FORMAL SUBMISSION
THE BRUCE C NUCLEAR PROJECT CANNOT BE APPROVED

Thirty-Four Independent Bruce Stoppers

Each Bruce Stopper independently bars approval of the Bruce C Nuclear Project. The Impact Assessment Agency of Canada does not need to find all thirty-four persuasive — any single one, properly applied to the statutory obligations of the Impact Assessment Act, is sufficient grounds to refuse approval. Together they form a closed logical structure from which there is no exit within the current state of knowledge or the current regulatory architecture.

OPENING STATEMENT

Purpose and Structure of This Submission

This submission is filed by a member of the public with documented technical expertise in the radiological health risk framework applied by the Canadian Nuclear Safety Commission to nuclear facility licensing and environmental assessment in Canada. It is filed on the public registry of the Bruce C Nuclear Project integrated impact assessment (IAAC Registry File No. 88771) and is intended as a formal public submission for all purposes of that proceeding.

The submission identifies thirty-four independent grounds — called Bruce Stoppers — upon which the Bruce C Nuclear Project cannot lawfully be approved. The thirty-four Bruce Stoppers fall into four categories. The first eleven concern the evidence: what the science actually shows about radiological health risk near nuclear facilities, why the models the Canadian Nuclear Safety Commission uses fail to predict what is observed in the real world, and why the studies the CNSC cites as proof of safety were structured in ways that made them almost certain to find nothing regardless of whether harm existed. The next five concern the institution: why the regulator upon whom this assessment depends cannot produce the independent scientific foundation the Impact Assessment Act requires. The following eleven concern the law: the specific statutory obligations triggered by the documented uncertainties, and how the current process fails to satisfy them. The final seven concern structural invalidity: why the assessment process as currently designed cannot produce a lawful outcome regardless of what the proponent submits.

This submission is fully self-contained. It does not rely on any external document, registry, or cross-reference. A reader with no prior knowledge of Canadian nuclear regulation, radiological epidemiology, or impact assessment law can read this submission and understand every argument it makes. Every factual proposition is supported by named sources. Every legal proposition is grounded in the text of the governing statute or regulatory instrument. Every

scientific proposition is referenced to the peer-reviewed literature or to the CNSC's own published documents.

Sixteen appendices provide the detailed evidentiary foundation for the arguments made in the body. The appendices are not supplementary — they are substantive. A reader who wishes to understand the full scientific and legal basis for any Bruce Stopper should read the relevant appendix. The appendices collectively constitute the evidentiary record that the Review Panel, exercising its independent powers under section 46 of the Impact Assessment Act, will need to evaluate independently.

How to Read This Submission

Each Bruce Stopper is presented in a consistent format. The heading identifies the stopper by number and title, with a cross-reference in brackets to any equivalent submission in a related proceeding where such a cross-reference is useful for tracking purposes. The body of each stopper sets out the factual and legal argument in full. At the end of each stopper, two coloured boxes state the consequences: a red finding box states the specific legal consequence for the Bruce C assessment, and an orange trap box explains how this stopper traps the IAAC — why it is not open to the Agency to proceed without addressing this ground.

The thirty-four Bruce Stoppers are cumulative and mutually reinforcing. They are not alternatives. The IAAC does not need to find all thirty-four persuasive — any single one is independently sufficient. But the submission is structured so that if a reader rejects one ground, the remaining thirty-three are unaffected. If a reader rejects ten, twenty-four remain. The logical structure is closed: there is no path through all thirty-four that reaches a lawful approval on the current record.

What This Submission Does Not Argue

This submission does not argue that nuclear power is inherently unacceptable, that the Bruce C project could never be approved under any circumstances, or that the proponent is acting in bad faith. It argues something narrower and more specific: that the current state of the scientific evidence, the current state of the CNSC's regulatory framework, the current design of the TISG, and the current state of the assessment record do not provide the evidentiary foundation that the Impact Assessment Act requires for a lawful public interest determination under section 63.

The remedy for most of these grounds is not cancellation of the project. It is remediation of the evidentiary and regulatory deficiencies before the assessment proceeds. Where the remedy is more fundamental — where the deficiency goes to the structural design of the Canadian nuclear regulatory system itself — the submission says so explicitly and explains why no supplementary process can cure it.

A Note on the CNSC's Role in This Proceeding

The Canadian Nuclear Safety Commission participates in this integrated impact assessment as a technical expert body. Its published positions on radiological health risk — its fact sheets, guidance documents, and regulatory conclusions — will form a significant part of the evidentiary record the Review Panel must evaluate. This submission demonstrates, in detail and with specific documentary evidence, that several of those published positions diverge materially from the

current peer-reviewed scientific literature and, in some cases, from the CNSC's own internal scientific documents.

This is not an argument that the CNSC is generally incompetent or that its staff act in bad faith. It is a specific, evidenced demonstration that on particular questions — the characterisation of the KiKK childhood leukemia signal, the application of the tritium relative biological effectiveness factor, the scope of health endpoints assessed, the acknowledgment of recent scientific literature — the CNSC's published positions do not accurately represent the current state of science. The Review Panel, which exercises Commission powers independently under section 46 of the IAA, must evaluate those positions on their merits. This submission provides the evidentiary foundation for that evaluation.

Section 46 of the IAA exists precisely because Parliament recognised that the CNSC is not a disinterested scientific body. The CNSC is funded primarily by fees from the nuclear industry it regulates, holds a dual mandate to both regulate and promote the peaceful use of nuclear energy, and has had its operational independence overridden by direct government intervention in at least one documented historical instance. Parliament's response to this structural reality was to give the Review Panel independent Commission powers — to ensure that the assessment of a major nuclear project is not simply a validation of the CNSC's own regulatory conclusions. This submission explains why that parliamentary intent matters for the Bruce C assessment, and why the current TISG defeats it.

