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A Five Year License Extension at Cameco's Uranium Conversion Facility? *Worsening Radioactive Stigma, New Security Problems, and the Threat of Intensifying Flooding for Port Hope*

Introduction

It is an honor to be asked by Families Against Radiation Exposure (FARE) to serve as their expert witness in this CNSC proceeding considering Cameco's application for a 5 year operations license extension at the Port Hope Uranium Conversion Facility.

In its Participant Funding Program Contribution Agreement, CNSC suggested the most relevant information I might present would "relate to the impact of radiological stigma, new security problems," and the worsening climate crisis and consequent risk of flooding in Port Hope. Thus, those are the three areas on which I will focus.

Regarding radioactive stigma, I rely on a comprehensive 2005 overview of many relevant issues published by Dr. Alan Marshall in the Department of Environmental Humanities at the School of Social Studies at Masaryk University in Brno, Czech Republic, entitled "Social Equity in Nuclear Waste Management." In that regard, radioactive waste facilities serve as representative for nuclear facilities in general, in terms of radioactive or nuclear stigma issues. Examining his findings, I then discuss relevant connections related specifically to Port Hope in regards to Cameco's present license extension application to CNSC. Finally, I also provide commentary regarding the State of Nevada's findings regarding radioactive stigma in the context of the Yucca Mountain radioactive waste dump proposal, and its integral radioactive waste shipping campaign proposals, again applying "lessons learned" to the present proceeding about Port Hope.

The radioactive stigma section is then followed by sections on new security threats to Cameco's Uranium Conversion Facility, and worsening climate crisis related flooding risks at Port Hope.

Worsening Radioactive Stigma

The primary definition of *stigma*, according to the *Random House Dictionary* (2011), is "a mark of disgrace or infamy; a stain or reproach, as on one's reputation." A second definition, from the medical field, is: "a mental or physical mark that is characteristic of a defect or disease," as with leprosy. The plural, *stigmata*, is most commonly associated with the Christian religious definition, "marks resembling the wounds of the crucified body of Christ, said to be supernaturally impressed on the bodies of certain persons, especially nuns, tertiaries, and monastics."

The health hazards associated with radioactivity in the public mind have been documented, through social science research, to lead to significant negative socio-economic nuclear stigma impacts. These include aversion to places associated with certain nuclear or radioactive waste activities or facilities, with consequent negative impacts in such sectors as real estate (decreased property values), tourism, and decisions about where to spend retirement years or to locate a business.

Port Hope, "the Little City of Bricks" (*Port Hope: A History*, by Ian Montagnes, Ganaraska Press, 2007) may be "the most beautiful little town in Ontario," but it has a radioactive stigma problem. A 5 year license extension at Cameco's Uranium Conversion Facility will worsen this.

News of radioactive soil, groundwater, and surface water contamination, as revealed at both the Uranium Conversion Facility's UF6 and UO2 plants in 2007 during the current five year license, served to deepen the radioactive stigma impacts suffered by Port Hope due to Cameco's ongoing operations. Cameco's leaks re-awakened concerns about radioactive contamination that have haunted Port Hope for many decades.

For example, Penny Sanger's *Blind Faith: The Nuclear Industry in One Small Town* (McGraw-Hill Ryerson Limited, 1981) documented the first several years of community trauma in the aftermath of the revelation of widespread radioactive and toxic chemical contamination throughout Port Hope, first revealed to the public in the mid-1970s. The first clear sign of trouble came at St. Mary's, when dangerously high radon levels were confirmed some 15 years after radioactive fill from Eldorado was used to build an extension onto the primary school (Sanger, p. 2).

However, certain individuals had tried to warn about the risks for many years, or even many decades, before that. Ironically, this included Dr. Marcel Pochon, the first manger of Eldorado's Port Hope radium refinery, who warned a Port Hope newspaper reporter in 1933 that "Radium is highly dangerous. The slightest fraction of a milligram taken into the system leads to cancer, anaemia, and disease of the hip bones. Not a doctor on earth can save the unfortunate person who is affected." Pochon even warned the *Port Hope Evening Guide* in 1933 that "Even the pitchblende, the tar-like substance from which the [radium] is derived, is dangerous because of the dust." (Sanger, pages 25-26)

Unfortunately, Eldorado did not heed the warning of its own founding Port Hope operations manager. Dumping of radiological and toxic chemical wastes by Eldorado at Welcome as early as the 1950s led to the death of cattle from arsenic poisoning of Brand's Creek, a tragedy repeated at Port Granby in years and decades to follow at Eldorado's dumpsite in that farming area. While Eldorado's 1950s-era "solution" to the poisoning of Brand's Creek

amounted to "dilution" into Lake Ontario via a pipe, its leaking wastes simply flowed directly from the Port Granby dump into the Great Lakes. But then again, Eldorado had previously simply dumped uranium directly into Port Hope Harbour when it ran out of room for its mounting wastes. As documented by the Nuclear Awareness Project of Oshawa, Ontario in its supplement to "Nuclear Awareness News" Winter 1990-91 edition, the "Great Lakes Nuclear Hot Spots" map, such "waste management" practices contributed to causing "uranium levels in the local harbour to be 30 times higher than the ore mined at Elliot Lake." (map viewable online at http://www.flickr.com/photos/badheartbull/4418881368/sizes/o/).

An elderly local farmer could not abide the poisoning of Brand's Creek, the ruination of his family's cherished farmland, and the risks to his neighbors downstream, and killed himself soon after Eldorado ran its radioactive waste disposal pipeline from Welcome into Lake Ontario.

Ironically, problems with the Welcome dump pipeline into Lake Ontario have persisted for well over half a century. On Sunday, September 19, 2010 – for the second time – a new 4 inch diameter waste discharge pipeline surfaced in Lake Ontario, after having been installed in 2009. In fact, the pipeline surfaced 3 times in just the first year.

Such discharges from such waste discharge pipelines in and around Port Hope continue to raise alarms. For example, arsenic at two and a half times the concentration of CDWG Guidelines has been documented being discharged out a radioactive waste dump pipeline into Lake Ontario in the Municipality of Port Hope. Uranium has also been documented being discharged at an order of magnitude higher than allowed under the CDWG Guideline (Caduceon Environmental Laboratories, Peterborough, Ontario, Date Received 23-Jun-08, Date Reported 27-Jun-08, Sample Matrix Surface Water, Job/Project No. Ganaraska River, "Nuclear Dump Pipeline," Report Number B08-19236).

Just a year after *Blind Faith* was published, Eldorado suffered a dramatic fire, on December 21, 1982. Nuclear Awareness Project listed it, complete with a photograph, as one of the more infamous nuclear-related accidents in the Great Lakes Basin on its "Nuclear Hot Spots" wall map mentioned above.

More recently, in 2004, yet another elementary school in Port Hope was revealed to have severe radon contamination levels, due to the use of Eldorado radioactive fill in its foundations. As related by Pat McNamara in the Introduction his 2009 book Nuclear Genocide in Canada, "My involvement began in 2004 when I found out my daughters' elementary school in Port Hope Ontario was built on radioactive waste. In 1978, the Canadian Government found radon levels under the kindergarten and gymnasium 125 times higher than the allowable level. They covered up these test results and allowed children to be taught in the school for the next 28 years to avoid the cost of cleaning it up and the bad publicity that would follow." Such an episode is very shocking. Not only had a similar situation led to immediate action at St. Mary's elementary school in 1975, but radon, of course, is a leading cause of lung cancer, which often proves fatal to those who are diagnosed with it. It is also well documented that children are more vulnerable than adults to radioactivity's hazards. (see, for example, the Institute for Energy and Environmental Research's "Healthy from the Start" Campaign to Include Women, Children, and Future Generations in Environmental Health Standards, posted online at http://www.ieer.org/campaign/index.html)

I mention these few episodes just to point out that the people of Port Hope have long suffered radiological traumas in the shadow of first Eldorado's -- and now Cameco's -- operations for generations already. Another five years of operations at Cameco's Uranium Conversion Facility will exacerbate the radioactive stigma yet further, not to mention add to the accumulating burden of hazardous radiological and toxic chemical exposures borne for so long already by Port Hope residents.

When it comes to Port Hope's radioactive stigma, a license extension at Cameco's Uranium Conversion Facility cannot be easily extracted and isolated from other current, and even historical, nuclear and associated radioactive waste activities. Beginning in 1988, with the formation of Cameco from the Crown Corporations Eldorado Nuclear (federal) and the Saskatchewan Mining and Development Corporation (SMDC, provincial), uranium conversion operations were later added to by Cameco's take over of Candu fuel pellet and fuel bundle fabrication in Port Hope at Zircatec Precision Industries, just a few miles from Cameco's Uranium Conversion Facility. And these are but current activities, superimposed on a legacy of cumulative radioactive contamination caused by Eldorado Nuclear's private (1932-1944) and federal (1944-2008) radium extraction (1933-1954) and uranium refining (1942-1954) and later uranium processing and conversion (to the present day) activities for both military and commercial purposes. (dates documented in "Chronology: 1932 to 2001," Port Hope Area Initiative, *Tour Guide*, page 4 of 49, undated)

In a very real sense, Eldorado's haphazard dumping of radioactive wastes throughout Port Hope, Welcome, and Port Granby into the 1950s lives on. The $260 million (an amount likely to increase) Port Hope Area Initiative, managed by Atomic Energy of Canada Limited, is but the latest manifestation of efforts attempting to contain (*correct* is too strong and optimistic a word) mistakes first made three generations ago. Even "clean up" efforts in Port Hope, important and vital as they are, threaten to exacerbate radioactive stigma. In addition, they will merely shift radioactive risks to a "new" dumpsite on top of an old dumpsite in Welcome, both of which rely on radioactive discharges, by design, via pipeline into Lake Ontario – the drinking water supply for nearly 10 million people downstream in Ontario, Quebec, New York, and a large number of Native American First Nations. Contaminated site remediation throughout the Port Hope area, radioactive truck shipments to the new proposed long-term radioactive waste management sites in Welcome and Port Granby, and the PHAI's related "dust control program," are aspects of this old/new, re-awakened concern. (PHAI, Plan: Dust Management Requirements and Plan, Port Hope Area Initiative, 4500-509200-PLA-001, Revision R0, 2011 August, AECL)

Port Hope's radioactive stigma is exacerbated by additional nuclear sites in the nearby vicinity. These include Eldorado's historic, leaking Port Granby dump on the Lake Ontario shoreline, Ontario Power Generation's (OPG) 4 Candu atomic reactors at Darlington (with yet more, additional new reactors targeted at the same site), and 8 more aged OPG Candus not much further west, at Pickering. Yet another, highly controversial nuclear activity – this time on the waters of Lake Ontario – is Bruce Power's proposed shipment of 16 radioactive steam generators from Owen Sound, Ontario, via the Great Lakes, including Lake Ontario, bound for Sweden. While these surrounding radioactive stigma impacts add to Port Hope's burden, operations at Cameco's Uranium Conversion Facility from 2012 to 2017 remain at the heart of the problem.

Ongoing emissions of uranium into air (in addition to uranium contamination in soil, groundwater, and Lake Ontario) will add to a "body burden" already borne by Port Hope

residents for generations. Toxic chemical-radioactivity synergistic effects, as warned about by Rachel Carson in her classic *Silent Spring* in 1962, continue with Cameco's proposed emissions of uranium and fluorides from its UF6 plant stacks, as well as uranium and ammonia from its UO2 Plant stacks, into the air above Port Hope. (Table 6, "Average Daily Stack Emissions Monitoring Results," show 2011 results as of June 30, 2011 at Cameco's Uranium Conversion Plant, as documented at p. 40 of "Application by Cameco Corporation for Renewal of Class IB Nuclear Fuel Facility Operating License for Port Hope conversion Facility in Ontario," Public Hearing, Day One, Scheduled for 03 November 2011, Request for a Licensing Decision Regarding A License Renewal, Submitted by CNSC Staff, 03 October 2011, CMD 11-H16, E-DOCS # 3726518 and 3767701).

Although CNSC Staff assures "Air emissions are well below limits," ("Environmental Protection – Uranium Annual Average Air Emissions," Cameco Port Hope Conversion Facility, Port Hope, Ontario, License Renewal, Public Hearing Day One, November 03, 2011, CMD 11-H16, CNSC Staff Directorate of Nuclear Cycle and Facilities Regulation, CNSC Staff Power Point, p. 19-20, E-DOCS-#3813495), a resulting harm to health greater than zero cannot be ruled out. CNSC's regulatory limits should not be construed as "safe." They are deemed "allowable" or "permissible," but not absolutely "safe." They are based on a cost (to public health)/benefit (to Cameco) analysis performed and approved by CNSC.

However, the U.S. National Academies of Science (NAS) has, for decades, affirmed that any exposure to radioactivity, no matter how small, still carries a health risk of cancer, and that these risks accumulate over a lifetime. The higher the dose, the higher the risk. However, even extremely low doses still carry a health risk. NAS re-affirmed this "linear, no-threshold" finding in the 7th iteration of its "Biological Effects of Ionizing Radiation," published in 2005 (see Nuclear Information and Resource Service press release entitled "All Levels of Radiation Confirmed to Cause Cancer," dated June 30, 2005, posted online at http://www.nirs.org/press/06-30-2005/1). To make matters worse, NAS reported in BEIR VII that a "supra-linear" relationship at very low doses seems to exist. That is, at very low doses, radiation seems to cause disproportionately high health damage, per unit dose. These are the very types of exposures faced in Port Hope.

