APPENDIX A

Meeting Agenda

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Ontario
Advisory Council on Drinking Water Quality and Testing Standards
Le Conseil consultatif sur les normes de qualité et d'analyse de l'eau potable

Ontario Drinking Water Advisory Council
Tritium Drinking Water Standard
Public Consultation Meeting

Wednesday March 26th
Thursday, March 27th, 2008
8:30 a.m. – 5:00 p.m.

Royal Sutton Ballroom
The Sutton Place Hotel, 955 Bay Street
Toronto, Ontario

PRESENTATION AGENDA

Day 1: Wednesday, March 26th

Time	Item
8:00 am	Coffee
8:30 am	Introductions, General Welcome, Housekeeping
8:45 am	Opening Remarks by Chair of the Council
9:00 am	Dorothy Goldin Rosenberg, WHEN
9:15 am	Mark Goldsworthy, Toronto green team
9:30 am	Ruth Grier
9:45 am	Ole Hendrickson, Concerned Citizens of Renfrew County
10:00 am	Coffee Break
10:15 am	Lynn Jones
10:30 am	Siegfried Kleinau, Citizens For Renewable Energy
10:45 am	Marie E Lorenzo
11:00 am	Mark Mattson, Lake Ontario Waterkeeper
11:15 am	Sarah Miller, CELA
11:30 am	Davis Mirza
11:45 am	(open)
noon	Lunch Break
12:45 pm	Dell Williamson, Overhoff Technology Corporation
1:00 pm	Mike Nagy, Wellington Water Watchers
1:15 pm	Kelly O'Grady, The First Six Years
1:30 pm	Shawn-Patrick Stensil, Greenpeace

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1:45 pm	Faye More, Port Hope Community Health Concerns Committee
2:00 pm	Kathryn Wrong
2:15 pm	Lyn Adamson, Ontario Voice of Women for Peace
2:30 pm	Coffee Break
2:45 pm	Dr. Monica Campbell, Toronto Public Health
3:00 pm	Helen Armstrong
3:15 pm	Anar Baweja, Health Canada
3:30 pm	Alexandra Bennett, Precautionary Principle Canada
3:45 pm	Nancy Bradshaw, Occupational and Environmental Working Group
4:00 pm	Riina Bray, Ontario College of Family Physicians
4:15 pm	Maurice Brenner
4:30 pm	Closing Remarks for the Day, Questions
5:00 pm	Adjourn

Day 2: Thursday, March 27th

Time	Item
8:00 am	Coffee
8:30 am	Introductions, General Welcome, Housekeeping
8:45 am	Opening Remarks by Chair of the Council
9:00 am	Vanessa Butterworth
9:15 am	Charles Caccia, Institute of the Environment, University of Ottawa
9:30 am	Patti Chmelyk
9:45 am	Steve Coupland, Canadian Nuclear Association
10:00 am	Coffee Break
10:15 am	Phyllis Creighton, Science for Peace
10:30 am	Judith Deutsch
10:45 am	Gordon Edwards, CCNR
11:00 am	Christine Elwell, Sierra Club of Canada
11:15 am	Shirley Farlinger, International Institute of Concern for Public Health
11:30 am	Gideon Forman, Canadian Association of Physicians for the Environment
11:45 am	Jaison Gibson, Blacklab
noon	Lunch Break
1:00 pm	Carol Canzona, Provincial Council of Women of Ontario
1:15 pm	Paul York, Students Against Climate Change
1:30 pm	To be determined
1:45 pm	To be determined
2:00 pm	To be determined
2:15 pm	To be determined
2:30 pm	Coffee Break
2:45 pm	To be determined
3:00 pm	To be determined
3:15 pm	To be determined
3:30 pm	To be determined
3:45 pm	To be determined
4:00 pm	To be determined
4:15 pm	To be determined
4:30 pm	Closing Remarks for the Day, Questions
5:00 pm	Adjourn

APPENDIX B

Summary of Meeting Questions and Answer Sessions

Note: Questions were asked by ODWAC panel members to the presenter.

Dorothy Goldin-Rosenberg, Women's Healthy Environments Network

ODWAC Question: What do you recommend the standard be after the five years?
Presenter Answer: First go to 7 Bq/L, and then achieve 0 Bq/L.

ODWAC Question: What about background levels?
Presenter Answer: The standard should be 0 Bq/L in addition to background. Go for zero emissions.

ODWAC Question: As we go thorough the standards review, which are the 2 or 3 most critical issues to be part of that debate?
Presenter Answer: Those are political issues. I'm not being paid by a vested interest, I'm here as a volunteer. When you are hearing quotes from the science, you need to follow the money.

ODWAC Question: But what are key scientific issues?
Presenter Answer: Look at BEIR report, there will be more than enough references.

Mark Goldsworthy, Toronto Green Team

ODWAC Question: With respect to the standards for other areas, the Council is trying to understand the direction where other jurisdictions went. How are those numbers applied? Are the numbers handled in different ways? Do you have any view on how they apply those numbers and monitor them?
Presenter Answer: It is hard for us to monitor in the Great Lakes Region, when there is one Standard here and another in the US. We need to work with the US facilities, to look at how tritium is being released and is dispersing in the Great Lakes. We need to look at why Canada's standard is higher than US when share a border.

ODWAC Question: The numbers you recommend are from the ACES report. Why those numbers?
Presenter Answer: I'm not an expert, but any form of radiation in the environment is harmful, so bring the numbers down to help avoid issues.

