

Issues in Developing a New Uranium Mine in Canada

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U resource and associated radioactivity projects for ~ 30 years

All Canadian U mine projects, many in other countries

- Industry, governments, NGO's

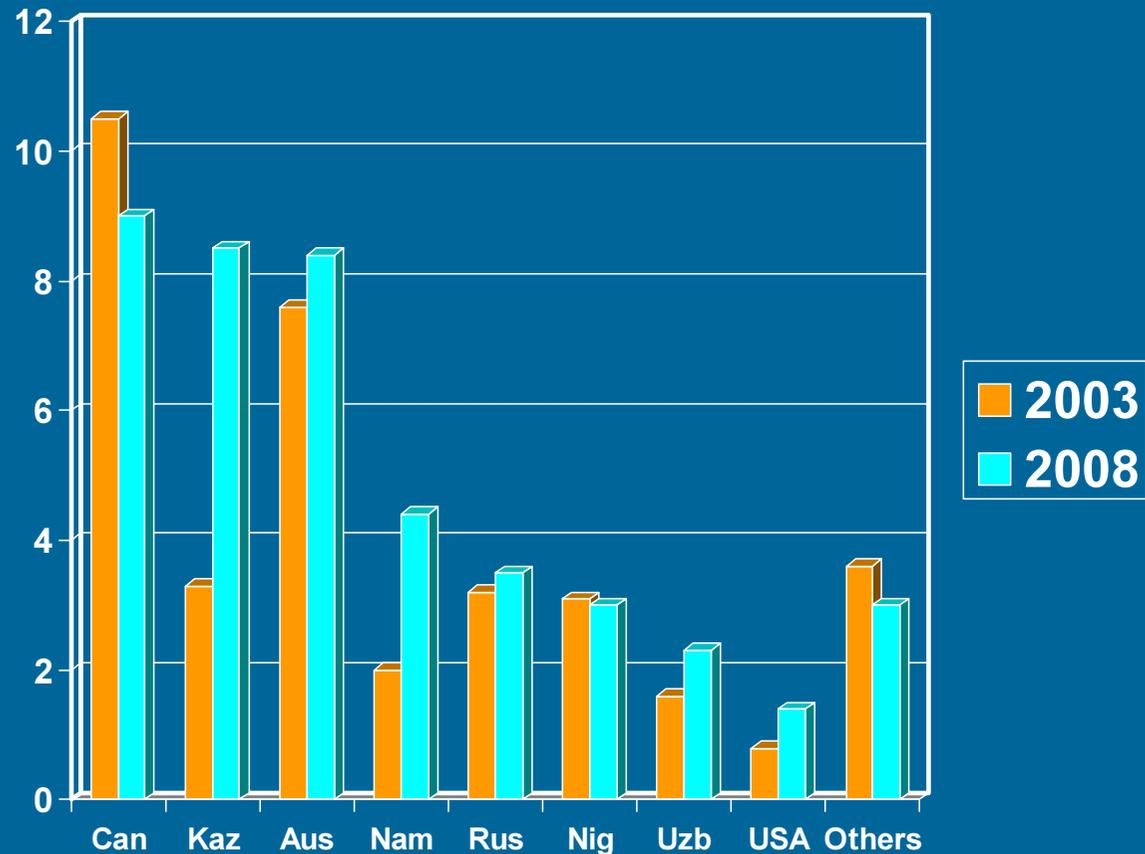
Global U Production (10^3 t U)

Canada – currently
largest U producer

Total Global U

Prod: 49,000 t (2009)