The Cross-Reference Convention

Some Bruce Stoppers carry a cross-reference in their heading, for example '(SS1)' or '(SS3)'. These references are to equivalent submissions filed in a related CNSC-IAAC integrated assessment proceeding in Canada. They are provided for tracking purposes and to assist any reviewing court or independent scientific reviewer who wishes to examine the parallel evidentiary record. They are not required for understanding this submission. Every argument in this document stands independently on its own evidence and legal analysis.

SCHEDULE OF BRUCE STOPPERS

The following table catalogues all thirty-four Bruce Stoppers. Each is independently sufficient to bar approval. The Part column identifies the section of this submission in which the stopper appears. The Cross-Reference column identifies any equivalent submission in a related proceeding.

Bruce Stopper	Title	Part	Ref
BS1	The Real-World Cancer Data Does Not Match the Models — A Forty-Year International Evidence Record	Part 1 — Evidence	SS1
BS2	The Bruce Site Has a Fifty-Year Chronic Exposure Baseline That Invalidates Standard Incremental Risk Methodology	Part 1 — Evidence	—

Bruce Stopper	Title	Part	Ref
BS3	The Primary Emission of CANDU Reactors Cannot Be Adequately Assessed — The CNSC's Own Scientists Said So in 2010	Part 1 — Evidence	SS3
BS4	The Dose Models Are Structurally Wrong — RBE 1.0 Applied Against the CNSC's Own Internal Recommendation of 2.2	Part 1 — Evidence	SS4
BS5	The Required Research Has Not Been Done — Sixteen Years of Acknowledged Gaps, No Action	Part 1 — Evidence	SS5
BS6	Absence of Evidence Is Not Evidence of Absence — Underpowered Studies Presented as Safety Evidence	Part 1 — Evidence	SS6
BS7	Seven CNSC Published Documents Contain Representations Irreconcilable with the CNSC's Own Internal Scientific Record	Part 1 — Evidence	SS7
BS8	Six Major Peer-Reviewed Studies Published 2024-2026 Have Not Been Acknowledged or Acted Upon	Part 1 — Evidence	SS15
BS9	The Lake Huron Cumulative Tritium Pathway Is the Largest Uncharacterised Radiological Baseline in Canada	Part 1 — Evidence	—
BS10	Every Comparator Jurisdiction Has Reached a More Qualified Conclusion from the Same Evidence	Part 1 — Evidence	SS9
BS11	The Darlington SMR Is a Mandatory REGDOC-2.5.2 §2.2.1 Comparator That Has Not Been Required	Part 1 — Evidence	—
BS12	The CNSC Has a Structural Conflict of Interest That Prevents It from Producing Independent Science	Part 2 — Institution	SS8
BS13	Regulatory Abdication — The CNSC Knew About Every Deficiency for Thirteen Years and Took No Action	Part 2 — Institution	SS13
BS14	No Harm Standard Has Ever Been Defined — ALARA Has No Upper Bound	Part 2 — Institution	SS16
BS15	The Precautionary Principle Has Been Systematically Inverted — The Burden of Proof Runs the Wrong Way	Part 2 — Institution	SS10
BS16	The Monitoring Framework Is Structurally Incapable of Detecting Harm at the Bruce Site Population Scale	Part 2 — Institution	SS12
BS17	Cancer-Only Health Impact Assessment Scope Violates IAA Section 22(1)(a)	Part 3 — Law	SS14
BS18	The Benefits-Outweigh-Harm Standard Has Been Formally Rejected — CARN v BWXT 2022 FC 849	Part 3 — Law	SS21/26
BS19	IAEA Dose Constraint Non-Compliance — Two Consecutive International Review Cycles, No Remedy	Part 3 — Law	SS22/27
BS20	Free Prior and Informed Consent Has Been Given on a Materially Inaccurate Health Information Base	Part 3 — Law	SS11
BS21	The Saugeen Ojibway Nation Formally Documented Its Inability to Engage With TISG Scoping Before the TISG Was Finalised	Part 3 — Law	—

Bruce Stopper	Title	Part	Ref
BS22	Irreversibility — If Harm Occurs at the Bruce Site Scale It Cannot Be Detected, Remedied, or Reversed	Part 3 — Law	SS12 adapted
BS23	The CNSC Has Breached Its Duty of Candor Through Multiple Material Non-Disclosures	Part 3 — Law	SS30
BS24	The Great Lakes Water Quality Agreement Creates Binding International Legal Obligations That Have Not Been Addressed	Part 3 — Law	—
BS25	No Licensed Permanent Waste Disposal Pathway Exists — The Eagle Lake First Nation Court Challenge Eliminates the Only Proposed Route	Part 3 — Law	SS19/24
BS26	The Concurrent Bruce A&B Power Uprate Creates a Moving Baseline During the Assessment	Part 3 — Law	—
BS27	No Alternatives Assessment Has Been Required Despite the IAAC's Own Summary of Issues Identifying It as a Key Concern	Part 3 — Law	SS17
BS28	Technology Neutrality Structurally Precludes Completion of Mandatory CNSC Licensing Requirements	Part 4 — Structural	SS18/23 adapted
BS29	The TISG Is Deficient as a Regulatory Instrument in Seventeen Identified Respects	Part 4 — Structural	SS32
BS30	IAA Section 46 Independence Is Defeated by the TISG's CNSC-Dependent Evidentiary Foundation	Part 4 — Structural	SS32
BS31	IAA Section 63 Public Interest Determination Lacks a Lawful Evidentiary Foundation	Part 4 — Structural	SS32
BS32	The VDR Status of Both Candidate Technologies Has Not Been Disclosed — Neither Has a Current Completed Canadian Regulatory Basis	Part 4 — Structural	SS29
BS33	IAAC Is Legally Trapped — Every Available Path Leads to an Unlawful Outcome	Part 4 — Structural	SS31
BS34	Cumulative Structural Invalidity — Seven Independent Grounds Each Independently Requiring Process Restart	Part 4 — Structural	SS31

The thirty-four Bruce Stoppers are cumulative and mutually reinforcing. Any single one is independently sufficient to bar approval on the current record. Together they form a closed logical structure from which there is no lawful exit without fundamental remediation of the evidentiary and regulatory deficiencies identified in this submission.

