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Environmental Impacts and Challenges Associated with of Uranium Exploration and Uranium Mill Tailings:

A Slide Presentation Supporting an Invited Statement
before
Quebec Uranium Inquiry Commission
Bureau D'Audiences Publique sur L'Environnment (BAPE)
Quebec City, Quebec, Canada
September 9-10, 2014
Includes:
Part 1 - Uranium Exploration – slides 2 – 16
Slides related to both topics – slides 17 – 21

Part 2 – Uranium Mill Tailings - slides 17 – 65
In separate file
by

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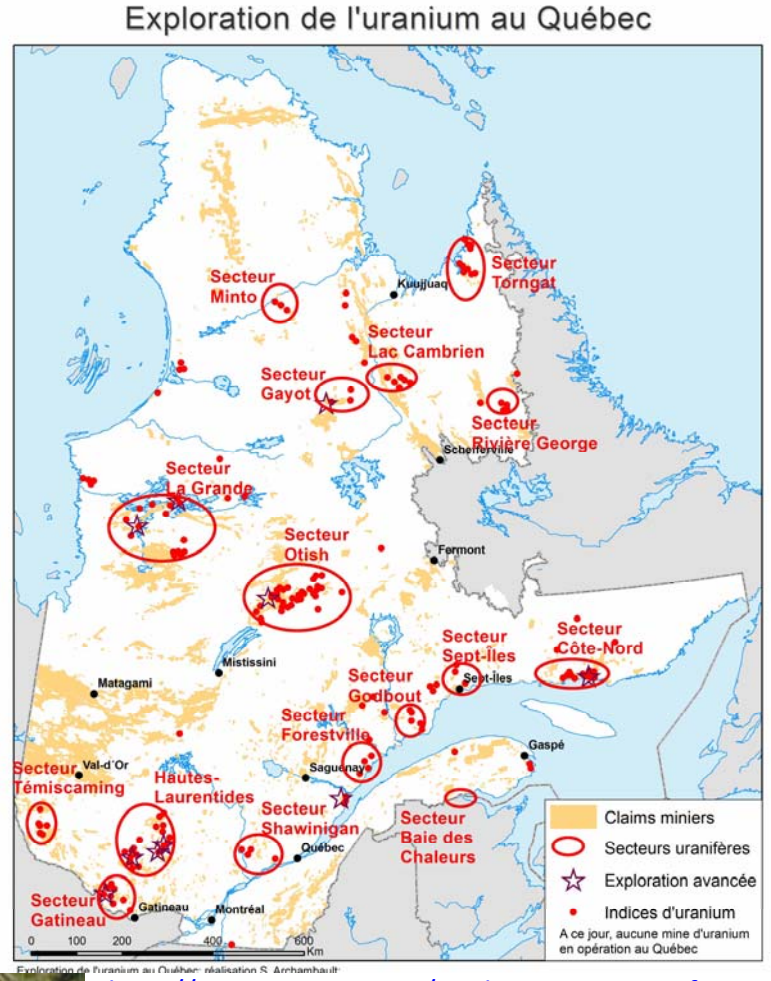
Part 1 – Uranium Exploration

Uranium prospecting brings significant changes to a region, even before drilling begins… Disturbances such as noise, light, vibrations, smells, and people will change a pristine environment and affect flora and fauna and habitat and lifecycle activities for wildlife, and the availability and quality of subsistence food sources, often before area residents or leaders are informed about proposed activities or before community engagement begins.

http://www.azimut-exploration.com/en-prop-photos.html



http://www.mining.com/study-on-impacts-of-uranium-mining-may-extend-moratorium-indefinitely-report-87731-23280/

http://magazine.cim.org/en/2014/March-April/special-report/Uranium-exploration-spikes-in-Saskatchewan.aspx

Exploration drilling usually follows aerial surveys Field sampling and trenching. Depending on the site, company and existing requirements, drilling can be a four season operation and spawn mine Camps- mini-villages in areas previously isolated From the sights, sounds and debris of non-traditional societies.

http://resourceclips.com/2014/03/02/athabasca-basin-and-beyond-38/

ww.abenresources.com/i/photos/Justin-Property-
-2012.jpg

Just looking at selected drilling scenes from company sources….

http://www.uraniumseek.com/news/PeterSpina/1190185231.php

http://www.lapresse.ca/le-soleil/affaires/les-regions/201006/17/01-4290775-uranium-sur-la-cote-nord-uracan-entreprend-sa-grande-seduction.php?utm_categorieinterne=trafficdrivers&utm_contenuinterne=cyberpresse_vous_suggere_4306969_article_POS1

http://www.lapresse.ca/le-soleil/actualites/environnement/201007/29/01-4302383-la-decontamination-des-sols-tarde-au-lac-kachiwiss.php?utm_categorieinterne=trafficdrivers&utm_contenuinterne=cyberpresse_vous_suggere_4304425_article_POS1

…. won't tell the whole story.

A detailed baseline database, frequent inspections – both-announced and unannounced by professional staff and native land user representatives, photo-documentation, sampling materials on site, reclamation plans with financial guarantee and electronic record keeping are all essential to effective enforcement of legal standards and seeing whether best practices are in use.