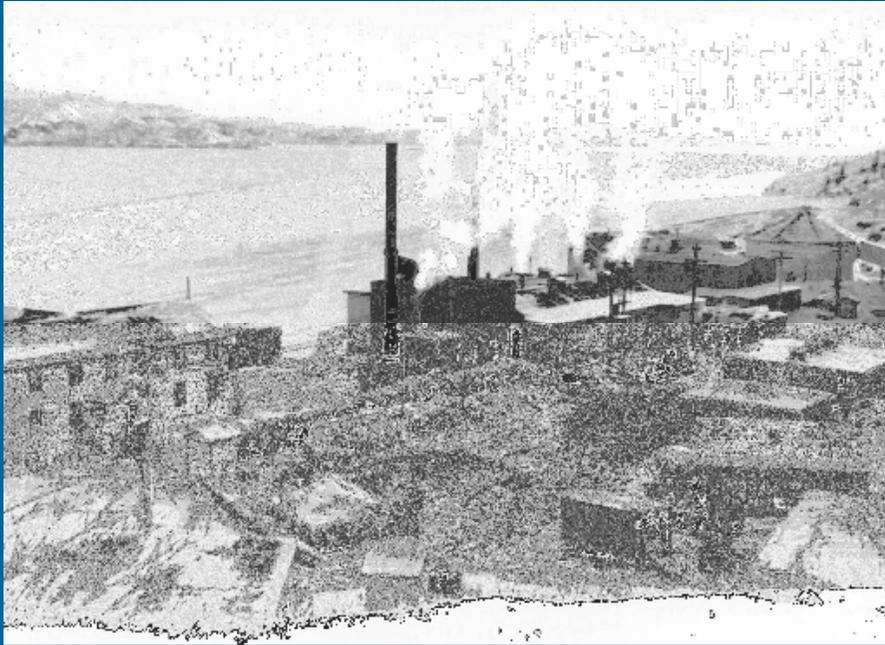
Demand: 74,000 (2015)



Uranium – Canada 1930-50



Port Radium – then and now

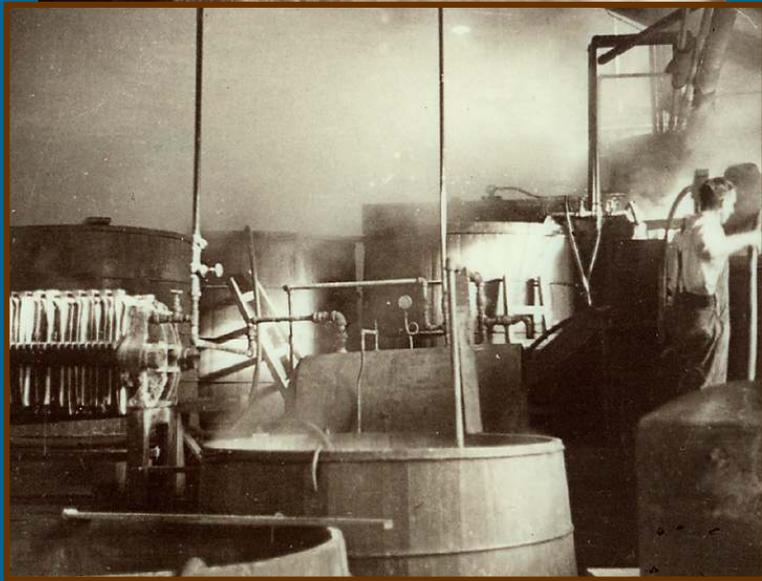


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Port Hope: Ra refinery → UO₂ & UF₆ conversion



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In 50 years..