Ruth Grier

ODWAC Question: You made a reference to the application of 1 in million when using the chemical risk evaluation model. Is it going to be a challenge of the radioactivity model and the chemical model? The elements going into those two models come up with different outputs. Any

thoughts on those models? It seems there are different originating views of issue and public expectations.
Presenter Answer: I'm not sure of the history of how they were developed. It seems to be a double standard. I assume it was concocted to avoid being held to same standard as chemicals. It does not make sense. Industry is being required to meet new standards, can't get away from the mathematical debate. If something causes cancer, there is no reason why one substance should be treated one way than another despite where it comes from.

ODWAC Question: Regarding the standard, are you recommending the number set by ACES?
Presenter Answer: That number was set 14 years ago. There is newer technology, and we know more about background radiation. ACES should be starting point, and see how low we can get it.

Ole Hendrickson, Concerned Citizens of Renfrew County

ODWAC Question: You reported on information of tritium in food. Can it be measured in humans? Do you have data on tritium in humans?
Presenter Answer: You can do that, but the data is limited. We have found 2,000 Bq/L in urine, but that's not a good one to use.

ODWAC Question: Is the data in humans related to in what is in food?
Presenter Answer: It goes to ambient levels, so you exhale the tritium. But we drink water from the Ottawa River. But we can be guinea pigs, you can test us.

ODWAC Question: Is there any information on the concordance between models and field measurements?
Presenter Answer: In 2005, SENES found that measurements were 15 to 25 fold greater than the model predicted. The models were much lower, the air monitors were higher. It was found that SRB was underreporting for several years, but there is some discrepancy, the model doses are lower than monitoring.

ODWAC Question: The model has to be calibrated with real data.
Presenter Answer: Usually the monitoring trumps the model, but not in this case.

ODWAC Question: Is the monitoring data available?
Presenter Answer: The data is available and could be provided to the Council. There are places well over 100 km away from point of emission with tritium levels at 100 Bq/L.

ODWAC Question: Regarding cause and effect, is there a relationship between the standard and what is happening with tritium and discharges? We are going to a drinking water standard, what will that do for the other issues you raise?
Presenter Answer: It is important for ground water and other water sources. The pathway for drinking water is from emissions, so it could protect wells.

ODWAC Question: The actual levels that the Council have seen are much lower than what the standard currently recommends, so some people are saying why not to jump to a new standard anyway. There seems to be some messaging we are not hearing.
Presenter Answer: There is different information about how to meet standards. The variations in the Ottawa River are significant; sometimes they push 20 Bq/L. That would push AECL, and they should be challenged to reduce their discharges to the river. When they discharge, the water basins

adjacent to the leaks are high. They found a leak in the NRL fuel bay, and they have high numbers there.

Ole Hendrickson (for Lynn Jones)

ODWAC Question: Any thoughts about the application of ALARA?
Presenter Answer: The standard should be at a maximum level to start from, but it should be as low as is reasonably achievable. That goes to both benefits and costs. In those cases, the local community should get involved with discussions on the benefits and costs.

ODWAC Question: How would that work? When dealing with other contaminants, ALARA is not necessarily used.
Presenter Answer: It's almost like a secondary standard that licensees are supposed to aim for, but don't have to make. Have to balance ALARA against the precautionary principle. I have not heard if one should be used over the other.

ODWAC Question: Is a level of 0 Bq/L achievable?
Presenter Answer: Yes, but will take a long time.

Siegfried Leinau, Citizens for Renewable Energy

ODWAC Question: In the application of ALARA, how involved is it in when looking at health effects?
Presenter Answer: It just meets the standard. You can't look at what gets past the industry. The industry does not pay into the health system. It is just a continuous fight to make sure that the public is protected, not industry.

ODWAC Question: You made reference to the numbers used in California and other areas. How do they put those numbers into effect and what is the mechanism for compliance? Are they compliance numbers?
Presenter Answer: The cost to the industry is the most common argument. It makes no sense, because the public is the one affected by tritium. We have other ways to generate electricity that don't have that kind of effect on the environment. We have to look to other ways of generating electricity.

ODWAC Question: In our understanding of ALARA, it's not just about environmental health but also ecological and social health. Also, with respect to the standard, the limits may be 70 times higher, rather than the exposure.
Presenter Answer: We are not just worried about the present population; we have to protect the future. The testing is just for those in the prime of their life.

Marie Lorenzo

ODWAC Comment: In Ontario, the limits for nitrate are based on the needs for the most sensitive populations. It is based on an infant. It's the same for lead, which is based on impacts on children.

ODWAC Question: The levels in drinking water are consistently well below 100 Bq/L (except for what was observed in Mr. Hendrickson's presentation). What would be impact of lowering the standard to 100 Bq/L?
Presenter Answer: It's true, just because the standard is at 7,000 Bq/L does not mean that the concentrations are that high. But it means that when have a spike, we are still told it is fine. By lowering the standard, we then take more immediate action when spikes happen.

ODWAC Question: You note that you have seen evidence of the damages mounting.
Presenter Answer: I am referring to a study from 2008 on female children. I can obtain it for the Council.