THE LEGAL FRAMEWORK

The following statutory provisions and regulatory instruments govern this submission. They are set out here in full so that a reader without prior knowledge of Canadian impact assessment or nuclear law can understand the legal basis for each Bruce Stopper.

The Impact Assessment Act, SC 2019, c.28

The Impact Assessment Act is the federal statute governing major project assessments in Canada. For the Bruce C Nuclear Project, the IAA operates through an integrated review panel process in collaboration with the Canadian Nuclear Safety Commission. The following provisions are central to this submission.

Section 6(1)(a) codifies the precautionary principle: where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation. As confirmed by the Supreme Court of Canada in 114957 Canada Ltée (Spraytech) v Hudson, [2001] 2 SCR 241, the precautionary principle places the burden of demonstrating the absence of significant adverse effects on the proponent — not the burden of proving harm on affected communities.

Section 22(1) lists the mandatory factors the impact assessment must take into account, including: changes to the environment and to health, social, and economic conditions (s.22(1)(a)); mitigation measures (s.22(1)(b)); alternatives to the designated project (s.22(1)(f)); the purpose of and need for the project and alternative means of carrying it out (s.22(1)(i)); Indigenous knowledge (s.22(1)(j)); and cumulative effects (s.22(1)(l)).

Section 46 provides that for an impact assessment of a designated project including activities regulated under the Nuclear Safety and Control Act, the Review Panel may exercise the powers conferred on the Canadian Nuclear Safety Commission. This provision means the Review Panel exercises CNSC powers independently — it is not bound by CNSC published science, it does not defer to CNSC positions on contested scientific questions, and it must form its own independent judgments on the evidence before it.

Section 63 governs the Minister's public interest determination. The determination must be based on the Review Panel's report and must weigh whether adverse effects within federal jurisdiction are justified in the public interest, taking into account the factors in section 63(4) including health effects and impacts on Indigenous rights.

The Nuclear Safety and Control Act, SC 1997, c.9

The Nuclear Safety and Control Act establishes the CNSC and governs the licensing of nuclear facilities in Canada. Section 24(4) requires that before issuing a licence, the Commission must be satisfied that the applicant will make adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security. Section 9(b) gives the CNSC authority to fund research necessary to discharge its regulatory mandate.

CNSC REGDOC-2.5.2 §2.2.1: The Mandatory Comparative Societal Risk Requirement

CNSC REGDOC-2.5.2, Design of Reactor Facilities, Version 2.1, section 2.2.1, Safety Goals, states: 'Societal risks to life and health from reactor facility operation shall be comparable to or less than the risks of generating electricity by viable competing technologies, and shall not significantly add to other societal risks.' The word 'shall' is confirmed as expressing a mandatory requirement by REGDOC-3.5.3, Regulatory Fundamentals: 'The words shall and must are used to express requirements to be satisfied by the licensee or licence applicant.' This requirement applies to every new reactor facility in Canada regardless of which technology is proposed.

Vavilov and the Reasonableness Standard

Administrative decisions by IAAC — including the finalization of the TISG and the acceptance of the Impact Statement — are subject to judicial review on the standard of reasonableness under Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65. Reasonableness requires that the decision comply with all relevant legal constraints imposed by the governing statute and applicable regulatory instruments, be transparent and intelligible, and — where the decision-maker departs from its own previously stated position — be accompanied by an explanation of that departure. A decision made on an indefensible factual foundation is unreasonable.

The Duty of Candor

Administrative bodies participating in quasi-judicial proceedings owe a duty of candor to the tribunal. This duty, grounded in Baker v Canada (Minister of Citizenship and Immigration), [1999] 2 SCR 817, and affirmed through Dunsmuir v New Brunswick, [2008] 1 SCR 190 and Vavilov, requires that material information affecting the Panel's assessment be disclosed even where that disclosure is adverse to the disclosing party's institutional interests. Failure to disclose material qualifications to conclusions presented to a quasi-judicial body is a breach of this duty.

UNDRIP and the FPIC Standard

The United Nations Declaration on the Rights of Indigenous Peoples, implemented in Canada through Bill C-15 (the United Nations Declaration on the Rights of Indigenous Peoples Act, SC 2021), requires that States obtain the free, prior, and informed consent of Indigenous peoples before approving projects affecting their lands, territories, and resources (Article 32(2)). The word 'obtain' imposes an obligation to actively seek FPIC — not merely to consult. In Kebaowek First Nation v. Canadian Nuclear Laboratories, 2025 FC 319, the Federal Court established in the Canadian nuclear regulatory context that the FPIC process must be genuinely pursued and that a failure to do so is a reviewable procedural defect.

NOTE ON THE APPENDICES

This submission is accompanied by sixteen appendices, filed as a separate document. Each appendix provides the detailed evidentiary foundation for one or more Bruce Stoppers. The appendices are listed below with a brief description of their contents. They are substantive, not supplementary — the arguments in the body of this submission rest on the evidence in the appendices.

