SEVENTEEN YEARS, NO ACTION: THE ODWAC TRITIUM DRINKING WATER RECOMMENDATION, THE CNSC ACKNOWLEDGEMENT, AND THE REGULATORY ACCOUNTABILITY GAP IN CANDU LICENSING

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1.. Background

In 2009, the Ontario Drinking Water Advisory Committee (ODWAC) — an independent scientific advisory body convened by the Ontario Ministry of the Environment to review the provincial tritium drinking water standard — recommended a 350-fold reduction in the maximum acceptable tritium concentration, from 7,000 Bq/L to 20 Bq/L [1]. The basis for the recommendation was a comprehensive review of tritium health effects evidence, including the differential sensitivity of pregnant women and fetuses, the incorporation of organically bound tritium (OBT) into fetal DNA, and the inadequacy of the existing standard to protect the most sensitive members of the population at concentrations approaching the current limit.

The Canadian Nuclear Safety Commission (CNSC) acknowledged the ODWAC recommendation in its own technical report INFO-0799 (Health Effects of Tritium, 2010) [2]. It did not refute the scientific basis of the recommendation. It did not commission a counter-review. It did not publish a regulatory response explaining why the recommendation should not be implemented federally. The current Canadian drinking water tritium guideline remains 7,000 Bq/L. As of the date of this paper, the ODWAC recommendation has been neither implemented nor formally refuted for seventeen years.

This paper documents the ODWAC recommendation, the CNSC acknowledgement, the scientific basis that has not been contested, and the consequence for CANDU licensing assessments that rely on the existing standard as the safety threshold for routine tritium releases.

2.. The ODWAC recommendation: scientific basis

2.1 The advisory process

ODWAC was convened specifically to review the tritium drinking water standard in the context of the expanding Ontario nuclear fleet and its documented tritium releases into source water. The committee included toxicologists, epidemiologists, radiation biologists, and public health specialists. Its report constitutes a peer-reviewed expert consensus process within a formal government advisory structure. It is not advocacy literature; it is a government-commissioned scientific advisory document [1].

2.2 The basis for 20 Bq/L

The ODWAC recommendation of 20 Bq/L was derived from a risk-based calculation applying the principle that the maximum acceptable concentration in drinking water should produce an incremental lifetime cancer risk no greater than one in one million (10^{-6}), applied to the most sensitive subpopulation — the developing fetus of a woman who relies on the affected drinking water source throughout pregnancy [1]. The 7,000 Bq/L standard was calculated for a whole-

body adult average population, not for the fetal endpoint identified in the peer-reviewed literature as the primary biological concern for tritium exposure.

The 350-fold difference between the current standard and the ODWAC recommendation is entirely attributable to the difference in the reference population. Using the same risk calculation framework, applied to the correct reference population (fetal tissue, consistent with the documented primary risk endpoint for OBT incorporation), produces a standard 350 times more stringent. This is not a methodological dispute. It is an application of the same methodology to the appropriate subpopulation.

2.3 CNSC INFO-0799 acknowledgement

CNSC INFO-0799 references the ODWAC recommendation and its scientific basis without refutation [2]. The same document acknowledges: that fetal dose from tritiated water is double the adult dose at any concentration; that OBT incorporates into fetal oocyte DNA; that biokinetic models for fetal tritium exposure have not been validated; and that wR = 2.2 would best reflect radiation risk for tritium rather than the wR = 1.0 used in regulatory calculations. Each of these acknowledgements is individually consistent with the ODWAC scientific reasoning. Together they constitute an implicit endorsement of the basis on which the recommendation was made, without the conclusion being implemented.

> The CNSC acknowledged the scientific basis of the ODWAC recommendation in its own published technical report in 2010. It has not refuted that basis. The standard has not changed. The question is not whether the science supports the recommendation. The question is why the recommendation has not been implemented.

3.. The regulatory accountability gap

3.1 What regulatory accountability requires

When an independent scientific advisory body convened by a government ministry makes a specific, quantitative, risk-based recommendation to reduce a safety standard, and the relevant federal regulator acknowledges the scientific basis of that recommendation in its own published technical literature without refuting it, basic regulatory accountability requires one of three responses: implementation of the recommendation; formal publication of a scientific counter-analysis explaining why the recommendation should not be implemented; or a published regulatory position acknowledging the gap and committing to a resolution timeline.

None of these three responses has occurred in the seventeen years since the ODWAC recommendation was published.

