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Written Submission to the Canadian Nuclear Safety Commission concerning renewal of Cameco's Port Hope Class 1B Nuclear Fuel Facility Operating Licence and Zircatec's Port Hope Class 1B Nuclear Fuel Facility Operating Licence For the Public Hearing Nov 28-30, 2006

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Introduction and summary

Environmentalists for Nuclear Energy (EFN) is an international organization with over 8,000 members and supporters in 56 countries on 5 continents. We were incorporated in Canada as a not-for-profit corporation in February 2006. Our honorary chair is Patrick Moore (the founder of Greenpeace in Canada) and an honorary member is the British scientist and environmentalist James Lovelock (creator of the Gaia Theory). But I am making this submission not formally as EFN-Canada (though I have had input from our Directors) but rather as an individual — because I live just down the road in Cobourg, I went to school in Port Hope (a half century ago), and I have friends and a relative living in Port Hope today.

I want to say, at the outset, that I honour citizens — such as those involved with Families Against Radiation Exposure (FARE) — who are seeking (on behalf of future generations, their children and grandchildren) to ensure that adequate attention is given to the requirements of safety in the handling of radioactive materials and safety with respect to limitations in radiation exposure. These safety considerations are of paramount importance, as I know the Canadian Nuclear Safety Commission (CNSC) agrees and as I am sure all the executives and workers of Cameco and Zircatec agree as well. But it is also important that the actual risks involved are not exaggerated, as I believe they often are.

I have read the two transcripts of the Day 1 proceedings for the Cameco and Zircatec applications (250 pages in all) and the main concerns that FARE has listed on its website (9 for Cameco and 5 for Zircatec). But I will speak only briefly about these detailed issues, although there would be much to be said. The main point I want to make is the following:

Our planet and civilization are in serious danger from the threat of abrupt climate change and the threat of oil exhaustion and the cure for these threats necessarily involves a significantly increased use of clean nuclear energy around the world — a cure in which Canada, Canadian uranium, and the CANDU reactor can play major roles. We must (for the sake of our children and grandchildren) intelligently balance (a) the intolerable risks of doing nothing against (b) the manageable risks of handling nuclear materials.

Relevant to safety issues

An initial objection might be raised that global risks have nothing to do with the CNSC's mandated focus on nuclear safety. But I would argue that they provide an important *context* which is necessary for making safety judgments. If nuclear generation were a trivial luxury, then indeed any minute risk, however miniscule, in handling nuclear materials could reasonably be argued to be sufficient to suspend nuclear processing completely. Why would one risk the health of workers and the neighbouring community, however minimal the risk, if the benefit were completely unimportant? But if the benefit to future generations is overpowering (saving the planet), then small risks may be acceptable, as long as they are brought to the *absolutely minimum practical level*. Therefore to make safety judgments it is necessary to appreciate the context. That is my excuse for turning now to a consideration of the climate change threat and the oil exhaustion threat. I do not in any way wish to imply that safety standards should be lax. Far from it. I am *not* arguing for the cutting of any safety corners. The as-low-as-reasonably-achievable (ALARA) principle is critical – though I make some brief comments later as to one possible limitation. But, in any case, the term "reasonably" must be judged in a context. For example, if one refers to the website (www.jlab.org) of the Thomas Jefferson National Accelerator Facility in Newport News, Virginia, one finds the scientists' expansion of the ALARA principle there is that: "the risk from receiving the exposure is 'worth' the net benefit of the activity. . . . There should not be any occupational exposure of workers to ionizing radiation without the expectation of an overall benefit from the activity causing the exposure." Exactly. But then to make the assessment of what is *unnecessary* exposure one has to also assess the related benefit.

FARE is right to be vigilant on behalf of the community and to raise important questions that their members have — though I believe that, in fact, adequate answers have already been supplied to those questions and that the risks involved are miniscule. Cameco and Zircatec are right to stress the importance of a corporate safety culture. And the CNSC is right to carry out its rigorous program of inspections. But in exercising judgment as to the reasonableness of inspection results and as to appropriate licence conditions, it is surely essential to assess the context. Of course, if that context were well known to everyone, one could again argue that further consideration would be superfluous. But I believe that the threats of climate change and running out of oil are *seriously under-reported* in the media, that large segments of the population are in denial, and that this context in general is therefore *not very well understood*. With that excuse, then, I turn now to a consideration of the climate change threat and the oil exhaustion threat — and the critical importance of nuclear generation in meeting those threats.

