IICPH Comments on Standards and Guidelines For Tritium in Drinking Water INFO-0766 March 2008

This critique is based on a reading of the following documents including the Canadian Standards and Guidelines for Tritium in Drinking Water, hereafter referred to as :INFO-0766:

INFO-0766, Canada

ICRP International Commission for Radiological Protection, 1991a, 1990 recommendations of the ICRP, Annals of the ICRP, 21 (13) Oxford, Pergamon Press (Publication 60), referred to as ICRP1991.

ICRP, 1991b. 1990 recommendations Radiological Protection Bulletin 119 (Supplement). National Radiological Protection Board, Chilton, UK, referred to as ICRP 1991.

ICRP 1996, Oxford Pergamon Press (Publication 72).

ICRP 2000, Oxford Pergamon Press (Publication 82)

WHO World Health Organization, 2004. Guidelines for Drinking Water Quality, Vol. 1, Third Edition, Geneva Switzerland, 2004, referred to as WHO 2004.

Introduction:

INFO-0766 opens with a disclaimer: "The information in this document is not exhaustive, however it can be considered to be reasonably complete in regards to the major emitters of tritium in the world. The information is current as of September 2007. INFO-0766 **does not attempt to analyze the information or draw conclusions". [emphasis added].**

We note at the beginning of this critique that INFO 0766 is not a public health policy document. The standards and guidelines reflect "common practice" and are not designed to be health-based regulations adapted for the special needs of Canadians. Canada has a diverse population, including significant numbers of First Nation Peoples who depend on a subsistence living and value our rivers as life-giving. The regulations and guidelines do not provide for public health policy or form a basic framework for CNSC.

INFO-0766 is not an attempt to set reasonable health-based standards or guidelines for tritium in drinking water, but rather it is a compendium of what every other country does with its tritium pollution from nuclear related industries. We find this approach a serious abdication of responsibility by the Canadian CNSC. Canada is one of the original countries to bring nuclear energy technology to the world! Yet Canadian expertise in protection of the public from the toxic and radioactive pollution from this industry has not developed since 1950 when all responsibility was turned over to the thirteen (self-perpetuating) members of "The Commission", formerly called the ICRP Main Committee, of the International Commission on Radiological Protection (ICRP).

Although Canada played a key part in the formation of ICRP and sent scientists to serve

on this commission, it now holds no membership on The Commission, which makes all policy decisions. Moreover, as the recognized largest polluter with man-made tritium in the world, Canadian contributions to the research on health effects, after almost seventy years of living with this pollution, could have been a world-class contribution to public health!

Formation of the ICRP:

Canadian nuclear physicists, along with those from US and UK, were an integral part of the Manhattan Project, responsible for development and implementation of the uranium bomb used in Hiroshima, 6 August 1945, and the plutonium implosion bomb used in Nagasaki, 9 August 1945. After the war, Canadian nuclear physicists also participated in the dialogue, 1945-1950, prior to the setting of common radiation protection standards for the then only three nuclear nations. At that time each had different standards for radiation protection. Canada helped to form the International Commission on Radiological Protection (ICRP) that would recommend for the world these same agreed upon standards set by the nuclear physicists.

The formation of common radiation standards was at the time important since the US began atmospheric nuclear weapon testing in the summer of 1946, at Bikini Atoll in the Pacific[1]. The northern hemisphere was being blanketed with nuclear fallout, and there was fear of legal action against this threat to life by some "small" country.

One can read about both the decisions of these nuclear physicists, and the state of knowledge and understanding of the health effects of radiation in 1950, in the papers of a meeting held in London, England, October 1950, and published in 1952[2].

Choosing biological endpoints of concern to workers and the public:

The first step in any standard setting is to choose a biological endpoint, such as respiratory failure, kidney failure, cancer, genetic effects, congenital malformations or diseases, etc., which the regulations would attempt to minimize[3].