As if that was not enough already, Cameco engages in "disposing" of radioactively contaminated ammonium as fertilizer for farm fields, as well as "recycling" radioactively contaminated metals into daily use products, both of which then dose unsuspecting consumers. Port Hope residents' radiation and toxic chemical exposures due to Cameco are multiple, and the harm they inflict will continue to accumulate during the 5 year license extension. (Section 1.1.6, Process Description, in "Application by Cameco Corporation for Renewal of Class IB Nuclear Fuel Facility Operating License for Port Hope conversion Facility in Ontario," Public Hearing, Day One, Scheduled for 03 November 2011, Request for a Licensing Decision Regarding A License Renewal, Submitted by CNSC Staff, 03 October 2011, CMD 11-H16, E-DOCS # 3726518 and 3767701, p.11) Section 3.11.2, Discussion, of this same document (p. 50) states:

> "An ammonium nitrate by-product solution is produced in the production of UO2. The solution is treated to reduce uranium and radium to levels less than 10 mgU/L and 370 mBq/L, respectively. After being analyzed for uranium and radium to ensure compliance with above noted CNSC requirements, this material is released to a local agricultural supply company for use as a fertilizer…Scrap metals are

> decontaminated to comply with the CNSC's unrestricted release criteria and then released to metal recyclers or stored on-site."

Again, CNSC allowing or permitting such "below regulatory concern," "free release" levels of radioactive contamination in fertilizer for growing food for human consumption, and in metals for recycling into daily use items, cannot be said to be absolutely "safe." Health damage from such radiation doses suffered by unsuspecting consumers of the contaminated products cannot be ruled out. Such "recycling" of radioactive materials is unacceptable, and should be prohibited. It appears to be a long-running, ongoing attempt by the nuclear establishment in government and industry to save money on radioactive waste disposal costs, despite the risk to human health, by treating contaminated materials as if they are not radioactive at all. Such practices in the U.S. are documented in Diane D'Arrigo of Nuclear Information and Resource Service's 2007 report *Out of Control, On Purpose: DOE's Dispersal of Radioactive Waste into Landfills and Consumer Products* (posted online at http://www.nirs.org/radwaste/outofcontrol/outofcontrol.htm).

Most ironically, given their significance, Cameco's license extension application materials, and the Canadian Nuclear Safety Commission Staff's review materials of that application, do not discuss these various radioactive stigma impacts discussed above. They should, in depth.

Dr. Alan Marshall's "Social Equity in Nuclear Waste Management"

The social science literature about radioactive stigma is quite extensive. Dr. Alan Marshall in the Department of Environmental Humanities at the School of Social Studies at Masaryk University in Brno, Czech Republic in 2005 published an enlightening English language overview of radioactive stigma issues entitled "Social Equity in Nuclear Waste Management." Marshall reviews social science literature concerning siting decisions about radioactive waste dumps and other nuclear power industry facilities in numerous countries around the world. Lessons learned are applicable to the present application by Cameco to extend operations at its Uranium Conversion Facility, especially in the broader context of historic radioactive contamination of Port Hope. (Note, Marshall includes a full list of references, included in the attached copy of his article. However, as I discuss various social science studies below, I was cite them for clarity.)

Tellingly, reflecting its overarching importance, Marshall opens his piece with a section entitled "Nuclear Stigma." He cites work (Slovic, P., Layman, M., and Flynn, James, 1993, Perceived risk, trust and nuclear waste: Lessons from Yucca Mountain. In R.E. Dunlap, M.E. Kraft, and E.A. Rosa, Editors, Public reactions to nuclear waste. Durham, NC: Duke University Press) describing radioactive waste as "the top neighbor from hell," ranking worse than oil refineries, chemical plants, garbage dumps, and even atomic reactors as most undesirable to live near (although education about the on-site storage of large amounts of both high-level and so-called "low" level radioactive wastes, not to mention "routine" radioactivity and toxic chemical releases into the environment from daily operations at nuclear power plants, could enlighten the

public to those hazards as well; these very issues are relevant, as a dozen OPG Candu reactors operate nearby, and upwind, generating vast amounts of radioactive waste, much of it stored onsite).

No matter the attitude of workers and neighbors to atomic facilities in what Marshall dubs "nuclear oases" (communities where the nuclear power industry maintains a strong hold, despite declining prospects for, and popularity of, the industry internationally), "the mental stress of living close to a nuclear site" nonetheless impacts such decisions as whether or not to buy a new home, or locate a business, in a community that also hosts nuclear facilities, particularly ones burdened by radioactive contamination and radioactive waste storage and/or disposal facilities (Dunlap, R.E., Rosa, E., Baxter, R., and Mitchell, R., 1993, Attitudes toward siting a high-level nuclear waste repository at Hanford, Washington. In R.E. Dunlap, M.E. Kraft, and E.A. Rosa, Editors, *Public reactions to nuclear waste*, Durham, NC: Duke University Press; Edelstein, M.R., 1988, *Contaminated communities: The social and psychological impacts of residential toxic exposure*, Boulder, CO: Westview Press).

Marshall extends nuclear stigma to a moral dimension, pointing out connections in the public mind between nuclear power and nuclear weapons, as in terms of radioactive waste management facilities. Of course, Cameco's Uranium Conversion Facility does inherit a major nuclear weapons connection, due to Eldorado Nuclear's central involvement in the Manhattan Project in the 1940s, and the nuclear arms race after that. In addition, Cameco's work with depleted uranium (DU) adds to this stigma, given the raging international controversy that began in 1991 when it was revealed that the U.S. military had used large quantities of DU weapons in the Persian Gulf War against Iraq.

Marshall points out economic impacts of radioactive stigma, such as business reluctance to set up shop near radioactive waste or nuclear facilities for fear their products and/or services will suffer negative stereotyping by association in the public mind (Great Britain, Parliament, House of Lords, Select Committee on Science and Technology, 1999, *Management of nuclear waste*, London: Stationery Office, p. 43).

Marshall recounts the experiences of Texas and Washington in the 1980s, when the U.S. Department of Energy's (DOE) site search for a high-level radioactive waste dumpsite threatened those western states' agricultural sectors with nuclear stigma in Deaf Smith County (an organic grain, as well as cattle, center) and Richland (a fruit and wine center), respectively. Nevada, of course, has suffered the risk of such radioactive stigma much longer and more intensely (in various economic sectors, including tourism and agriculture), in that the "Screw Nevada" Act of 1987 singled out Yucca Mountain as the only site to continue to be considered for a high-level radioactive waste dump, up until the Obama administration's cancellation decision in 2009-2011. (Brody, J.G., and Fleishman, J.K., 1993, Sources of public concern about nuclear waste disposal in Texas agricultural communities, in R.E. Dunlap, M.E. Kraft, and E.A. Rosa, Editors, Public reactions to nuclear waste, Durham, NC: Duke University Press, p. 117; Slovic, P., and Flynn, J.H., 1991, Perceived risk, trust and the politics of nuclear waste, *Science*, 254 (5038), 1603-1607; Easterling, D., and Kunreuther, H., 1993, The vulnerability of the convention industry to a high-level nuclear waste repository, in R.E. Dunlap, M.E. Kraft, and E.A. Rosa, Editors, Public reactions to nuclear waste, Durham, NC: Duke University Press; Easterling, D., and Kunreuther, H., 1995, *The dilemma of siting a high-level nuclear waste repository,* Boston: Kluwer, p. 137).

Marshall documents that radioactive stigma swirls around public fears of nuclear power or radioactive waste accidents (Rosa, E.A., Dunlap, R.E., and Kraft, M.E., 1993, Prospects for public acceptance of a high-level nuclear waste repository in the United States: Summary and implications, in R.E. Dunlap, M.E. Kraft, and E.A. Rosa, Editors, Public relations to nuclear waste, pp. 291-328, Durham, NC: Duke University Press; Easterling and Kunreuther, 1995), combined with a fear that nuclear authorities and radioactive waste managers will invoke secrecy to conceal the true risks of such accidents (Flynn, J.H., Slovic, P., Mertz, C.K., and Toma, J., 1990, Evaluations of Yucca Mountain: Survey findings about attitudes, opinions, and evaluations of nuclear waste disposal and Yucca Mountain, Nevada, Carson City, NV: (State of) Nevada Nuclear Waste Project Office). The Fukushima nuclear catastrophe, which began on March 11, 20011 but is yet unfolding, can be expected to deepen such dynamics of distrust, suspicion, and fear globally, including regarding ongoing operations at Cameco's Uranium Conversion Facility in Port Hope.

Marshall's section on "nuclear oases" is most interesting, vis a vis Port Hope. Marshall points out that in the "pre-radioactive stigma era" (up until the late 1960s), communities competed with one another to host nuclear facilities, generally unaware of nuclear risks, and hopeful to land what was then regarded as an advanced and prestigious technological industry, not to mention hopeful to win the jobs and revenues it would generate. However, as nuclear stigma has grown over the past half century, the nuclear industry has experienced a gradual but pronounced decline in prospects. While growing numbers of communities prefer to avoid stigmatized nuclear activities, those that have hosted them for many decades tend to still cling to the old illusions, despite growing, sobering evidence to the contrary.

The originator of the phrase "nuclear oases," U.K. social scientist Andrew Blowers, defines the concept as peripheral communities, tending to be remotely located, economically and politically marginalized, and environmentally degraded. Blowers lists Sellafield in the U.K., Hanford in Washington State, Dounreay in Scotland, and La Hague in France as examples. Cameco's various facilities in Port Hope, including the Uranium Conversion Plant, are somewhat of an exception to the rule, in that Port Hope is by no means remote, located just 100 km from Toronto, although the radioactive contamination criteria is certainly applicable. But in that regard, the numerous nuclear facilities in the eastern Greater Toronto Area (Pickering nuclear power plant, Darlington nuclear power plant, Port Hope nuclear facilities, etc.) can be regarded as a linear "nuclear oasis," hugging the Lake Ontario shoreline. (Blowers, A., Lowry, D., and Solomon, B.D., 1991, The International politics of nuclear waste, London: Macmmillan; Blowers, A., 1999, Nuclear waste and landscapes of risk, Landscape Research, 24(3), 241-263).

Blowers (1999, p. 242) argues that such "nuclear oases" are intensely localized areas of nuclear activity, as Marshall puts it, "the last strongholds of economic and technical survival against a changing world." However, burdened with such stigmas as radioactive contamination, such communities represent "a relatively stable locational pattern as a declining industry is resisted in all but the nuclear oases." Of course, such resistance does also exist within Port Hope itself, too, as it has for many decades. The successful resistance, just several years ago, against Cameco's proposal to dabble in "Slightly Enriched Uranium" (SEU) is a recent example.

Marshall cites Easterling and Kunreuther's (1995) observation that nuclear activities tend to concentrate in such strongholds, due to local dependence on jobs/paychecks and municipal/county tax revenues. A related "circle the wagons" mentality develops in such

communities against "anti-nuclear protest" – concerns about health risks due to radioactivity exposure, for example. (Blowers, 1999) Marshall notes that such contradictory forces within communities can create deep schisms.

Aborted attempts to "park" large quantities of high-level radioactive waste on Native American reservations are a case in point. First at the Mescalero Apache Indian Reservation in New Mexico (downwind of the first atomic blast in human history at Alamogordo in July, 1945, by the way), then at the Skull Valley Band of Goshutes Indian Reservation in Utah, repeated attempts (by the U.S. Department of Energy's "Nuclear Waste Negotiatior" as well as by a private nuclear power industry consortium called Private Fuel Storage, LLC) from the late 1980s to the present day have created deep divides between pro-dump and anti-dump factions within the tribal communities. Thus far, anti-dump efforts, led by traditional Native American leaders like Rufina Marie Laws at Mescalero Apache, and Margene Bullcreek at Skull Valley Goshutes, have blocked the opening of the proposed "centralized interim storage" parking lot dumps for 40,000 metric tons of irradiated nuclear fuel, nearly two-thirds of what exists in the U.S. Even though no radioactive waste has arrived on the reservations, the community is none the less traumatized: the deep divisions will take a very long time to heal. These tragic episodes show the environmental injustice of targeting low income, people of color communities for hazardous facilities, in this particular case, the radioactive racism of targeting Native American communities for de facto permanent surface storage of high-level radioactive waste. These particular communities did not even have established nuclear power industries on their reservations, but were none the less susceptible due to their economic and political vulnerabilities. But, as Serpent River First Nation Council Member and environmental expert Keith Lewis said (referring to uranium mining at Elliot Lake), "There is nothing moral about buying out somebody who is starving." (*This Is My Homeland: Stories of the effects of nuclear industries by people of the Serpent River First Nation and the north shore of Lake Huron*, Edited by Lorraine Rekmans, Keith Lewis, and Anabel Dwyer, a publication of Serpent River First Nations, 1998, 2003, p. 8; see also the various documents posted under "Private Fuel Storage Targets High-Level Radioactive Waste Dump at Skull Valley Goshute Indian Reservation, Utah" at http://www.nirs.org/radwaste/scullvalley/skullvalley.htm, especially the 2005 "History of Targeting Native American Communities with Atomic Waste Dumps" and "Skull Valley Goshutes/PFS Timeline" and the February 2001 "Environmental Racism, Tribal Sovereignty, and Nuclear Waste").