Mark Mattson, Lake Ontario Waterkeepers

ODWAC Question: The Council has dealt with other substances. Often, when there is a Standard in question, municipalities have their own water sources and try to meet the standard. There is something missing with respect to tritium, in that we have heard a lot about limits of 100 Bq/L and 7,000 Bq/L, but I'm not sure if it will make a difference when we see that the monitored levels are around 10 Bq/L. What is the real debate?
Presenter Answer: There are two parts of the debate, and one is around your Standard. Ten times of the allowable limit goes into Bay of Fundy because it is not drinking water. If we are to take steps on industry, we have to move to zero discharge. Also, there is not a lot of research going into the health risks of tritium. But if we later learn we were wrong, then it will be too late. Need to send industry economic signals to reduce toxic pollution.

Secondly, in criminal law, if they had to show damage, they would be out the window. People are charged to prevent harm. If some one cheats welfare, it is hard to show the impact on system. But the judge has to follow rules.

You can't put the onus on the public to justify why it's not safe. It's a matter of values. As regulators, you have to take page of the other law, where standards reflect values, and the influence the economy. Setting the standard lower also sends out a message.

And don't forget that tritium is not the only substance in the water (e.g., sewage) and the synergies could harm us. Need to force them to reduce emissions and protect drinking water.

ODWAC Question: But even if we make the standard 20 Bq/L, I don't see if it would change anything.
Presenter Answer: If it is changed to 20 and there is a leak, then we don't have to do anything. But if it leaks at 100, then who cares, if the standard is at 7,000. A lower standard will help raise alarm bells, and help to move the issue forward. It sends economic signals and makes people more ware of when there are leaks. The leaks and discharges won't make news unless they are above the standard.

ODWAC Question: The goal of 0 discharge and 0 risk is admirable, but is it achievable? There is a whole world of pollutants and it would be great to get rid of it all. But you have to look at achievability. Normally risk is 1 in a million, but that does not show above background.
Presenter Answer: Energy generators that could not reduce smog, mercury and other components are being shut them down. Nuclear competes for that electricity market. Ontario has to do a better job of risk assessments, and we need more health studies. This industry will be in trouble because it using unsuitable standards.

For 0 discharge, what would it cost them? Has any one challenged them to not put out tritium in the drinking water? No, it's easier for them to ask you to prove it's harmful.

ODWAC Question: If you are going to 0 discharge and 0 risk, you can't just look at the nuclear industry. It's a change in values.
Presenter Answer: Not so. CEPA and other acts provide standards that organizations can pollute above certain levels through permits. The nuclear industry does not have that. Instead, they say they can't meet it and so there is no standard. Put a prohibition in place where they have to get a permit to go over.

Use good regulations that send good signals to the market place.

Sarah Miller, CELA

ODWAC Question: If CELA does not support nuclear, what are the safer alternatives?
Presenter Answer: Geothermal, hydro power, wind, solar.

Presenter Comment: ALARA does not allow for unstable plants, weapons testing, or human error. If you are looking at nuclear plants, then the new ones have to be built at a higher standard. We owe it to future generations for 0 discharge, and future plants have to adhere to that.

ODWAC Question: How long before the standard should be 5 Bq/L?
Presenter Answer: 5 years.

ODWAC Question: The natural levels are close to 5 Bq/L.
Presenter Answer: We recognize that and that you have to allow for error. We have a new framework for drinking water and have new tools to protect it. We have a commitment to source protection. The new framework is a precautionary one.

ODWAC Question: Since the natural background is close to 5 Bq/L, what would you do then? Should the standard be based on natural background?
Presenter Answer: We need a health protection background. There is a disconnect between those enforcing the standards ands those making them. The local ministries of health are responsible for health, and they have to work within the provincial framework and with the tools. This includes the suite of things that had to happen because of Walkerton.

ODWAC Question: How could monitoring be done? Municipalities are not required to give advice. The chemical model is based on chronic update. What is the relationship vs. instantaneous vs. long term, with respect to monitoring?
Presenter Answer: Reporting should be regular, and monitoring be instant, and on a website. The public needs to be informed for emergency response.

ODWAC Question: Should there be daily monitoring of all plants, or only those at risk?
Presenter Answer: All of them.

Davis Mirza

ODWAC Question: You're clearly desirous of low discharge or emission limits. How do you see changes to the drinking water standard affecting discharge limits?
Presenter Answer: You have to show that you are protecting Ontarians and protecting their drinking water. The safety aspect will also connect with the privatizing of the nuclear industry.

ODWAC Question: You mentioned people being harmed and damaged. If you have information, we would like to see it. You also mentioned that as a minimum we should adopt the ACES standard. Should the drinking water standard go elsewhere, besides what ACES recommended?
Presenter Answer: I recommend Lynn's Standard, which is lower. Drinking water is a source of life. We need to take a precautionary, preventative measure.

ODWAC Question: If you have any information about tritium in the environment, we would be interested in that.
Presenter Answer: I can provide a source to the Council. Other advocates are also linking radiation in water to cancer. But if we are not sure, then should not just go ahead, be instead be preventative.

Dell Williamson, Overhoff Technology Corporation

ODWAC Question: The equipment you discussed, is it accurate throughout that range?
Presenter Answer: yes.

ODWAC Question: How much does it cost?
Presenter Answer: $300,000 to $400,000

ODWAC Question: MDA means minimum detectable?
Presenter Answer: Yes. This would be used on site, for potential discharge.

