having significant effects. These effects have been manifested by the restriction of access to uranium resources in many countries, the application of restrictive permitting regimes and extremely long development lead times. These hurdles are particularly challenging in countries with developed economies including the various states and provinces of Australia, United States and Canada. Moratoria restricting uranium resource development are then used to provide evidence of a grave danger. In Canada, in the 8 provinces and 2 territories where uranium significant resources are known:

- 2 provinces: long term province-wide moratoria in effect. Exploration for uranium is not permitted;
- 1 province: 3 year moratorium on uranium mine development put in effect by aboriginal government;
- 2 provinces: widespread locally-based opposition resulting in a large number of local jurisdictions passing motions to ban uranium exploration and mining, and these 2 provinces restricting exploration in specific areas;

- 1 province: uranium resource development not being considered because of local peoples' concerns and demands; and
- 1 territory: sector ban on uranium exploration;

However, in the Canadian province of Saskatchewan, which has the world's highest grade deposits, uranium mining and resource development continues with the support of 80% of the local population according to recent surveys.[3] In Quebec an advanced uranium exploration project is undergoing permitting, at the same time as vigorous opposition has emerged in the province to exploration in proximity to populated and recreation areas. In Canada's largest territory, Nunavut, a proposed uranium mine project is moving forward to feasibility and environmental assessment with the cautious support of the local aboriginal organizations and the Territorial Government.

These political restrictions and protest movements in developed economies are believed to be resulting in expanded exploration and resource development in those countries with developing economies such as Kazakhstan, Namibia and Niger. Although the resource grades in these locations are low by Canadian or Australian standards, development is proceeding under the management of international mining companies that operate with exemplary environmental standards – e.g. Rio Tinto, Areva and Cameco. It recently was reported in the press[4] that Niger will become the second largest uranium producer in a few years (after Kazakhstan), surpassing Australia and Canada.

4. REASONS FOR PROTEST EFFECTIVENESS

There are several apparent reasons why the groups and individuals opposed to uranium are so effective:

- The relative ease of exploitation of the fear of radioactivity using exaggerated claims, irrelevant associations through the use of modern communication techniques.

- A person may be more easily frightened than reassured when it comes to risk to health by unseen agents.

- The effective adoption by anti-uranium protest groups of effective techniques from other issue-concerned and political groups who are effective in getting their message out by:

    - Creating media situations – e.g. blocking public facilities;
    - Focussed political pressure – emails, phone calls – "phones ringing off the hook"[5];
    - Fundraisers including well known personalities; and
    - Exploitation of land tenure and ecological issues.

[3] "Working with our Communities", www.arevaresources.com/communities/index.html
[4] "Uranium's Next Frontier", Toronto Globe and Mail, February 9, 2009
[5] Personal Communication, Kingston Ontario, City Councillor to G. Feasby March 2008

- The poor image of mining and historical uranium mining. Anecdotal and pictorial evidence is readily available to lend support to exaggerated claims. Intuitively it may be understandable that few would tolerate a uranium mine their back yard (NIMBY).

- A general public misunderstanding of the concept of environmental and health risk. If, as is alleged by the anti-uranium groups, there is no safe level of radiation exposure, then all components of the nuclear fuel cycle would not meet public acceptability.

- The absence of independent, committed scientists and spokespersons that are prepared to provide evidence that uranium resource development is indeed an acceptable activity. If a small fraction of the public is passionate, organised and persistent in opposing uranium resource development, while an equally small, passionate and knowledgeable collection of scientific and technical people are not willing to speak up and provide credible counter evidence, then it is hardly surprising that the public representing 95% of adults would err on the side of caution and adopt the anti-uranium resource development strategy.

- The recent, rapid expansion of the use of social media as an effective means of spreading misinformation or conspiracy theories. Typically the basic false information is repeated – e.g. "Uranium is the heaviest metal" (5 most dense). Unrealistic images of hazards and dangers are repeated – example Figure 3, which is designed to raise fears of uranium tailings[6].

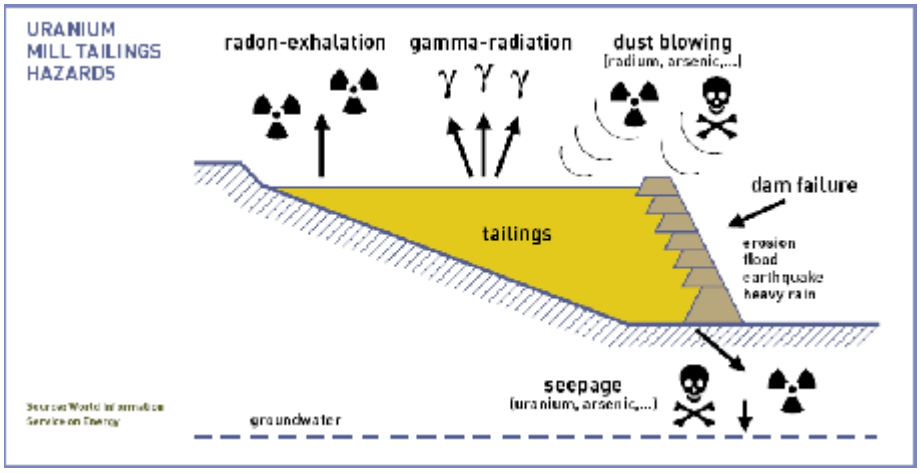

Figure 3. Unrealistic Uranium Tailings Disposal Hazards

There are probably other reasons why a generally well educated public would buy into positions that are not backed by scientific and factual evidence. One reason might be what could be termed a "Culture of Individuality". This culture suggests that experienced experts and those with aligned motives, such as having a commercial objective, should not be trusted or believed.

