IAAC COMPLAINT ADDITIONS

Energy Alberta Peace River Nuclear Power Project

SS 14 | **The HIA Scope Defect: A Cancer Risk Assessment Labelled as a Health Impact Assessment**

Source: G4SR6 Paper 1 (Non-Oncological Health Endpoints Excluded from CANDU HIAs)

INSERT AFTER	**SS13 — insert SS14 as the next full show stopper in Part Three: The Law** *SS14 is a statutory scope argument. It does not require acceptance of any epidemiological finding in SS1–SS13.*

The Argument

Health impact assessments for CANDU nuclear facilities in Canada evaluate cancer risk as the primary, and in practice the sole, quantitative health endpoint. Dose calculations are performed for routine radionuclide releases, incremental cancer risk is computed using the LNT model, and the resulting figure — typically expressed as a fraction of background cancer risk — is used to conclude that routine releases do not pose an unreasonable health hazard. The structure reflects the historical prioritisation of stochastic cancer risk in radiological protection frameworks. It does not reflect the current state of the peer-reviewed literature and it does not satisfy the statutory mandate under which CANDU HIAs are submitted to IAAC review.

The Six Excluded Endpoint Categories

The peer-reviewed literature documents the following non-oncological health endpoints from chronic low-dose ionising radiation exposure, none of which are routinely assessed in CANDU HIAs:

- Cardiovascular Disease: The INWORKS study of over 300,000 nuclear workers across France, the UK, and the United States reported a statistically significant association between cumulative radiation dose and circulatory disease mortality. LSS cohort follow-up shows excess cardiovascular mortality at doses as low as 0.5 Sv. A 2023 meta-analysis of occupational radiation exposure studies found consistent elevated relative risk for ischaemic heart disease and cerebrovascular disease across multiple independent cohorts. The evidence base now exceeds the evidence base that was available for cancer when cancer was incorporated as the primary endpoint.
- Neurological and Neurodevelopmental Effects: In utero radiation exposure is an established cause of intellectual disability above 100 mGy during the period of peak sensitivity at 8-15 weeks of

gestational age. Animal studies document neurodevelopmental effects from prenatal OBT exposure at dose rates comparable to those produced by chronic environmental tritium contamination, including reduced brain weight, altered neuronal density, and impaired spatial learning. CNSC INFO-0799 acknowledges the animal neurodevelopmental data but does not incorporate it into human health impact assessment frameworks.

- Immune System Dysregulation: Chronic low-dose ionising radiation has documented effects on immune function, including reduced lymphocyte count, altered natural killer cell activity, and dysregulation of inflammatory cytokine expression, in occupational cohorts at cumulative doses in the range of 50-200 mSv. Immune dysregulation is relevant both as a direct health outcome and as a potential mechanism for the childhood leukemia signal: childhood leukemia is fundamentally a disease of immune system failure in haematopoietic progenitor cells. An HIA that does not assess immune endpoints cannot claim to have assessed the pathway most directly relevant to the primary observed health signal.
- Ophthalmic Effects: The ICRP reviewed evidence of radiation-induced lens opacity at doses substantially lower than the previously assumed threshold, prompting a reduction of the occupational eye lens dose limit from 150 mSv per year to 20 mSv per year in 2012. Posterior subcapsular cataracts — the specific type associated with radiation exposure — are progressive, debilitating, and occur in a working-age population. No CANDU HIA quantifies ophthalmic risk despite the ICRP's own revised guidance.
- Adverse Reproductive and Developmental Outcomes: Beyond cancer and neurodevelopmental effects, chronic low-dose radiation has been associated with reduced sperm count, increased miscarriage rates, and intrauterine growth restriction in occupational and environmental exposure studies. For communities near a CANDU facility, where women of reproductive age may receive continuous low-level tritium exposure across multiple pregnancies spanning decades of facility operation, the cumulative reproductive health profile has never been assessed in any Canadian environmental review.
- Mixture and Interaction Effects: The peer-reviewed literature on mixture toxicology documents that carcinogenic and genotoxic effects of radiation and chemical co-exposures are in many cases synergistic rather than additive — the radiation effect is amplified in the presence of chemical promoters. For the Peace River region of northern Alberta, the background chemical carcinogen burden from bitumen extraction and pipeline operations represents precisely the mixture synergy environment identified in the literature. No CNSC regulatory framework requires mixture interaction assessment as a component of CANDU HIA.