ODWAC Question: Is there other equipment with lower MDAs for measuring contamination on sites?
Presenter Answer: No

ODWAC Question: Do you know what the minimum detectable levels in drinking water could be?
Presenter Answer: No

ODWAC Question: There are recommendations that the standard should be 100 or 20 Bq/L. Presumably you would have to send quantities to a lab to test that. What are the issues of monitoring those levels, compared to other?
Presenter Answer: Not sure of regulatory process, but monitoring takes a lot of time. The process could take a day to complete. If you're able to continuously monitor, you can take advantage of spikes.

ODWAC Question: What are sample enhancements?
Presenter Answer: You enhance through electrolysis. You take a bigger sample of water and concentrate it down.

ODWAC Question: Couldn't some tritium escape from the steam? Removal with the steam.
Presenter Answer: Could be.

ODWAC Question: How many players in the industry? Do your competitors measure lower?
Presenter Answer: Not sure, but their focus is on air monitoring.

ODWAC Question: In some of the jurisdictions that have lower drinking water criteria, what monitoring methods do they use to enforce?
Presenter Answer: In US, its 20,000 picaqueries. You can do it with a batch method.

Kelly O'Grady, The First Six Years

ODWAC Question: Should short term exceedance in tritium levels be followed by alternative water sources for the public?
Presenter Answer: If the standard is exceeded, then the public should be provided with alternate water source.

ODWAC Question: Do you see similar results between the Chalk River facility and the Pembrooke facility?
Presenter Answer: Chalk River has a 7 km buffer. I expect you would see some levels from Chalk River in Pembrooke. The standards would help us know what is safe to eat.

Shawn Patrick Stensil, Greenpeace

ODWAC Question: How could we have gone further in consulting with people?
Presenter Answer: You could have met with people privately, such as Norman Rubin. He had requested to meet with the committee. Look outside of the industry world and Greenpeace for experts. Have a broader outreach – we are here in Toronto having a 2 day meeting, but you could have had meetings elsewhere.

ODWAC Question: We are looking at natural tritium because we have been asked. You looked at tritium specifically. Any thoughts on how it relates to other radionuclides?
Presenter Answer: I'm not sure can answer that. But ODWAC could suggest looking at other nuclides in its recommendations.

ODWAC Question: In applying models, do you suggest following the same regime as with chemical models, in how they are monitored and how they fit into the regulatory framework?
Presenter Answer: We did not address that in our report. If it's only done weekly, that's not enough. Perhaps you could put something on the table so we can analyze and respond to it.

Katheryn Wrong

No ODWAC questions.

Anar Baweja, Health Canada

ODWAC Question: It's not fair to single out one radionuclide to assess as a chemical. Should they be different from other carcinogens?

Presenter Answer: I'm not that familiar with the toxicology. They consider 1.5, the EU considers 2. Chemical guidelines for ours are 1 in a 1,000 for cancers. At 1 in a million cancers, there is no risk, which is why the limit for tritium is 7,000 Bq/L.

ODWAC Question: Is there a technical reason for considering the cancer risks from radioactive materials differently compared to chemicals?
Presenter Answer: It's the universally accepted method of assessing risk. .

ODWAC Question: When you did your evaluation, did you consider the most recent information on dose coefficients? And how did it compare?
Presenter Answer: The evaluation results are very close.

ODWAC Question: We heard that the dose coefficient is 1, and we also heard that it should be doubled.
Presenter Answer: The prevailing consensus is that the coefficient should be between 2 and 3.

ODWAC Question: Of your list of countries and their tritium limits, the lowest is the US. Do you know why the US used a lower dose per year?
Presenter Answer: I don't know, it is odd. But for our dose, what will a 0.1 receiver dose do? The short answer is that those doses are negligible.

ODWAC Question: Is your background in radiation physics or biology?
Presenter Answer: It is in radiation chemistry. I worked with Health Canada for 30 yrs, and worked on the tritium guidelines for last 5 or 6 years.

ODWAC Question: I attended the Ottawa workshop. The person from ICRP had a number of cautions when he presented and a number of questions. The cautions raise the question on if the number and approaches in the ICRP were appropriate for drinking water?
Presenter Answer: RBE looks like it should be a lower receiver number. The conclusion he has drawn is that the RBE is not 1 but closer to 2.4. Guidelines have no impact as guidelines unless they are adopted.

I am here talking about the scientific basis, so we should be cautious talking about policy and guidelines. We should not stop doing RBE, and federal guidelines should be the minimum to follow. The tritium levels in the natural environment rarely exceed 20 Bq/L, and the Pembrooke plant contributes about 2 Bq/l.

ODWAC Question: When the 0.1 mSv is used for tritium in drinking water and back-calculated, what is the risk associated wit it?
Presenter Answer: 5×10^{-6}, or 5 cancers per million.

Lyn Adamson, Ontario Voice of Women for Peace

ODWAC Question: There is a statement in your presentation about leukemia deaths around the Bruce site. To make that the committee does not overlook that, can you provide the studies to us?
Presenter Answer: Yes

ODWAC Question: Interested in your point about ISO and being able to achieve the lower tritium levels – was that with respect to discharges or drinking water?

Presenter Answer: I'm not sure, will check into it.

Monica Campbell, Toronto Public Health

ODWAC Question: Is there a protocol developed on what the MOH would do if there was an exceedance?
Presenter Answer: A protocol is under development. The City is working with emergency personnel. We are talking about what would be a trigger value, where they would get other supply or shut the intake valves.