Exploring for Uranium



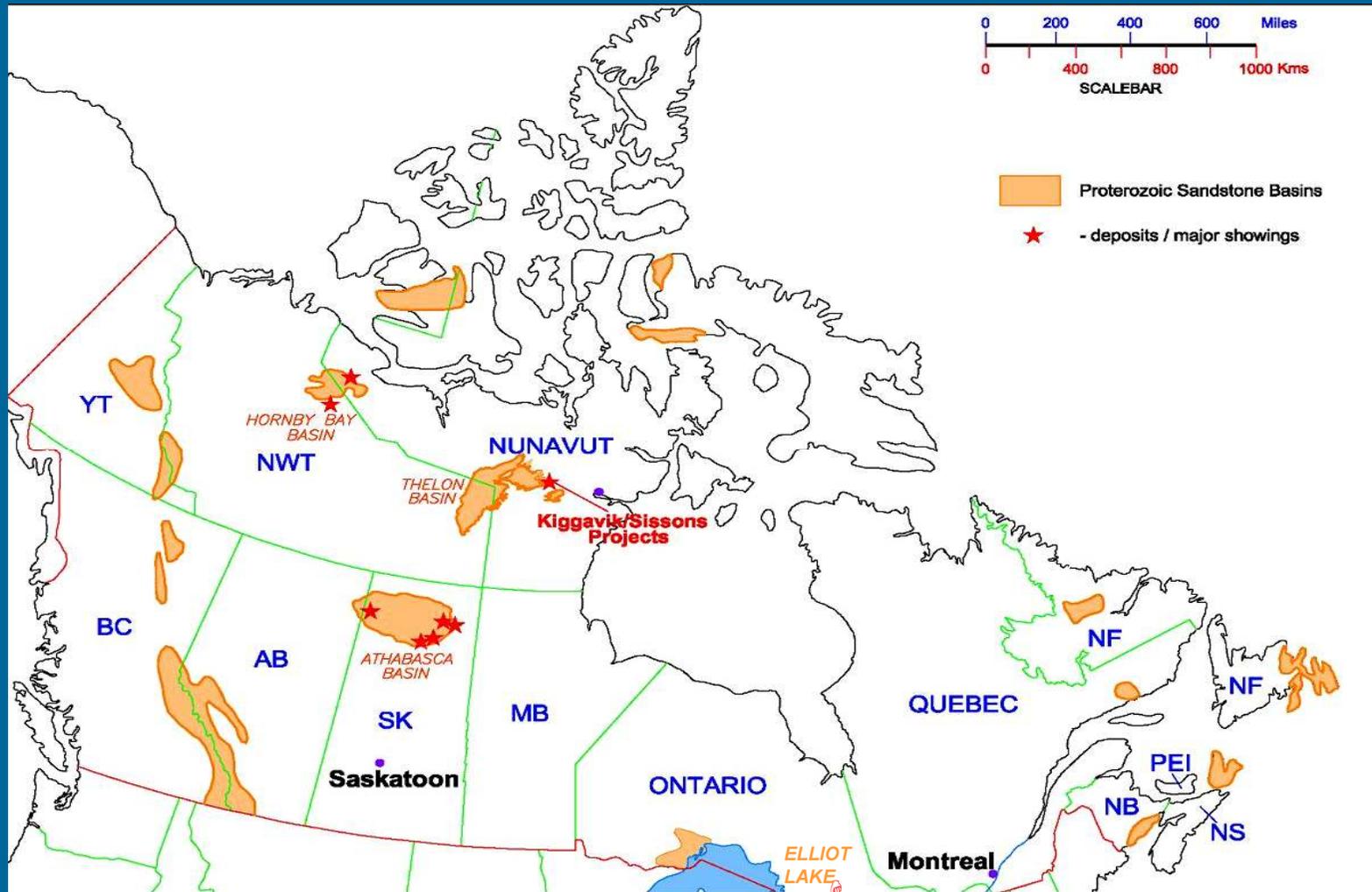
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Exploration Targets in Canada