Appendix	Title	Contents
A	**The Forty-Year Cancer Evidence Record**	Full narrative account of every major epidemiological study from the 1984 Black Report through Harvard Nature Communications 2026. Covers the UK, Germany, France, United States, and pooled international evidence. Establishes the 40-70 gap between model predictions and observed outcomes.
B	**KiKK: The Full 26-Study Literature Catalogue**	All 26 peer-reviewed studies addressing the KiKK signal catalogued with authors, year, findings, and odds ratios. Distribution table showing 14 confirming significant signal vs 5 finding no association. Documents the 19 studies omitted from CNSC's reference set. SSK, COMARE, IRSN, IARC, and WHO positions stated.
C	**Tritium: INFO-0799, OBT, RBE 2.2, ODWAC 2009**	Full documentation of INFO-0799 self-contradiction. Six irreconcilable representations in CNSC tritium fact sheet. OBT fetal DNA mechanism explained. RBE 1.0 vs 2.2 discrepancy documented. ODWAC 2009 350-fold recommendation explained.
D	**LNT Model: Four Extrapolation Steps Quantified**	Each of the four extrapolation steps from the LNT model's validated domain to CANDU chronic internal emitter exposure documented with specific uncertainty ranges. DDREF range 1.5-10. BEIR VII sex and age differentials. Tritium RBE 1.0-5.0+. Cumulative compounding 4.6x to 150x.
E	**Seven CNSC Documents with Irreconcilable Representations**	Each of seven CNSC published documents identified with the specific representation it contains that is irreconcilable with the CNSC's own internal scientific record. Documents the unaudited Cardis dataset revision. Shows how these documents will be used in the Bruce C Impact Statement.
F	**Six Post-2023 Studies Not Acknowledged**	INWORKS haematological (Lancet Haematology 2024), 47-study meta-analysis (2024), Harvard Environmental Health (2025), Harvard Nature Communications 2026 (~6,400 excess cancer deaths/year near US facilities), IJMS epigenetic transgenerational (March 2025), EJE INWORKS solid cancer (November 2024). Full findings and regulatory action not taken.
G	**International Regulatory Divergence**	What SSK, COMARE, IRSN, IARC, and WHO each concluded from the same evidence the CNSC characterised as 'unfounded'. Shows that no other major nuclear jurisdiction applied this characterisation and that the divergence is unexplained by Canadian-specific data.
H	**CNSC Structural Conflict and**	Licence-fee funding structure, unresolved dual mandate (34 years), NRU Parliament override documented. Full 13-year

Appendix	Title	Contents
	Regulatory Abdication	regulatory abdication chronology: known 2010, authority existed, budget existed, no action taken.
I	**REGDOC-2.5.2 §2.2.1 — Ontario Electricity Market**	Viable competing technologies in Ontario: Darlington SMR (LTC April 2025), Bruce A&B refurbishment, renewable-plus-storage, gas with CCS. Full parameter table for mandatory societal risk comparison. Darlington SMR as the primary REGDOC-2.5.2 comparator.
J	**Lake Huron Cumulative Tritium Pathway**	CNSC IEMP data for Bruce A&B tritium production. Cumulative 50-year loading quantified. Georgian Bay near-shore concentration argument. Great Lakes Water Quality Agreement Articles VI and IX. IJC enforcement mechanism. 40 million affected persons across two countries.
K	**Technology-Neutral TISG — Three Mandatory Requirements Impossible to Satisfy**	REGDOC-2.5.2 §2.2.1, REGDOC-2.4.2 (PSA), and REGDOC-2.10.1 (EPZ) each require design-specific data. CANDU vs PWR tritium comparison table (2-3 orders of magnitude difference). Why technology selection is a precondition to a complete Impact Statement.
L	**SON Engagement Record and FPIC Legal Analysis**	SON May 2025 letter documented. Kebaowek First Nation v CNL 2025 FC 319 applied. Why post-TISG engagement cannot cure a scoping defect. Why FPIC on inaccurate health information base fails the UNDRIP Article 19 standard.
M	**The 17 TISG Deficiencies — Full Regulatory Basis**	Each of the 17 Bruce C TISG deficiencies with full regulatory and statutory basis, the specific CNSC framework failure it flows from, and the precise amendment required. Drawn from the First and Second Amendment Requests adapted for the Bruce C/Ontario context.
N	**Precautionary Principle — Legal Analysis**	Full legal analysis of IAA s.6(1)(a), 114957 Canada Ltée v Hudson [2001] 2 SCR 241, the correct allocation of the burden of proof, and how the CNSC systematically inverts it. Applied to the six documented scientific uncertainties in this proceeding.
O	**Monitoring Framework Statistical Power Analysis**	Statistical power calculations showing that the population in the Bruce site catchment area is insufficient to detect the effect sizes documented in the KiKK and international literature. Why 'no statistically significant effect detected' from an underpowered programme is not the same as 'no effect'.
P	**Irreversibility — Why Monitoring Conditions Cannot Cure Post-Approval Harm**	Why a monitoring condition attached to approval cannot function as a safeguard when the monitoring programme cannot detect harm if it occurs, radioactive contamination of the Lake Huron watershed is irreversible at practical scales, and the NLCA cap means residual liability falls permanently on the public.

PRIMARY INSTRUMENTS

The following statutory provisions, regulatory instruments, judicial decisions, and scientific publications are cited throughout this submission. They are listed here for convenient reference. Full citations appear in the relevant Bruce Stoppers and appendices.

Statutes and Regulations

Impact Assessment Act, SC 2019, c.28, s.1 (ss.6, 22, 46, 63); Nuclear Safety and Control Act, SC 1997, c.9 (ss.9, 24, 35); Nuclear Liability and Compensation Act, SC 2015, c.4, s.24; Nuclear Fuel Waste Act, SC 2002, c.23; Bill C-15, United Nations Declaration on the Rights of Indigenous Peoples Act, SC 2021; Constitution Act 1982, s.35; Regulations Designating Physical Activities, SOR/2019-285; Physical Activities Regulations.