ODWAC Question: Since you need trigger values before taking action and it would be dependent on the drinking water standard, there needs to be an adjunct piece of information developed. The standard is a target, where industry would ensure without intentional leaks. But based on past history, there are releases. Is there an activity to determine what to do in those responses? What was done in 1996?
Presenter Answer: Not sure, as I was not involved then. I'm not sure if anything is done to reduce water intake, so the emergency plan is for the worst case scenario.

ODWAC Question: I'm not a medical person, but much of the rationale is based on the lifetime cancer risk, based on 70 yrs. What is the medical significance of the peaks?
Presenter Answer: I'm not entirely certain with the short term peaks, but we want to monitor them and how frequent they are. It is related to Right-to-Know.

ODWAC Question: The standard would help to trigger that?
Presenter Answer: Partially. We are recommending that it be lowered. In addition, we would also like to get notification. The question is when does the MOH want to be notified.

ODWAC Question: The standard is at 7,000 Bq/L. But you show average levels at 10 or 20 Bq/L. In a simplistic way, would there be no improvement of public health?
Presenter Answer: Partially. This is based on weekly averages, but we're not sure of the daily variability. We want to see the values on a daily basis, to find out if it goes over. Also, there is the benefit of ensuring that the industry is using the best diligence possible to make sure it reduces.

ODWAC Question: I was involved with some of those releases in the 1990s. People can think that there is an immediate risk with peaks.
Presenter Answer: We often work with industry to communicate with the public if there are chemical spills.

ODWAC Question: Your presentation focuses mainly on cancer. Are there other concerns for adverse effects? Any particular populations the MOH concerned about?
Presenter Answer: We have not done a systematic review, but we acknowledge that there are some populations that are more vulnerable than others.

ODWAC Question: What would you say is an acceptable risk?
Presenter Answer: In terms of standards, you have to pick a number. The practice in public health is to recommend per carcinogen.

ODWAC Question: One of the issues that will come up is the monitoring. We have to ask who is the appropriate body to do it. Usually it's the treatment plant, but in this case they can't do anything. Do you have views if that would be the right way to do it, or if there are other issues, who should do it?
Presenter Answer: That's hard to answer. We receive drinking water test results from OPG from the treatment plants along their facilities. It's important to saddle it with reporting out. For example, the City of Toronto has asked the water authority to report out on all substances, including radionuclides. It's appropriate to saddle it with industry and have them report to authority, who would pass that information to the MOH.

ODWAC Question: Is there a trust issue?
Presenter Answer: If so, then the municipalities can audit.

Helen Armstrong

ODWAC Question: What are the synergistic health effects? Do you have documents about them?
Presenter Answer: I will submit them to you tomorrow by e-mail.

ODWAC Question: You note that the releases of tritium should be set to 0. Should treatment facilities have the ability to remove the background levels?
Presenter Answer: I'm not sure if that is feasible. Deal first with the discharge.

ODWAC Question: Your suggestion of 5 Bq/L is lower than the commonly suggested 20 Bq/L – what is the basis for the 5 Bq/L?
Presenter Answer: My preference is 0, but I'm trying to be incremental, since you can't get to 0 right away.

ODWAC Question: Your references to detrimental effects – is the Richardson document the source of your lit? Or did you use others?
Presenter Answer: It was the main source, but I also looked at the Greenpeace study.

Alexandra Bennett, Precautionary Principle Canada

ODWAC Question: With respect to ISO – would those levels apply to discharge or drinking water.
Presenter Answer: It is in terms of their discharge. The drinking water in Durham includes 2- 20 Bq/L or tritium.

ODWAC Question: If 100 Bq/L, then the dilution rate be considerably more. What would be the normal level of their discharge?
Presenter Answer: They are at 100 today, and for the past 2 years they are consistently below 100 Bq/L.

ODWAC Question: After mixing with cooling water?
Presenter Answer: Not sure. They state that every time they test, it's below the level. We have seen that the levels in drinking water have also gone down. But when look at the dosage that a foetus would be getting, they are more sensitive up to a 1,000 times, so 20 Bq/L is enough.

ODWAC Question: What have they done in last 2 years to reach those levels?
Presenter Answer: You'll have to ask them. Pickering has a tritium recovery facility, and it would be good of OPG to have one as well.

ODWAC Question: The CANDU reactor produces 10 times more tritium than the light water reactor? Is the light water reactor safer?
Presenter Answer: We have to choose our poison. Plutonium has a longer half life. I would say that plutonium contamination is worse (e.g. the Irish and Scottish fisheries have been impacted by English plutonium discharges). You can ask their public health officials what they tried to do to protect their people from that contamination.

Nancy Bradshaw, Occupational and Environmental Working Group

ODWAC Question: Is tritium the only radionuclide that you are concerned about?
Presenter Answer: There are other hazardous materials in drinking water. The concern is the cumulative effects.

ODWAC Question: Would a lower drinking water standard lead to lower discharges?
Presenter Answer: Yes

ODWAC Question: Is the lower dose to women different because of fat or body mass?
Presenter Answer: It's the differences in the male/female physiology, and it's based on body mass. If they take in the same amount, it affects them more.

ODWAC Question: Do children take in higher dose, drink more water?
Presenter Answer: Maybe, but that's not the issue. Because they are smaller, it's a higher concentration.