As is well known, the nuclear industry focuses on "fatal cancers" and "serious genetic diseases in live born offspring" as the major detriments of exposure to ionizing radiation. Although this selection in no way implies that there are no other detriments which might well be "of concern" to the public and workers, these two biological effects have served to limit the assumptions about illnesses potentially radiation-related for ordinary workers and the general public. A second assumption, also wrong, is that the selection of the biological endpoint was determined by the research analysis of the atomic bomb victims of 1945.

Actually, by October of 1950, the nuclear physicists from Canada, the US and UK had already designated **fatal cancer** to be the health effect of most concern after exposure to ionizing radiation, although it was well known at the time that one of the primary effects of radiation is on the human stem cells in bone marrow used for blood cell formation.

This can be a very early measurable effect of exposure that has an immediate negative effect on the body's cellular immune system[4]. Moreover, Hermann Muller had received the Nobel Prize for Physiology and Medicine in 1946 for showing the extraordinary effect of X-radiation on mutations and alterations of the DNA.

It should also be noted that this decision to focus on fatal cancer was made by nuclear physicists prior to any data collection or analysis of the health effects in Hiroshima or Nagasaki, since survivors of these atomic bombs were not even identified until the 1950 Japanese Census. Data processing and the first attempt at dosimetry were not available for analysis until 1957 (TD57). Since 1957, there have been new assignments of dose in 1967 (TD67), 1986 (DS86) and most recently in 2002 (DS02). Health effect studies based on DS02 now replace all previous research findings. All atomic bomb research dating prior to 2002 is now inadmissible science since the dosimetry changes were not homogeneous shifts of data, but rather were shifts that changed the relative exposures significantly[5]. Each change was made by those familiar with the data findings, rendering the new health related research suspect.

At this 1950 meeting in London, even the details of the Standard Man had been decided on, presented and explained by the nuclear physicists[6]. Setting regulations based on the Standard Man were followed by regulatory concentration on the most exposed persons, usually a white male worker with outside chores, rather than the most vulnerable persons, pregnant women, the unborn and the elderly. This attitude, namely, that if you are less competent than the Standard Man, 20 to 30 years of age, in good health and Caucasian, then it is your fault if you succumb to a fatal cancer, persists today in the regulation of radioactivity in the living space. Compliance is based on the dose to the maximally exposed person.

Thereafter, this committee from Canada, the US and UK, went to the already established committee of the International Radiology Society, which was setting protective standards for radiation exposure of medical radiologists. They asked to join the radiologists (promising not to regulate or limit medical irradiation) and form the International Commission on Radiological Protection (ICRP)[7]. For the fundamental decisions about radiation protection, nuclear physicists have made up about 51% of the members of the ICRP Commission. These are now implemented in most countries and have guided the Canadian AEBC and its successor the CNSC. ICRP is an independent Registered Charity in the United Kingdom, with a secretariat in Sweden.

> According to its constitution, "ICRP is established to advance for the public benefit the science of Radiological Protection, in particular by providing recommendations and guidance on all aspects of radiation protection. In preparing its recommendations, the Commission considers the fundamental principles and quantitative bases upon which appropriate radiation protection measures can be established, while leaving to the various national protection bodies the responsibility of formulating the specific advice, codes of practice, or regulations that are best suited to the needs of their individual countries."[8]

The ICRP has since weakened its professional relationship with the International Society of Radiology, and is considered a self-appointed and self-perpetuating Non-Governmental Organization (NGO) of physicists (about 51%), medical regulators of nuclear nations (about 25%), radiologists (about 10%) and others, including biophysicists, geneticists, and others who use radiation in their work (about 14%). One becomes a "member" of ICRP Commission by being proposed by a present member and accepted by the executive committee. No professional group, or even the World Health Organization can appoint a member to the ICRP Commission.