[6] "Uranium Fact Sheet" Nunavummiut Makkitagunarningit, Iqaluit, Canada, January 2010

This might explain the contradiction that in the United States, a country with the highest developed scientific and technical communities (60% of Nobel prizes in science) has a majority of the population that does not believe in Evolution of the Species.

There is also the culture of "counter-knowlege entrepreneurs".[7] Thompson (2008) observes: *"These are dedicated persons who may or may not believe all of their claims, but have an instinctive understanding of how social epidemics work"*. These individuals successfully exploit the public's fear of radioactivity and the press and media frequently pick up these concerns. Each country with a long history of uranium mining and peaceful use of nuclear energy seems to have their share of sector specific counter-knowledge entrepreneurs, a few of whom have made anti-uranium and anti-nuclear their life's work.

5. APPROACHES IN OBTAINING A SOCIAL LICENSE TO EXPLORE FOR, AND TO DEVELOP URANIUM RESOURCES

Although as in Canada and elsewhere, early mines were developed in the relative absence of environmental and social guidelines, it can be concluded that current exploration and mine development meets the highest safety and environmental standards at most locations. In spite of this, no exploration or development can typically take place without the informed support of local people – **the social license**. Some encouraging success is being achieved in Canada in obtaining this social license as a result of:

1. Conducting extensive and sustained consultations with local people, before and during exploration. Even though well-managed exploration activities can be shown to present negligible risk of radiation exposure to people and to the local ecology, full discussion and transparency is needed.

2. Providing local peoples access to independent, credible spokespersons who can explain the low risk associated with a well managed uranium development. The spokespersons should include scientific and technical representatives as well as persons who live and work in the area of operating or closed uranium mine facilities. A recent example of such consultation is depicted in Figure 4.

[7] Thompson, Damien; 2008, Counterknowledge – How we surrendered to conspiracy theories, quack medicine, bogus science and fake history.

Figure 4. Uranium Consultations in Nunavut Territory, Canada, 2008

3. Avoiding populated areas and sensitive land-use areas for exploration and potential development activities.

4. Providing access by potentially concerned citizens to an operating uranium mine or ISR facilities as well as closed facilities.

5. Assuring adequate financing, management and technical support. Junior exploration companies are now more aware that an unofficial social license is needed before any staking, or other exploration activities are initiated. Successful uranium exploration and development activities are typically well funded and allow for long periods of consultation, environmental protection and assessment beyond regulatory requirements.. As has been shown in the Canadian situation, speculative exploration activities can result in significant public opposition with potentially industry wide implications.

6. CONCLUSION AND PATH FORWARD

With the shift to increased nuclear energy in the world, the price and demand for uranium for reactor fuel have recently increased and are expected to remain robust. This expansion in the development of new uranium resources has been hampered by the evolution of anti-uranium mining and recovery protests. This has resulted in some known uranium resources effectively being declared "*off limits*". Uranium production by conventional mining and ISR technologies is being shifted to developing economies where political restrictions and public opposition appear relatively limited, at least at present.

However, in Canada, significant progress is being realised in obtaining the social license to maintain uranium resource development and to expand this activity outside the province of Saskatchewan. Effective ways of avoiding the effects of an ill-informed anti-uranium protest movements or interventions are being considered and implemented. A key component of success is the intervention of credible, independent experts and experienced citizens in countering the fear of a very small release of radioactivity from a uranium resource development. It is now well recognised that such intervention is needed before, or at the beginning of

exploration activity. Also, such efforts are required on a sustained basis in order to be effective. Scientifically defensible information must be provided in a clear, easy to understand format and the presentation requires adjustment for local concerns and issues.

Individuals, companies and government agencies are all beginning to become proactive of counteracting the distribution of misinformation. As an example, the principle Canadian regulator, the CNSC, has taken a public position to ensure Canadian citizens that exploration and uranium mine development is safe. [8] Even though in this publication the CNSC states that "uranium is exempt from regulation because it poses no risk to public, health or environment", diligence and consultations with the potentially concerned public in transparent ways are needed.

Encouragingly, knowledgeable members of the public are beginning to speak up and address the campaigns of concern related to uranium resource development and nuclear energy. The following are representative statements from members of the public concerning the December 2009 anti-uranium protest in Sept Isles:

> "*The concerns of residents are all valid and should by addressed. It helps to involve the community in the mine planning. Come on, spring for some public presentations, tours, question and answer sessions; get the community involved don't just tell people there is no danger - show them".*
> *"There is no danger involved with the exploration. Move on".*

Reviewers of the story publicly supported the above comments by a ratio of 26:3.

In 2010, it is expected that the first new Canadian uranium mine development in 35 years outside the province of Saskatchewan will receive its initial permits. More developments are anticipated to follow.

8 http://www.nuclearsafety.gc.ca/eng/mediacentre/releases/news_release.cfm?news_release_id=364