ODWAC Question: With respect to your health studies, could you be more specific about which effects and substances are synergistic?
Presenter Answer: Cant now, but will send.

ODWAC Question: The risk is for 1 in a million cancers over a lifetime. Why would you call for an alternate drinking water supply during a spike, when the risk is based on life time exposure?
Presenter Answer: If the levels are over the life time exposure limits, then the public should be at least warned and provided with other source of water. It's a precautionary approach.

ODWAC Question: Are we talking about a short term increase?
Presenter Answer: More of a longer term increase. If there are continuous peaks, then that should be looked at.

Maurice Brenner

ODWAC Question: Are you representing The City of Pickering?
Presenter Answer: No, but they endorsed the resolution unanimously.

ODWAC Question: For a phase out, there are background levels in Lake Ontario. Do you recommend that communities should treat to remove background levels?

Presenter Answer: Yes.

Steve Coupland (with Don Hunt), Canadian Nuclear Association

ODWAC Question: Our points of confusion relate to what is seen as a difference in regulating radioactive material in water versus chemicals. Can you help to rationalize that, scientifically?
Presenter Answer: The annual dose commonly reported by facilities and judged in terms of their performance is a convenient, suitable long term measure of exposure. Over 70 years, you can come up with life time risks. If it's annual, you can catch what is going on early.

ODWAC Question: Could you put in writing please?
Presenter Answer: Yes

ODWAC Question: Is there a scientific basis for evaluating one type of radioactive material over another? Are some genotoxic carcinogens different than others, and why?
Presenter Answer: The Health Canada Joint Working Group report reviewed this question. All radionuclides emit radiation, and the differences in energy are taken into account. If background radiation is high, the chemical equivalent would be arsenic. The working group's approach has been to set an acceptable limit and then use ALARA and bring the limit as low as achievable. It's different with chemicals, where a minimum acceptable level is set and relaxed where needed.

ODWAC Question: The criteria for arsenic is not what we want, it's based on treatability. But before the decision was made, was the number based on lifetime exposure? Why not do that same calculation for tritium, and then look at what is applicable?
Presenter Answer: They don't regulate nuclides one at time, they want to limit incremental exposure, that's why they have the summation rule. The rule works to make sure that the total dose is less than background. The difference between nuclides and chemicals is that there are differences in energy and how it is dispersed through the body. But that has been taken into account with dose coefficients, and are on whole body energy equivalent basis.

ODWAC Question: Can you comment on whether the 7,000 Bq/L is considering the event brought up yesterday, that is, the relative change of biological effectiveness (the limits based on a standard man rather than woman or child)?
Presenter Answer: It is on going debate on relative bio-effectiveness, depends on the radionuclide you utilize. CNSC aware of the issue and would like to see a consensus on the issue emerge. If consensus is that RBE is 2, then the drinking water limit will be adjusted.

ODWAC Question: There seemed to be a consensus above 2. Does this refer to a man or woman?
Presenter Answer: CNSC has looked at the gender issues and feels that it is small issue, so they have not set separate dose coefficients. The variations are small, so it's not necessary. They also looked at ages and published dose coefficients are for adults down to an infant. The drinking water standard is based on an adult, but could also calculate on an infant.

ODWAC Question: What would be the impact on using an infant to calculate?
Presenter Answer: The standard would come down to about 4,500 Bq/L.

ODWAC Question: Your third slide provides comparisons to other jurisdictions. There is a difference of a factor of 10 between the Canadian and US values. Why?

Presenter Answer: Not sure how the US gets it 740 Bq/L. Recent calculations on modern dosimetry goes to 2,400 Bq/L. If you take it to 0.1 mSv, takes it to around 6,000 Bq/L. Americans would have used some different calculations. The EPA recalculated it and came up with a higher value, but their regulations state that if you lower a standard then you can't go back up.

ODWAC Question: Dr. Osborne made comments on Dr. Fairlie's report. Has Dr. Fairlie responded?
Presenter Answer: No.

ODWAC Question: Should he do that?
Presenter Answer: Yes. But at the January conference a number of Dr. Fairlie's peers disagreed with his work.

ODWAC Question: You made reference to CNSC activities – could CNSC accelerate their activities?
Presenter Answer: I noted that it would be good if ODWAC could include the CNSC's research in its work. I expect that CNSC would be willing to share.

ODWAC Question: You suggested that a lower standard would have no impact. You noted that perception could be an issue. Are there other impacts on your members based on a lower standard, e.g., 20 Bq/L?
Presenter Answer: At 20 Bq/L, there may be occasions where short term releases exceed that, and there may be implications then.

ODWAC Question: Is there a way of controlling the discharge beyond setting limits for it? When setting a drinking water standard, that influences contamination clean up requirements. You have to clean up contaminated sites to drinking water standards. We hear that the number is working backward, and the number is working backward to the discharge point.
Presenter Answer: The measurements show that drinking water levels at intakes downstream from release pts. I'm not sure what the values are at the discharge point, but would be higher.

ODWAC Question: If we set a drinking water standard, it would not necessarily affect the discharge unit.
Presenter Answer: Other than if the number is significantly lower, then the releases are closer, and so you would have to monitor closely. If there is an increase or spike in discharge, you run the risk of getting hitting 20 Bq/L. If you set lower for nuclide on a basis that is not scientific, then it will have implications in other areas. It raises questions for other nuclides, and raises questions for other industries. It could set a precedent for other areas, such as medical. If there is a scientific ground for doing so, then you should do it.

