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# Written submission from Ken Chaplin

# Mémoire de Ken Chaplin

In the Matter of

À l'égard de

**Decision on the scope of an environmental assessment of the proposed Micro Modular Reactor Project at the Canadian Nuclear Laboratories Ltd., in Chalk River**

**Décision sur la portée de l'évaluation environnementale pour le projet de microréacteur modulaire aux Laboratoires Nucléaires Canadiens ltée, à Chalk River**

Hearing in writing based on written submissions

Audience par écrit fondée sur des mémoires

**May 2020**

**Mai 2020**

Canada

# Submission on the Proposed Micro Modular Reactor (MMR) at CNL

SUBJECT: "the scope of factors to be considered in the EA for the proposed MMR Project, and … providing topic-specific and value-added written interventions to the Commission. ". This is as per: "Notice of Participant Funding and an Opportunity to Submit a Written Intervention on the Scope of an Environmental Assessment", January 27 2020.

This document attempts to address positive aspects of the project and incorrect societal assumptions that should be discussed in the environmental assessment.

Climate change is a serious problem and we should use all available technologies to solve it. Nuclear energy does not create greenhouse gases and should play a major role in the world-wide energy mix. Four things listed below and described in more detail in the body of this document should be considered in the environmental assessment for the proposed MMR project at CNL. These four points are all applicable to the worldwide nuclear industry, but they also apply specifically to the current discussions of putting one MMR at CNL.

1. The proposed project will help CNL reduce its: greenhouse gas emissions, harm to human health from air pollution, and environmental effects. In addition, the proposed project can help launch SMR/MMR technology which will extend nuclear's impact beyond the ~15% of energy represented by electricity.
2. Nuclear risks are heavily over-estimated whereas fossil fuel risks are underestimated.
3. The effects of radiation are misunderstood causing the public to oppose: reactor development, siting, construction, and operation, as well as waste management.
4. Society typically over-estimates the benefits of renewable energy in the energy mix.

I will briefly describe my past as related to this topic. While investigating pollution in high school I read that 50,000 Americans died annually from air pollution from fossil fuels. Since the impact on human health was so large, I was concerned that the environmental impacts would be enormous.

After graduation from university in 1974, I got a job at Atomic Energy of Canada Limited (AECL), just when oil shortages led to increased interest in energy. Eventually, I became more interested in conservation and alternate energy and left AECL to do graduate studies in applied math at Waterloo. I studied and did my thesis on solar energy. Upon graduation I got a job in the environmental industry working on oil spill and air pollution (acid rain) computer models as an Air Quality Scientist. In 1984 I returned to AECL convinced that the world would start building reactors again. More recently I have been studying the effects of radiation.

## Point 1 SMR/MMR Can Improve Human Health and the Environment

CNL's fossil fuel power plant has been used for district heating for many decades[1]. This plant has caused greenhouse gas emissions, air pollution that affects human health, and risk to the workers from potential accidents in the power plant. Each year many truckloads of fuel were delivered with potential highway accidents. The power plant is within tens of metres of the Ottawa River making a fuel spill into

[1] I believe the fuel is bunker C, which is not the cleanest choice.

the river a distinct possibility. I am not trying to raise alarm bells about this power plant. Rather, society should recognize that replacing an old fossil fuel plant with a brand-new MMR is overwhelmingly advantageous. Building an SMR/MMR at CNL and reducing fossil fuel consumption would reduce greenhouse gas emissions, reduce air pollution in Renfrew County, and would reduce the risk of bunker C in the Ottawa River.

Clean energy from an MMR would be advantageous at CNL, as it would be at many other sites in Canada and around the world. Nuclear energy should be replacing fossil fuels which emit greenhouse gases and also many other chemicals. Fossil fuels also contaminate water and lead to oil spills. Hansen and other climate scientists estimate that nuclear saved millions of lives by reducing air pollution from fossil fuels. I agree with that assessment based on the World Health Organization's estimate of millions of deaths annually from air pollution. Currently, nuclear is used for electricity. However, electricity only accounts for about 15% of total global energy. SMR/MMR technology can extend the reach of nuclear by giving factories, mines, and remote communities access to electricity and large heat sources for industrial applications and district heating. Data centres would have access to reliable, emission free electricity.

The Commission should consider in the EA the benefits of the MMR both locally and from a worldwide SMR/MMR industry.

## Point 2 – Nuclear Accidents Versus Fossil Fuel Accidents

Three Mile Island (TMI) did not expose people to much radiation and no one died from it. TMI taught us that even though the public and workers were not harmed by this accident, the economic cost to the utility and the reputational cost to the regulator were enormous. The nuclear industry worldwide took steps to ensure that TMI never happened again, certainly to prevent possible harm to people and the environment, but also because the industry could not afford another accident.

Chernobyl was of course much more serious, and claims that many people would die from radiation shocked the world. Although not obvious, these claims were for deaths over the next 50+ years in populations of hundreds of millions, or even billions, of people. However, these death estimates were theoretical, and fictious, as will be shown in Point 3. In spite of widespread perceptions, Chernobyl killed only about 50 people. Many of these deaths could have been prevented with the simplest of precautions.