CNSC Regulatory Documents

CNSC REGDOC-2.5.2 Version 2.1, Design of Reactor Facilities, §2.2.1 (Safety Goals — mandatory comparative societal risk); CNSC REGDOC-3.5.3, Regulatory Fundamentals ('shall' = mandatory); CNSC REGDOC-2.4.2, Probabilistic Safety Assessment for Reactor Facilities; CNSC REGDOC-2.10.1 Version 2, Emergency Preparedness and Response; CNSC REGDOC-1.1.1 Version 1.2, Site Evaluation and Site Preparation for New Reactor Facilities; CNSC REGDOC-3.3.1, Financial Guarantees for Decommissioning; CNSC INFO-0799 (2010); CNSC-IAAC Memorandum of Understanding on Integrated Impact Assessments, 2019; CNSC KiKK Study Fact Sheet; CNSC Tritium Fact Sheet; CNSC Environmental Monitoring Program, Bruce A and B Nuclear Generating Stations (published IEMP data); CNSC Enforcement Letter to Ontario Power Generation re Darlington Unified Command 2025 exercise, November 6, 2025.

International Instruments

Great Lakes Water Quality Agreement, Canada-USA, 1978, Articles VI and IX; IAEA GSR Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, Requirement 29; IAEA Integrated Regulatory Review Service Mission to Canada, 2019 (Recommendation R2); IAEA IRRS Follow-up Mission to Canada, 2024; United Nations Declaration on the Rights of Indigenous Peoples, Articles 19, 29.2, and 32(2).

Judicial Decisions

Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65; Baker v Canada (Minister of Citizenship and Immigration), [1999] 2 SCR 817; Dunsmuir v New Brunswick, [2008] 1 SCR 190; 114957 Canada Ltée (Spraytech) v Hudson (Town), [2001] 2 SCR 241; CARN v BWXT Nuclear Energy Canada Inc., 2022 FC 849, ¶¶47-53; Kebaowek First Nation v. Canadian Nuclear Laboratories, 2025 FC 319.

Scientific Publications

Kaatsch et al. (KiKK study), European Journal of Cancer, 2008; Spix et al., European Journal of Cancer, 2008; COMARE 14th Report, UK; SSK (German Scientific Committee on Radiation Protection), KiKK review, 2008; GEOCAP study, INSERM France, 2012; INWORKS haematological cancer study, Lancet Haematology, 2024; 47-study meta-analysis, Current Environmental Health Reports, 2024; Harvard Environmental Health, 2025; Harvard Nature

Communications, 2026; IJMS epigenetic transgenerational study, March 2025; EJE INWORKS solid cancer reanalysis, November 2024; Ontario Drinking Water Advisory Committee, Report on Tritium, 2009; BEIR VII Report, US National Academies, 2006; UNSCEAR 2006 and 2012 Reports.

PART 1

THE EVIDENCE

Part One establishes the empirical foundation of this submission. It begins with the forty-year international evidence record showing that cancer rates near nuclear plants consistently exceed model predictions by factors that the models cannot explain. It then shows that the Bruce C site compounds this problem because its population has already been chronically exposed to CANDU radionuclide emissions for approximately fifty years — making the incremental risk calculation structurally wrong before a single model input is considered. It then explains why the primary emission of CANDU reactors — tritium — cannot be adequately assessed: the CNSC's own scientists formally acknowledged in 2010 that the evidence base was insufficient, and that acknowledgment has been contradicted by every tritium publication the CNSC has issued since. It demonstrates structurally why the dose models fail: they were calibrated on the wrong people, measure the wrong thing, apply the wrong biological weight to the substance the plant will emit most, and are applied against an exposure baseline they were never designed to address. It establishes that the research required to fix the models has never been done. It closes by demonstrating that the null findings the CNSC will cite as evidence of safety come from studies that were structured in ways that made them almost certain to find nothing regardless of whether harm existed — making them measurement failures, not safety evidence.

BRUCE STOPPER 1 — THE REAL-WORLD CANCER DATA DOES NOT MATCH THE MODELS — A FORTY-YEAR INTERNATIONAL EVIDENCE RECORD (SS1)

What the Models Predict

The safety case for the Bruce C Nuclear Project rests, as every nuclear safety case rests, on mathematical models. Those models calculate radiation emissions from the facility, the dispersal of those emissions through air and water, the uptake of radionuclides by humans through inhalation and ingestion, the resulting radiation dose to the human body, and from that dose, the calculated increase in cancer risk. For populations living near a nuclear power plant at regulatory emission levels, these models predict that the incremental increase in radiation dose is between 0.001 and 0.01 millisieverts per year — a tiny fraction of background radiation — and that the resulting increase in cancer risk is immeasurably small. The models predict, in effect, zero additional cancer cases in communities near nuclear plants. This is not a contested interpretation of the models. It is what the models straightforwardly produce given their inputs.

The problem is that the models do not predict what is observed in the real world. The following is not a characterisation of contested data or fringe science. It is a catalogue of independent research programmes spanning four decades, conducted in different countries, by different scientific teams, using different methodologies — all documenting elevated cancer rates near nuclear power plants that the models predict should not exist. This body of evidence is the most important scientific fact in this submission. It is also the fact that the CNSC's published materials most systematically fail to represent accurately. See Appendix A for the full study-by-study account.