ODWAC Question: I'm confused how ALARA is applied. Their philosophy talks about a precautionary approach, but we understand that industry applies ALARA after the standard. That's different in the work the council does in other substances. We will take science and look at the number and see if it's fine, and go the other way to see what is achievable. For example, what can be measured. Is ALARA being applied after the standard?
Presenter Answer: Not sure. In practice, the CSNC will set a standard or level and use ALARA to drive it down. ALARA is a limit.

Presenter Answer: We do report exceedances to local municipal councils. Any releases for tritium would be noted, and Durham would know.

ODWAC Question: We heard that Pickering has also established ISO 14001 have achieved 100 Bq/L as a discharge. Is that correct? We also heard that they have routinely met 100 Bq/L for the last 2 years.
Presenter Answer: I don't think that is correct. OPG and the Bruce has 100 Bq/L as their target for drinking water intake.

ODWAC Question: We understand that there is a plan for removal of tritium at Darlington. Is there a technology to remove tritium from drinking water?
Presenter Answer: Not sure, don't think so. Will check into it.

ODWAC Question: What causes the periodic releases? What is in place to reduce levels before discharge? Also, what steps would be required if the standard was lowered?
Presenter Answer: I'm not sure; I will consult with an engineer and follow-up.

ODWAC Question: If the limit for tritium is reduced, what are the implications for other nuclides?
Presenter Answer: If the limit is lowered the limit for one nuclide, people will be asked to lower the limits for others they are exposed to as well. Not necessarily in drinking water, but in other areas as well, such as with x-rays. The biggest impact would be in the medical field.

ODWAC Question: A presenter yesterday said the derived release limit approach used in Canada was flawed. He said it is based on modeling instead of monitoring data, said that the model was under predicting releases by 14 fold.
Presenter Answer: The way nuclear facility discharges are regulated is unit per time. You have to use a modeling approach to derive releases in a time release way, so can be applied at discharge. That's why it's on modeling basis. They also make a lot of measurements in the receiving environment, and tritium is a key thing they measure. There is good agreement between models and what they measure in the field, by a factor of 2. But they are refining models all the time.

ODWAC Question: Is the factor of 2 in one direction or another?
Presenter Answer: It could be in either direction, but typically models over predict.

ODWAC Question: Could we get some of that data in summary form and have a walkthrough?
Presenter Answer: Yes. Facilities publish their monitoring reports.

ODWAC Question: Are models calibrated with real data?
Presenter Answer: Yes, we are in process of doing that now.

Phyllis Creighton, Science for Peace

ODWAC Question: You talked about setting the standard for water at 20 Bq/L, and then 0 for discharge. We are not looking at discharge. What would 0 discharge mean for drinking water?
Presenter Answer: About 3 or 4 Bq/L.

ODWAC Question: What in your view is the ranking of the risks you mentioned? Are some risks greater than others?
Presenter Answer: The order of the risks is not pertinent to reducing the risk to women and children.

Judith Deutsch

ODWAC Question: What should the standard be for drinking water?
Presenter Answer: It should be 0 Bq/L.

ODWAC Question: There are background levels. What should we do about those?
Presenter Answer: The focus should be on what can be done with nuclear reactors. Reduce their discharges to 0. I can't speak to naturally occurring tritium.

Christine Elwell, Sierra Club of Canada

ODWAC Question: You mentioned US light water reactors emit less tritium. Is the US design is safer and better?
Presenter Answer: In that respect, yes.

ODWAC Question: Should we use those reactors instead?
Presenter Answer: No, but the technology is there to make improvements.

ODWAC Question: One of challenges when formulating advice is you have to put context behind it. We heard that we need to start with the science, but that is not the end of it. We want to see the impact of moving to 100 Bq/L and then 20 Bq/L. We that Pembrooke is working to move within that standard now. If we move to that standard, what would be the change or benefit, and how a drinking water standard would influence that.
Presenter Answer: You need to use best technology. Build in incentives for them to do better.

ODWAC Question: Water treatment plants have to meet the standards that are set. How would municipalities go about meeting the standard? We have never gone to zero for chemicals in water treatment.
Presenter Answer: Lets use the lessons learned there, it will take all of us to get there. In the current system, the municipalities are the front line. We depend on them to provide surveillance, they will need service. If they can't monitor it, then we need to improve the monitoring.

Shirley Farlinger, International Institute of Concern for Public Health

ODWAC Question: You mentioned that tritium was not measurable before 1954. Would detection limits be able to do that at that time?
Presenter Answer: Not sure.

ODWAC Question: We are trying to collect as much info as possible. We don't seem to have the document you reference. Could you send us a copy?
Presenter Answer: It's not with me, but I will track it down.

ODWAC Question: Do you have information relative to impacts on humans and cancer?

Presenter Answer: We won't be able to assess that until do an epidemiological study. The government should produce the money to do the study.

Gideon Foreman, Canadian Association for Physicians for the Environment

ODWAC Question: The quote you read – can we please get the reference? It's not consistent with the material received from Dr. Fairlie. We understood that the material did not bioaccumulate. Can you add to that?
Presenter Answer: No, I am basing it on this research.

ODWAC Question: Should the background radiation be removed from the drinking water?
Presenter Answer: Yes, that is the vision.