The climate change threat

First, let me say that I acknowledge that global warming is the subject of some contention. There are a *few* scientists (including the Lavoisier Group in Australia and the Science & Environmental Policy Project in the U.S.) who question the facts of alleged global warming and whether it is caused by anthropogenic greenhouse gas emissions. Of course, everyone is entitled to his or her opinion. And one can be in favour of nuclear-generated electricity without necessarily accepting anthropogenic global warming. However, it happens to be one of *my* strongest concerns — so here I speak as an individual citizen.

I'll touch on this controversy only very briefly. A few, but certainly not all, of the organizations objecting to mainstream science's view of global warming are funded by ExxonMobil, an outspoken corporate opponent of mainstream climate science. But I must concede that some of the more independent organizations have prestigious people in their ranks. The Science & Environmental Policy Project [SEPP] is chaired by Dr. Frederick Seitz, a former president of the U.S. National Academy of Sciences and a former president of Rockefeller University — and SEPP was founded by the outspoken atmospheric physicist Dr. Fred Singer).

But having acknowledged the existence of a few sceptics, I must emphasize that the vast majority of scientists accept global warming as fact. Dr. James Baker, of the National Oceanic and Atmospheric Administration in the US has said: "There's a better scientific consensus on this than on any issue I know except maybe Newton's second law of dynamics." Certainly, the recent Al Gore film, *An Inconvenient Truth*, expresses dramatically this consensus view (seriously marred, however, by his failure to mention nuclear energy as the obvious solution). But, in any case, even if there's some doubt, the precautionary principle would suggest that we act on the basis that it

could be true. If the smoke alarm starts ringing in your house while your children are sleeping upstairs, do you pour yourself another brandy and say "You know it just might be that that smoke alarm is defective" ? I don't think so.

Meanwhile, more evidence of climate change is accumulating. Last century's global warming of 0.6 degrees sounds small, but an extra 1.5 to 2 degrees will mean the loss of coral and other delicate ecosystems. It is said to be the most rapid warming the planet has seen in 10,000 years. In that time, carbon dioxide in the atmosphere remained constant at around 280 parts per million. It is now nearly 380 ppm, a level the earth has not experienced for at least 400,000 years.

In November 2004, an eight-nation report (sponsored by the 8 nations with arctic territories) found global warming was causing the polar ice-caps to melt at such an unprecedented rate that significant portions (if not all) could be gone by century's end — or even by 2070 (according to the report in the *Guardian*).

But having said all that, I am *not* worrying primarily about the gradualist model (Kyoto style) of global warming. I am talking about *abrupt climate change* — an issue seriously under-reported in the media and not addressed at all in the federal government's recent proposed legislation.

In a nutshell the concept is this. Initial global warming causes fresh water to flood onto the polar seas. The Gulf Stream (part of the 'Great Conveyor Belt') has had a moderating influence on Europe's climate by carrying warm water from the Caribbean up on the ocean surface to the north, where it then sinks and travels back to the south along the ocean bottom. The problem is: if the polar seas become flooded with fresh water (which is, of course, lighter than salt water) then the Gulf Stream water *won't* sink in the north when it should -- and thus the Great Conveyor Belt shuts down. If this were to happen then Europe's agriculture could sustain only 10% of its population. Mass starvation and desperate wars for survival would ensue!

The problem is that you don't get much warning before it happens. When a finger slowly pushes against a light-switch nothing happens until the switch reaches the 'tipping-point' and flips to the off position and the lights go off. There is no gradual dimming ahead of time to forewarn you. The flip here takes place over a *three-year period*, once started. This may not be the most likely scenario but there is an unacceptably high risk of it happening some time in the next 50 years. This is an intolerable risk to be running and we should do something about it!