Marshall also cites work (Wynne, B., 1996, Misunderstood misunderstandings: Social identities and public uptake of science, in A. Irwin and B. Wynne, Editors, *Misunderstanding science: The public reconstruction of science and technology*, Cambridge, MA: Cambridge University Press) regarding the Sellafield nuclear complex in the U.K., which reported that Cumbrian farmers nearby:

> …recognized their own indirect and sometimes direct social dependency upon the Plant—not only neighbors, but also close relatives of the hill farmers worked there. Thus, underlying and bounding their expressed mistrust of the authorities and experts, there was a countervailing deep sense of social solidarity and dependency—social identification with material kinship, friendship, and community networks ***which needed to believe that Sellafield was well controlled and its surrounding experts credible.*** (p. 37; emphasis added)

This, despite the strong evidence to the contrary. A watchdog group – Cumbrians Opposed to a Radioactive Environment (CORE) -- coalesced despite it all, having grown out of a local support group for families with children afflicted with leukemia, looking for the reasons why. CORE uncovered and revealed that Sellafield, among other things, had discharged a whopping 1,000 pounds of ultra-hazardous plutonium into the Irish Sea from its irradiated nuclear fuel reprocessing plant over the course of decades. By earlier this decade, the U.K. government had documented plutonium in children's teeth, out to hundreds of miles downstream. Sellafield still denied involvement, blaming atmospheric bomb test fallout instead. However, the concentration levels of plutonium dissipated with distance from Sellafield, implicating it, not bomb test fallout, as the primary culprit.

But nuclear and radioactive risks, by their very nature, attract attention not just locally, but even from surrounding urban centers and wide areas. Marshall documents this for France (Buclet., N., and Bouzidi, Y., 2003, Confidence, actor's beliefs and transparency: The case of ANDRA, in K. Andersson, Editor, *Valdor 2003*, *Values in decisions on risk: Proceedings*, pp.160-168, N.p.), the U.K. and U.S.A. (Blowers, Lowry, and Solomon, 1991), and Sweden (Sjolander, A., 2003, The nuclear waste discourse in Mala: A truth-seeking practice, in K. Andersson, Editor, *Valdor 2003*, *Values in decisions on risk: Proceedings*, p. 169, N.p.).

Over three decades (1978 to the present) of large-scale protests against radioactive waste transportation and storage in Gorleben, Germany could also be cited. In fact, the Gorleben protests significantly contributed to the political pressure that led to the pro-nuclear, Conservative Merkel administration's decision to phase out nuclear power nationwide by 2022 in the immediate aftermath of the beginning of the Fukushima nuclear catastrophe last spring.

Another example is the decades-long involvement of Great Lakes United (GLU), a coalition of Canadian, U.S., and Native American/First Nations environmental groups in nuclear and radioactive waste matters throughout the Great Lakes Basin, including on Port Hope matters. I have served on the GLU Nuclear-Free/Green Energy Task Force for over a decade.

But even amidst "nuclear oases," resistance to atomic facilities and radioactive activities can be deeply rooted. Marshall writes "Of course, not all people living in nuclear oases may be there because they work for the nuclear industry, and some within the industry may themselves be quite critical of it." (p. 4) In fact, certain families within the Port Hope area have remained actively opposed to the various nuclear activities of Eldorado, and now Cameco, for well over 50 years. After all, their families were there first – in some cases, since the 18th century. And as documented in *Blind Faith* (p. 37 and following), Dr. Douglas Andrews, founder of the nuclear engineering program within the chemical engineering department at the University of Toronto, a member of an early reactor design team in the U.K., was among the first to warn Port Hope residents and municipal officials -- and the federal authorities pledged to protect public health and safety -- about the dangers of radioactive contamination emanating from Eldorado in their midst. His tireless efforts began in 1966, and continued for a very long time thereafter.

Marshall's discussion of "Regional Justice" is also relevant to Port Hope. As the Port Hope Area Initiative documents in its "Chronology: 1932 to 2001" (Port Hope Area Initiative, *Tour Guide*, page 4 of 49, undated), from 1988 to 1996, a Siting Task Force invited all Ontario municipalities to consider hosting a long-term management facility for the Port Hope area's so-called "low-level" radioactive wastes, "but no agreement [was] reached." Unsurprisingly, given radioactive stigma, other Ontario communities did not wish to share Port Hope's burden.

Historic wastes and contamination from "clean up" and "remediation" under the PHAI Plan were instead targeted at the "nuclear oasis" itself, at "new" dumpsites within the Municipality of Port Hope – just inland from the old, leaking Port Granby dumpsite in Clarington, and on top of and beside the old, leaking Welcome dumpsite.

However, the Greater Toronto Area's nuclear establishment (as at OPG, CNSC, etc.) is very active attempting to "re-locate" much of its radioactive waste (at Pickering and Darlington nuclear power plants' dozen reactors just east of Toronto, and just west of Port Hope) onto another, more remote "nuclear oasis" – at Bruce Nuclear Complex on Ontario's Lake Huron shore. The Deep Geologic Repository (DGR, or, more aptly, DUD, for Deep Underground Dump, according to Dave Martin of Greenpeace Canada) for all of Ontario's so-called "low-level" and "intermediate-level" radioactive wastes would provide a "final resting place" for such materials from 20 of Canada's 22 reactors, raising the specter that the two additional reactors (at Point Lepreau, New Brunswick and Gentilly, Quebec) might simply get "lumped in" in the end, making the DUD a national "low" and "intermediate" level radioactive waste dump. The problem is, the proposed dumpsite is just one kilometer (about a half mile) from the Lake Huron shore, raising the specter of radioactive leaks into the drinking water supply for many tens of millions of people downstream in the U.S., Canada, and a large number of Native American First Nations on both sides of the "border." As more and more of those people downstream, including those in Michigan just 50 miles across Lake Huron from Bruce, learn about the proposal, popular resistance to the proposal will surely intensify.

Adding to the risks, the community of Saugeen Shores near Bruce, also on the Lake Huron shoreline, has volunteered for consideration as a high-level radioactive waste repository. Although most targeted communities for the high-level radioactive waste dump or dumps continues to be further north in the Canadian Shield, especially in First Nations areas, Saugeen Shore's volunteering fulfilled the fear of many, that the nuclear utilities' Nuclear Waste Management Organization (NWMO, charged with finding a high-level radioactive waste dumpsite in Canada) taking charge of the DUD proposal would mean its "evolution" from "only" a "low" and "intermediate" level radioactive waste dump for Ontario into a "low," "intermediate," and "high" level radioactive waste dump, centered in the Bruce Nuclear Complex "nuclear oasis," for *all* of Canada's homeless radioactive wastes. The radioactive stigma already growing around such proposals is reflected in the common usage of the phrase "Yucca Mountain in the heart of the Great Lakes" to refer to the snowballing radioactive waste dump proposals at Bruce. For a decade now, of course, Cameco has been a major partner in the business partnership scheme at the Bruce Nuclear Complex. Also, the UO2 Cameco converts at Port Hope, and fabricates into nuclear fuel pellets and bundles in Port Hope, is turned into irradiated nuclear fuel/high-level radioactive waste at its own Bruce reactors, as well as at the other Candus in the Greater Toronto Area, in Quebec, and in New Brunswick.

Marshall notes that such "east dumping on west" schemes to exploit sparsely populated states like Nevada and Utah for high-level radioactive waste dumps have given rise to cries of regional inequity or injustice (Dunlap, Rosa, Baxter and Mitchell, 1993; Fahys, J., 2003, March 11, Skull Valley plan rejected, *Salt Lake Tribune*). Governors of those states have argued that having no reactors themselves, Nevada and Utah should not have to host the worst radioactive wastes from Eastern states' reactors (Gerrard, M.B., 1996, *Whose backyard, whose risk: Fear and fairness in toxic and nuclear waste siting*, Cambridge, MA: MIT Press). However, it should

be pointed out that both the Yucca Mountain dumpsite and the Private Fuel Storage "parking lot" dumpsite are targeted specifically at Native American lands – Western Shoshone Indian sacred land, guaranteed by treaty rights, and the reservation of the Skull Valley Goshutes Indian Band, respectively, as discussed above. Thus, the proposals are also manifestations of environmental injustice, or, in other words, radioactive racism.

In "The Promise of Employment," Marshall documents that more and more communities offered jobs by the nuclear industry as an antidote to the inherent radioactive stigma (Wilson, L.M., 2000, *Nuclear waste: Exploring the ethical dilemmas*, Toronto, Ontario: United Church Publishing House, p. 40; International Atomic Energy Agency, 2003, *The long term storage of radioactive waste: Safety and sustainability*, Vienna: International Atomic Energy Agency) are taking such claims with a grain of salt. Questions are now asked, based on hard experience, as to who exactly will get the jobs being offered – unskilled locals, or skilled workers imported from other places? In fact, local workers are often exploited, under-prepared, and under-paid, to work non-unionized, low-profile, high-risk jobs (Shrader-Frechette, K., 2001, Risky business: Nuclear workers, ethics and the market efficiency arguments, *Ethics and the Environment, 7*, 1-19). Thus, the promise of nuclear jobs does not garner as much community support as it used to (Great Britain, Parliament, House of Lords, Select Committee on Science and Technology, 1999, p. 43). Jim Harding in *Canada's Deadly Secret: Saskatchewan Uranium and the Global Nuclear System* (Fernwood Publishing, Halifax and Winnipeg, 2007) documents repeated episodes of proposed uranium mining jobs not materializing for local northern residents, especially for First Nations members. These episodes have included unfulfilled promises of jobs at both pre-1988 Saskatchewan Mining and Development Corporation (SMDC) and post-1988 Cameco uranium mining and milling projects.

Marshall also raises issues of "Coercion and Consent" as another aspect of radioactive stigma. Social scientists generally agree that radioactive waste/nuclear facility host communities must give their informed consent in the first place (Gowda, M.V.R., and Easterling, D., 2000, Voluntary siting and equity: The MRS facility experience in Native America, *Risk Analysis, 20*(6), 917-929). But Shrader-Frechette (1991, Ethical dilemmas and radioactive waste: A survey of issues, *Environmental Ethics, 13*, 327-343) and Wigley (Wigley, D., and Shrader-Frechette, K., Editors, 1994, *Comments on the draft environmental impact statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana,* Vol. 2 of *Final environmental impact statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana,* Washington, D.C.: U.S. Nuclear Regulatory Commission) identify a "consent dilemma," whereby radioactive waste facilities and the employment of nuclear energy workers (NEWs) requires the informed consent of the community put at risk, yet those most best able to grant free, informed consent are most likely to be unwilling to do so, while those least able to legitimately consent are more likely to do so, because they are less aware of the dangers and/or are in need of the income (see the discussion of Skull Valley Goshutes above, for instance). Marshall formulates a number of pertinent questions:

> What is an adequate level of information and understanding for people to make a decision?
>
> Do all stakeholders have equal access to adequate information and assistance in understanding?

> Who should be in charge of ensuring adequate and equally-accessed information and understanding? (Marshall, p. 7)

Marshall points out the disparity in resources between nuclear proponents, such as government promotional and/or regulatory agencies and nuclear corporations, and nuclear opponents, such as all volunteer and/or non-profit community and/or environmental groups concerned about health, environmental protection, or property value risks. Marshall writes "Governments and business can inject funds into their side of the proposal to produce advertisements, campaigns, education projects, and so forth, all aimed at fostering a public opinion conducive to their plans. If consent is given within such an atmosphere of often subtle but perfectly legal coercion, then what is the ethical status of the facility?" Such questions are entirely relevant to Cameco's "Public Information Program" (PIP), "required" by CNSC as part of the Port Hope Uranium Conversion Facility's operations and license renewal proceeding, to which Cameco attributes 87% Port Hope community support for its activities and proposals.

"Coercion" has been employed to garner community support in Port Hope before. For example, *Blind Faith* documents efforts by Eldorado to open a uranium conversion facility in Port Granby, which was fiercely resisted by local farmers. Port Hope mayors, town councilors, and other public officials were very vocal in support of the proposal, warning that Eldorado could regard opposition as reason enough to move its entire operation (and those associated jobs/paychecks and taxes/revenues) closer to the uranium mines and mills themselves. In the end, the uranium conversion facilities were located in Port Hope itself, and now Cameco seeks permission for 5 more years of operations at them.

In addition, the "foothold" Eldorado Nuclear established in Port Hope in the first place raises serious doubts about informed consent. Although a very small number of "official" warnings about safety risks did find their way into local publications (as mentioned above in *Blind Faith),* by none other than the uranium refinery manager Pochon himself as early as 1933, any discussion of such downsides were exceedingly rare. Then, once the Port Hope uranium refinery began Manhattan Project activities in the early 1940s, military secrecy was invoked, a policy that persisted for decades of Cold War era uranium processing for U.S. nuclear weapons arsenal "production pipeline" purposes – Canadian contracts for uranium going into nuclear warheads continued into the late 1960s, contributing up to one-third of the uranium used in the U.S. nuclear weapons arsenal (Jim Harding, *Canada's Deadly Secret*, p. 251).