ODWAC Question: You mention three risks associated with drinking water containing tritium. Which is the risk of most concern?
Presenter Answer: Radiological risks.
ODWAC Question: For an acute outcome?
Presenter Answer: We are balancing long term vs short term. The main emphasis on radiation is long term.

ODWAC Question: In terms of resources, such as more nurses, testing equipment, etc - does your organization have an order on resource priorities?
Presenter Answer: Difficult to say, like to see more money put in other areas too. But it should be in the top 5.

ODWAC Question: You say that the ACES recommendations were not implemented because of pressure from the Nuclear lobby. Do you have evidence of that?
Presenter Answer: No, I read it. There is also the lobby influence.

ODWAC Question: In terms of 25-30 % prevalence, what is the burden on society from the radiation?
Presenter Answer: Hard to say, we are not exposed to radioactive elements one at a time. The difficultly is in teasing out the effects.

ODWAC Question: We have to use science as a basis for a rationale decision. We heard from the Walkerton report that risk cannot be 0. Even though we are setting up a standard, we are asked how practical it will be. Do you think we should go at 0 risk, or a reasonable or quantifiable risk?
Presenter Answer: There is no 0 risk. The 0 risk is an eventual goal, but the 20 Bq/L is practical and doable.

ODWAC Question: Reducing the standard to 20 Bq/L would not have measurable risk reduction, since evidence shows current water levels to be below 20 Bq/L.
Presenter Answer: So 20 is practical. It shows our values and helps to protect the future.

Jasion Gibson, Blacklab

ODWAC Question: Are you here as a citizen?
Presenter Answer: I started a citizen group.

ODWAC Question: What is your opinion, if a standard is set on a lifetime of exposure, and if that is considered to be a reasonable risk, as a member of the public, what would be your interest if there was a short-term spike? What should officials do to protect you?
Presenter Answer: If there is a known detriment, then wisdom has to rule the day. The standard has to move to where is no risk. You have to educate the average citizen when there is not a risk, to limit exposure.

ODWAC Question: Part of addressing standards is that it creates a monitoring and reporting framework. Justice Connor came up with a regime of how the standard should work. To what extent do you feel you are informed now? You live there, are you receiving the info?
Presenter Answer: A citizen today can't sit on its haunches; you have to seek out the knowledge. In the last few generations, we have let it slide. The business has been lobbying, the citizens have been consuming. We have to take back rights.

ODWAC Question: Do you have a sense that the responsible organizations should be doing more to get that information?
Presenter Answer: The problem with information delivery and gathering is that it is mainly in the hands of corporate interest. A better way is to provide seed money to communities interested in setting up an information organization.

Paul York, Students Against Climate Change

ODWAC Question: We are being asked to advise the minister on what the standard is for drinking water to ensure public safety. It is a stretch that what we recommend relates to the broad public issue of nuclear power or waste. We are not providing advice on nuclear power or waste, just on the standard and public safety.
Presenter Answer: If health is the only consideration, then the standard should be 0 Bq/L.

ODWAC Question: You raised an interesting reference, connecting the by-product of disposal of nuclear waste. No one has indicated that as a significant source of tritium. Do you have information on the types of levels of tritium from the storage from nuclear waste?
Presenter Answer: No, but I will ask Dr Edwards and others. They said that it was a risk. Why err on side of danger?

Chai Kalavar, Just 1 World

ODWAC Question: The copyright statement for your poem – does Council has full permission to use it?
Presenter Answer: Yes.

ODWAC Question: In you presentation, is there a standard you are recommending?
Presenter Answer: Make a distinction between avoidable risk and unavoidable risk. Unavoidable is what is part of the climate. Accept it as nature's risk for planet. But there is avoidable risk. We are taking on risk that is not necessary not only for us but for generations to come. Waste of western cultures is a large problem.

ODWAC Question: Are you endorsing the recommendations of ACES?
Presenter Answer: The avoidable risk should be 0 Bq/L; the unavoidable should be what it is.

ODWAC Question: You have engineering training. You know that 0 cannot be achieved. How does this Council propose that the standard be 0 Bq/L?
Presenter Answer: Not being able to reach 0 is your problem, because the terms of reference are too narrow. We are saying we are not going to change, and we build reactors. I am not putting myself in that box. Put that poison industry in the heaps of industry. Tritium is a poison.

ODWAC Question: In Ontario, we do talk to the mayors of New York State.
Presenter Answer: We did not hear OPG make a public presentation. Why can they make a presentation that we cannot hear?

Kyle Wivcharak, Peel Public Health

ODWAC Question: We are interested to hear on the Health Unit's perspective. Does a standard need to be set on number reached in a lab or lower? And what would be your position on short term exceedance, or fraction of lifetime?
Presenter Answer: We already monitor for tritium in drinking water and can measure to down to 20 Bq/L, so that is not an issue. With short term exceedance, we would consider addressing that with tools outside of the standard. We have dealt with that scenario before. The standard is chronic and for the long term, so short term exceedance is not as big an issue.

ODWAC Question: You are from the organization that would have to react to this. In terms of measuring for monitoring, have any views on who would be appropriate do the monitoring? Radiation is now done at a provincial or federal level, but with drinking water, but it would be the owner of the drinking water facility. If there is an exceedance, you have to go to the health board and the province. Any thoughts on who that should be? How frequently? And would it be onerous?
Presenter Answer: I can't answer that at this time. The municipality currently tests for tritium. I'm not sure on frequency.