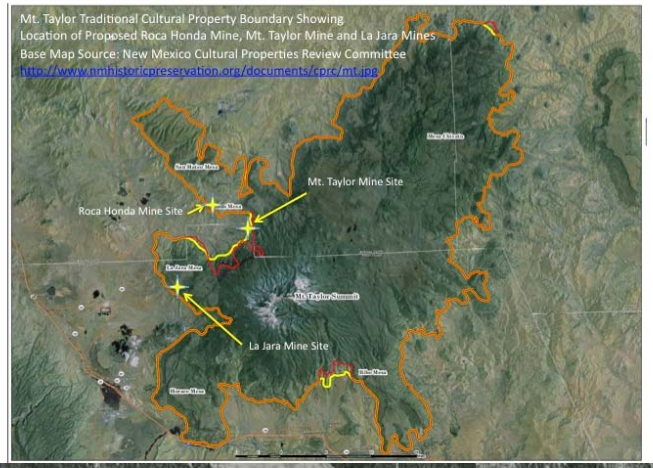
Uranium exploration in Quebec – citizen inspections illustrate the failure to use best practices by companies in operations and government in oversight and enforcement.

Uranium exploration in Quebec – citizen inspections illustrate the failure lack of best practices by companies in operations and government in oversight and enforcement.

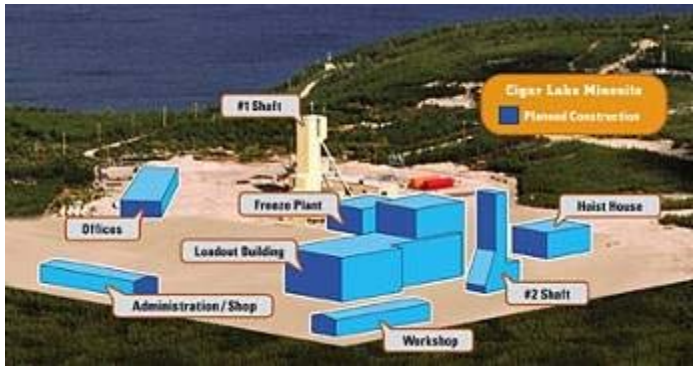
From: SISUR

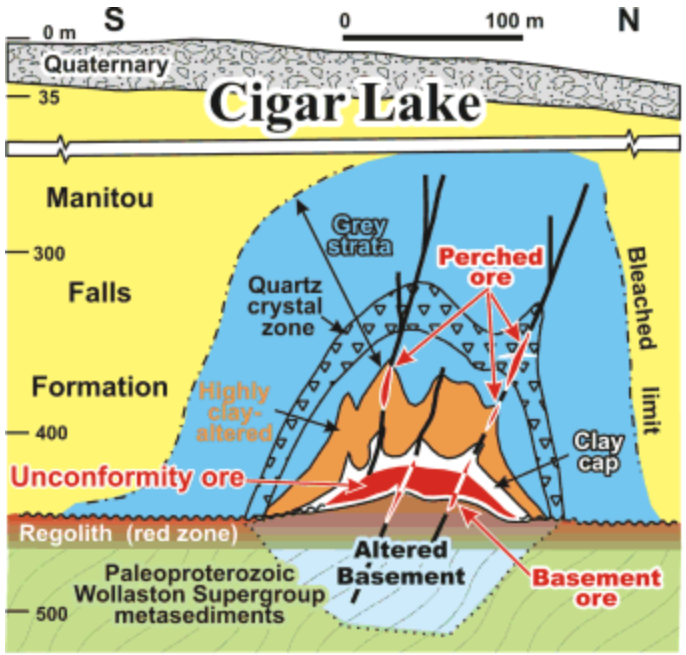
Surface disturbance visible at Mt. Taylor mine drilling sites in New Mexico more than forty years after completion of exploration drilling completed on US Forest Service managed land where regulations are supposed to “minimize adverse environmental impacts on surface resources.”