The Forty-Year Evidence Record

The Black Report — United Kingdom, 1984

The first formal government investigation of childhood cancer near a nuclear facility was the Black Inquiry, commissioned by the United Kingdom government following public concern about leukemia rates in Seascale — the village immediately adjacent to the Sellafield nuclear complex in Cumbria. The inquiry was led by Sir Douglas Black, former Chief Medical Officer of England. It found that childhood leukemia incidence in Seascale was approximately ten times the national average. The Black Report did not attribute this excess to radiation — it concluded that the excess could not be explained by any single cause — but it documented the excess as real, acknowledged it could not be dismissed as chance, and recommended further systematic investigation. That excess — ten times the national average in the community immediately adjacent to a nuclear facility, at dose levels the models said should cause essentially zero additional cancers — was the opening data point of the evidence base that now spans forty years.

COMARE — United Kingdom, 1986 Onwards

The United Kingdom government established the Committee on Medical Aspects of Radiation in the Environment in 1985, directly as a result of the Black Report's recommendation for further investigation. COMARE published a series of reports through the late 1980s, 1990s, and 2000s examining childhood cancer rates at Sellafield, Dounreay, and other UK nuclear sites. The reports consistently documented elevated cancer rates that could not be explained by the radiation doses measured at those sites. COMARE's 14th Report, published in 2011, examined the KiKK study results in detail and concluded that the findings were statistically significant and warranted investigation of the cause. COMARE did not characterise the KiKK finding as 'unfounded.' It did not dismiss it as a statistical artifact. It acknowledged the signal as real and called for research into its explanation. Across its entire body of work, COMARE found approximately a 20 per cent excess leukemia risk within five kilometres of UK nuclear installations — statistically significant across the aggregated UK data.

The Krümmel Cluster — Germany, 1990-2005

In the early 1990s, an elevated childhood leukemia cluster was identified near the Krümmel nuclear power plant in northern Germany. Between 1990 and 1995, six cases of childhood leukemia were diagnosed in the area, five of them within a five-kilometre radius, against an expected number of approximately one — representing a rate roughly five to six times the expected level. The cluster persisted until at least 2005. Radiation emissions from the plant were

within regulatory limits throughout the entire period. Modestly elevated levels of caesium were detected in rainwater and air samples near the plant during this period. The UK's COMARE examined the Krümmel data and concluded the cluster could not be explained. The Krümmel cluster was one of the direct scientific motivations for the German government commissioning the KiKK national case-control study — the most methodologically rigorous study of nuclear plant proximity and childhood leukemia ever conducted.

Pre-KiKK Ecological Studies — Multiple Countries, 1990s-2000s

Through the 1990s and early 2000s, ecological studies in the United Kingdom, France, Germany, Canada, and the United States consistently found elevated childhood leukemia rates near nuclear power plants. A formal pooled meta-analysis of geographic studies from this period reported a 23 per cent higher incidence of leukemia among children aged zero to nine years living within 16 kilometres of nuclear facilities — a finding pooled across multiple countries and multiple study designs. These studies established the signal that motivated the more rigorous case-control designs that followed. Their consistent directional finding — elevated rates, models predicting no elevation, gap unexplained — is the foundation on which the KiKK study was built.

The KiKK Study — Germany, 2008

The Kinderkrebs in der Umgebung von Kernkraftwerken study was commissioned by Germany's Federal Office for Radiation Protection specifically to address methodological criticisms of the earlier ecological studies. It was designed as a national case-control study — the most rigorous epidemiological design for investigating rare outcomes — covering every nuclear power plant in Germany over a 23-year period (1980-2003). It was conducted by the German Childhood Cancer Registry, one of the world's leading childhood cancer databases. It covered 1,592 confirmed childhood leukemia cases and 4,735 controls. It is the largest and methodologically strongest study of nuclear plant proximity and childhood cancer ever conducted anywhere in the world.

The KiKK study found an odds ratio of 2.19 for leukemia in children under five living within five kilometres of a German nuclear plant, with a 95 per cent confidence interval of 1.51 to 3.20. An odds ratio of 2.19 means that children in this proximity zone had approximately double the leukemia rate of children living further away. The finding was statistically robust — the confidence interval does not include 1.0 and is not wide — and the dose-distance relationship showed that risk decreased continuously with increasing distance from the plant, which is the pattern expected if proximity to the plant is causally related to the outcome. The study found an odds ratio of 1.61 (95% CI 1.26-2.06) for all childhood cancers combined, representing a 61 per cent excess risk.

The KiKK study was published in the European Journal of Cancer in 2008 and has been subject to extensive international peer review. No methodological flaw has been identified that explains away the finding. Germany's own Scientific Committee on Radiation Protection (SSK) reviewed the study in detail in 2008 and concluded that the results were statistically robust and could not be explained by methodological artifact, confounding, or chance. France's Institute for Radiation Protection and Nuclear Safety (IRSN) reviewed the findings and supported further investigation. The UK's COMARE reviewed the findings in its 14th Report and concluded they were statistically significant and warranted investigation.

The CNSC's published KiKK fact sheet characterises the finding as 'unfounded.' This characterisation diverges from every other major nuclear regulatory body that has examined the same evidence. It is based on a reference list that omits 19 of the 26 peer-reviewed studies addressing the KiKK signal. The derivation and consequences of this characterisation are addressed in detail in Bruce Stopper 7 and Appendix B.

The French GEOCAP Study — France, 2012

The GEOCAP study was conducted by INSERM, France's national institute for health and medical research. It was a national case-control study using French cancer registry data, designed and conducted independently of KiKK and using a different methodology. It found an odds ratio of approximately 1.9 for childhood leukemia near French nuclear plants in the closest proximity subgroup — a roughly 90 per cent excess risk. Two independent national case-control studies, in two different countries, using different methodologies, finding consistent results: children living close to nuclear power plants face approximately double the leukemia rate of children living further away. The GEOCAP study did not receive the same international attention as KiKK, partly because it was published in French-language literature, but its findings are consistent with and reinforce the KiKK results.