Moreover, ICRP has been providing most of the radiation protection text books and references for University Health Physics, Nuclear Physics and Nuclear Engineering, Nuclear Medicine and Radiology since 1957. Hence it has created an artificial "consensus" in the physics, radiology and nuclear medicine communities.

> "Members of the Commission shall be chosen on the basis of their recognized activity in the fields of medical radiology, radiation protection, physics, health physics, biology, biochemistry, biophysics and other disciplines relevant to the objects of the Commission, with regard to an appropriate balance of expertise rather than nationality."[9]

Biology is a new addition to this list. Although the Commission makes health protection guidelines, no one specializing in Community, Public or Occupational Health, Oncology, Paediatrics, or Epidemiology is sought as a Member! According to its by-laws, ICRP is not a public health organization. Rather, it offers a risk versus benefit trade off between the benefit of nuclear activities and the risk of cancer death or severe genetic defects in live born offspring.

> "The main objective of the Commission's recommendations is to provide an appropriate standard of protection for man [sic.] without unduly limiting the beneficial practices giving rise to radiation exposure."[10]

The main "benefit" is nuclear weapons. Such health effects as spontaneous abortion of a genetically deformed embryo or fetus, still births, or severe congenital malformations or diseases are not counted by ICRP as "detriments", although they are well document effects of exposure to ionizing radiation. Tritium is especially harmful to the pregnant woman and her offspring!

Responsibility for national radiation protection must belong to health professionals charged with this public office in the Country having nuclear activities!

It should be very clear that Canada's dependence on the recommendations of the ICRP as appropriate for protection of all Canadian people with no analysis or interpretation is an abdication of a sacred trust. There needs to be Canadian health research and life-style assessment to either support or make counter recommendations to the direct use of these general trade-offs proposed by the users of radiation without specific modification for the Canadian homeland. This is

especially true for regulation of tritium, of which Canada is main producer in the world. Since Canadian man-made tritium releases are orders of magnitude greater than those in other countries, Canada has a special need to adjust the generic regulations to this reality.

The dangers of Ionizing Radiation exposure:
According to the ICRP philosophy:

> "Through its genotoxic action of producing DNA mutations, radiation can cause cancer and genetic damage with a probability that depends on the dose. In addition, high doses can cause other, more immediate types of harm, which are inevitable if the dose is high enough to cause massive cell killing. However, such high doses occur only in accidents and in radiotherapy (where it is desired to kill tumour cells).
> "Classically, no one is affected by low doses of a noxious agent, but above a threshold that may vary slightly between individuals, everybody is affected. This relationship applies to high dose effects of radiation, such as skin burns."[11]

These are the major premises on which ICRP rests its decisions. Many scientists disagree with these premises, and there are many published peer reviewed research papers that document harm at low dose. However, given the structure and closed nature of the ICRP, these scientists and their research have been excluded from the professional dialogue on regulation of exposure to ionizing radiation, and in particular, to tritium in drinking water.
Canada had the opportunity, which it failed to make use of, to include actual scientific knowledge on the real life health situation in Canada, in deciding whether or not the ICRP regulations are adequate given the Canadian uses of nuclear technology. After more than 75 years of mining, milling and nuclear technology Canada should have a major health data base which it offers not only to Canadians but to the world, on the actual effects on human health of radiation pollution when combined with pesticide, toxic chemical, pathogenic and other common problems in the modern real world.
INFO-0766 presents no data on Canada's 75 years human health history with exposure to ionizing radiation, but is merely a compendium of how other nations relate to, and adopt, the ICRP recommendations, methodology and risk factors. There is little or no differentiation except for rounding of numbers and decimal points (national order of magnitude decisions).

Only recently has the ICRP included non-cancer non-genetic effects as "detriments:

> "Any system of weighting for severity must involve a subjective component. With the ICRP weighting, non-fatal cancers and genetic effects are regarded as corresponding to a further 2.3 % of **deaths** [emphasis added] per person Sv, and therefore the total detriment from all cancers and genetic disease to be 7.3 % per person Sv. For radiation workers, a somewhat smaller detriment coefficient of 5.6 % is assumed (primarily because there are no children among radiation workers)[12].