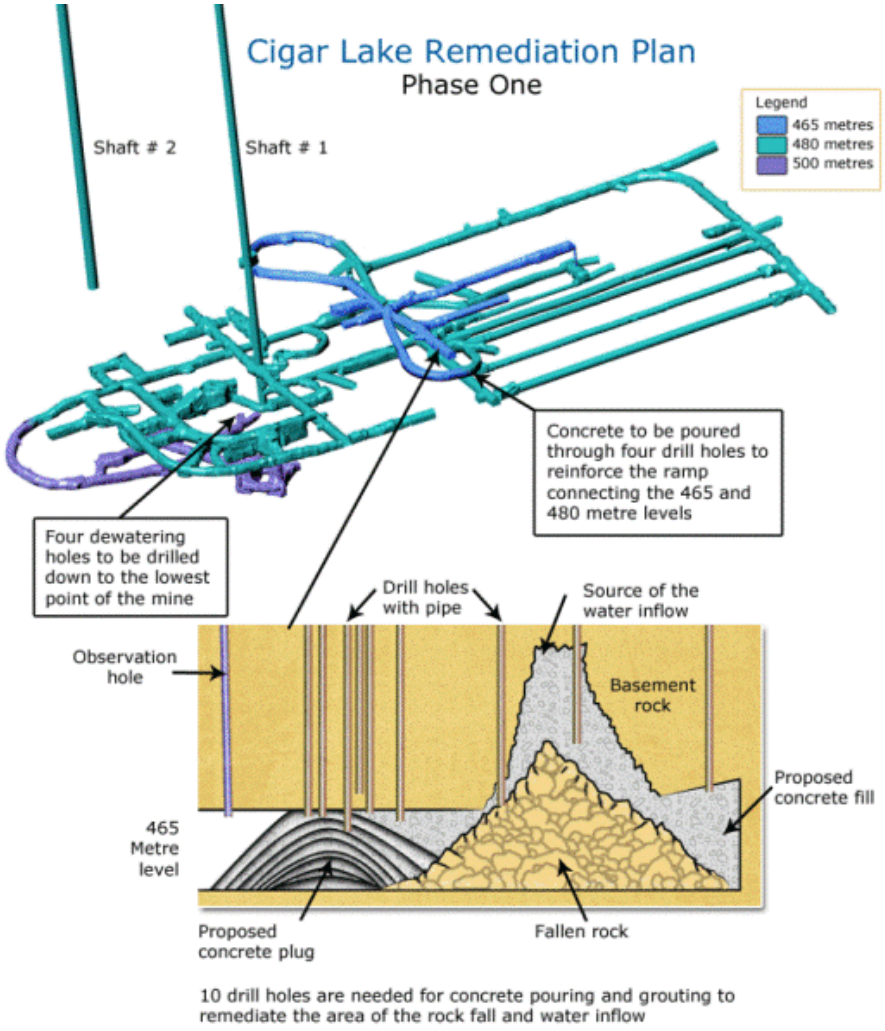
Mt. Taylor Traditional Cultural Property



Cigar Lake - Modern Uranium Mine with a Major Problem –
Nine-year mine closure due to unforeseen and extensive mine flooding problem







July 16, 2014 - Canadian uranium miner Cameco Corp said on Wednesday that some ore from its Cigar Lake, Saskatchewan, mine would not be milled until early 2015, instead of before the end of 2014, due to problems with a mining process that involves freezing the ore and the ground around it.

As a result, Cameco said it will lower its 2014 uranium target for milling Cigar Lake ore, which is currently 2 million to 3 million pounds.

Cameco, the world's third-biggest uranium producer, first expected to open Cigar Lake in 2007, but two floods pushed the launch of the mine well behind schedule. The mine finally began production in March 2014.

"UPDATE 1-Uranium output at Cameco Cigar Lake mine delayed by freezing problem", - http://ca.reuters.com/article/companyNews/idCAL2N0PR11G20140716

October 23 2006 - Cameco Corp. said its Cigar Lake underground uranium project in northern Saskatchewan is expected to flood completely after a rockfall yesterday.

Cameco said the fall occurred Sunday afternoon in an underground area that had been dry and a "significant" amount of water started flowing in.

"Cameco's Cigar Lake mine inundated; stock falls" Last Updated: Monday, October 23, 2006 http://www.cbc.ca/money/story/2006/10/23/cameco.html

Nov 6, 2007 - Cameco doesn't have a "fixed" deadline for the overhaul of its flooded Cigar Lake mine, the uranium miner's chief operating officer said in documents made available on Tuesday.

At a hearing last week before the Canadian Nuclear Safety Commission (CNSC), which is considering extending Cameco's construction license to rehabilitate the mine, COO Tim Gitzel said Cameco, the world's largest uranium producer, would not take shortcuts in the overhaul process.

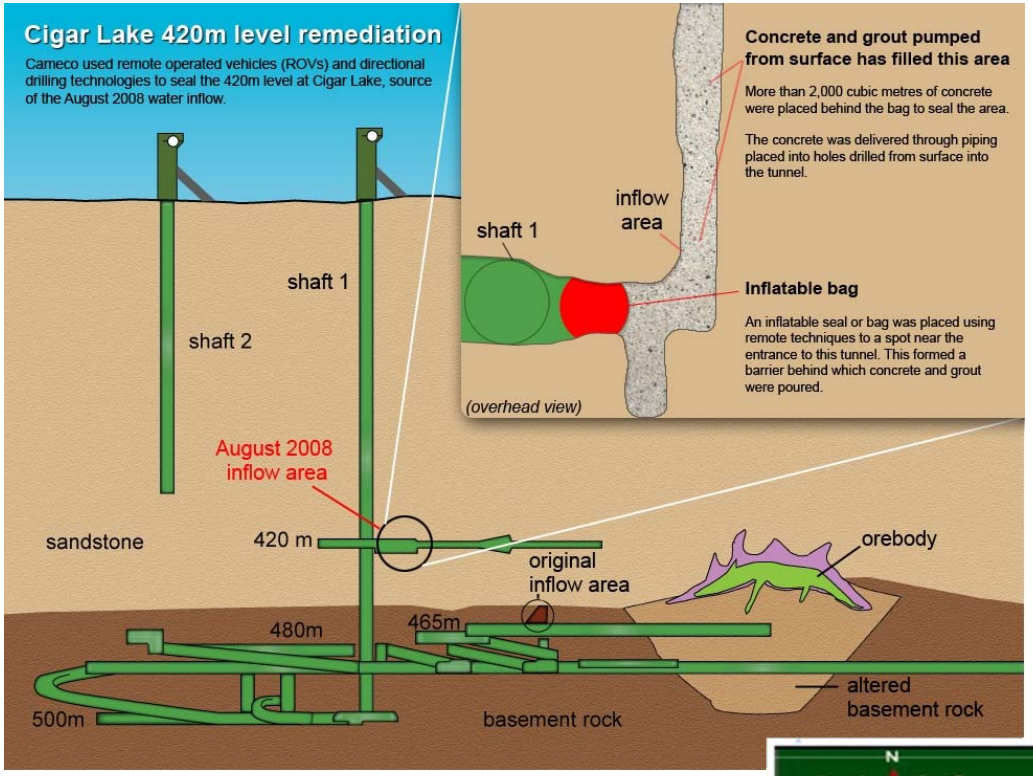
"No set deadline for Cigar Lake repairs-Cameco COO" | Reuters Wed Nov 7, 2007http://energynet.newsvine.com/_news/2007/11/07/1080920-no-set-deadline-for-cigar-lake-repairs-cameco-coo-reuters