New Canadian Mines

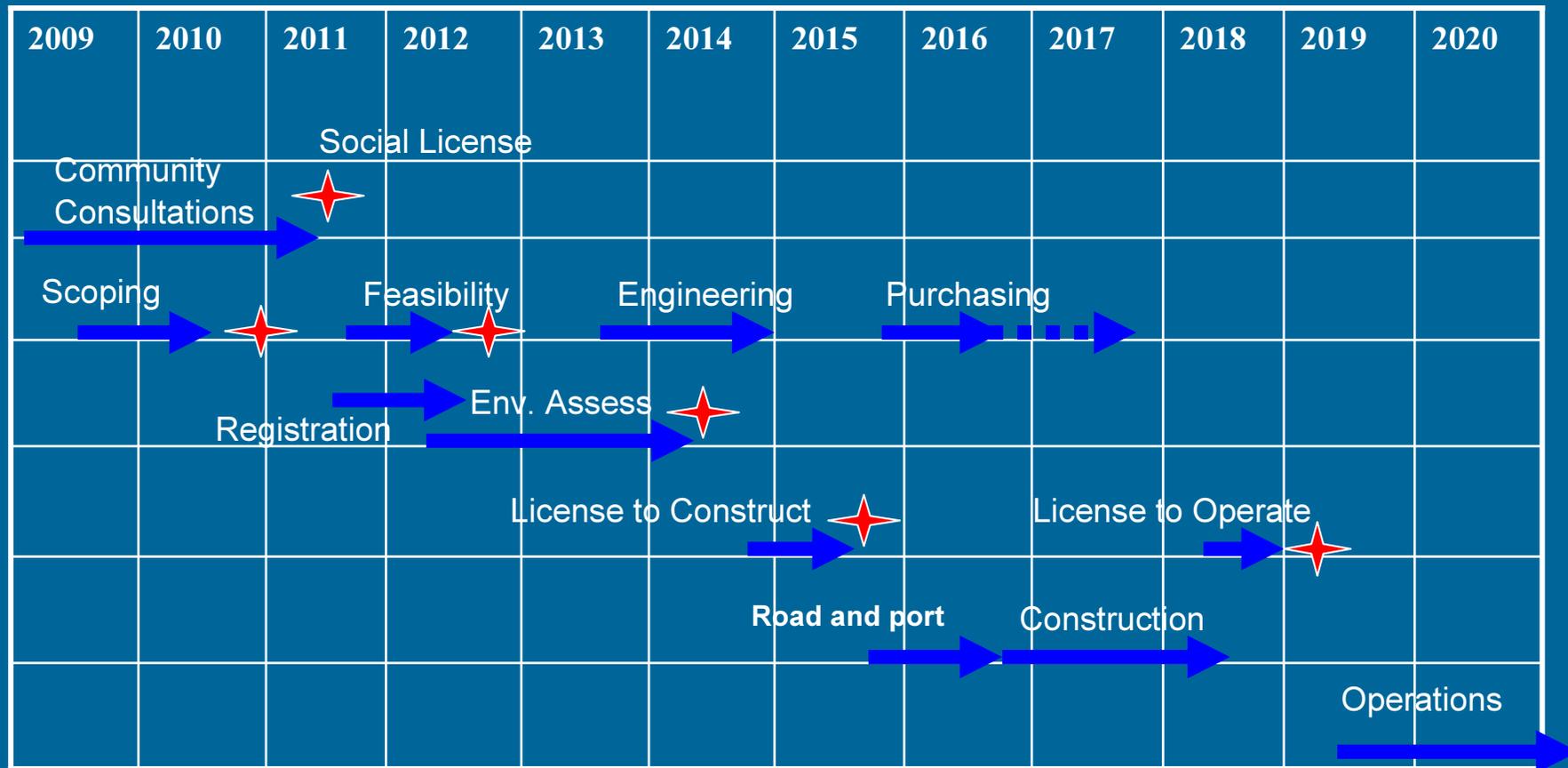


- Cigar Lake – prod'n in 2011
 - Discovered 1981
 - 18% U
 - 230 million lbs U_3O_8
- Other properties in EA process
 - Midwest - 4.6%U
 - Millenium – 3.8%U
 - Kiggavik – 0.23%U
- Other low grade properties

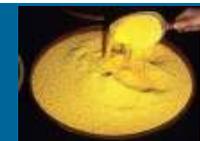
Impediments to U Mine Development in Canada

1. High Capital and Operating Costs
 - Geology - high grade deposits in “poor ground”
 - Remote locations
2. Very long lead times
3. Tightening performance expectations
4. Practices for high grade: challenging for lower grade
5. Withholding of social and political licenses

Fast Track - U Project Licensing



★ +ve decision



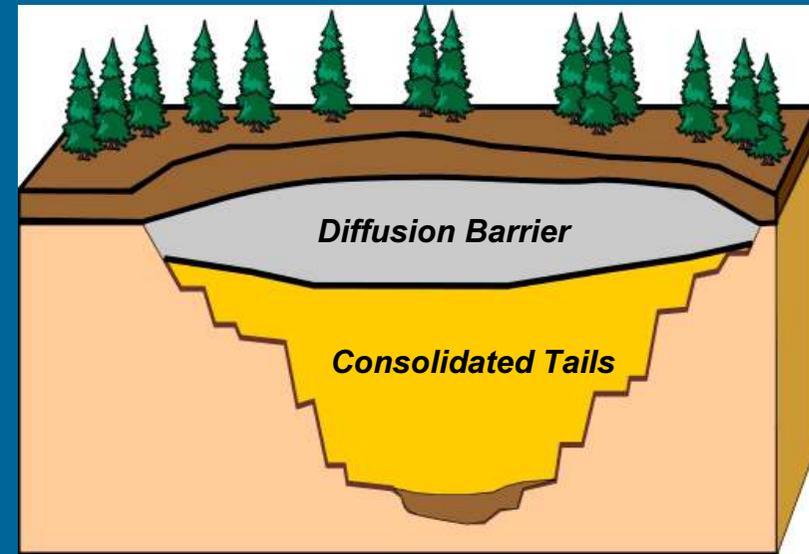
Key Reasons for Long Lead Times in Canada

- Multiple jurisdictions
 - Federal regulation; provincial/territorial, local, first nations approvals
- Sequential decision and licensing steps
 - Economic impacts
- Time to build experience and credibility by new players