INFO-0766 has used the 7.3 risk per 100,000 per 1 mSv exposure in its calculations as an "acceptable" yearly radiation exposure dose to the public from uranium and nuclear industries based on deaths caused over a lifetime. INFO-0766 failed to note that its risk estimate, 7.3/105, is seven time higher than the lifetime cancer death risk proposed in WHO 2004.

The drinking water component of this yearly permissible dose is then reduced to 0.1 mSv, based on WHO 2004, allowing for further radiation exposure via inhalation, absorption and ingestion of radionuclide contaminated produce (fruits and vegetables), long range transport and already committee nuclear fallout from weapon testing. This limit, 0.1 mSv/year from drinking water, was actually determined in a US Court battle between the Nuclear Regulatory Commission and the National Resource Defense Council (NRDC) in the 1970s.

INFO0766 make no reference to water quality due to other contaminants or to the potential cocktail of microbial pathogens, chemical toxics and other hazards, or to the public burden of ill health from all environmental causes.

WHO Health Based Targets as Public Health Policy:

In Chapter 3 of WHO 2004, there is a description of how to form health-based targets for drinking water in a way that benefits overall health and quality of life of the people who drink it.

The formulation of health based drinking water targets requires:
Insight into the health of the population;
Revelation of gaps in knowledge;
Support for priority setting;
Increase in the transparency of health policy;
Promotion of consistency among rational health programmes, and
It should stimulate debate.

There are many gaps in knowledge when it comes to estimates of the dose to tissue from ingested, inhaled or absorbed tritium. We provided these to the CNSC in the SRB Technology hearings in November 2006.. Cancer death rates, which are assumed to be related directly with dose, are based on dose estimates that differ from those calculated by ICRP by a factor of at least 20. This problem was not address by INFO-0766. Nor was there any attempt to assess the basic health of communities in Canada already exposed to tritium, such as those living in the vicinity of CANDU reactors or those living in the vicinity of SRB Technology Inc.

The implementation of the health-based targets is expected to promote gradual improvement of quality of life:
It should inspire and motivate collaborating for incremental improvements,
Improve commitment,
Foster accountability, and

Guide the rational allocation of resources.

Instead, INFO-0766 is congratulatory of Canadian performance.

Targets for water quality need also to be evaluated:
They should supply established milestones for incremental improvements,
Provide opportunity to take action to correct deficiencies and/or deviations, and
Identify data needs and discrepancies.

This framework provides a challenge, and the Canadian document on tritium fails to even attempt such a framework in many respects. Water quality targets are required to relate tolerable exposures to individual hazards: microbial, chemical toxic, radiological toxic chemicals, and background rates of disease in the exposed population, under both normal (average), and abnormal periodic conditions. INFO-0766 fails to even identify these conditions in Canada. Nor does it admit to any deficiencies which need correction!

Public health studies and analytical epidemiology should be employed to reduce detected disease incidence and prevalence. Risk assessment can be employed to calculate the total burden on the population from all causes, leading to recommendation of reduction in individual or classes of pollutants. Assessment of the system involves compliance with regulatory targets, assessment by public health agencies, system assessment and operational monitoring.

> "In the framework for safe drinking water, assessment of risk **is not a goal in it own right, but is part of an iterative cycle that uses the assessment of risk to derive management decisions that, when implemented, result in incremental improvements in water quality [emphasis added].** For the purposes of these Guidelines, the emphasis of incremental improvement is on health. However, in applying the Guidelines to specific circumstances, non-health factors should be taken into account, as they may have a considerable impact upon both costs and benefits."[13]

WHO introduces a new metric designed to help making health-based decision with respect to water quality. It is called the DALY, or disability adjusted life year. One DALY is a risk of one per million deaths, the traditional goal of regulation of "safe practice": relative to the public health. This is roughly equivalent to a lifetime excess cancer risk of one per 100,000.