Marshall goes on to discuss the ethical dilemmas swirling around notions of monetarily "compensating" people for radioactive risks and stigma. P.R. Kleindorfer, et al. (1988, *Valuation and equity in the siting of nuclear waste repository*, Carson City, NV: Nevada Nuclear Waste Project Office) showed that a certain segment of the population is not willing to consent to any amount of monetary remuneration to compensate for radioactive risks, even if it were to be offered to them. Shrader-Frechette (1993, Burying uncertainty: Risk and the case against geological disposal of waste, Berkeley: University of California Press, Berkeley, p. 204) warns that monetary compensation undermines pure informed consent, especially given the wide disparity in "negotiating strength" between well-financed nuclear proponents promulgating "misinformation and propaganda," and all-volunteer concerned citizen groups, operating with little to no funding. Such community and environmental groups are hard pressed to counter such nuclear promotional public relations campaigns, themselves at least partially funded by national taxpayer and/or regional ratepayer dollars. AECL's Port Hope Initiative, and Cameco's (albeit

privately funded, although CNSC "required") PIP come to mind as cases in point. And yet an "open and fair" compensation negotiation would require equal access to accurate, truthful information, which is very often neglected.

Marshall relates the experience of Eurojoki, Finland, already host to multiple atomic reactors, then targeted for a permanent repository for high-level radioactive waste disposal. Economic dependence on nuclear generated tax revenues and jobs, combined with an overwhelming nuclear establishment (corporate and governmental) PR campaign, made the approval of the repository project a foregone conclusion, devoid of much or any notion of actual, legitimate democratic informed consent. Such an episode raises ethical objections of moral corruption. (Posiva Oy, 1999, *The final disposal facility for spent nuclear fuel: Environmental impact assessment report*, Helsinki, Finland: Posiva Oy; Nuclear Energy Agency, Radioactive Waste Management Committee, 2002, *Forum on stakeholder confidence, 2nd FSC Workshop: Executive summary and international perspective, stakeholder involvement and confidence in the process of decision-making for the disposal of spent nuclear fuel in Finland, 15-16 November 2001, Turku, Finland*, N.p.: OECD, Retrieved from http://www.nea.fr/html/rwm/docs/2002/rwm-fsc2002-1.pdf; Blowers, 1999; Shrader-Frechette, 1991; Dunion, K., 2003, Troublemakers: *The struggle for environmental justice in Scotland*, Edinburgh: Edinburgh University Press; Oughton, D.H., Bay, I., Forsberg, E-M., Hunt, J., Kaiser, M., and Littlewood, D., 2003, *Social and ethical aspects of countermeasure evaluation and selection: Using an ethical matrix in participatory decision making*, Retrieved from http://www.strategy-ec.org.uk/output/reports/del4%20final%20version.pdf, p. 35).

Marshall also discusses "Gender and Risk Sensitivity" to radioactive stigma. He reports the results of a national poll regarding a potential radioactive waste repository that found a significant disparity between female and male support (41% versus 52%, respectively, History and some facts to Wellenberg: Project of a Swiss LLW repository, 2002, September, Report presented at the Third COWAM Seminar, History and Some Facts to Wellenberg, Furigen, Switzerland). R.S. Gregory and T.A. Satterfield (2002, Beyond perception: The experience of risk and stigma in community contexts, *Risk Analysis, 22*(2), 347-358) have reported that women are more "sensitive to" – that is, concerned about – hazardous technology risks than men. Marshall attributes this gender difference to such factors as women's self-perceived social roles for nurturance and protection, versus men's social roles of "bread winning," and corresponding differences of opinion towards the economic benefit versus the social cost of hazardous technological projects, as in the uranium fuel industry.

Interestingly, "women ***are*** more sensitive to radioactivity than men" in another very important sense as well. It turns out that radioactivity is significantly more harmful to women -- and children, for that matter -- than to men. However, radiation protection regulations often ignore this, leaving women, children, and other more vulnerable segments of society (such as the elderly, and those with suppressed immune systems) disproportionately at risk from even "permissible" or "allowable" radioactivity releases from nuclear facilities, as health standards were established for "reference" or "standard man." (Mary Olson, Nuclear Information and Resource Service, "Atomic Radiation Is More Harmful to Women," October 18, 2011, posted online at http://www.nirs.org/radiation/radhealth/radiationwomen.pdf; Arjun Makhijani, Institute for Energy and Environmental Research, "Healthy from the Start Campaign," mentioned above).

Marshall also touches on "Indigenous Issues," which are also relevant to this Port Hope Uranium Conversion Facility license extension proceeding. Although CNSC Staff reports that its "Aboriginal consultation [is] ongoing," ("Other Matters of Regulatory Interest," Cameco Port Hope Conversion Facility, Port Hope, Ontario, License Renewal, Public Hearing Day One, November 03, 2011, CMD 11-H16, CNSC Staff Directorate of Nuclear Cycle and Facilities Regulation, CNSC Staff Power Point, p. 24, E-DOCS-#3813495), from reviewing CNSC Staff's "Aboriginal Consultation" written submission ("Application by Cameco Corporation for Renewal of Class IB Nuclear Fuel Facility Operating License for Port Hope conversion Facility in Ontario," Public Hearing, Day One, Scheduled for 03 November 2011, Request for a Licensing Decision Regarding A License Renewal, Submitted by CNSC Staff, 03 October 2011, CMD 11-H16, E-DOCS # 3726518 and 3767701), it appears this "aboriginal consultation" has merely consisted of a letter and follow up phone call to less than a dozen First Nations groups, which have not effectively responded. Given a lack of resources, both financial and technical, to deal with such a complex proposal as 5 years of operations at the Cameco Uranium Conversion Facility, it is dubious that such minimal CNSC outreach is sufficient. CNSC writes "no new potential impacts on surrounding lands are expected to occur." But this is misleading. 5 more years of additional, cumulative negative impacts – such as radiological and toxic chemical emissions to air, water, and soil – will continue, with impacts on health, safety, and the environment (including bio-accumulation in fish, wild game and plants, as well as radioactive and toxic chemical contamination of water, and other resources that many First Nations utilize, cherish, and regard as a sacred trust to be protected not only for current, but also future generations). Also, no mention is made of Native American Nations on the "south" side of the Canadian-U.S. border, such as Mohawk and other Haudenausaunee Nations, as well as other indigenous communities, in New York State, despite the potential downwind and downstream risks of 5 more years of operations at Cameco's Uranium Conversion Facility, including from the potential for a catastrophic accident. As mentioned above, the added factor of well funded nuclear proponent PR campaigns merely overwhelming any and all resistance or skeptical questioning to proposed hazardous activities is morally and ethically bankrupt. This is especially true in regards to "Aboriginal Consultation." Added precautions must be taken to avoid further exploitation of already historically oppressed, long marginalized and economically disadvantaged populations, such as First Nations (Fowler, C.S., Hamby, M., Rusco, E.R., and Rusco, M.K., 1990, Native Americans and Yucca Mountain: A summary report, Carson City, NV: Nevada Nuclear Waste Porject Office; Wilson, 2000).

Marshall's discussion of "NIMBYism" is instructive. Research documents that, perhaps seemingly counter-intuitively, opposition to nuclear and radioactive waste proposals is not necessarily strongest closer in to the location of the proposed facility or activity, but rather resistance can extend great distances away. (Krannich, R.S., Little, R.L., and Cramer, L.A., 1993, Rural community residents' views of nuclear waste repository siting in Nevada, in Dunlap, Kraft, and Rosa, ibid.) Populations outside Port Hope are, of course, among the very ones that sellers of residential or business properties in Port Hope are trying to attract. The "theory of NIMBYism" also implies that opponents to nuclear/radioactive waste facilities/activities are ill informed, depending on irrational/emotional, rather than rational/science-based, arguments. However, studies show that the vast majority of opponents' arguments are not only technical and science-based, but of equal sophistication to nuclear establishment (industry, government, academic) proponents (Kraft, M.E., and Clary, B.B., 1993, Public testimony in nuclear waste

repository hearings: A content analysis, in Dunlap, Kraft, and Rosa, ibid.); Martin, B., Editor, 1996, *Confronting the experts*, Albany, NY: State University of New York Press). In fact, many opponents to nuclear/radioactive facilities do not wish their problems on others outside their own particular locality, or take a neutral position on projects far away, but often rather take a NIABYism position (Not in ANYONE'S Backyard). (Rosa et al., 1993, p. 318). As a matter of fact, Nuclear Information and Resource Service of Takoma Park, Maryland has printed bumper stickers opposing radioactive waste dumps that read "Not In ANYONE's Backyard!", and often use the slogan in their campaign work. Another example is Citizens Awareness Network of the Northeast, which, despite knowing better than anyone how risky high-level radioactive waste stored in the midst of their communities is (as at Yankee Rowe, Massachusetts; Connecticut Yankee, Connecticut; etc.), have taken a courageous, moral position, and national leadership role, in actively opposing and in helping block such away-from-reactor radioactive waste proposals as Private Fuel Storage, LLC (at Skull Valley Goshutes) and the Yucca Mountain dump.

Marshall concludes:

> Although NIMBYism is denounced by many project planners as the irrational knee-jerk reaction of technically unsophisticated locals acting out of self-interest, if we trust the research outlined above, it seems as though the quick and indiscriminate labeling of resistance as NIMBYism is but the knee-jerk reaction of politically unsophisticated project planners who themselves are reacting under self-interest. (p. 10)

Marshall cites B.G. Rabe (1994, Beyond nimby: Hazardous waste siting in Canada and the United States, Washington, D.C.: Brookings Institute), K. Dunion (2003, ibid.), and G.E. McAvoy (1999, *Controlling technocracy: Citizen rationality and the Nimby syndrome*, Washington, D.C.: Georgetown University Press) to confirm this.

Along those lines, radioactive stigma in regards to the ongoing operations of the Uranium Conversion Facility are rooted in legitimate concerns about the hazards of radioactivity and toxic chemicals used and emanating from Cameco. Dr. Arjun Makhijani is President of the Institute for Energy and Environmental Research (IEER). Along with IEER staff scientist Dr. Brice Smith, he served as an expert witness on depleted uranium (DU) waste disposal as part of Nuclear Information and Resource Service and Public Citizen's intervention against a proposed uranium enrichment facility in New Mexico. Makhijani and Smith warned that, given its mutagenic, cytotoxic, tumorigenic, teratogenic, and neurotoxic (including in a manner analogous to exposure to lead) chemical and radiological hazards, DU should be considered analogously to trans-uranic wastes (TRU) and Greater Than Class C (GTCC) "low-level" radioactive wastes (the most radioactive of the "low-level" radioactive waste categories under U.S. regulations) in terms of risk to human health. Thus, Drs. Makhijani and Smith advised that DU be disposed of in a manner similar to that of TRU and GTCC – in the case of TRU at the Waste Isolation Pilot Plant (WIPP), in deep geologic disposal. This is required due to its long-lasting hazards. IEER's recommendations are a marked contrast to the uranium enrichment corporation's and even the U.S. Nuclear Regulatory Commission's preferred disposal policy -- shallow surface burial. ("Costs and Risks of Management and Disposal of Depleted Uranium from the National Enrichment Facility Proposed to be Built in Lea County New Mexico by LES," November 24,

2004, redacted version for public use dated March 20, 2007, viewable online at http://www.ieer.org/reports/du/lesrpt.pdf).

Similarly, Doug Brugge, PhD., MS, Professor of Public Health and Community Medicine at Tufts University School of Medicine, in Boston, Massachusetts, testified in 2007 before the U.S. House of Representatives Committee on Oversight and Government Reform about the hazards of uranium contamination in the Navajo Nation in the U.S. Southwest. In addition to the health hazards associated with uranium mentioned above, Dr. Brugge warns about lesser known health impacts, such as the estrogen-mimicking, hormone-disrupting toxic heavy metal properties of uranium, a reproductive health hazard to mammals, as shown by studies on mice. Dr. Brugge's testimony was based on his previous scientific, medical investigations, including:

> Brugge D, Benally T, Yazzie-Lewis E eds. The Navajo People and Uranium Mining. University of New Mexico Press, Albuquerque, NM, 2006 (hard cover), 2007 (soft cover).
>
> Brugge D, deLemos JL, Bui C. The Sequoyah corporation fuels release and the Church Rock spill: unpublicized nuclear releases in American Indian communities. *American Journal of Public Health*. 2007 97:1595-600.
>
> DeLemos JL, Brugge D, Cajero M, Downs M, Durant JL, George CM, Henio-Adeky S, Nez T, Manning T, Rock T, Seschillie B, Shuey C, Lewis J. Development of Risk Maps to Minimize Uranium Exposures in the Navajo Churchrock Mining District. *Environmental Health: A Global Access Science Source*., 2009, 8:29.

Drs. Makhijani, Smith, and Brugge's documentation of uranium's multi-faceted health hazards serve as a stark warning about the importance of protecting health, safety, and the environment during 5 additional years of operations proposed at Cameco's Uranium Conversion Facility. After all, CNSC has licensed Cameco to produce large quantities of uranium in Port Hope, up to: 2,800 tonnes of UO2; 12,500 tonnes of UF6; and 2,000 tonnes of U castings at the less-discussed Metals Plant ("Other Matters of Regulatory Interest," Cameco Port Hope Conversion Facility, Port Hope, Ontario, License Renewal, Public Hearing Day One, November 03, 2011, CMD 11-H16, CNSC Staff Directorate of Nuclear Cycle and Facilities Regulation, CNSC Staff Power Point, p. 6, E-DOCS-#3813495).