The Körblein and Fairlie Pooled Analysis

Ian Fairlie and Alfred Körblein conducted a pooled analysis of the available case-control and ecological studies of childhood leukemia near nuclear power plants. Their analysis, examining data from multiple countries and multiple study designs, found consistent patterns of elevated risk that were statistically significant across the pooled data. The pooled analysis allowed examination of whether the KiKK finding was an anomaly specific to Germany or part of a broader international pattern. It was not an anomaly. The signal was present across multiple jurisdictions, multiple study designs, and multiple decades of data.

Harvard Nature Communications — United States, 2026

In 2026, a study published in Nature Communications by researchers at Harvard University estimated approximately 6,400 excess cancer deaths per year near nuclear facilities in the United States. This is not a small or borderline finding. It represents a systematic quantification of harm at a scale that, if the effect sizes apply in the Canadian context, would represent one of the largest regulatory failures in the history of Canadian public health. The CNSC has not acknowledged this study in any published regulatory document. It has not been required to be addressed in the Bruce C Impact Statement under the current TISG. The methodological basis for this study and its regulatory implications are addressed in Bruce Stopper 8 and Appendix F.

The Gap Between Model Predictions and Observed Outcomes

The pattern established by forty years of epidemiological evidence can be stated precisely. The regulatory models predict that children living within five kilometres of nuclear power plants should have essentially the same cancer risk as children living further away — the incremental dose at regulatory emission levels is predicted to be so small as to produce no measurable increase in cancer incidence. The epidemiological evidence consistently shows that children in this proximity zone have approximately double the leukemia rate. The gap between what the models predict

and what is observed in the real world is not a small calibration error. It represents a fundamental disconnect between the theoretical predictions of the dose models and the empirical observations of independent research programmes across multiple countries and multiple decades.

The CNSC's response to this gap is to deny that the gap exists — to characterise the KiKK finding as 'unfounded' and to cite Canadian null studies as evidence that no elevated risk has been found near Canadian nuclear facilities. Bruce Stopper 6 addresses the scientific validity of those null studies. Bruce Stopper 7 addresses the reliability of the published documents on which that denial rests. The gap itself — the fundamental unexplained discrepancy between model predictions and empirical observations — is not denied by any serious scientific body that has examined it. What is denied is its cause. The CNSC denies that radiation causes the observed excess. But acknowledging the cause question does not resolve the regulatory question: if the excess exists, and its cause is unknown, the precautionary principle requires that it be addressed before a new nuclear facility is added to an existing nuclear-proximate community.

The Bruce C Specific Dimension

The forty-year evidence record documented above applies to nuclear power plants in general. For Bruce C, the evidence is not merely relevant — it is directly applicable. Bruce Power has operated CANDU nuclear generating stations at the Bruce site in the Municipality of Kincardine for approximately fifty years. The communities proximate to the Bruce site — Port Elgin, Tiverton, Kincardine, and surrounding areas — have been nuclear-proximate for their entire existence as communities. The population within five kilometres of the Bruce site has been exposed to CANDU radionuclide emissions throughout the period covered by the forty-year evidence record.

This means the Bruce C Impact Statement is not assessing the risk to an unexposed greenfield community from a hypothetical future nuclear facility. It is assessing the incremental risk from an additional nuclear facility to a community that has already been chronically exposed for fifty years. Any honest application of the forty-year evidence record to the Bruce C assessment must begin with this fact.

> **FINDING: The forty-year international evidence record documents elevated childhood leukemia rates near nuclear power plants — approximately double the background rate within five kilometres — that the regulatory models systematically fail to predict. This is not contested by any serious scientific body that has examined it. The cause is disputed; the observation is not. The Bruce C Impact Statement must address this evidence record, its implications for the existing Bruce-proximate population, and the incremental risk of adding a new nuclear facility to a community already chronically exposed for fifty years. The current TISG does not require this.**

IAAC TRAP: IAAC is trapped between accepting an Impact Statement that ignores forty years of epidemiological evidence showing doubled childhood leukemia rates near nuclear plants, or requiring the proponent to address that evidence — which the TISG as drafted does not require. If IAAC accepts a compliant Impact Statement that does not address this evidence record, it accepts a public interest determination made without the most significant body of empirical data on nuclear facility health risk available. Under Vavilov, that is a determination made on an indefensible factual foundation and is unreasonable. If IAAC requires the evidence to be addressed, it must either amend the TISG or issue supplementary instructions — neither of which is available without acknowledging that the current TISG is deficient.

BRUCE STOPPER 2 — THE BRUCE SITE HAS A FIFTY-YEAR CHRONIC EXPOSURE BASELINE THAT INVALIDATES STANDARD INCREMENTAL RISK METHODOLOGY

How Incremental Risk Assessment Works — and Where It Requires an Uncontaminated Baseline

Standard incremental risk assessment methodology calculates the additional cancer risk that a proposed new facility will impose on the surrounding population. The method requires three components: a baseline characterisation of the existing cancer risk in the population, a model for how the new facility's emissions will add to that baseline, and a result expressed as the incremental additional risk. The scientific validity of the incremental risk figure depends entirely on the accuracy of the baseline characterisation. An increment added to an unknown or inaccurate baseline produces a meaningless result — you cannot know how much you are adding to a quantity you have not measured.

Standard incremental risk methodology was designed for greenfield assessments — new facilities proposed in communities that have not previously been exposed to the type of emission being assessed. The baseline is the background cancer rate in a population without chronic nuclear facility exposure. The increment is the additional risk from the proposed facility. The method is scientifically valid in that context.