Updated Preliminary Assessment of the Matoush Project Central Quebec, Canada for Strateco Resources by Scott Wilson Roscoe Postles Associates, April 2010
http://www.stratecoinc.com/data/pdf/Scoping%20Study/ScopingStudyPart1April122010_1-56.pdf

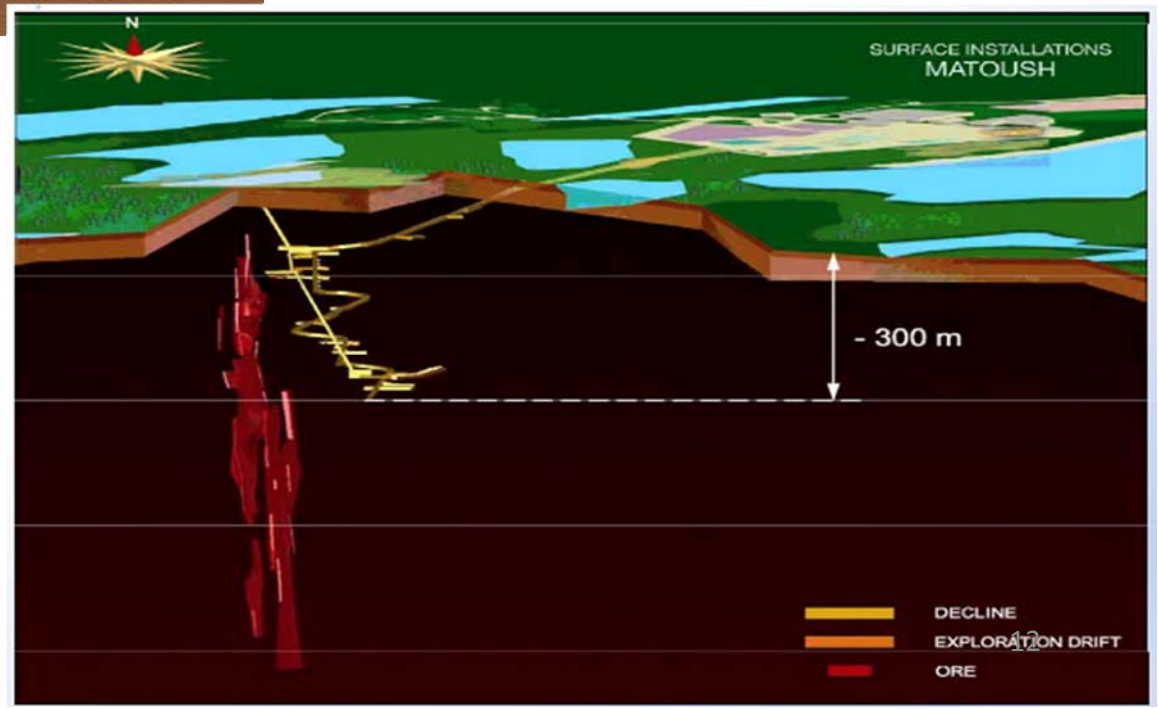
"The Matoush Project site is located at the top of a watershed, and the underground mine is entirely located within fairly permeable sandstone. Groundwater which will likely be the largest contributor to the mine effluent, and average yearly stream flows within a radius of a few kilometres around the site are likely to be less than the mine effluent average discharge rate. Considering the physical limitations of natural streams to take up additional flow without generating uncontrolled erosion and the potential sensitivity of aquatic species, it is unlikely that the mine effluent discharge point will be close to the mine site. There will likely be a trade-off between water treatment cost, water segregation cost, and distance of effluent relative to the mine facilities.

"Hydraulic conductivity of sandstone facies ACF4 (400 m thick), the basal conglomerate (28 m thick), the basement regolith (4 m thick) and the Archean granitic basement has not been assessed. Some of these geological features may provide conditions for permeable zones. Assessment of deep hydraulic conductivity and deep groundwater chemistry should be assessed in the future in order to evaluate potential mine water inflows and mine seepage water quality.

"Mine water seepage in deep uranium mines within or at the contact with sandstones is known to pose major challenges to mining operations in Saskatchewan. Detailed mine seepage estimations should be carried out and use of mitigation measures should be assessed in order to reduce the operational risks, if any, and reduce the volumes of water that could potentially require treatment.