What's the evidence? The main evidence is outlined in the 2002 National Research Council Report to Congress: "*Abrupt Climate Change: Inevitable Surprises*". The NRC Committee which authored the book was chaired by Dr. Richard Alley of Pennsylvania State University. Dr. Alley's book *The Two-Mile Time Machine* discusses the issues further. He points out that a shut-down of the Gulf Stream would mimic an event that happened some 11,000 years ago in the Younger Dryas Period — and the cataclysmic change (once it began) happened not over decades but over a 3-year period. Of course, cutting down greenhouse gas emissions is critical but Dr. Alley argues as well that with more research we should be able to stabilize the earth in one of its two equilibrium states (namely the one that has the Gulf Stream running). But is the research getting done?

Dr. Alley in his 2003 Testimony to the U.S. Senate pointed out that "we do not understand abrupt climate changes well enough to predict them." But he added: "it is likely that climate surprises await us. . . . Abrupt climate changes were especially common when the climate system was being forced to change most rapidly. Thus, greenhouse warming and other human alterations of the earth system may increase the possibility of large, abrupt, and unwelcome regional or global climatic events." Four of Dr. Alley's five recommendations involve improving research and modeling and one can hardly disagree. His fifth recommendation is to investigate "no-regrets" strategies to reduce vulnerability. Here surely we have to stop pushing that greenhouse-gas-emitting finger against the light switch that has no dimmer. I have communicated with Dr. Alley very briefly by email and he supports our work in trying to reduce greenhouse gas emissions.

Many expert scientists participated in the report. Could they all be wrong? But someone could say, you know shutting down the Gulf Stream may not be the *most likely* scenario. It may have only, say, a 30% chance of occurring in the next 40 years. But would you let your children (or your grandchildren) cross the highway if there was a 30% chance they wouldn't make it to the other side? I don't think so. Let's *stop* pumping those greenhouse gases up there — gas-fired plants may not be quite as bad as coal-fired and oil-fired but they still send up tons and tons of carbon dioxide. The only massively available forms of electricity generation that don't are waterfalls (and in Canada we've exploited most, not all but most, of them) and nuclear generation.

And it's not just about keeping the lights on in Ontario under status quo conditions. We should be replacing the fossil fuels that go into transportation. We need to electrify our railways. Invest more massively in electrified urban transit. We need to move to e-hybrid cars and perhaps eventually the hydrogen economy. Where's the massive amount of electricity going to come from that can permit that to happen? The only answer is nuclear generation. We need to start planning *not* just one or two but *many, many* nuclear generating stations -- and we need to start doing that now. This is my main concern personally.

Our international president, the French scientist Dr. Bruno Comby, (who made a visit here three months ago) says that it is important to remain optimistic. And I *am* optimistic. I believe that homo sapiens is immensely resourceful once aroused. I do believe that humanity will wake up, even at this eleventh hour, and solve the problem. But right now, the important thing indeed is to awaken public opinion. I feel it's as if we are coasting along on the Lake Erie waters above Niagara Falls and some of us are shouting: 'turn the boat around, we're going to go over the falls' – while others are saying: 'we're not sure how safe it is to turn this particular boat around; perhaps we should do an environmental assessment first; and besides there's some chance that there really isn't a falls down there anyway.'

Running out of oil

There's been some talk of this — but more about energy independence. In the main, we're in denial about the end of oil — because it's never happened before. But past personal experience is not necessarily a reliable gauge of the future. As one of my statistics professors used to say: "Every day hundreds of thousands of people in the world die who never died in their lives before." One of the problems is that the Saudi numbers (both reserves and production) have been secret since the 1980s. The disputants are divided between the "peak oil pessimists" (who frankly I find persuasive) and the "cornucopians" (who say, don't worry, we'll find something, we always have). I would say to the cornucopians: we *have* found something — human ingenuity and nuclear generation — now use them. James Howard Kunstler's 2005 book *THE LONG EMERGENCY: Surviving the Converging Catastrophes of the Twenty-First Century* is profoundly disturbing but terribly important. I agree with Kunstler that we are "sleepwalking into the future". If there is any hope of saving the world for our children and grandchildren, it is essential that we start mobilizing public opinion immediately.