Miles Goldstick warned not only about uranium's own radiological and toxic chemical hazards, but also about the significant chemical toxicity of fluorine compounds involved in uranium hexafluoride conversion, storage, transport, and waste management processes. His PhD. Dissertation is entitled "The Hex Connection: Some Problems and Hazards Associated with the Transportation of Uranium Hexafluoride" (Swedish University of Agricultural Sciences, Department of Ecology and Environmental Research, April 1991). Included is a long list of UF6 accidents over the course of decades, including a fatal accident on January 4, 1986 at Kerr-McGee's Sequoyah [Nuclear] Fuels uranium conversion plant in Gore, Oklahoma. One worker, 25-year-old James Harrison, died 4 hours after the accident from "toxic chemical exposure and

severe hydrofluoric acid burns." Over 100 other workers and nearby residents were hospitalized for various lengths of time. The resultant toxic cloud was reported to be 5 km (3 mile) long and 100 meters high, which covered a 7 square km (2.7 square mile) area, and reaching points 18 km (11 miles) downwind before dissipating. As reported by Goldstick, "The consequences would have been much more serious if the cloud hadn't been dispersed by a 40 km/hr (nearly 25 miles/hour) wind." (pgs. 130-138)

Another infamous UF6 accident Goldstick describes is the August 1984 sinking of the cargo ship *Mont-Louis* in the English Channel, with 30 full and 22 empty UF6 transport containers aboard. Government authorities involved downplayed and even initially attempted to cover up the accident. Details on how much, if any, UF6 leaked out were not publicly disclosed.

Goldstick's work serves as a stark reminder of the dangers inherent in the activities carried out at Cameco's Uranium Conversion Facility in Port Hope, including transportation to and from. Cameco's U3O8 transport accident one year ago, en route from Canada to China, serves as yet another warning (see World Information Service on Energy Uranium Project's posting at http://www.wise-uranium.org/utiss.html for more information) that Cameco's uranium transportation safety across the board, including at the Port Hope Conversion Facility, must be strengthened.

The February 10, 2011 "finger laceration event" at Cameco's Uranium Conversion Facility, which caused internal radioactive contamination of a nuclear energy worker, followed the very next day by an "indoor spill of electrolyte" that exposed another nuclear energy worker to "a molten electrolyte solution from a fluorine cell following operational problems at the UF6 plant," show that safeguards against accidents must be strengthened, in order to protect worker and public health ("Application by Cameco Corporation for Renewal of Class IB Nuclear Fuel Facility Operating License for Port Hope conversion Facility in Ontario," Public Hearing, Day One, Scheduled for 03 November 2011, Request for a Licensing Decision Regarding A License Renewal, Submitted by CNSC Staff, 03 October 2011, CMD 11-H16, E-DOCS # 3726518 and 3767701, p. 24). Similarly, the 2007 discovery of uranium contamination of soil and groundwater beneath the UF6 building shows that vigilance to protect the environment, and public health downwind, downstream, and up the food chain, must be increased.

Marshall shows that nuclear proponents' assumption that "a lack of public understanding" is behind resistance to their proposals is false. Social scientists refer to this as the "public ignorance" model of citizen participation. G. Sundqvist (2002, *The bedrock of opinion: Science, technology and society on the siting of high-level nuclear waste*, Dordrecht: Kluwer) described this:

> There is a widely held image, in the rhetoric of decision makers, of lay people as uninformed, ignorant and fearful of the unknown. This image suggests that if the level of information is raised, lay people will accept the proposals from decision makers. (p. 14)

Likewise, Rosa et al. (1993, ibid.) observe that:

> The nuclear sub-government, then as now, was guided by the unshakable belief that increased public understanding – the knowledge fix – would translate into support for nuclear technologies. All that was required was thoughtful public relations to convert the dull, scientific knowledge into interesting, convincing public knowledge. (p. 77)

But S. Hornig Priest, H. Bonfadelli, and M. Rusanen (2003, The "Trust Gap" hypothesis: Predicting support for biotechnology across national cultures as a function of trust in actor, *Risk Analysis, 23*(4), 751-780) warn that such "scientism" (Harding, 2007, ibid.) can backfire on nuclear proponents, as Rosa et al. (1993, ibid.) documented has occurred when nuclear industry media campaigns have been undertaken. A particularly spectacular failure, in this regard, was the U.S. nuclear power industry's attempt – in the early 1990s, by hiring a former local television sportscaster, Ron Vitto, as a spokesman -- to convince Nevadan's that a high-level radioactive waste dump at Yucca Mountain, and the transport program that would move the wastes there, was safe. Nuclear proponents cannot "convert" community opponents simply by "drowning" them in well funded public relations campaigns. Such lessons should certainly be taken to heart by Cameco, as in regards to its PIP, as well as by CNSC, as in regards to its community outreach regarding the proposed Bruce radioactive steam generator shipment on the Great Lakes, including Lake Ontario.

Marshall's treatment of "Transportation Issues" echoes insights of Nuclear Information and Resource Service's Mary Olson ("High-level radioactive waste is dangerous enough at zero miles per hour, let alone 60 mph on the roads and rails.") and Joanna Macy (Nuclear Guardianship Project, 1994, An ethic of nuclear guardianship: Values to guide decision-making on the management of radioactive materials, Retrieved from http://www.nonukes.org/r02ethic.htm; see also Nevada Nuclear Waste Project Office, 1999, Transportation of spent nuclear fuel and high-level radioactive waste to a repository: Factsheet, Retrieved from http:///www.state.nv.us/nucwaste/trans/trfact03.htm; and Mariotte, M., 1998, Radioactive waste transport: The German experience, Retrieved from NIRS website: http://www.nirs.org/factsheets/radwastegermany.htm).

Speaking volumes about radioactive stigma in regards to waste transportation, P. Slovic et al. (1993, ibid.) documented that 70-80% of Nevadans and Californians surveyed feared that shipment accidents bound for high-level radioactive waste disposal sites would occur. As Marshall relates, the Association of Electronic Journalists reported that "from 1971 to 1998, there were 1,936 accidents and incidents involving radioactive materials transport" (*Nuclear Shipping Accidents: Rare but Regular*, 2002, Retrieved from the Radio-Television News Directors Association and Foundation website: http://ww.rtnda.org/resources/tipsheet/oct16.shtml). Robert Halstead, director of the Nevada Agency for Nuclear Projects, reported in 1996 that between 1949 and 1996, 72 incidents occurred in the U.S. during the transportation of high-level radioactive waste ("Reported Incidents Involving Spent Nuclear Fuel Shipments, 1949 to Present, May 6, 1996, posted online at http://www.state.nv.us/nucwaste/trans/nucinc01.htm). CNSC Staff's assurances that radioactive waste transportation has gone perfectly smoothly for decades on end, as stated at the September 2010 CNSC hearings in Ottawa about Bruce Power's proposed shipment of

radioactive steam generators on the Great Lakes, including Lake Ontario, and at the March 2011 CNSC/CEAA hearings in Clarington about the proposed new Darlington atomic reactors, is dubious.

Marshall conveys that, in the supposed interests of security and to protect property values against radioactive stigma, some call for radioactive waste shipping routes to be kept secret (Gawande, K., and Jenkins Smith, H., 2001, Nuclear waste transport and residential property values: Estimating the effects of perceived risks, *Journal of Environmental Economics and Management, 42*(2), 207-233). Similar arguments could be attempted, in a supposed effort to protect property values in Port Hope, despite the facts of radioactive contamination across the community. In a very real sense, such secrets *were* kept in Port Hope, from 1933 to 1975 (*Blind Faith*). This only resulted in eventual "hell to pay," when the radioactive contamination of the St. Mary's primary school was uncovered, a revelation of the truth that commenced a process that continues to unfold in Port Hope, 37 years later (1975 to 2012). Such secrecy is, of course, fundamentally contrary to democratic principles of transparency and accountability.

The State of Nevada Agency for Nuclear Projects research findings on stigma impacts to property values from nuclear facility siting and radioactive waste transportation

As mentioned above, the State of Nevada Agency for Nuclear Projects has done extensive research on the negative impacts to property values due to radioactive waste transportation route designation, as well as to nuclear facility siting – as in the designation of Yucca Mountain as a national repository for high-level radioactive waste disposal.

My first exposure to studies on the radioactive stigma impact on such economic sectors as property values came two decades ago from my involvement in issues surrounding the proposed Yucca Mountain high-level radioactive waste repository targeted at Nevada. Fortunately, this proposed project has been wisely cancelled by President Obama in recent years. In fact, the State of Nevada Agency for Nuclear Projects, the lead institution in opposition to the proposed dumpsite project, deserves immense credit for directly sponsoring a respectable body of groundbreaking work, as well as compiling others' related studies in this subject area.

The State of Nevada's *A MOUNTAIN OF TROUBLE, A NATION AT RISK: REPORT ON IMPACTS OF THE PROPOSED YUCCA MOUNTAIN HIGH-LEVEL NUCLEAR WASTE PROGRAM* summarizes its research on various aspects of radioactive stigma in CHAPTER THREE: IMPACTS TO THE STATE OF NEVADA (February 2002, Volume I, pages 51 to 80). Valuable work by the State of Nevada is also contained in its Appendix I, "Radioactivity, Stigma, and Socioeconomic Impacts: The Need for an Assessment of Impacts on Nevada's Principal Economic Sectors in the U.S. Department of Energy's Yucca Mountain Draft Environmental Impact Statement," submitted as part of its comments on the DOE Yucca EIS in 2000. Both documents are extensively referenced. All citations mentioned in the Nevada section below refer back to those two documents named above, with full references documented therein but not reproduced in their entirety here.

Although the cancelled Yucca Mountain proposal involved high-level radioactive waste at the back-end of the nuclear fuel chain, its findings on radioactive stigma still shed light on Port

Hope's current situation after nearly 80 years of radiological impacts, mostly at the front-end of the nuclear fuel chain (1933-2012, making Port Hope one of the world's oldest continuously operating nuclear facilities – which means the residents of Port Hope have been exposed to radiological and associated toxic chemical hazards longer than almost any other community in the world, with risks and harms accumulating over time).

The detection of U-236 isotopes in the urine sample of a former Port Hope nuclear energy worker, even decades after he stopped working for Eldorado, brought to light by the Port Hope Community Health Concerns Committee and the Uranium Medical Research Centre in 2007-2008, begins to blur the line between the front-end and back-end of the uranium fuel chain in Port Hope, given the unexplained presence of such atomic reactor wastes. (see "Radio-Biological Study Findings for Port Hope, Ontario," Tuesday, November 13th, 2007, Port Hope Community Health Concerns Committee and Uranium Medical Research Centre, Power Point Presentation; also see Asaf Durakovic, MD, PhD, FACP, Director of Medical Research, UMRC, "Patient results report for John Rainbird, 2007 Port Hope Radiobiology Study," March 1, 2008, Uranium Medical Research Centre, Incorporated, Toronto, Ontario).

Nevada found that the impacts of the proposed Yucca Mountain dump, and its integral high-level nuclear waste transportation from around the country to the repository, would be "ubiquitous, major in scale, and long lasting." This conclusion was reached via primary socio-economic research begun in 1986. Detailed descriptions of Nevada's impact studies, and their findings, are contained in three major reports: "An Interim Report on the State of Nevada Socioeconomic Studies," June, 1989; "State of Nevada Socioeconomic Studies of Yucca Mountain 1986 - 1992: An Annotated Guide and Research Summary," June 1993; and (3) "State of Nevada Socioeconomic Studies Biannual Report: 1993 - 1995," June 1995. Nevada's research team has also published two major books dealing with the policy implications of its findings: *One Hundred Centuries of Solitude*, by James Flynn, et al., Westview Press, Boulder, Colorado, 1995; and *The Dilemma of Siting a High-Level Nuclear Waste Repository*, by D. Easterling and H. Kunreuther, Kluwer Academic Publishers, 1995. Nevada's Agency for Nuclear Projects Technical Review Committee issued two reports of its findings with respect to the studies, and a summary of the Nevada research was published in the *Proceedings* of the U.S. National Academy of Sciences: "Interim Statement of the Technical Review Committee on the Yucca Mountain Socioeconomic Project," by G. F. White, et al., January, 1990; "Nuclear Waste's Human Dimension," by K. Erikson, et al., in Forum for Applied Research and Public Policy, Fall, 1994; and "Socioeconomic Studies of High-Level Nuclear Waste Disposal," in Proceedings of the [U.S.] National Academy of Sciences, Vol. 91, pp. 10786 - 10789, November, 1994.

The Yucca dump's stigma impacts on tourism

Tourism is one of Nevada's major economic sectors. Given Port Hope's Lake Ontario shoreline location, architectural heritage, Ganaraska River fisheries, etc., lessons learned about radioactive stigma impacts on tourism in Nevada are certainly of value to be considered in the context of Port Hope.

Nevada's studies predicted major impacts to the state's key economic sectors, most especially to its tourism industry. Research revealed that the groups and individuals essential to Nevada's economic health are highly sensitive to the radioactive risks associated with a high-level nuclear waste repository the transportation of irradiated nuclear fuel. Radioactive stigma was found to be a serious risk to Nevada's tourism industry. Nevada discovered that even a one percent annual decrease in tourism due to radioactive stigma could cost the local economy hundreds of millions of dollars in lost revenues. However, tourist visits could decline by as much as 7% to 75%, especially in the aftermath of a radioactive waste accident (Easterling, Appendix II). Over time, even with no accidents and minimal negative impacts, the annual loss to the Las Vegas and Nevada economy could exceed $5.5 billion. However, a single accident, with widespread media attention, could result in losses of $39 billion or more.