Cigar Lake Underground Mine Cross-Section



Matoush Project Underground Mine Development Ramp Cross-Section

Matoush “Data”

HIGH QUALITY AND UNIQUE DEPOSIT

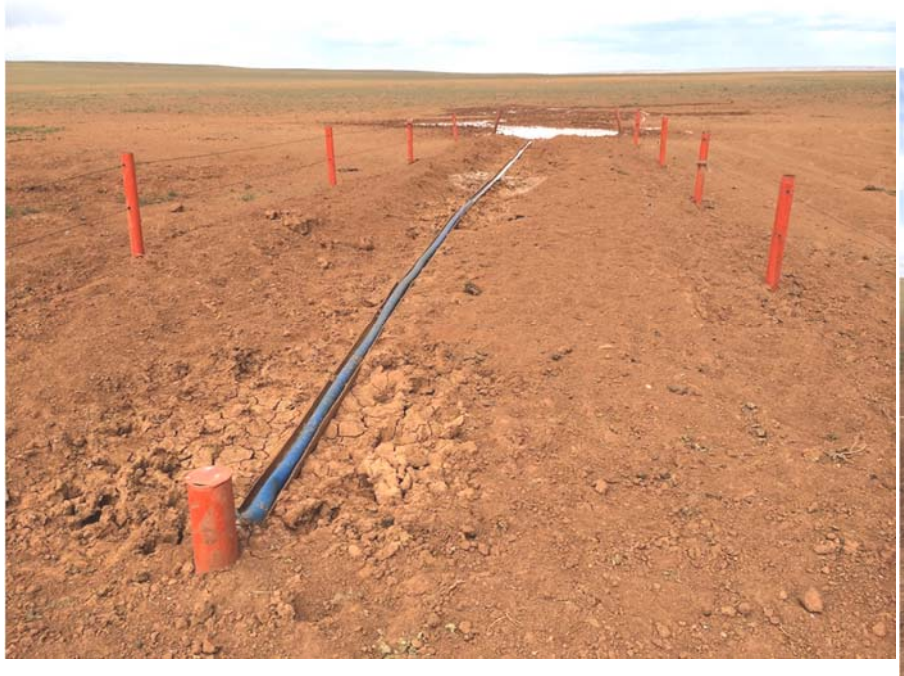
Deposit characteristics		Operating Uranium Mines in Canada	Matoush Project
Acid-generating sulphide minerals		Various levels	traces
Thorium-232 minerals		Various levels	none
Toxic elements			
	arsenic	Various levels	traces
	selenium	Various levels	traces
Elements			
	copper	Various levels	traces
	nickel	Various levels	traces
	molybdenum	Various levels	traces

Source: Expected environmental Conditions for a Potential Uranium Mine at the Matoush Project Site, SENES Consultants Limited

Uncontrolled flow from released from artesian wells created for use in aquifer tests at uranium exploration site has resulted in significant drop in flow at a natural spring that is sole water source for a county in southeast Mongolia.
Pre-drilling environmental assessment identifying water sources and hydrologic conditions may have been able to prevent this damage

Ongon Soum, Sukhbaatar Aimag, Mongolia

Water waste and unknown groundwater conditions….



Lead to loss of flow at the sole water source for people and their livestock
in Ongon Soum, Sukhbaatar Aimag, Mongolia

TOOLS FOR USE IN DEVELOPING QUEBEC APPROACH:

New Mexico Mining Act of 1993
http://www.emnrd.state.nm.us/MMD/MARP/documents/MiningAct.PDF

New Mexico Mining Act Regulations
http://www.nmcpr.state.nm.us/nmac/_title19/T19C010.htm

"At 2010 rates of consumption, identified resources are sufficient for over 100 years of supply for the global nuclear power fleet." (P. 9)

Table 1.26. World uranium production capability to 2035

(in tonnes U/year, from RAR and inferred resources recoverable at costs up to USD 130/kgU, except as noted)

Country	2011		2015		2020		2025		2030		2035	
	A-II	B-II	A-II	B-II	A-II	B-II	A-II	B-II	A-II	B-II	A-II	B-II
Argentina	120	120*	150	150*	150	250	500*	500*	500*	500*	500*	500*
Australia	9 700	9 700	10 100	16 600	10 100	24 200	10 100	27 900	9 800	27 600	9 800	27 600
Brazil	340	340	1 600	1 600	2 000	2 000	2 000	2 000	2 000*	2 000*	2 000*	2 000*
Canada	16 430	16 430	17 730	17 730	17 730	19 000	17 730	19 000	17 730	19 000	17 730	19 000
China*	1 500	1 600	1 800	2 000	1 800	2 000	1 800	2 000	1 800	2 000	1 800	2 000*
Czech Republic	500	500	50	50	50	50	50	50	50	50	30	30
Finland**	0	0	0	350	0	350	0	350	0	350	0	350
India*	295	980	980	980	980	1 200	1 000	1 600	1 000	2 000	1 000	2 000
Iran, Islamic Rep. of	70	70	90	90	100*	100*	100*	100*	100*	100*	100*	100*
Jordan*	0	0	0	0	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000
Kazakhstan	22 000	22 000	24 000	25 000	24 000	25 000	14 000	15 000	12 000	13 000	5 000	6 000
Malawi*	0	1 000	1 270	1 270	1 425	2 525	0	0	0	0	0	0
Mongolia*	0	0	0	500	150	1 000	150	1 000	150	1 000	150	1 000
Namibia*	5 350	5 350	7 600	13 400	9 450	19 250	5 450	15 250	1 600	11 400	1 600	10 050
Niger*	5 400	5 400	5 500	10 500	5 500	10 500	5 500	10 500	2 500	7 500	2 500	7 500
Pakistan*(a)	70	70	70	110	140	150	140	140	140	650	140	650
Romania*(a)	230	230	230	230	350	475	350	475	350	630	350	630
Russian Federation	3 360	3 360	4 480	4 790	5 840	6 610	6 410	7 270	2 620	11 240	5 450	10 450
South Africa*	1 050	1 050	1 588	2 360	2 686	3 460	2 795	3 565	1 386	2 155	1 381	2 150
Ukraine*	1 500	1 500	2 700	2 700	2 700	2 700	5 200	5 200	5 200	5 200	5 200	5 200
United States(b)	2 040*	2 040*	3 400	6 100	3 800	6 600	3 700	6 500	3 100	5 600	3 100*	5 600*
Uzbekistan	3 350	3 350	4 150	4 150	4 500	4 500	5 000	5 000	5 000*	5 000*	5 000*	5 000*
Total	**73 305**	**75 090**	**87 488**	**110 310**	**95 451**	**133 570**	**83 975**	**125 050**	**69 026**	**118 625**	**64 831**	**109 460**