The problem, very briefly, is that we likely passed the world oil production peak about last year (2005). We have used up 1 trillion of the 2 trillion barrels of oil that the Earth once had. At the current rate of world usage (27 billion barrels a year) and *if* we can extract all the remaining reserves, which seems unlikely, oil would last us 36 years — until 2042. That deadline will come sooner if we can't extract all the oil and if world annual oil consumption continues to increase for a while (which seems likely — particularly because of the exploding consumption in China and India). A more realistic deadline for running out of oil might therefore be somewhere around 2035. In 2035, my son and daughter will be trying to enjoy their retirement at ages 72 to 75 -- and my five grandsons will be in mid-career at ages 36 to 43. So this is a very personal issue to me. And, of course, the problems will start long before the last drop of oil is used up. As oil becomes scarce — and as production begins necessarily to decline — the price will rise astronomically. This will be aggravated by the fact that cheap oil in the past ratcheted up the world's population from under 1 billion to 6-1/2 billion. It won't be easy for these 6-1/2 billion people, hyper-dependent on oil, to go back (in a mere 30 years or so) to the situation of under a billion people a century and a half ago living without oil. Suburban, car-centred lifestyles may no longer be affordable for many people. The globalized economy (which depends on transporting goods thousands of miles cheaply) will end. In addition, as Kunstler argues, we are likely to be "entering an era of titanic international military strife over

resources." In short, we are facing, right now, the "end of the cheap fossil fuel era" — though you wouldn't know it by looking at television ads for new cars. Kunstler continues: "This is a much darker time than 1938, the eve of World War II. The current world population of 6.5 billion has no hope whatsoever of sustaining itself at current levels."

Why isn't anyone talking about this? The age of cheap oil (about a hundred years) is short in terms of the history of humankind but long enough for people to become so accustomed to it as "to consider it absolutely normative". We are not very good as a species at foreseeing events that have never happened before in our lifetimes. Even if there is good evidence, we tend to dismiss disasters as simply preposterous (or, at least, unnecessarily alarmist). Think of the wealthy Jewish families in the 1971 film *The Garden of the Finzi-Continis* sipping wine in their garden and discussing the strange anti-Semitic happenings in Nazi Germany. They concluded it was simply too preposterous to actually happen there in civilized Italy. We feel like shouting at the movie screen: "Take the next train to Paris, NOW!" But they stay put -- and eventually all of them are shipped to the gas ovens. As Kunstler says, "public discussion of this issue [running out of oil] has been amazingly lame". It is not a matter of conspiracy. "Mostly, it is a matter of inertia, aggravated by collective delusion" -- what Erik Davis has called "consensus trance".

So what can be done about it? The main thing that could buy us a little time would be, as Kunstler says, to ramp up a *Project Apollo-style program of nuclear power plant construction*. With the proven uranium reserves and the uranium in phosphate minerals, we have about 500 years of uranium reserves still in the earth (even without reprocessing the largely unburnt nuclear fuel) and these could be used to replace, with nuclear-electricity, things that are now running on oil. With reprocessing of used nuclear fuel and generation 4 reactors, this figure can be multiplied 50 to 100-fold to dozens of millennia, not to mention the billions of tons of uranium in sea water and the even greater reserves of thorium.

Some might ask: can't we just assume that some new innovation is going to solve all our problems? Kunstler calls this a "dangerous fantasy". It's true that the oil peak phenomenon has been, as he says, "discounted to about zero among conventional economists, who assume that 'market signals' about oil supplies will inevitably trigger innovation" and solve the problem. "Corporate executives fall victim to their own propaganda as much as the general public." The problem is simply: there isn't time. Kunstler comments: "Nobody is prepared for the sinkhole that awaits us down the road."

"The denial about global peak in the United States is already fierce, as investments in car-dependent, oil-addicted infrastructure are greater [there] than in any other nation" and Dick Cheney has famously said: "The American way of life is not negotiable" -- meaning, nobody's about to make changes any time soon to prepare for a dramatically different future.

But someone might again ask: isn't it still three decades before we run out of oil? The problem is, the difficulties begin *long before* we run out. As Kunstler says, "Peak is quite literally a tipping point. Beyond peak, things unravel and the center does not hold. Beyond peak, all bets are off about civilization's future." We're *probably* beyond peak now (the problem is we can only prove things looking into the rear view mirror for a while). Anyway — long before we actually run out, oil prices will skyrocket and there will be major military conflicts over resources (what we are seeing in Iraq today is only the very beginning of what is yet to come). "At peak, the human race will have generated a population that cannot survive on less than the amount of oil generated at the peak — and after peak, the supply of oil will decline remorselessly". That means starting now.