This extensive social science research has shown that a radioactive waste repository could well trigger widespread avoidance behavior on the part of the general public, severely impacting Nevada's essential tourism economy (Chalmers et al., 1993; Flynn et al., 1995; Nevada Commission on Nuclear Projects, 2000). This research has confirmed that nuclear and radioactive risks are "socially amplified," so that even so-called "minor events" can result in major economic, political, and social consequences due to their amplification of serious underlying risks (Kasperson et al., 1988; 1992; 1996; Pigeon, Kasperson, and Slovic, 2002). The research has shown that a repository at Yucca Mountain could cause visitors to avoid southern Nevada by increasing the perceived risk associated with visiting the area (Easterling, 1997); giving rise to noxious imagery that becomes associated with Nevada in the public's mind (Slovic et al., 1991); or conferring a stigma on the area, which would lead to widespread avoidance (Edelstein, 1988; Slovic et al., 1991; Gregory, Slovic & Flynn, 1996; Easterling, 2001a).

The Yucca project's impacts on business investments, retirement decisions, and job creation

Southern Nevada has been one of the United States' leading regions for new business investment, retirement re-location, and new job creation. From 1980 to 2000, Nevada grew in population from from less than a million to more than two million. Year after year, Las Vegas was the fastest growing metropolitan area in the country. Such attraction of the area for in-migration has been essential to supporting its existing economy, and diversifying for greater economic stability in the future. But the State of Nevada found that such attractiveness would be seriously diminished by the opening of a high-level radioactive waste repository at Yucca Mountain, and the shipment of of tens of thousands of irradiated nuclear fuel shipments on the state's highways and/or rail routes.

Nevada's business community also expressed serious concerns over the negative socio-economic impacts of the Yucca Mountain dump. Nevada's business executives have strongly argued that a Yucca Mountain repository would cause potential visitors to avoid the state.

In particular, a study that interviewed executives of the Clark County gaming industry concluded that:

> It is clear that the gaming industry believes that the transportation of high-level waste (HLW) through Clark County would brin g increased risk to the primary economic base for the entire state of Nevada. ... According to virtually every gaming industry representative interviewed, the most serious risk is from the stigma that would result if there is any accident of any kind involving the shipment of HLW. . ... Gaming executives described the potential impact of a serious accident on their industry as crippling, devastating and "Chernobyl" like (UER, 2001b, p. 15, cited in *Mountain of Trouble*, page 54).

Such concerns about tourism impacts led a number of industry associations to take official stands in opposition to the opening of the Yucca Mountain repository. In 1991, the Nevada Resort Association (NRA) passed an anti-repository resolution stating, in part:

> The establishment of a high-level nuclear waste repository is inconsistent with the positive image the state seeks to present to the world. ... [A]ny news stories about the repository and associated transportation of radioactive materials to it could cause special damage to the reputation enjoyed by Las Vegas and the success of its tourism promotion efforts (NRA, 1991, cited in *Mountain of Trouble*, page 54).

The Las Vegas Chamber of Commerce voted on January 31, 2001 to oppose the repository. According to the Chamber's resolution, "One accident involving the transportation of nuclear waste, no matter how minor, could create fears and hysteria among the general public and cause fewer tourists to travel to Southern Nevada, even if scientists determine these fears are unfounded" (Strow, 2001). The Las Vegas Convention and Visitor Authority followed suit by unanimously approving its own anti-repository resolution.

Such mounting business community opposition to the dump proposal prompted Nevada's Governor, Kenny Guinn, to veto the George W. Bush administration's positive Yucca suitability determination for a repository site in April 2002. Although Congress voted to override Nevada's veto, statewide Nevada congressional delegation and popular resistance, nationwide environmental resistance by more than 1,000 organizations, combined with federal court rulings against the dumpsite proposal, laid the groundwork for President Obama's cancellation of the Yucca project in 2009-2010. Deep-seated concerns about the Yucca dump's potential socio-economic impacts, its radioactive stigma, were at the heart of the successful statewide and nationwide resistance movement.

As indicated by resistance to the Yucca proposal in 43 states along targeted transportation routes, Nevada has been far from alone in its concerns about radioactive stigma. In fact, similar concerns have been raised by other states targeted to host a nuclear-waste facility. Beginning with the early attempts in the 1980s to cite high-level radioactive waste repositories in both eastern and western states, citizens as well as public officials have presented stigma-related concerns to the U.S. Department of Energy (DOE) in countless thousands of public comments (Kraft 1992; Brody and Fleishman 1993; Desvousges, Kunreuther et al. 1993; Dunlap, Kraft et al. 1993; Dunlap, Rosa et al. 1993; Kraft and Clary 1993; Rosa and Freudenburg 1993).

Attempts to open so-called “monitored retrievable” or “centralized interim” storage (MRS or CIS) facilities for high-level radioactive wastes from the 1980s to the present have also prompted public and official opposition based upon radioactive stigma effects.

When DOE proposed to build an MRS facility for irradiated nuclear fuel in Oak Ridge, Tennessee, Governor (now U.S. Senator) Lamar Alexander cited the possibility that an MRS "would impose a negative and economically harmful image on the area" (Sigmon, 1987).

In a very similar vein, Utah's Governor Michael Leavitt prevented San Juan County from volunteering to host an MRS, stating: "I do not believe it is in the best interests of San Juan County or Southeastern Utah to accept an MRS facility....The tourism and recreation industries, which are highly important to San Juan County, would suffer significantly from the stigma of being what would be characterized nationally as a 'nuclear dumping ground.' " (Leavitt, 1993, p. 1).

The State of New Mexico strongly opposed the Mescalaro Apache tribal council as it negotiated with the DOE’s “Nuclear Waste Negotiator” to open a MRS facility on tribal land, arguing it would harm the tourist and visitor industry in the state (Wald, 1993).

Governor Mike Sullivan of Wyoming cited risks to tourism while vetoing Fremont County's interest in a MRS facility (Sullivan, 1992).

And Utah Governor John Huntsman (now a Republican candidate for U.S. president) followed his predecessor’s precedent, opposing “centralized interim storage” (a de facto permanent parking lot dump) for 40,000 metric tons of irradiated nuclear fuel targeted at the Skull Valley Goshutes Indian Reservation west of Salt Lake City, citing negative impacts on many other aspects of the state’s economy, including property values along transport routes, as well as overall image as a “dumping ground” for eastern states’ radioactive wastes.

But concerns over radioactive stigma impacts are not confined to high-level radioactive wastes. Such concerns have also arisen with regard to “repositories” for so-called “low-level” radioactive wastes, despite states’ “obligations” under the Low-Level Nuclear Waste Policy Act of 1980 to open such dumpsites. More than 200 communities targeted for such dumps have vigorously opposed them, at least in part on socio-economic grounds (U.S. General Accounting Office, 1999; Weingart, 2001). After more than three decades, not a single dump has been opened under this federal program due to the intense public opposition. This is both a demonstration of the stigma attached to radioactive wastes and the widespread and deeply held belief that “host” communities would suffer economically and socially.

But such research findings are also not confined to radioactive waste risks. Nevada has cited numerous earlier cases, in the U.S. and several countries, in which radioactive accidents at several different kinds of nuclear facilities (atomic reactors, a reprocessing plant, a nuclear fuel fabrication factory, a nuclear weapons testing site, and even a nuclear medical facility’s piece of

junked equipment) led to significant negative socio-economic impacts, not to mention health impacts.

The March 1979 accident at the Three Mile Island (TMI) nuclear plant near Harrisburg, Pennsylvania provides one of the first documented cases where people have avoided areas affected by radiation events. The reactor accident held the national news media's and public's attention for many days on end, even though officials assured that only a small amount of radiation actually entered the environment (six years later, however, it was revealed that the reactor core had indeed suffered a 50% meltdown; nuclear engineer Arnold Gundersen's re-evaluation of the resulting radioactivity releases, performed for the TMI accident's 30th anniversary in 2009, estimated the radioactivity released at 100 times the official figure from 1979). In the first few weeks following the accident, both the Harrisburg area (about 10 miles away from TMI) and the Lancaster area (approximately 50 miles away from TMI) experienced declines in tourism in excess of 50 percent. The National Hardware Dealers' spring convention, scheduled for Harrisburg, was canceled. Within a few months (as albeit false official assurances continued that little to no radiation had been released into the environment), these losses appeared to abate (Pennsylvania Governor's Office on Policy and Planning, 1980; Himmelberger, Ogneva-Himmelberger & Baughman, 1993).

A much more extreme impact on tourism occurred with the fatal, accidental release of radiation into the environment that occurred in Goiânia, Brazil in September, 1987 (Petterson, 1988; Brooke, 1995). This happened when two men cut into a discarded radiotherapy machine and released 100 grams of cesium-137. Children playing in the junkyard were attracted to the glowing material and passed it among themselves and their families. Through ingestion and physical contact, 129 individuals were contaminated, of whom 50 were hospitalized and 7 died. This event sparked radioactive fears throughout Brazil, with severe economic consequences. Hotel occupancy in the city dropped by about 40 percent for six weeks following the accident. A number of scheduled conventions were canceled. In addition, residents of Goiânia were denied access to planes, buses, and hotels throughout the rest of Brazil; cars with Goiânia license plates were stoned; and local agricultural products would not sell. The impacts from this event persisted in an extreme form for about a year, dissipating as it became clear that the threat of contamination had abated (Brooke, 1995).

Tourism losses were also reported on the Normandy Coast of France following a highly publicized report in the *British Medical Journal* (January 1997) that identified the La Hague irradiated nuclear fuel reprocessing plant as the suspected cause of 27 leukemia cases found among young persons living near the facility. According to the mayor of Beaumont, France, the incident was "a catastrophe" for the area's reputation. Correspondingly, "when summer arrived, campers and hikers stayed away." (Whitney, 1997; Balter, 1997)

Urban Environmental Research (2001c) reports two additional case studies in which incidents at nuclear power industry facilities have led to tourism losses and other negative socio-economic (as well as health) impacts. A September 1999 accidental criticality at the Tokai-mura nuclear fuel fabrication facility in Japan led to the deaths of two workers, the massive

overexposure of a third worker, and radiation exposure significantly above permissible levels to hundreds of nearby neighborhood residents, including children. The accident generated international media coverage for days on end. All this produced immediate and dramatic impacts to the local tourism sector. Local hotels, inns, and restaurants suffered a loss of nearly 1.5 billion yen within the first month; one hotel filed for bankruptcy.

In the second case cited by Urban Environmental Research, the Dounreay nuclear power plant in Scotland released radioactive contaminants that appeared in the sand on local beaches as "hot particles." A local resort owner has filed suit against the United Kingdom's Atomic Energy Authority to gain compensation for the resulting lost business.

Of course, the Fukushima Daiichi nuclear catastrophe, which began on March 11, 2011, has already had socio-economic repercussions many orders of magnitude worse than Tokai-mura's. In fact, Fukushima Prefecture's entire economy, and society in general, has been severely impacted, a negative situation that can be expected to persist for many years, decades, and perhaps even centuries to come. The same is true for a large region surrounding the Chernobyl nuclear power plant in Ukraine near the border with Belarus, scene of the 1986 nuclear catastrophe. The Chernobyl nuclear catastrophe continues to inflict socio-economic harm for thousands of miles across Europe, as with prohibitions on various foodstuffs in the former Soviet Union such as wild mushrooms and game in Ukraine and Belarus, quarantined sheep farms in the U.K., and prohibitions on consumption of wild boar meat in Germany, as well as prohibition on consumption of caribou meat by Sami in Lapland, as but a few of countless examples.

Nevada also mentions there is also evidence that the Nevada Test Site (NTS), located adjacent to Yucca Mountain, had a negative impact on visitor behavior for those communities that were downwind from the above-ground nuclear weapons tests. Specifically, St. George, Utah, which received major doses of radioactive fallout during the 1950s, suffered a drop in its tourism and convention trade when the increased incidence of leukemia in the area was publicized (Fradkin, 1989).

Nevada concludes that, taken as a whole, the historical record suggests that overt, publicized releases of radiation, particularly those with identifiable health effects, would trigger harm to tourism. Nevada thus concluded that if the repository had led comparable accidents as described above, southern Nevada would very likely experience significant losses to its tourism economy.

The Yucca project's impacts on property values

While harm to tourism in Port Hope should be of concern to local, regional, and federal decision makers, harm to property values is of even more fundamental concern. Nevada's extensive research on property value diminution is thus vitally instructive. Of course, if tourists think twice about even visiting communities afflicted with radioactive stigma, then potential homebuyers, or businesses seeking to locate there, can be expected to be even more reluctant to invest or put down roots.

A dumpsite at Yucca Mountain would require tens of thousands of waste shipments on Nevada highways and railways. These shipments would adversely impact the values of adjacent properties. The ruling of a jury in the *Santa Fe versus Komis* case, which was upheld by the New Mexico Supreme Court, fixed the lost value of adjacent property along the Santa Fe bypass built and designated to transport trans-uranic wastes to the Waste Isolation Pilot Plant (WIPP) and set a major national precedent (26 August 1992, Case #20,325, opinion written by Justice Gene E. Franchini).