A-II = Production capability of existing and committed centres supported by RAR and inferred resources recoverable at <USD 130/kgU.

B-II = Production capability of existing, committed, planned and prospective centres supported by RAR and inferred resources recoverable at <USD 130/kgU.

* Secretariat estimate.

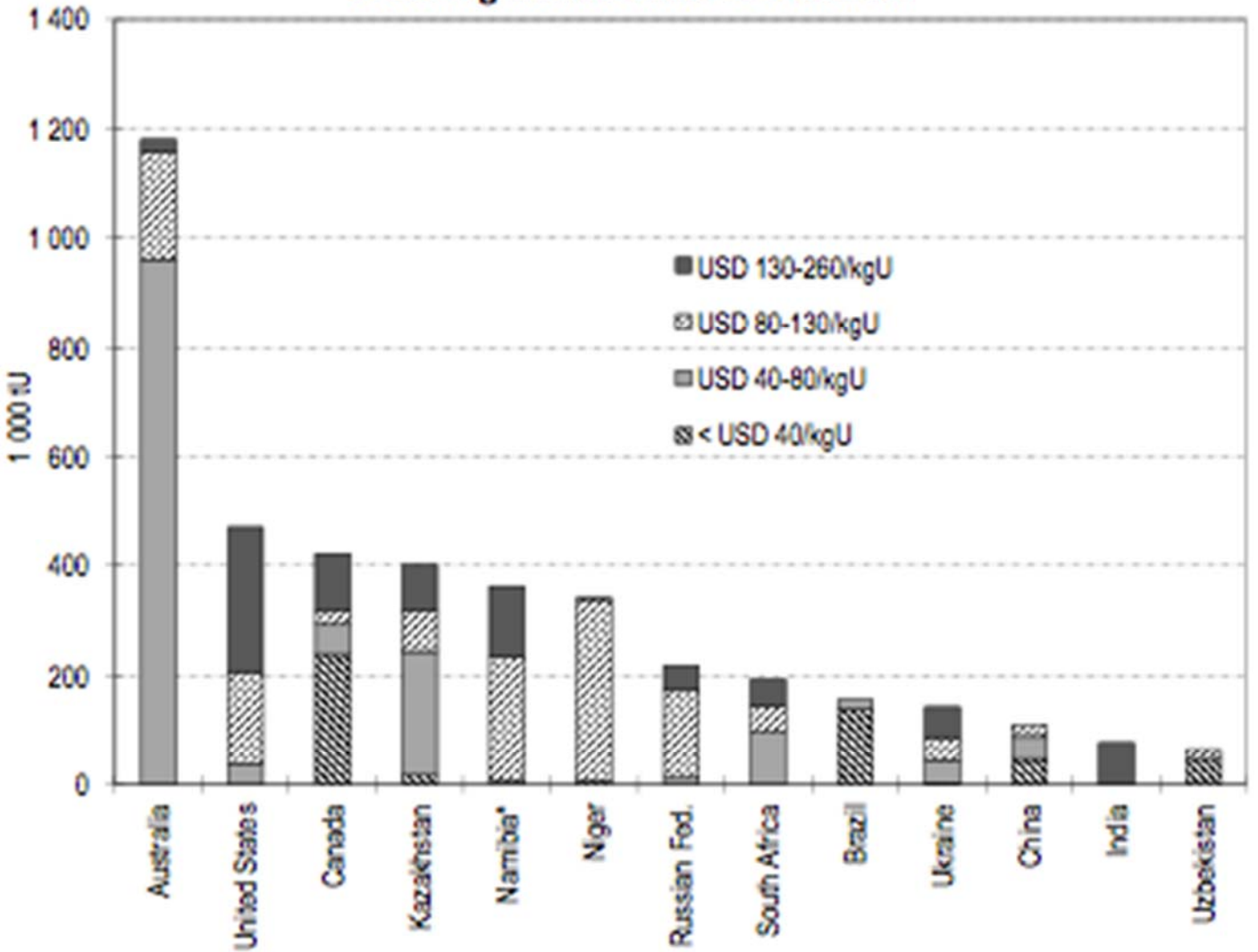
** By-product of nickle production.