The Statutory Argument

The Nuclear Safety and Control Act mandates that the CNSC regulate nuclear activities in Canada to protect the health and safety of persons. The mandate is not limited to cancer protection. The Impact Assessment Act requires consideration of health effects as a factor in environmental assessment — not cancer effects, but health effects. The Guidelines for Canadian Drinking Water Quality cover a range of health endpoints; tritium guidelines are set with reference to the full health effects literature, not cancer alone.

A CANDU HIA that evaluates cancer and no other endpoint is not a complete assessment of the health effects of routine releases under any of these statutory frameworks. It is a cancer risk assessment labelled as a health impact assessment. For purposes of IAAC review, the distinction is legally material: a Review Panel evaluating whether a project is in the public interest, including health impacts, cannot rely on an assessment that addresses one of seven documented health endpoint categories and presents that assessment as complete.

CANDU HIAs assess cancer. Six additional endpoint categories have peer-reviewed evidence of association with chronic low-dose radiation. The statutory mandate covers health of persons, not cancer in persons. A fraction of the required assessment, labelled the whole, does not satisfy the statutory mandate.

What the IAAC Must Require

The IAAC should require, as a condition of accepting the health impact assessment as adequate for review purposes: that the HIA scope be defined to include all endpoint categories for which peer-reviewed evidence of association with chronic low-dose ionising radiation exists; that for endpoints where dose-response relationships are uncertain, the HIA present a qualitative assessment of relevant population subgroups and a conservative upper-bound estimate rather than excluding the endpoint; that a mixture interaction assessment be conducted for the Peace River site given its documented chemical carcinogen background; and that the cancer risk estimate be presented alongside the acknowledged uncertainty from the LNT model structural failures identified in SS4 of the main complaint.

References

The following references are cited in the new and updated material in this document. All references to CNSC internal documents (INFO-0799, RADICON, INFO-0210 series, KiKK Fact Sheet) are to the published CNSC versions.

1. Canadian Nuclear Safety Commission, Health Effects of Tritium, INFO-0799, CNSC, Ottawa, 2010.
2. Ontario Drinking Water Advisory Committee, Advice on Ontario's Drinking Water Quality Standard for Tritium, ODWAC Report, Ontario Ministry of the Environment, Toronto, 2009.
3. Canadian Nuclear Safety Commission, Fact Sheet: The KiKK Study Explained, cnsc-ccsn.gc.ca, last modified October 24, 2025.
4. Canadian Nuclear Safety Commission, Radiation and Incidence of Cancer around Ontario Nuclear Power Plants from 1990 to 2008 (RADICON), CNSC, Ottawa, 2013.
5. Canadian Nuclear Safety Commission, Radioactive Release Data from Canadian Nuclear Generating Stations 1990 to 1999, INFO-0210/REV.10, CNSC, Ottawa.
6. Canadian Nuclear Safety Commission, Radioactive Release Data from Canadian Nuclear Generating Stations 1999 to 2008, INFO-0210/REV.13, CNSC, Ottawa.
7. S. Wanigaratne, E. Holowaty, H. Jiang et al., Estimating cancer risk in relation to tritium exposure from routine operation of a nuclear-generating station in Pickering, Ontario, Chronic Diseases and Injuries in Canada, Vol. 33, No. 4, 2013, pp. 247-256.
8. SSK (German Radiological Protection Commission), Assessment of the KiKK Study, Commission on Radiological Protection, 2008.
9. Committee on Medical Aspects of Radiation in the Environment (COMARE), Fourteenth Report, COMARE, 2011.
10. C. Sermage-Faure, D. Laurier, S. Goujon-Bellec et al., Childhood leukemia around French nuclear power plants — the Geocap study 2002-2007, International Journal of Cancer, Vol. 131, 2012, pp. E769-780.
11. J. Hatch et al., Cancer mortality near US nuclear facilities, Nature Communications, 2025.

12. L. Kinlen, Evidence for an infectious cause of childhood leukaemia: comparison of a Scottish new town with nuclear reprocessing sites in Britain, Lancet, Vol. 2, 1988, pp. 1323-1327.
13. International Commission on Radiological Protection, Statement on Tissue Reactions (Eye Lens), ICRP Ref. 4832-3230-6655, ICRP, 2011.
14. E. Cardis et al., The 15-Country Collaborative Study of Cancer Risk among Radiation Workers in the Nuclear Industry, BMJ, Vol. 331, 2005, pp. 77-82.
15. National Research Council, Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2, National Academies Press, Washington D.C., 2006.
16. F.R. Greening, correspondence with CNSC Executive VP Ramzi Jammal (2017) and CNSC President Tremblay (2026), personal communication.