Appropriate Technologies for High Grade Mines

- Remote mining methods
- In pit disposal of mineralised waste rock and tailings

In-pit Tailings Disposal



Challenging for low grade

Social License Restrictions U in Canada - 2009

- 3 Provinces, part 1 Territory – moratoria
- 3 Provinces – protest hindered exploration
- 1 Province – industry wary
- Province of Saskatchewan – steady progress
- Nunavut Territory – cautious progress



Public Opposition to U Resource Development

- Typically locally based with national, and international support
- Effective exploitation of public fear of exposure to radioactivity
 - Filtered images and info
 - Public rallies with children and cancer allegations
 - Well spoken advocates (a.k.a. “experts”)



Photo "Evidence of Danger"



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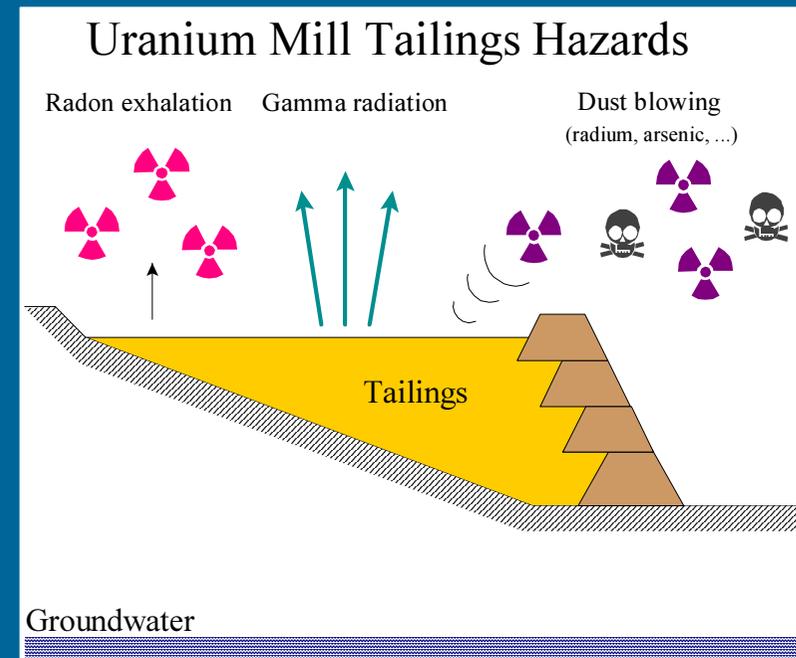
Exploitation of Fear of Radioactivity – an expanding activity

- Issues:
 - Historical miners' info
 - Old spills
 - “Clouds of radon”
 - No safe level of exposure
- TMI, Chernobyl
- Spent Fuel & Weapons
- DU

“All uranium ends up as

- Nuclear weapons,
- Plutonium,
- Radioactive waste, or
- Depleted U”