(a) Projections are based on reported plans to meet domestic requirements through the discovery of additional resources.

(b) Data from previous Red Book.

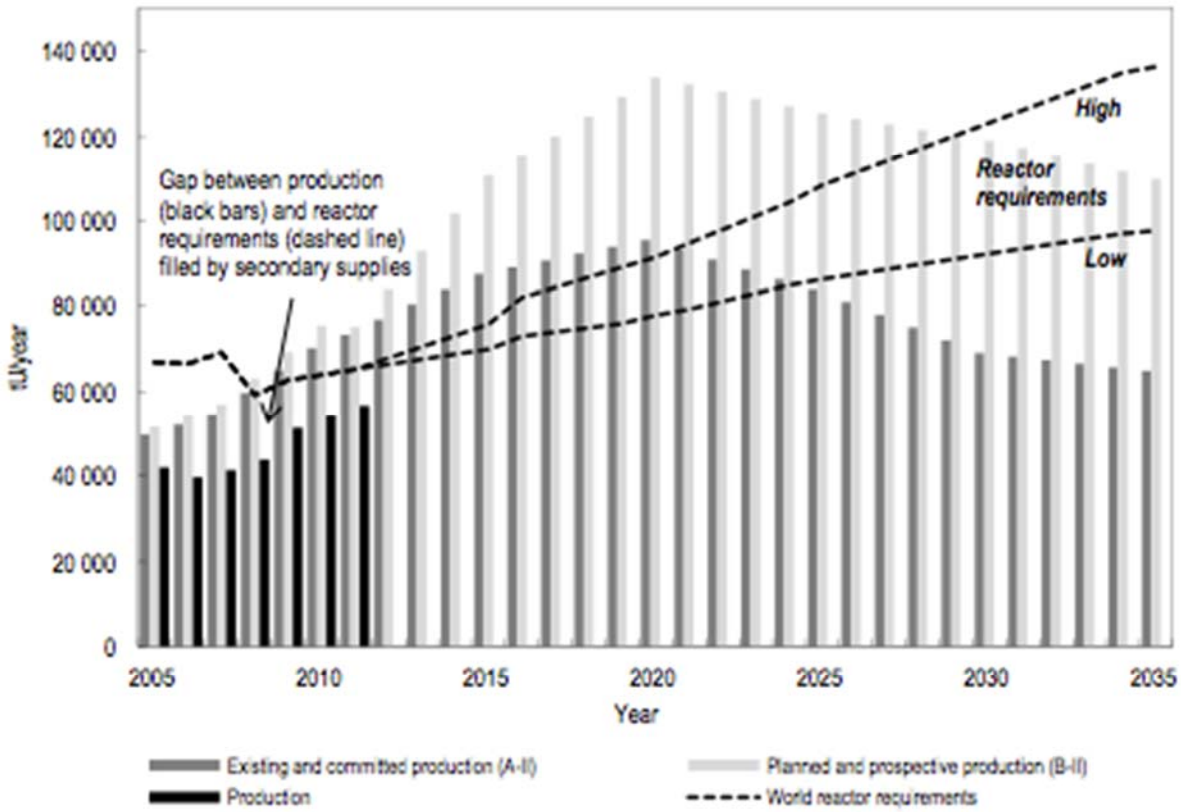
From: Uranium Red Book 2011

Figure 1.2. Distribution of reasonably assured resources (RAR) among countries with a significant share of resources



From: Uranium Red Book 2011

Figure 2.11. Projected annual world uranium production capability to 2035 compared with projected world reactor requirements*



Source: Tables 2.2 and 2.4.

* Includes all existing, committed, planned and prospective production centres supported by RAR and inferred resources recoverable at a cost of <USD 130/kgU.

Figure 2.8. Cumulative uranium production and requirements*
(1945-2011)