I don't believe this is unnecessarily alarmist. The alarm is necessary because the decline in oil production is about to happen, starting now. But we are all in denial. Kunstler believes that "the fossil fuel efflorescence was a one-shot deal for the human race." He adds: "It is extremely important that we make an effort to understand what is about to happen to us."

Another book I would refer to briefly is Matthew Simmons' 2005 book *Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy*. Matt Simmons is a financial analyst and founder of Simmons & Co. investment bankers. In his book he goes into an elaborate analysis of technical papers issued by the Society of Petroleum Engineers as a convincing means of piercing the Saudi veil of secrecy. One of the key factors is the amount of water that has to be pumped into an aging oil field to keep the oil coming out. It is like pumping more and more steroids into an aging athlete. If he weren't so aging, he wouldn't need that many steroids. So when the Saudis say, don't worry, be happy, we'll have lots of oil 50 years from now, Simmons' book would urge you not to believe them. Get ready. We're over the peak and coasting down the declining side of the curve now and the difference is that while we had a world population of about 1 billion when we began to climb the curve (a beginning we call the industrial revolution but perhaps more properly should be called the fossil fuel revolution) we now have over 6 billion as we begin to race down the post-peak side — and the annually increasing energy demands of China and India are scary. We need a lot more CANDU reactors than the 1,400 megawatts that AECL has successfully built (two 700 MW reactors) in Qinshan near Shanghai on budget and ahead of schedule. As one of our EFN-Canada directors, David Scott (of the University of Victoria) has written: "The ACR [Advanced CANDU Reactor] is the highest in high technology, the benefits are extraordinary, it is economical, and good for the environment. . . . It will be a leading advanced technology, designed and built in Canada, which can really help save planet earth, and that means that it should be deployed in Canada and then it can be deployed around the world."

We've got to get on with this. It would be ironic to encounter both of the disasters I've pointed to — that is, to provoke a climate disaster by being unwilling to wean ourselves off oil for the next 30 years and then we run out anyway and are forced to wean ourselves off oil — but with the weaning taking place 30 years too late.

A final book I'd like to refer to is Stephen Leeb's 2006 book: *The Coming Economic Collapse*. He refers to the dangers of what he calls 'groupthink'. He argues: "No authority — not Wall Street analysts, the media, government, or academia — believes that energy prices are in a long-term uptrend. *Unless* they soon realize that the mismatch between energy supply and demand is a chronic and worsening problem, the resulting catastrophe will make the tech bubble look like a picnic."

Wind power, solar power, geothermal and conservation

We should do all of these things — but they won't be enough. Conservation and energy efficiency (two different things) are terribly important and both should be pursued. But we mustn't have unrealistic expectations about what is possible — particularly with the explosive expansion in China and India. We're not going to cut our demand in half. Realistically we still need a massively available and reliable energy source to replace the carbon fuels we're dependent on today. And that source will have to be nuclear.

Wind and solar power, though expensive, should be pursued aggressively but they are unlikely to make up more than, say, 15% of our demand. Yes, we are behind in Canada -- and *should* catch up. Yes, Denmark gets 23% of its electricity from wind power — but it is situated in the middle of the windy North Sea. Most experts I read talk about 5% to 10% being the most one can likely expect across Canada on average. And the typical windmill (for example, the one down at the CNE) runs about 25% of the time — and an average of only 19% for the wind-champion Germany. That's a pretty low payback for the initial cost. And on top of that, wind power (and solar power too) need back up for when the wind isn't blowing or the sun (at night) isn't shining. And that back up (stand-by generating stations) has a cost too. Wind and solar *can't* make up reliable baseload power because of this intermittency problem. Let's do it by all means. But let's not have unrealistic expectations.

Geothermal energy is important as well. Our Honorary Chair of EFN-Canada, Patrick Moore has been a long-time advocate of geothermal — and I've just finished installing it in my place in Cobourg. For the heating of individual homes it makes a lot of sense — but in itself this is still not enough to offset our present tremendous dependence on oil (particularly in transportation).