The Ufa disaster was a gas products explosion in the Soviet Union three years after Chernobyl. It immediately killed almost 600 people, essentially all members of the public one third of whom were children. There were also many uninvestigated impacts. The number of deaths from Ufa is about ten times greater than from Chernobyl. Ufa and Chernobyl were both Soviet Union accidents in the energy industry. However, neither accident occurred because of inherent problems with the technologies. Rather, both accidents were symptomatic of dysfunctionality in the USSR, especially during its collapse.

Chernobyl has had an endless stream of articles, studies, books as well as an HBO miniseries and PBS special. Ufa by contrast is virtually unknown in spite of immediately killing almost 600 people. Chernobyl is infamous because of the false perception that the radiation killed thousands. In fact, the thousands of deaths hypothesized have never materialized. Even the 100+ emergency response workers who survived extremely high radiation exposure did not have elevated deaths rates 30 years

after the accident[2]. There was a large evacuation and a large area that the public believes is uninhabitable. The evacuated people suffered because they lost their home, way of life, and support network of family and friends. However, the animals have returned and thrived in the evacuated area. The inaccurate fear of radiation damage led to hundreds-of-thousands of unnecessary medical abortions, which left emotional and physical scars.

The Fukushima accident was due to inadequate preparation for a tsunami in the Pacific Ring of Fire, which means the accident could have been avoided with basic precautions. Fukushima shows us that the fear of radiation can be more harmful than the radiation. About two thousand people, often in their 70s and 80s, were hurriedly evacuated to avoid a very small hypothetical increase in cancer rates in the decades to come, only to die soon after from stress. Younger evacuees lost their way of life and support network causing depression and precursors to diabetes and heart disease. Also, fear of radiation caused Japan and Germany to shut down nuclear reactors and replace the electricity by burning fossil fuels. This increased air pollution which affects all Japanese, and it increased greenhouse gas emissions which affects the entire world. The harm from the Fukushima accident was due to fear of radiation, not the actual radiation.

The lessons from these accidents will prevent future accidents. There was harm from the fear of radiation from TMI and Fukushima, but there is no demonstrated harm from the radiation. Chernobyl was a unique case caused by dysfunctionality in the Soviet Union. Society overestimates the harm from radiation and quickly forgets that fossil fuels have many more accidents with much larger consequences. The design, implementation, and operation of the MMR will be safe. Even the perception of a small accident would be devastating to CNL, CNSC, and GFP.

The Commission should consider in the EA that nuclear accidents have been much less harmful than people believe, and that fossil fuel accidents are both much more numerous and much more harmful than people believe.

## Point 3 – Misunderstanding of the Effects of Radiation

The perception of large amounts of harm from Chernobyl's radiation is because of a theory that says that any amount of radiation can be harmful. Everyone gets naturally occurring radiation on a daily basis from the ground, from food, and from space without suffering harm, but the Linear No Threshold (LNT) theory states that any small increase in radiation from nuclear energy could cause a cancer at some point in your life, maybe 60 or more years later. This is not true.

In 1946, A Nobel Prize winner's acceptance speech claimed that there is: "no escape from the conclusion that there is no threshold dose". This assertion was based on studies of inheritable genetic damage in fruit flies caused by massive radiation bursts, which was later shown to not apply to people. Studies of Hiroshima/Nagasaki survivors showed that fear of changing the human genome was unfounded. Instead, it was suggested that any DNA damage could lead to cancer, which was a powerful argument against nuclear bomb testing. Unfortunately, the idea that small radiation doses could cause cancer became dogma preventing the beneficial application of nuclear energy.

[2] There might be 3-4 more leukaemia-related diseases in this group which had 1 to 4 Sieverts whole body and 10+ times more than that in skin dose.

LNT causes people to fear radiation doses that are much too small to cause harm. People are told that the risk from a small radiation dose is acceptably small, but that this small dose increases their risk of cancer. In particular, LNT causes nuclear waste to be feared much more than necessary. A specific example is that I was exposed to radiation doses in a thirty-hour period that exceeded the lifetime doses that the "most exposed person" would get from CNL's proposed Near Surface Disposal Facility (NSDF). Study of the epidemiological data shows that my doses were safe and certainly the negligible doses from the NSDF are safe. However, the assumption that any increase in dose increases cancer risk makes people fear the NSDF. When they are calculated, I am confident that doses to the public and workers from CNL 's MMR will be negligible, i.e. will cause no harm.

The Commission should consider in the EA that there is no evidence showing that low doses of radiation are harmful.

## Point 4 – Nuclear Versus Renewables

Solar and wind can't replace fossil fuels on their own. The world has been trying to do that for 50 years and in that time energy from renewables, predominantly hydro, has approximately doubled to about 5% of total world energy. The rest comes largely from fossil fuels, and fossil fuel consumption more than tripled in that time. In fact, greenhouse gas emissions continue to rise world wide. Even if the world doubled its efforts to convert to renewables, it is likely the world would only rely on renewables for total energy when the sun shone, the winds blew, and the hydro reservoirs were full. By contrast, France and Ontario expanded nuclear in the 1970s and 80s and essentially displaced fossil fuels for electricity production.

The Commission should consider in the EA that renewables will not replace fossil fuels on their own and that nuclear will be required in the energy mix.