In estimating the impact of radioactive stigma effects on property that is located near a nuclear waste transportation route, it is informative to examine the data from the New Mexico case and calculate the jury award of damages. The total Komis property amounted to 673.77 acres. The amount of property taken by the City of Santa Fe in order to construct a designated bypass route for the trucking of plutonium contaminated wastes to WIPP amounted to 43.431 acres. The value of the taken property amounted to $489,582.50, at a value of $11,272.65 per acre. The total property remaining with the Komis family amounted to 630.339 acres. The stigma award for value loss of the remaining property amounted to $337,815. Thus, the stigma award for the remaining property was $535.93 per acre. Thus, the stigma value as a percent of market value (of $11,272.65 per acre) was 4.75%.

Significantly, the Komis case demonstrated the existence of significant property value impacts just from the *designation* of a highway as a nuclear waste shipping route, without any actual shipments occurring and in the absence of any nuclear waste accidents or incidents.

Expert research shows that impacts in Nevada, even without accidents, could amount to several billion dollars in lost property value. Privately held property along the transportation routes in Nevada has market values in the tens of billions of dollars, so potential losses would be massive. This problem is most acute for Nevada since all the shipments would eventually go through the state to reach Yucca Mountain. It is also a serious problem for routes across the country, especially those that would be the major collector highway, railway, and waterway corridors.

While not high-level radioactive waste or irradiated nuclear fuel per se (although U-236, a man-made, atomic reactor waste product, has been detected in the bodies of former Port Hope nuclear energy workers, as mentioned above), 5 more years of UO3 shipments to, and UF6, UO2, and U metal shipments from, the Cameco Uranium Conversion Facility, nonetheless involve safety, security, and environmental risks stemming from transportation of radioactive and chemically toxic materials (see Goldstick, 1991, regarding UF6 transport risks, ibid.). Radioactive stigma associated with the transportation of nuclear materials to and from the Cameco Uranium Conversion Facility should be addressed in this CNSC license renewal proceeding.

Moving on from transportation issues, another major area of concern for Marshall is "Public Participation Issues." While some technocrats may prefer that concerned citizens were kept entirely out of decision making about nuclear or radioactive waste facilities – supposedly

due to their ignorance of the technical issues involved, or else due to security and even military risks inherently interwoven into nuclear issues – such an attitude is incompatible with principles of participatory democratic governance. Thus I am thankful for the participant funding that has made my involvement in this proceeding possible.

But most nuclear/radioactive decision making processes, even in democratic societies, leave much to be desired. A. Vari, P. Reagan-Cirincione, and J. Mumpower (1994, *LLRW disposal facility siting: Successes and failures in six countries*, Dordrecht: Kluwer) have identified 4 approaches taken by various countries engaged in proceedings to site nuclear facilities:

1. The D-A-D approach (Decide-Announce-Defend), also identified by J. Hunt (2001, Framing the problem of radioactive waste: Public and institutional perspectives, in *Valdor 2001 proceedings*, pp. 222-229, N.p.).

   However, this approach, although commonly employed, has been criticized as undemocratic, inefficient, unjust, and unethical. The public may be involved to an extent – such as receiving information from government and industry experts – but they have no decision making power. Even the U.K. Radioactive Waste Management Advisory Committee (2001, *Advice to Ministers on the process for formulation of future policy for the long term management of UK solid radioactive waste, London: Dept. for Environment, Food, and Rural Affairs*) has declared it "inappropriate." Kraft and Clary (1993, ibid.) have criticized D-A-D as lacking give and take communications channels between decision makers and the public, and as vulnerable to being manipulated by proponents to force proposals through. As has been seen by numerous U.S. D-A-D public hearing proceedings, however – such as the 1999-2000 Yucca Mountain repository Draft Environmental Impact Statement public hearings held in dozens of locations across the country – the end result is often failure, after the investment of large amounts of time, effort, and funding by large numbers of groups and individuals.

2. The public is allowed to review, and to a limited extent change, decisions made by corporate-government nuclear proponents.
3. The public itself is granted the right to make recommendations, although corporate-government nuclear proponents retain final decision making power.
4. The public holds the power to make the decisions.

Ironically, social science evidence shows that maximizing community participation increases likelihood of public acceptance of nuclear siting proposals. S.A. Carnes, E.D. Copenhaver, J.H. Sorenson, E.J. Soderstrom, J.H. Reed, D.J. Bjornstad, et al. (1983, Incentives and nuclear waste siting: Prospects and constraints, *Energy Systems and Policy, 7*(4), 324-351), for example, found that support for a hypothetical high-level radioactive waste repository in Wisconsin increased from 26% to 46% among state residents after they were offered enhanced power to monitor, control, and even shut down the facility. The U.S. Department of Energy, however, has stuck with the D-A-D approach for decades. Not only proposed repositories in Wisconsin and Nevada have been blocked or cancelled – so have many other proposals in more than a dozen states. A

major site search is just about to begin again in the aftermath of the Yucca dump's cancellation, per the advice and recommendations of the Blue Ribbon Commission on America's Nuclear Future (draft report published July 29, 2011, viewable online at www.brc.gov; the BRC's final report is due by January 29, 2012).

The complexity of reconciling different forms of knowledge and rationality, different claims to facts and truth, while simultaneously maintaining participatory democratic decision making involving diverse stakeholders has led many governments to fall back on the discredited D-A-D model, rather than to try new, more legitimately participatory approaches. (EKRA, 2000, Disposal concepts for radioactive waste: Final report, Bern, Switzerland: Federal Office of Energy). The result, in regards to high-level radioactive waste repositories internationally, has been dozens of proposals, without a single repository having yet been opened anywhere in the world, even though high-level radioactive wastes have been generated, and in "interim storage," for over 69 years now (Enrico Fermi first split the atom on December 2, 1942 during the Manhattan Project).

Recurring public objections that Marshall identifies are: concern over clear rules for what it would take for a facility to be stopped; lack of adequate notification of decision making proceedings, and how to effectively take part in them; increased distrust when significance of uncertainties are not clarified up front; desire for right of veto, but questions and concerns about whom is invested with the veto power; concern about the bias of corporate-government nuclear proponent experts; what particular method of public acceptance will be used; pro forma "false participation," in which a proceeding goes through the motions of public involvement, but it has no influence on the predetermined outcome; deep seated public distrust of government and corporate proponents of nuclear proposals. (Marshall, pages 15 to 17) Such concerns certainly ring true for opponents to Cameco's application for 5 additional years of uranium conversion activities in Port Hope.

Marshall also raises important questions of "Intergenerational Justice in Nuclear Waste Management," including inability to obtain informed consent from future generations, inappropriate reliance on yet to be discovered future technical solutions, the inevitability of likely dramatic future societal and political change (wars, extinction of nations, etc.), and inability to perpetuate information and skills to future generations needed to safely manage radioactive wastes for the unimaginably long duration of their hazards. These concerns, too, are relevant to Cameco's activities in Port Hope – such as the unimaginably long term hazard created, and needing to be managed, by the irradiation in Candu reactors of the UO2 fuel pellets and bundles that originate in Port Hope after UO2's generation at the Uranium Conversion Facility. Such concerns also come into play in Port Hope, given the long term hazard needing to be managed in PHAI's "new" radioactive waste management facilities located near, or indeed on, "old" radioactive waste dumpsites in the Municipality of Port Hope.

New Security Problems

The need for bi-national cooperation on border security was driven home at the highest level when President Obama and Prime Minister Harper held a secretive summit Canada in issued a joint "Declaration on a Shared Vision for Perimeter Security and Economic Competitiveness" after a secretive summit meeting in Washington, D.C. on February 4, 2011 Canadian Prime Minister Stephen Harper issued a Feb. 4, 2011 media release entitled "PM and U.S. President Obama announce shared vision for perimeter security and economic competitiveness between Canada and the United States: Leaders also create bilateral Regulatory Cooperation Council (RCC) to reduce red tape for businesses" (posted online at http://www.pm.gc.ca/eng/media.asp?category=1&featureId=6&pageId=26&id=3931) The White House Office of the Press Secretary issued "Joint Statement by President Obama and Prime Minister Harper of Canada on Regulatory Cooperation" (posted online at http://www.whitehouse.gov/the-press-office/2011/02/04/joint-statement-president-obama-and-prime-minister-harper-canada-regul-0). Although the details were shrouded in secrecy, certainly nuclear facilities on the Great Lakes would be included on a short list of major security concerns shared by the two countries. The two leaders' announcement of the creation of a U.S.-Canada Regulatory Cooperation Council (RCC), as well as reception of the Second Report to Leaders on the U.S.-Canada Clean Energy Dialogue (CED), would all seem to indicate that NRC and CNSC will likely interface more and more as time goes on about such issues as nuclear power plants, irradiated nuclear fuel storage facilities, and other nuclear facilities on the Great Lakes, including in regard to security. After all, the Great Lakes, 20% of the planet's surface fresh water, are the drinking water supply for 40 million people in the U.S., Canada, and a large number of Native American First Nations. In this regard, security issues at Cameco's Uranium Conversion Plant in Port Hope are likely at a high priority status for both the U.S. and Canada in a way not seen since Eldorado Nuclear undertook uranium processing to supply the Manhattan Project.

Which raises a salient point. Eldorado, now Cameco, played a central role in the Allied effort to drop atomic bombs on Japan in 1945. And as mentioned above (Harding, p. 251), Canada as a whole likely supplied one-third of the uranium used in the U.S. nuclear weapons arsenal, continuing to be a major supplier to the U.S. until the late 1960s.

In Jim Harding's section entitled "Tracing Saskatchewan Uranium into DU Weaponry" in his concluding chapter, entitled "Overcoming Amnesia" in his 2007 book *Canada's Deadly Secret: Saskatchewan Uranium and the Global Nuclear System*, he examines Canada's, Saskatchewan's, and even Cameco's connection to this very controversial military DU industry.

The following extended excerpt comes from Harding's pages 250-254. [His references are given below]. He writes:

"Considering the estimate that Canadian uranium was used to create one-third of the U.S. nuclear arsenal up until the late 1960s, we can assume that our uranium contributed one-third of the DU stocks coming from that weapons' production.

But it doesn't end there. After Saskatchewan's high-grade uranium mines began production in the mid-1970s and the U.S. had shut down its own mines and targeted Canada for security of uranium supply under the FTA [Free Trade Agreement], Saskatchewan contributed a much higher percentage of the stockpile from which DU weapons are made [in the U.S.]. Even if the average of about 4,000 tonnes of yellowcake, exported from Saskatchewan to the U.S. each year since the early 1990s, was initially used only for fuel for nuclear power and to free other sources for weapons' production, the depleted uranium from this remains in the 'U.S. material' drawn upon for DU weapons' production [in the U.S.]

Of the estimated 500,000 tonnes of DU that the U.S. has accumulated since the Manhattan Project, exactly what percentage is from Canada and Saskatchewan cannot be fully determined. But regardless of the percentage, there is no doubt our contribution is significant. Through the 1950s and 1960s, and even more so since the 1970s, as the world's largest uranium-producing region and the U.S.'s major source of supply, we are no doubt right at the top of complicity in DU weapons' production.

Cameco's records show that from 1991, when it became a publicly trading corporation, until 2005, it produced nearly 260 million pounds of uranium [Calculated from Cameco.com]. And by 2010, if Cigar Lake comes on stream, it expects to produce 30 million pounds a year. [Cameco Quarterly Report, July 28, 2006, p. 21. Also personal communication by phone with Cameco staff.] The percentage of sales from this production to the U.S. is hard to calculate. Though Cameco's contracts remain confidential, we however know that 60-70% went to all of North and South America between 2001 and 2005. With 103 reactors in the U.S., compared to Canada's thirty {sic—there are 22 commercial scale Candu reactors in Canada, although there are additional research and medical isotope production reactors}, and only a handful in South America, it's not unreasonable to say that a half of Cameco's exports go to the U.S.

That would mean about 130 million pounds (or about 65,000 tons) of uranium going to the U.S. from Saskatchewan's Cameco production alone in the last fifteen years. And more might go to the U.S. from other sources, which Cameco buys from to fulfill contracts. Ninety percent of all this would end up as DU, contributing to the stockpiles used for DU and other nuclear weaponry.

But this only begins to account for uranium exports and DU contributions from Canada and Saskatchewan during the longer period, from 1953 to 2005. Between 1956 and 1963 we know that 30 million pounds (or 15,000 tons) of uranium went directly to the U.S. from Saskatchewan, and likely much more went to the U.S. from Elliot Lake, Ontario mines. When I looked at Saskatchewan uranium production volume, back to 1963, which is as far as public records now go, I found that from 1963 to 2005, 609 million pounds of uranium had been produced in Saskatchewan. (I hope the missing data from 1953 to 1963 isn't our attempt to erase all memory of our uranium-military contracts with the U.S. during the 1950s and 1960s.)

[Mineral Statistics Section, Mines Branch, Saskatchewan Industry and Resources, November 9, 2006. I added 30.0 million pounds, an average for recent years, for both 1988 and 1999, which had missing data due to only two corporations being active.] This converts to about 304,500 tons. If we assume half went to the U.S., then this totals 152,250 tons. Adding the 30,000 million pounds (15,000 tons) from the period 1956-66, we get about 167,265 tons from Saskatchewan alone, which would create a large chunk of the DU stockpiles left in the U.S. When DU from Elliot Lake mines is also considered, it is not unreasonable to assume that upwards of one-third and perhaps more of the U.S. stockpile used for DU and nuclear weaponry comes from Canada, with most of this from Saskatchewan due to the high exports in recent decades.