Well if conservation, wind, geothermal, and solar are good but not enough, what can be done? As I've already indicated, the only alternative is more nuclear-generated electricity. In his *Long Emergency* book, Kunstler says that the main thing that could buy us a little time would be to ramp up a Project-Apollo-style program of nuclear power plant construction. In Ontario that would mean not one or two but ten or twenty new nuclear plants. We're not just talking about the OPA's gap between projected electricity demand and supply on the *present* system — we're talking about the *much bigger figures* when we add to that: replacement of oil-based transportation energy.

Nuclear power the only massively available non-greenhouse-gas emitting electricity source after waterfalls. Again I'll refer to our Honorary Chair: Dr. Patrick Moore. Patrick was the founder and first Canadian President of Greenpeace. No one can accuse him of not having the highest environmentalist credentials. But he left Greenpeace when they turned anti-nuclear. Patrick has said to the US energy senate committee: "Nuclear energy is the only in fact non-greenhouse gas emitting energy source that can effectively replace fossil fuels and satisfy global demand." I will add as well the comment by our Honorary Member, the famous British Scientist, James Lovelock, creator of the Gaia Theory (that we should treat the world as a sort of living organism and understand its feedback loops): "I *am* a Green and I entreat my friends in the movement to drop their wrongheaded objection to nuclear energy (...) We have no time to experiment with visionary energy sources; civilisation is in imminent danger and has to use nuclear -- the one safe, available, energy source -- now or suffer the pain soon to be inflicted by our outraged planet."

There's not the space here to get into a refutation of all the common misperceptions of nuclear (cost, accidents, radiation, and waste disposal). These all have answers but this is not the place to present all the answers at length. I'll just quote briefly Patrick Moore: "103 nuclear reactors are operating every day in the US, 442 world-wide. No serious accident since 1986. No one died as a result of a radiation-related accident in the history of the US or Canadian civilian nuclear program. 45,000 people die in automobile accidents every year in North America."

A few comments on the FARE issues re Cameco

I'd now like to briefly comment on some of the nine issues FARE identifies on its website with respect to the Cameco application. I do this because they have been urging their members to intervene with these points and there may well, therefore, be a number of interventions raising various subsets of these nine points. As I said earlier, I respect FARE members for their desire to protect the community and future generations from unnecessary hazards. Where we differ arises from my belief that the identified risks are miniscule and my concern that impeding nuclear development too much will expose future generations to gigantic hazards (abrupt climate change and oil exhaustion).

1. Licence period

FARE argues that the Cameco licence should be reduced from 5 years to 2 years. I believe, in contrast, that the CNSC Staff recommendation of another 5 years (like the last licence period) is reasonable. It's true that there are some outstanding compliance issues with respect to the most recent National Fire Code — but the company is moving on these issues in what seems to me a reasonable fashion. FARE argues that the Vision 2010 decommissioning of certain buildings will start in 2009 and operating procedures at that time need clarification. But I would presume that such clarification will be completed well before 2009. Finally, FARE argues that B performance grades are not adequate. I can understand, though it is excessive, the desire to punish a company for failure to reach A grade performance but when I look at the likely effect of that punishment (impeding progress towards eliminating greenhouse gas emissions) we would, in effect, be punishing our own children and grandchildren. Accordingly, within this important context, I feel strongly that the CNSC Staff recommendation of another 5 years is reasonable.

2. Emissions

FARE argues that Cameco should be made to "declare its support for zero emissions" (of uranium, hydrogen fluoride, ammonia and nitrous oxide). I am not expert enough to comment on the change in methods for estimating uranium emissions and the comparison between stack and "fugitive" emissions. I would simply observe that the

Cameco emissions are a tiny fraction (about 5%) of the regulatory limit and that arguing for zero emissions is like demanding the company make omelettes without breaking any eggs. That would be fine if we didn't need the omelettes but we desperately do (reduction of greenhouse gas emissions). I therefore feel that the CNSC Staff recommendations are reasonable ones. The health damage of fossil fuel emissions (which nuclear generation will help to reduce) are far greater than the minute risk of Cameco emissions. The Suzuki Foundation has noted that air pollution from fossil fuel emissions is linked to the premature deaths of up to 16,000 Canadians every year (see www.cmaj.ca/cgi/content/full/166/13/1678). Surely those 16,000 annual fossil-fuel deaths should count for something.