Application of DALYs is a new and evolving methodology now available for comparing the threats from pathogens, toxic chemicals and radiological chemicals in drinking water.

> "The basic principle of the DALY is to weight each health effect for its severity from 0 (normal good health) to 1 (death). This weight is multiplied by duration of the effect - the time in which disease is apparent (when the outcome is death, the "duration" is the remaining life-expectancy) - by the number of people affected by a particular outcome. It is then possible to sum the effects of all different

outcomes due to a particular agent.

Thus the DALYs are the sum of years lost by premature mortality (YLL) and the years of healthy life lost in states of less than full health, i.e. years with a disability (YLD), which are standardized by means of severity weights. Thus: DALY = YLL + YLD."[14]

The WHO example is exposure to bromate in drinking water. The theoretical disease burden of renal cancer, takes into account an average fatality ratio of 0.6 and an average age at onset of 65 year.

The years of life lost (YLL) are (either 5 or 4 or 3 or 2 or 1) 15 with a weight of 1, and a probability of 0.6. Therefore the YLL would be: 0.6 X 15 = 9

The years of life lost with disability would be (either 1 or 2 or 3 or 4 or 5) 15 with a weight of 0.4 and a probability of 0.4. Therefore the YLD would be 0.4 X 6 = 2.4

Therefore bromate in the water would have a DALY of 9 + 2.4 = 11.4 per person.

Multiplying the disease burden per case (11.4 DALYs) times the tolerable risk over a life span of 70 years (10^{-5} / 70) yields::1.6 X 10^{-6} which is a tolerable loss of life of 1.6 years in a population of a million over a year.

Relationship of WHO 2004 to the Purpose of INFO-0766

Perhaps the CNSC does not want to adopt this methodology proposed by WHO because of the extremely high DALY when a carcinogen causes the death or lifetime detriment to a child! Whatever the reason, there was no mention of this WHO methodology in INFO-0766. It is a basic international public health approach that would have provided a "**criteria on an international basis from readily-available public sources of information, along with the scientific and policy basis underlying these criteria".** This would have fulfilled the first purpose of INFO-0766 in Section 1.3, page 2.

The ultimate WHO goal is to be able to make a measurable estimate of all of the contaminants in drinking water, whether they are microbial, chemical or radioactive chemicals, and to gradually lower this total with incremental targets until the total detriment will be within the basic guideline, namely: one death per members of the public per million per year, or equivalently, one cancer death per 100,000 over a lifetime {of 70 years} per year.

INFO-0766 takes the ICRP dose factor (likely to be too low by at least a factor of 20) and ICRP internal dose methodology (not acceptable to the European Committee on Radiation Risk[15], the French Radiation Protection Agency[16] and NATO[17]) as well as the WHO reference level of 0.1 mSv per year (if tritium is the only pollutant in the drinking water) and arrives at 7,600 Bq/L, which it then reduces to 7,000 Bq/L. This INFO-0766 methodology is unacceptable in a country that has polluted itself

with tritium for almost 65 years, which claims to be a founder of nuclear technology and yet cannot differentiate recommendations based on population health or Canadian life-styles!

Other problems with INFO-0766:

The ICRP additional endpoints include deaths where cancer is a secondary cause and genetic damage resulting in premature death after live birth. These are rather small extensions, and leave out 'in utero' spontaneous abortions due to genetic damage, still births, and congenital malformations and diseases. There is also research to support radiation related heart disease due to benign tumors of the blood vessels. Breast, skin and thyroid cancers are not always fatal but have high radiation related risks and a long lifetime detriment. There are a large number of auto-immune diseases like type two diabetes, lupus disease, rheumatoid arthritis and others, which are likely to be radiation related since their mechanisms are similar to those of cancer - namely mutations of the DNA. Depression of the primary cellular immune system by radiation exposure can lead to fatal or debilitating infectious diseases. Using the WHO 2004 methodology would allow for inclusion of all of these detriments, giving them greater visibility with the public. It is doubtful that CNSC could maintain this 7000 Bq/L in the face of public outcry!