3.2 The consequence for CANDU licensing

CANDU reactors, particularly CANDU 6 and the MONARK next-generation design, produce more tritium per unit of electrical output than any other commercial reactor design, owing to neutron activation of the heavy water moderator and coolant. Tritium releases from Ontario CANDU facilities have been documented in source water for the Lake Ontario drinking water system and in groundwater near individual facilities. The existing 7,000 Bq/L standard is

routinely cited in CANDU environmental assessments as the relevant safety threshold, and tritium concentrations in affected water bodies are compared against this standard to conclude that no health concern exists.

If the appropriate standard is 20 Bq/L rather than 7,000 Bq/L — a position supported by the ODWAC scientific review and not refuted by the CNSC in seventeen years — then every CANDU environmental assessment that has cited the 7,000 Bq/L standard as the health safety threshold has cited the wrong number by a factor of 350. Communities that were told tritium concentrations were "well below" the safety standard may have been exposed to concentrations that exceed the appropriate standard for the most sensitive subpopulation.

7,000 Bq/L versus 20 Bq/L: a factor of 350.

Every CANDU environmental assessment that cites the current standard as its health threshold is using a number the CNSC's own cited science says is 350 times too high.

3.3 Implications for new project assessments

For new CANDU projects, including the proposed Peace River, Alberta MONARK facility, the consequence is direct. Environmental baseline assessments, health impact assessments, and drinking water pathway analyses will all reference the 7,000 Bq/L standard as the relevant safety benchmark. If that standard is not the appropriate benchmark for the most sensitive subpopulation, the health impact assessment is not assessing the appropriate health impact. No amount of monitoring against the wrong standard produces a valid safety determination for the correct reference population.

The IAAC review of any new CANDU project should require, as a pre-assessment condition, that the CNSC publish a formal regulatory position on the ODWAC recommendation explaining either the scientific basis for non-implementation or a timeline for review and implementation. A federal environmental assessment cannot rely on a safety standard that the relevant regulator's own science suggests may be set 350 times too high, without that discrepancy being formally addressed in the assessment record.

4.. Proposed regulatory actions

Three actions are proposed.

First, the CNSC should publish a formal regulatory response to the 2009 ODWAC recommendation within twelve months. The response should either implement the recommendation, publish a peer-reviewed counter-analysis explaining the scientific basis for non-implementation, or commit to a formal review process with a published timeline.

Second, pending resolution, any CANDU environmental assessment or health impact assessment that relies on tritium drinking water safety determinations should present its analysis using both the existing 7,000 Bq/L standard and the ODWAC-recommended 20 Bq/L standard, with explicit disclosure of the population for which each standard is appropriate and the difference in conclusions.

Third, Health Canada should be requested to conduct an independent review of the federal tritium drinking water guideline under its Guidelines for Canadian Drinking Water Quality process, using the updated health effects literature available since the guideline was last substantively reviewed.

5.. Conclusion

The ODWAC recommendation is the single most precisely documented safety gap in Canadian nuclear regulation. It is not a matter of scientific dispute between the CNSC and its critics. It is a matter of a government-commissioned scientific advisory body making a specific, risk-based, fetal-endpoint-grounded quantitative recommendation that the CNSC acknowledged in its own technical literature and did not implement for seventeen years. As the MONARK program proceeds toward licensing and rural communities are asked to accept CANDU facilities near their source water, the regulatory status of a 350-fold safety recommendation that has been sitting unaddressed on the CNSC's desk since 2009 is not a peripheral technical detail. It is the central accountability question for CANDU drinking water pathway health assessment.

6.. References

[1] Ontario Drinking Water Advisory Committee (ODWAC), Advice on Ontario's Drinking Water Quality Standard for Tritium, ODWAC Report, Ontario Ministry of the Environment, Toronto, 2009.

[2] Canadian Nuclear Safety Commission, Health Effects of Tritium, INFO-0799, CNSC, Ottawa, 2010.

[3] Health Canada, Guidelines for Canadian Drinking Water Quality: Guideline Technical Document — Tritium, Health Canada, Ottawa, 2019.

[4] R.C. Hamm, K. Davies and I. Fairlie, "Tritium Hazard Report: Pollution and Radiation Risk from Canadian Nuclear Facilities," Greenpeace Canada, Toronto, 2009.

[5] International Commission on Radiological Protection, Radiation and Your Patient: A Guide for Medical Practitioners, ICRP Supporting Guidance 5, Annals of the ICRP, Vol. 33, 2003.