3. Emergency management
FARE is right to identify an important point like this. However, when CNSC Staff credits the company with a "timely completion of actions" and concludes that the fire response issue "has now been adequately resolved" I would place my confidence on the CNSC Staff recommendations — particularly within the context of our desperate need for fuel for increased nuclear generation.

4. Fire protection and 5. Compliance with National Fire Code
Again FARE is right to shine the spotlight on an important issue like this one, but when CNSC Staff conclude that further improvements are happening and that the existing status does "not pose an unreasonable risk to the health and safety of persons or the environment" I would again place my confidence on the CNSC Staff recommendations — again within the context of the alternative risks of slowing up nuclear generation.

6. Neutron radiation
FARE argues that neutron radiation emanating from UF6 cylinders is serious and that CNSC Staff and Cameco have been lying about it. Again, when CNSC Staff dismiss these concerns and say that there is no issue with dose to workers or the public I see no reason not to have confidence in the CNSC Staff recommendations. Radiation in general is a topic subject to unreasonable hysteria. One can get more radiation taking one airplane trip than living at the Cameco fenceline for years. I see no reason to reject the recommendations of CNSC Staff.

7. Storage of contaminated soil and 8. Public information
I have no particular comment on these two issues.

9. Depleted uranium
FARE wants to know if the depleted uranium produced by Cameco is exported for military purposes. I would make just three brief comments. First, as Cameco has reported in the Day 1 Hearing, they made no depleted uranium during the last licence period (even though licensed to do so). Secondly, the use of depleted uranium even in military use has nothing to do with atomic bombs or uranium fission, but is simply using U238 as a heavy metal capable of forming exceptionally strong products. Thirdly, the company has stated publicly on numerous occasions that their products are sold exclusively for peaceful purposes.

A few comments on the FARE issues re Zircatec

I'd now like to briefly comment on the five issues FARE identifies on its website with respect to the Zircatec application (for the same reasons as my comments on the Cameco points).

1. Licence period
FARE argues that the Zircatec licence should be reduced from 5 years to 2 years, if it is relicensed at all. I believe, in contrast, that the CNSC Staff recommendation of another 5 years (like the last licence period) is reasonable. It should be noted that the CNSC Staff recommendation is with respect to the unchanged parts of the licence. The modifications required for the increased SEU handling will be subject to an environmental assessment — which surely deals with FARE's issue. And I would hope that such an EA can be completed expeditiously – again looking at the consequences for the future of delaying the eventual move to the Advanced Candu Reactor (ACR), which requires SEU. FARE secondly argues that Zircatec has been fighting CNSC Staff attempts to make them

compliant with fire protection codes. From reading the transcript of Day 1, I conclude that reasonable progress is being made and am therefore content with the CNSC Staff recommendations. FARE argues that "it is bad policy to reward a truant" but the "truant" term seems to me inconsistent with the CNSC Staff comments included in the Day 1 transcript.

2. Environmental assessment for SEU

FARE applauds CNSC staff for changing and now requiring an environmental assessment before the increased SEU handling is permitted. This does not need further comment because FARE and CNSC Staff are now on the same side on this one. As I say, I only hope that the EA can be carried out expeditiously.

3. Action levels

FARE has criticized the CNSC Staff for increasing the action levels for radiation doses to workers and argues that this has made CNSC "a lapdog and apologist for the nuclear industry". Establishing reasonable action levels has to be done in a context of the risks of inadequate control on the one hand (which I believe are very, very slight) and the risks of serious production impediment on the other (considering how much we desperately need increased nuclear generation). From reading the Day 1 transcript I certainly get the impression that CNSC Staff members (who conclude that Zircatec corrective actions proposed are acceptable and don't pose an unreasonable risk in the interim) are conscientious citizens sincerely trying to act for the public interest. Calling them names does not seem to me a useful way to advance discussion.

4. Decommissioning

FARE argues that Zircatec's decommissioning estimate of $3 million is "seriously deficient" when compared to Cameco's decommissioning figure of $83 million. While the numbers superficially may seem dramatically different, I would have expected that a fuel conversion operation (Cameco) would indeed have a far more complex and costly decommissioning than a fuel bundle assembly operation (Zircatec). If the CNSC Staff consider it adequate, I would see no reason to question their conclusion.