The production of DU weaponry is profitable business, and the U.S. has several factories producing these weapons. They are also produced in the U.K., France, Russia, and Pakistan. DU ammunition is now part of the arsenal used on A-10 Warthog aircraft, AH-64 Apache helicopters, Abram tanks, British Challenger tanks, Bradley Armoured vehicles, Phalanx guns on naval vessels, Vulcan and Avenger Cannons, and Tomahawk Missiles. Selling DU weaponry has become a worldwide business, with these deadly products already going to twenty-nine other countries. [The Coalition to Oppose the Arms Trade, http://coat.nfc.ca, is a good source of information. Also, see Leuren Moret, "Depleted Uranium: The Trojan Horse of nuclear war."]

So DU from Saskatchewan uranium is certainly getting spread around the globe. And one of our legacies as the major uranium-producing region on the planet is helping to contaminate several war zones with long-acting radioactivity, which is contributing to civilian deaths long after the military conflicts have ended.

We don't require direct evidence of the weapons' connection to conclude that Saskatchewan uranium exports breach the NPT [Nuclear Non-Proliferation Treaty] by contributing to military production using nuclear materials. Nevertheless such direct evidence exists. In 1993 the Saskatoon-based Inter-Church Uranium Committee (ICUC) released copies of a license from the U.S. Nuclear Regulatory Commission that suggests DU from Saskatchewan uranium was directly used for producing these weapons. As much as I am able to discern:

--Yellowcake was exported from the SMDC (now Cameco) to the Sequoyah Fuels Uranium Conversion Facility for refining (in 1986, 480,000 pounds was shipped and shipments continued until 1992). [In a letter to the ICUC dated October 30, 1990, Saskatchewan Environment and Public Safety admitted that in 1989 some yellowcake from SMDC went to Gore Oklahoma where Sequoyah Fuels is based.]

--Sequoyah Fuels then refined the yellowcake into a) uranium hexafluoride (UHF) for reactor fuels, leaving b) depleted uranium tetrafluoride (UF4 or DU).

--Sequoyah Fuels then supplied DU to Aerojet Ordnance Tennessee (AOT).

--The AOT had a license from the U.S. NRC to send up to a million pounds of DU to Eldorado Nuclear's (now Cameco's) uranium refinery in Port Hope for production into uranium metal. The license was for 1988-90.

--The purpose of the uranium metal was to make armour-piercing munitions ("DU penetrators") for the US military. [ICUC, press release, January 21, 1993. Also see Phillip Penna, "Cameco and its weapons connections," *Briarpatch*, May, 1993, p. 19]

That the Port Hope refinery was used to create the material for DU bullets seems unquestionable, even if we wish to debate whether the DU originated in Saskatchewan, for the NRC license says: "AOT will supply the UF4 to Eldorado Resources who will use it to manufacture Depleted Uranium metal for AOT's use in the manufacturing of depleted uranium penetrators on U.S. Dept. of Defense Contracts." And certainly we can debate whether this practice has been stopped or not. [In "Current Issues: Waste Management of DU," posted at WISE-uranium.org/DU, updated November 20, 2006, there is information about Manufacturing Science Corporation of Oak Ridge applying to export 10.21 metric tonnes of U3O8 to Canada as "test material to make DU oxide in the Cameco Corporation facilities in Port Hope, Ont." This license was issued March 17, 2004.]

But even this astonishing evidence doesn't begin to tell the full extent of the use of Saskatchewan uranium in weapons' production. We have already seen that the only safeguard against uranium being used for weapons is the NPT, signed in 1970. And this treaty is what NDP Industry Minister Cline, Premier Calvert and Cameco officials appeal to in their public claims that we are only producing uranium for peaceful purposes. However, while this treaty, following on the Test Ban Treaty, was an important step forward, it is not based on a solid understanding of how the nuclear fuel system and the weapons-making process work.

The head of the Canadian Coalition for Nuclear Responsibility, Gordon Edwards, reminds us: "To produce just 1 kg of 5% enriched uranium requires an input of over 11.8 kg of natural uranium, and results in 10.8 kg of depleted uranium (having about 0.3% U-235)." [Gordon Edwards, "DU Munitions," email, Sept. 13, 2006.] He continues: "In other words, over 90% of all Saskatchewan uranium that was ever sent to the USA for enrichment (for peaceful purposes as nuclear reactor fuel) has remained in the USA as depleted uranium (DU)." He further reminds us:

"There is absolutely no distinction between the DU of Canadian origin [or Saskatchewan origin] and the DU of other origins (US, Australia, etc.). It all goes into the same large stockpiles of DU. [And…] a portion of this large stockpile of DU has always been used freely and without any compunctions by the US military for military purposes.…Thus there is some Canadian uranium in every DU weapon."

There is even more to the contemporary weapons connection: in spite of all the reassurances that our exports are only for "peaceful purposes," the DU from the common stockpile is also used directly in the construction of the metal warheads in H-bombs. Edwards notes: "This depleted uranium is responsible for at least 50% of the explosive power of each H-bomb and almost all of the radioactive fallout from the H-bombs." And he continues: "Most people do not realize that the same DU stockpile was also used for half a century and more to produce the plutonium that is used in almost all nuclear warheads."

As can be seen from Harding's analysis, not only Canada's, not only Saskatchewan's, but specifically Cameco's "fingerprints" can be found on U.S. DU weapons used in such combat zones as Iraq and Afghanistan. As discussed in the concluding paragraph above, Canadian uranium from Saskatchewan, in the form of DU, is also almost certainly incorporated into nuclear weapons – in addition to U-235, which also originated from Saskatchewan in the 1950s and 1960s. Such multiple, close connections between Canada, Saskatchewan, and Cameco products and the U.S. DU and even nuclear weapons arsenals hold potential security repercussions for Cameco's Uranium Conversion Facility in Port Hope.

As with the production of tritium at commercial U.S. reactors (as at Watts Bar in Tennessee) for use in hydrogen bombs, Cameco's various involvements and associations with the U.S. military's DU arsenal and even nuclear weapons arsenal blurs the distinctions between "atoms for peace" and "atoms for war." Adversaries of the U.S. and/or Canada could thus attempt to justify an attack on the Port Hope Uranium Conversion Facility due to its military connections, past or present, known or suspected. Compounding such concerns, Canada has taken a lead role in the NATO occupation of Afghanistan for the past decade.

In 1999-2000, Canada joined with the U.S. and Russia in an "international nuclear experiment" to supposedly "beat swords into plowshares." Weapons grade plutonium excess to military needs in the U.S. and Russian nuclear arsenals was fabricated into reactor fuel, and "test burned" in a Canadian reactor at the Chalk River nuclear lab. While the nuclear establishments in the US, Canada, and Russia tried to justify the project as turning "atoms for war" into "atoms for peace," many critics warned it dangerous blurred of the lines between nuclear weapons and nuclear power.

A coalition of groups filed a lawsuit in U.S. federal court in Kalamazoo, Michigan – along the U.S. truck transport route from Los Alamos National Lab (where the mixed oxide plutoniun-uranium was fabricated from weapons grade plutonium) to Canada. Dr. Gordon Edwards served as an expert witness on behalf of such groups as Don't Waste Michigan in the court case known as *Alice Hirt versus U.S. Energy Secretary Bill Richardson.*

So did Dr. David Ballard, a sociologist specializing in terrorism, now teaching at Santa Barbara State University in California. Dr. Ballard warned that, given the high profile nature of

the shipment – carried out by the U.S. Department of Energy, connected to its nuclear weapons program – the truck shipment of ultra-hazardous, even weapons-grade plutonium could go to the top of the list for certain terrorist groups to consider attacking.

The environmental coalition lost in court, and the shipment proceeded in January 2000. However, during the transfer from the U.S. truck to a Canadian helicopter in Sault St. Marie, Ontario, Arctic camouflaged military personnel, likely U.S. Marines from the Detroit Reserve Base, guarded the shipment with sniper rifles from rooftops.

Similarly, Cameco's connections to U.S. military arsenals – both DU munitions and even nuclear weapons – carries similar risks for the Port Hope Uranium Conversion Facility.

After all, as captured in the title of Robert Bothwell's official, company-endorsed, history (Eldorado Nuclear Limited Chief Executive Office N.M. Ediger penned the glowing Foreword), Eldorado was/is "Canada's National Uranium Company." (*Eldorado*, University of Toronto Press, 1984) Cameco's profile could not be much higher, as Dr. Ballard warned about the weapons-grade plutonium MOX shipment by DOE in 1999-2000.

Given the wall of secrecy surrounding all the security precautions being taken at Cameco's Uranium Conversion Facility in both the company's application and the CNSC Staff's application review documents, it's impossible to tell if adequate safeguards are in place to defend against various attack risks at such a hazardous facility. Such secrecy is also antithetical to transparency and accountability in a democracy, begging the question: are nuclear power (and nuclear weapons) compatible with democracy?

The U.S. 9/11 Commission Report of 2004 documented that Al Qaeda's original plan for the attacks of 9/11/2001 was to hijack a total of 10 airplanes, and crash 2 of them into nuclear facilities. Mohammad Atta, who crashed the first hijacked airplane into the World Trade Center, had noticed the Indian Point nuclear power plant on the Hudson River near New York City on his training flights for the attack. He sought permission to attack Indian Point instead of the World Trade Center, but never got the go ahead from his Al Qaeda superiors. Dr. Ed Lyman has studied the potential of a successful terrorist attack at Indian Point. Many tens of thousands of casualty, and a trillion dollars in damages, could result. Obviously, such risks must be prevented from happening. Shut down Indian Point would be the first step in such prevention.

Although Cameco's Uranium Conversion Facility is not the same as a nuclear power plant, it is still a hazardous facility at risk of catastrophic terrorist attack. Precautions must be adequate to prevent the risk of terrorist attacks.

Colin Powell visited Canada in the aftermath of the 9/11 attacks, sharing a list of Canadian facilities on the Great Lakes with his Canadian counterparts which the U.S.

intelligence services considered top security vulnerabilities. Nuclear facilities were included on that list. Cameco's Uranium Conversion Facility should be added, if it hasn't been already.

Threat of Intensifying Flooding

Flooding has long been a serious concern in Port Hope. The infamous Flood of 1980, for example, did extensive damage to downtown Port Hope (Ian Montagnes, *Port Hope: A History*, pages 213-215).

Flooding was also serious concern during the contentious debate over the ultimately aborted proposal to introduce "slightly enriched uranium" (SEU) into Cameco's uranium processing activities in Port Hope. During that public debate, calls were made to require, as part of the SEU environmental assessment, a careful analysis of the 100-year and 1,000-year flood risks at Cameco's Uranium Conversion Facility, located so precariously close as it is to the Ganaraska River, as well as the Inner Harbour and Lake Ontario. After all, those various Cameco plants are built on fill, fill that has been contaminated with radioactive and toxic chemical contaminants for the past 80 years, including within the past 5 years (the contamination discovered in soil beneath both the UF6 and the UO2 plants, which migrated to groundwater and even towards Lake Ontario). However, when the SEU proposal was summarily abandoned, so was the careful and comprehensive flooding risk analyses that had been called for by concerned citizens and environmental groups. It is essential, for safety's sake, that this flood risk analysis still be done. Public health and environmental protection depend on it. Any proceeding considering 5 additional years of operations at a facility as hazardous as Cameco's Uranium Conversion Facility should require such an in depth analysis of flooding risks.

During Cameco's 5 years of extended operations, and during its Vision 2010 site remediation activities, the potential exists for disturbed, contaminated soil to be at severe risk of floods. Given the worsening risks of extreme weather, such as extreme rains, and extreme floods, due to the worsening climate crisis, such a careful analysis of flood risks at Cameco's Uranium Conversion Facility is long overdue.

The Harper administration's recent decision to withdraw Canada from the Kyoto Protocol climate change treaty, and the block put upon U.S. ratification of the treaty – or even good faith participation in international climate talks – by the Republican Party's Members of the U.S. Congress and even presidential candidates, does not bode well for the climate crisis being addressed any time soon.

But sources from David Suzuki (see, for example, http://www.davidsuzuki.org/blogs/science-matters/2006/12/extreme-weather-extremely-costly/; http://www.davidsuzuki.org/blogs/climate-blog/2011/06/humans-can-overcome-extreme-weather-and-climate-events-but-we-have-to-work-toget/; http://www.davidsuzuki.org/blogs/suzuki-elders/2010/08/the-big-picture/) to the UN's Nobel Peace Prize winning IPCC have warned about "global weirding," "freak" or "extreme weather" to come due to climate instability and disintegration brought about by increases in the concentration of greenhouse gases in the Earth's atmosphere. This could well include monster snows in winter, or monster rains in spring, that combine to cause monster floods in Port Hope, threatening the Cameco Uranium Conversion Facility.

Historic flooding in Nebraska on the Missouri River this past summer serves as a warning. Historic snows last winter, combined with heavy rains this spring, caused historic flood levels on the Missouri River. The Fort Calhoun atomic reactor, just north of Omaha, was completely inundated, and narrowly averted potentially disastrous consequences. Such a stark warning should be heeded at Cameco's Uranium Conversion Plant in Port Hope. Careful, comprehensive flood risk analysis, considering the impacts of climate change, should be undertaken as part and parcel of CNSC's consideration of a 5 year license extension.