CCNR 2007



Exaggerations re radioactivity

- Uranium
- Radium 226
- Radon 222
- Polonium 210

“ each tonne of U extracted, $\text{Po}^{210} =$
18 tonnes HCN” - CCNR, 2008

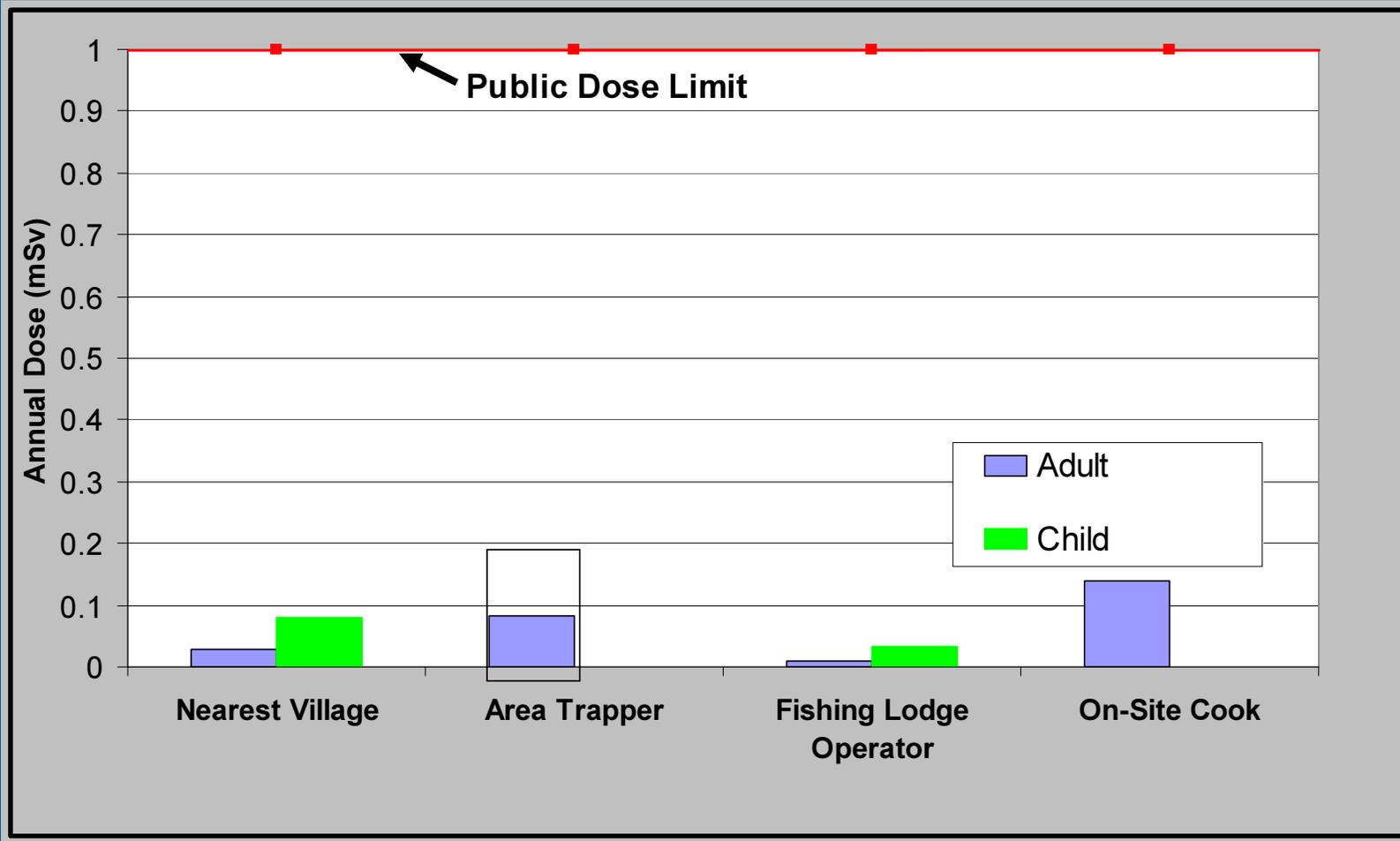


Evidence: Doses at and Near U Facilities are Very Low

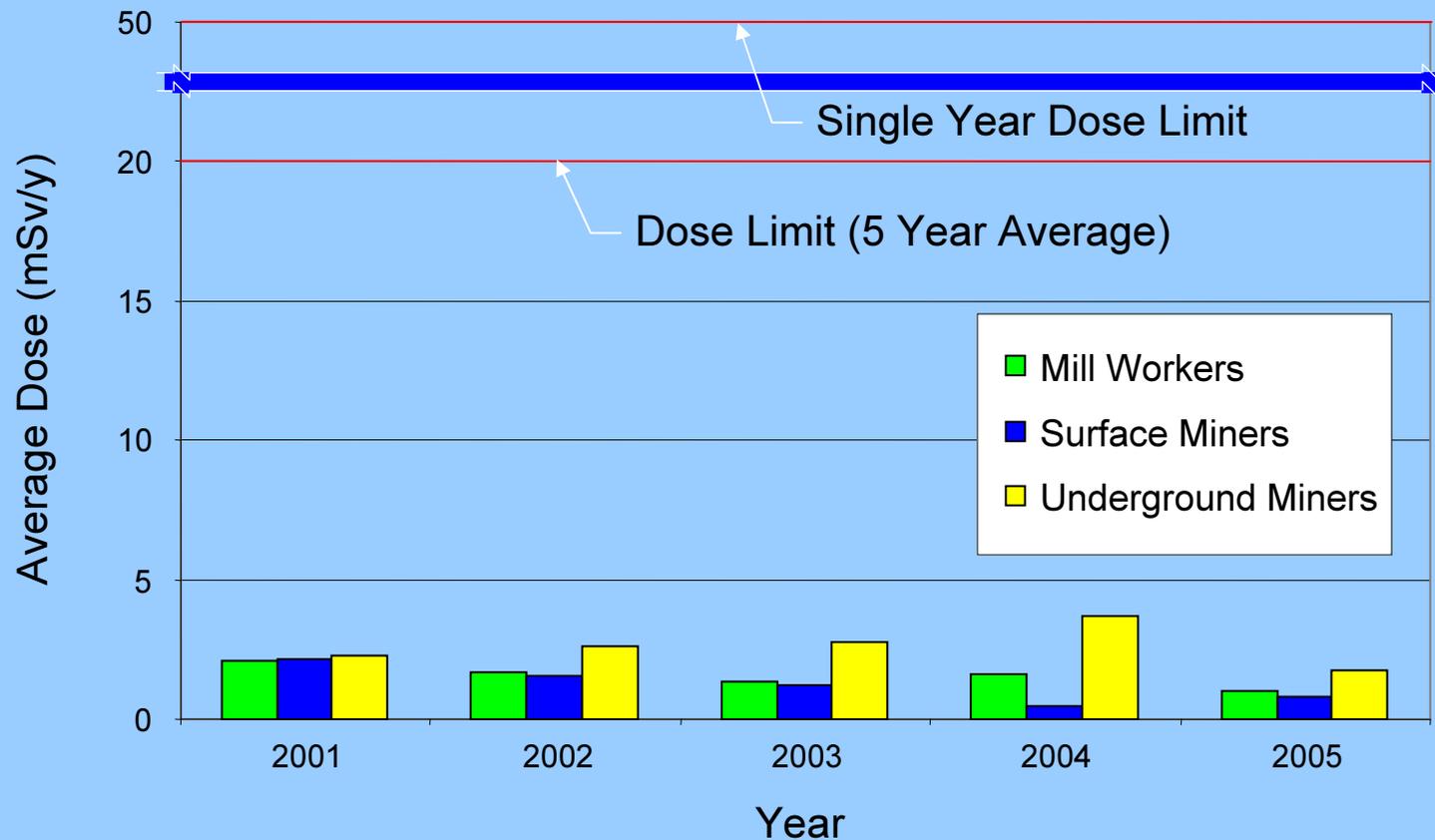
Source	Annual Dose (mSv/a)	Notes
Conventional Mine and Mill	0.05	NUREG 0706 and Chambers et. al, 1989
In Situ Leaching	0.005	Average of airborne releases for 3 nearest residences, NUREG 1508
Surface Workers	0.5	Canadian Data
Natural Background	3 2	U.S. average (NCRP 1987) Canada average

Public Doses

From U Mining and Milling in Canada



Average Annual Radiation Doses to Canadian Uranium Mine Workers



Note: Monitoring data from Health Canada National Dosimetry Services

Trend in U Resource Development

Canada

High Grade Resources

USA

➤ ISL Resources

Australia

➤ Byproduct and ISL



Kazakhstan

➤ ISL Expansion

Niger

➤ Low Grade Resource

Namibia

➤ Very Low Grade Resource

Why Protests Effective

- Radioactivity easy to exploit
- Protest methods/linkages
 - New media, blogs, personalities ..
 - Native peoples' issues
- Poor image of mining
- Poor general understanding of risk
 - Political and regulatory support typically weak
- Absence of credible, independent spokespersons who can inform public



...Other factors

Culture of Individuality: experts not to be trusted
e.g. – “intelligent design”, 9/11 conspiracies,
Da Vinci Code...

Counter Knowledge Entrepreneurs

“.. persons who may or may not believe their claims, but have an instinctive understanding how social epidemics work”

Thompson 2008

Brickbats

- Speculative exploration in sensitive and populated areas results in widespread, sustained opposition
 - Political activism
- Weak political support for NP on the global climate change issue

Bouquets

- 80% of Saskatchewan residents support U mining
- After firmly rejecting U mining 25 years ago, Inuit people now supporting responsible development

Recent Social Licensing Success

1. Extensive consultations with local people
2. Experts who can explain risks
3. Involvement of citizens from U producing areas
4. Visits to operating facilities
5. Patience: adequate time, financial and personnel resources by proponent

Crystal Ball

- Uranium production will match demand
- Local people will accept responsible development



Success in
Arctic

- Hard won support for expansion of U mining and electricity from nuclear energy

Thank You