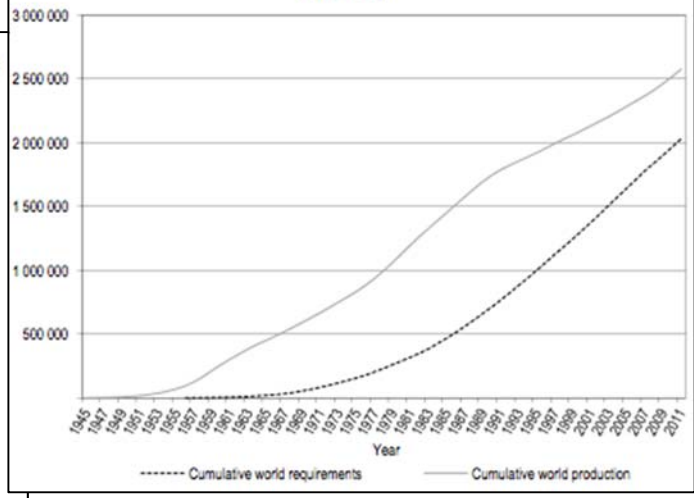
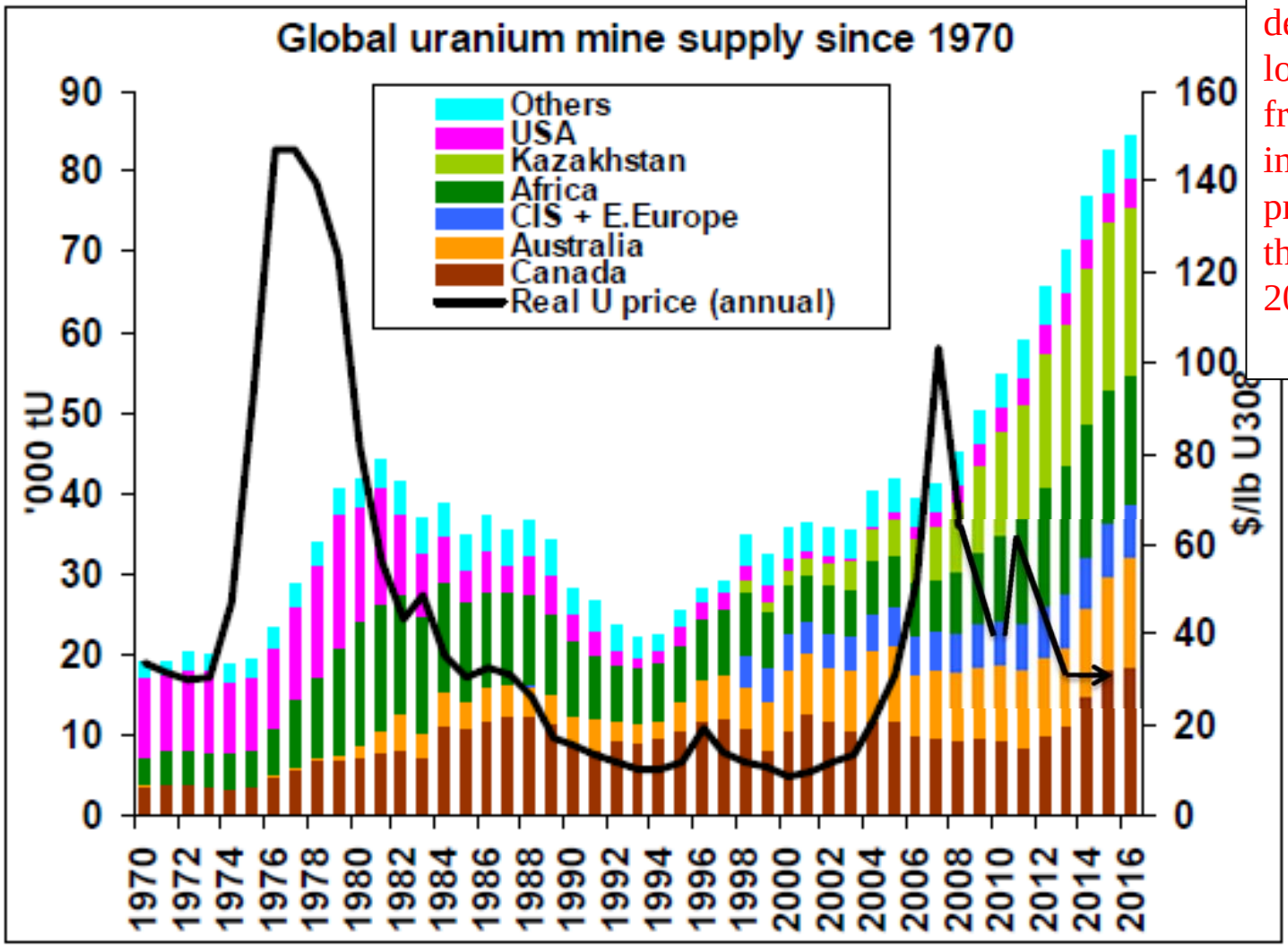


Figure 2.7. Annual uranium production and requirements*
(1945-2011)

From: Uranium Red Book 2011

Mine supply: strong growth assumed



Source: WNA, Macquarie Research, September 2008

Black line shows "Real U Price" that shows the value of old prices in current dollars and demonstrates that the lower uranium prices from the 1970s are equal in value to much higher prices in current dollars than more recent, post-2000, uranium prices

August 22, 2014 Uranium Spot Market Price (www.uxc.com) - $31.00

Updated through August 22, 2014 spot market price from "The Global Uranium Outlook 2008/9"- 2008 World Nuclear Association Symposium at - http://www.world-nuclear.org/sym/2008/presentations/laytonpresentation.pdf

What are the Potential Health Effects from Exposure to Uranium?[1]

- Uranium is a heavy metal and acts similar to lead (another heavy metal) in the body.
- Accordingly, for natural uranium, national and international human exposure standards are based on the possible **chemical toxicity** of uranium (e.g., effect on kidney—nephrotoxicity), not on radiation and possible "cancer effects" (radiotoxicity)

[1]Sources: (1) U.S. Nuclear Regulatory Commission. Standards for protection against radiation. 10 CFR Part 20; 1992. (2) International Commission on Radiological Protection. Limits for intakes of radionuclides by workers. ICRP Publication 30, Part 1.1979. (3) Agency for Toxic Substances and Disease Registry. Toxicological profile for uranium. Department of Health and Human Services, Public Health Service; 1999. Available at: http://www.atsdr.cdc.gov/toxprofiles/tp150.html.

Brown, 2009 NRC/NMA Symposium