5. Lack of fire protection

FARE argues that the CNSC should "suspend the licence of Zircatec until it secures adequate fire response." In the Day 1 transcript CNSC Staff point out the corrective actions scheduled for completion in late 2006 and the two slated for summer 2007 (as well as the many corrective actions already completed) and conclude that the corrective actions proposed are acceptable and don't pose an unreasonable risk in the interim. Given the CNSC Staff conclusions, it is hard to see the reasonableness of FARE's proposal to suspend the licence.

Questionable Assumptions in Radiation Protection and the Fallacy of Advocating Zero Emission Targets

Before closing, I would like to refer very briefly to issues about the normal regulatory determination of radiation limits. Typically radiation risk prediction is based on the linear no-threshold (LNT) hypothesis. An analogy to falling is instructive. If it is determined that falling 100 feet is always fatal, then one would expect that if 10,000 people fell 100 feet, all of them (10,000) would die. On that basis, assuming a linear relationship between falling-height and death, if 10,000 people fell 50 feet, then 50% of them (5,000) would die — and indeed that might be true. But extending the argument further, if 10,000 were to fall 1 foot the LNT approach would predict that 100 of them (1%) would die and if the 10,000 were to fall 1.2 inches, that 10 of them (0.1%) would die. Clearly, in this case, we recognize the last two conclusions are ridiculous. There *is* a threshold below which falling produces no risk of death at all. Of course, this example of the inapplicability of LNT to death-from-falling does not in any way prove the inapplicability of LNT to radiation. However, in recent years numerous radiation studies *have* indicated that the LNT hypothesis is incorrect for radiation exposure as well. There *is* indeed a threshold below which radiation is not harmful. In fact, there is the new field (extensively studied in the last decade or so) of radiation *hormesis* — the concept that low-dose radiation is actually *beneficial* to human beings because it stimulates *adaptive responses* which then help to protect the individual against any future accidental exposure to higher radiation doses (the same concept as used in *vaccinations*). The above examples of the LNT fallacy are taken from

the 2005 book by Ed Hiserodt *Under-Exposed: What If Radiation Is Actually Good for You?,* which then goes on at length to discuss radiation hormesis.

Related to the LNT fallacy is, Hiserodt points out, the "collective dose" concept. If a dose of 100 aspirins is fatal for one individual, then if 100 people take 1 aspirin each their "collective dose" is 100 aspirins and accordingly we can, the argument goes, expect one of them to die. Again we all can recognize that the conclusion is ridiculous. But the same concept tends to be used in radiation risk predictions.

I would urge the Commission to study these LNT and hormesis issues carefully (and perhaps you have already begun to do so). But in the meantime, it reinforces my argument that seeking zero emission targets (even at the risk of denying the important benefits that nuclear generation can provide in avoiding abrupt climate change and weaning us off oil) is not a reasonable goal and should be rejected. Indeed, it can be argued that the ALARA principle will need ultimately to be adjusted: if a radiation protection policy prevents a worker from receiving a very low radiation dose and thus preventing the induction of this protective response, the policy could be viewed as "withholding benefit" from such worker.

Conclusion

From reading the Day 1 transcripts for both Cameco and Zircatec, I see no reason to question the CNSC Staff recommendations.

The main point of this submission, however, is to emphasize *context*: that is, the importance to the community (and indeed the worldwide community) — and our future generations — of increasing nuclear generation in order to replace our dangerous reliance on greenhouse-gas-emitting fossil fuels (which we are running out of in any case). We need the contributions that Cameco and Zircatec can make. Yes, we should handle radioactive materials extremely carefully — and we do. CNSC is right to maintain its rigorous program of inspections. And FARE is right to shine the spotlight on questions its members have.

But on balance, weighing (a) the intolerable risks of doing nothing against (b) the manageable (indeed, if well managed, miniscule) risks of handling a limited amount of well-confined nuclear materials, I urge the Commission to grant these two licences, as recommended in the Day-1 recommendations of the CNSC Staff.

Respectfully submitted,

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