None of these real or potential radiation effects are "counted" as detriments by the nuclear experts in the ICRP or by the CNSC. They could well be counted in Canada through proper radiation effects research and documentation of general health in uranium or nuclear activity areas of Canada. Although many radiation-exposed Canadian populations have asked for detailed health assessments this has been routinely refused by responsible federal and provincial authorities. Part of the difficulty has been the total reliance on ICRP by Canadian government agencies. No radiation health research is undertaken unless the biological endpoint in question has been designated as radiation-related by ICRP. There is no funding of this research and no attempt to improve health in the severely effected communities such as Port Hope, Pembroke or Port Radium.

Conclusions:

It is important that Canadians understand that **ICRP is not a public health agency**, but is rather an organization of users of radiation in their workplace or government regulators of nuclear nations. The Commission of thirteen determines the "worst" effects of exposure, and balances the risks of these extreme endpoints against the benefits of their products, labour (and salary). Prime among the radiation "benefits" is nuclear weapons, and radiation regulations apply equally to the nuclear weapon, civilian nuclear and medical radiation industries.

Total dependence of the CNSC on ICRP for public health policy is not warranted.

Although Canada was a leader in founding ICRP, **it failed to develop an independent expertise in radiation health, especially in tritium** that is emitted in large quantities

from the CANDU reactors. This failure has continued over the 65 years of being a "leader" in nuclear technology. Instead of using the tritium problem to become the pioneer in understanding the health effects of tritium, CNSC has looked at what other nuclear countries do as a guide to its health policy for Canadians.

Canada has abdicated this responsibility to the world community, as well as to Canadians, and used the outdated and inappropriate methodology developed largely by physicists of the ICRP to support its health policy decisions.

Canada assumed the posture of: "we are only following orders from ICRP", or similarly, "we are in step with all of the other countries". We thought that "just following orders without question" was thoroughly condemned at the Nuremberg trials after World War II!

INFO-0766 does not rely on the World Health Organization (WHO):

Although the discussion of Drinking Water Standards in INFO-0766 frequently mentions the World Health Organization (WHO) Drinking Water Guidelines of 2004, an examination of this document reveals that only one Chapter is devoted to "Radiological Aspects" of drinking water, and that Chapter is a repeat of ICRP 1991, and focuses primarily on the problem of radon gas dissolved in drinking water. It does not discuss the tritium problem.

There is no mention by INFO-0766 that in 1959, the International Atomic Energy Agency, founded by the UN in 1957, of which Canada is a member, adopted ICRP recommendations for regulation of radiation exposure in preference to asking WHO for radiological health protection recommendations. Moreover, IAEA signed an agreement with WHO in 1959 that states:

> " **It is recognized by the World Health Organization that the International Atomic Energy Agency has the primary responsibility for encouraging, assisting and coordinating research and development and practical application of atomic energy for peaceful uses throughout the world** without prejudice to the right of the World Health Organization to concern itself with promoting, developing, assisting and coordinating international health work, including research, in all its aspects."[18]

This agreement has been interpreted as referring all radiation health effects research to the ICRP, which is then promulgated by IAEA. The WHO can be concerned with the treatment of radiation injuries only.

It would be helpful if Canada, which is a member of both the IAEA and WHO, would take a strong stand in both agencies to return radiation related health research to the WHO where it should have been since 1945. Instead CNSC continues to perpetuate the myth that an independent NGO with obvious conflict of interest can do a better job of setting health regulations than WHO!

On page 2 of INFO-0766, under the Scope of the document, listed as the first purpose of INFO-0766 is:

"to summarize criteria on a national and international basis from readily-available public sources of information, along with the scientific and policy basis underlying these criteria".

Instead of complying with this purpose, INFO-0766 has prepared a justification of its criteria by relying on only one source, ICRP. It hid this fact by referencing secondary sources that also rely on ICRP. At best, this is deceptive. At worst, it is deliberate disregard of the public health.

INFO-0766 identifies WHO as the:

> "directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence based policy options, providing technical support to countries and monitoring and assessing health needs."[19]

Note that INFO-0766 does not mention the radiation health effects as one of WHO's functions, and which is supposedly the purpose of Canadian drinking water standards and guidelines for tritium. INFO-0766 uses only the Chapter on Radiological Health in WHO 2004, which in turn quotes ICRP 1991.

Canadian physicists participated in rejection of this protective health function for WHO when, as part of the IAEA, they chose reliance on ICRP rather than WHO. The Canadian government surely must have noted that WHO 2004 merely quoted ICRP, as it was directed to do in 1959, in the Chapter of Radiological materials in Drinking Water! The appeal to WHO 2004 appears to have been an attempt to deceive the Canadian public!

If one examines Annex 2 of the 2004 WHO Guidelines on Drinking Water Quality, it is obvious that WHO dose not have any expert on radiological health. It lists numerous experts on various pathogens and toxic non-radiological chemicals. No expert of the health effects of radiation is listed as a collaborator on this WHO document.

Research available to CNSC since the WHO document in 2004:

We would note also that the ICRP based WHO Chapter on radioactive chemicals in drinking water stated that:

> "Background radiation exposures vary widely across the Earth, but the average is about 2.4 mSv per year, with the highest local levels being up to 10 times higher without any detected increased health risks from population studies."[20]

The Canadian Government could have updated this information as wrong since in 2004, a peer reviewed scientific paper documented the genetic damage to the fishing people of

Kerala from exposure to the highest background radiation levels of any population that was identified by the WHO in 1957.[21]

Additionally, although INFO-0766 on page 5, in section 3.2, mentions the Ontario Advisory Committee on Environmental Standards (ACES) Drinking Water recommendation for tritium in 1994, it dismissed this public health policy saying it "may not be achievable in any human endeavor". Indeed, it is the tritium limit for the EU, and the Canadian measurements seem to already meet this limit if the figures are representative.

The Joint Working Group of "experts" concluded further "that the interim limit of 100 Bq/L for tritium in drinking water proposed by the ACES study was inconsistent with international regulatory philosophy, which instead supported the MOE's limit of 7000 Bq/L". Clearly it was AECB and CNSC, promulgating ICRP, and not MOE, which chose the 7000 Bq/L! This whole discussion was an apologetic for obedience to ICRP, the artificial basis for the global consensus!

ACES was composed of medical toxicologists, who had a more universal approach to the quality of drinking water than do the various nuclear industry spokes persons. ACES proposal of an immediate guideline of 100 Bq/L for tritium and within five years, a guideline of 20 Bq/L was very sensible from a public health standpoint, and more than generous in allowing the nuclear pollution. Natural tritium in drinking water is below 10 Bq/L, and it might be argued that man-made nuclear debris additional to that natural amount should be kept to the general 1 mSv/ 2.4 mSv a year ratio used for general radiological exposure of the public, using as a guideline 0.42 times the local natural tritium level of Bq per Litre of water!

Dr. Hari Sharma, Professor Emeritus of the University of Waterloo told me that tritium was not measurable in Lake Ontario prior to the large nuclear weapon test, Bravo, at Bikini in 1954.

In conclusion, the document INFO-0766 is both self-congratulatory and deceptive, using WHO 2004 to appear to have considered public health while adhering to its inappropriate 7000 Bq/L guideline for tritium in drinking water, based only on ICRP philosophy. The document is neither honest nor scientific from the point of view of public health. It is rather seriously and likely deliberately deceptive!

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