The Bruce C assessment is not a greenfield assessment. It is an assessment of a new nuclear facility at a site that has operated eight CANDU nuclear generating stations for approximately fifty years. The surrounding population has been chronically exposed to CANDU radionuclide emissions — tritium, carbon-14, krypton-85, iodine-131, and others — throughout that period. The baseline cancer risk in this population is not the background rate in an unexposed community. It is the cancer rate in a chronically exposed community, which may already be elevated by the existing facilities' emissions.

The Bruce Site's Fifty-Year Emission History

Bruce Power has operated CANDU pressurised heavy water reactors at the Bruce site since the mid-1970s. Eight units have operated across the Bruce A and Bruce B stations. CANDU reactors

produce tritium through neutron activation of deuterium in the heavy water moderator and coolant system at approximately 100-130 grams per unit per year — orders of magnitude more than light water reactors of equivalent output. With eight units operating for approximately fifty years, the cumulative tritium production at the Bruce site is on the order of 40-60 kilograms over the facility's operational history, with a defined fraction released to the environment through permitted atmospheric and liquid release pathways documented in the CNSC's own Independent Environmental Monitoring Programme data for Bruce A and B.

In addition to tritium, CANDU reactors routinely release carbon-14, krypton-85, iodine-131, and other radionuclides through permitted atmospheric pathways. These radionuclides have been entering the air, water, and food chain of the Bruce-proximate community for fifty years. The communities within five kilometres of the Bruce site — including Port Elgin, Tiverton, and surrounding areas — have been breathing air, drinking water, and eating food produced in this radiological environment throughout their existence as communities.

The Epidemiological Consequence

If the forty-year evidence record documented in Bruce Stopper 1 is correct — that communities near operating nuclear plants face approximately double the childhood leukemia rate of unexposed communities — then the Bruce-proximate population's cancer baseline is not an unexposed baseline. It is a baseline that already reflects fifty years of nuclear proximity. The incremental risk from Bruce C cannot meaningfully be calculated by adding a model-predicted increment to a background cancer rate taken from the general Canadian population. The correct baseline for a Bruce C incremental risk assessment is an epidemiologically characterised measure of the current cancer experience of the Bruce-proximate population, measured against their actual fifty-year exposure history.

No such study exists. The CNSC's monitoring programme for the Bruce site measures radionuclide concentrations in environmental samples — air, water, soil, vegetation — and compares them to regulatory limits. It does not include an epidemiological study of cancer incidence in the Bruce-proximate population against their specific exposure history. No independent epidemiological study of the health of the Bruce-proximate community exists that characterises their cancer experience against the fifty-year CANDU emission record. The baseline against which Bruce C's incremental risk will be calculated is therefore not an empirically measured quantity. It is an assumption — the assumption that fifty years of CANDU operation at the Bruce site has had no effect on the health of the proximate population — that has never been tested.

Why This Is a Bruce C-Specific Problem

This problem is specific to Bruce C in a way that does not apply to most other nuclear assessments. Most nuclear assessments are greenfield: the proposed facility is the first nuclear facility at the site, and the standard incremental risk methodology is appropriate because the baseline is genuinely unexposed. The Bruce C assessment is different in kind, not merely in degree. The Bruce site has one of the longest operating histories of any nuclear site in Canada.

The existing facilities have produced more tritium per unit of generating capacity than any other reactor type in the world. The community has been chronically exposed for fifty years.

The appropriate scientific response to this situation is straightforward: before calculating the incremental risk from Bruce C, characterise the existing cancer experience of the Bruce-proximate population empirically, assess whether that experience is consistent with what would be expected from fifty years of CANDU operation, and use the measured current baseline — not a theoretical unexposed baseline — as the starting point for the incremental calculation. The TISG does not require this. The Impact Statement produced under the current TISG will calculate Bruce C's incremental risk against a theoretical unexposed baseline and will present the result as if it means something. It will not.

> **FINDING: The Bruce C incremental risk assessment will be calculated against a baseline that assumes fifty years of CANDU operation at the Bruce site has had no effect on the health of the proximate population — an assumption that has never been tested. No epidemiological study of cancer incidence in the Bruce-proximate population against their actual fifty-year exposure history exists. An incremental risk figure added to an uncharacterised chronic exposure baseline is scientifically meaningless. The TISG does not require the proponent to characterise this baseline before submitting its health risk chapter. This is a fundamental scientific deficiency unique to Bruce C that does not arise in greenfield nuclear assessments.**

> **IAAC TRAP: IAAC is trapped between accepting an Impact Statement with a health risk assessment built on a scientifically invalid baseline, or requiring an independent epidemiological baseline study before the health risk chapter is submitted — which the current TISG does not require and which IAAC has no mechanism to compel without amending the TISG or issuing supplementary instructions. If IAAC accepts the compliant Impact Statement, it accepts a public interest determination made on a health risk figure that is scientifically meaningless. Under Vavilov, accepting a decision on an indefensible factual foundation is unreasonable.**

BRUCE STOPPER 3 — THE PRIMARY EMISSION OF CANDU REACTORS CANNOT BE ADEQUATELY ASSESSED — THE CNSC'S OWN SCIENTISTS SAID SO IN 2010 (SS3)

Why Tritium Matters for the Bruce C Assessment

CANDU pressurised heavy water reactors produce tritium as a routine operational byproduct through neutron activation of deuterium in the heavy water moderator and coolant. This process is inherent to the CANDU design — it cannot be engineered away. Tritium production from CANDU reactors is orders of magnitude higher than from light water reactors of equivalent generating capacity. At the Bruce site, each CANDU unit produces approximately 100-130 grams of tritium per year. With eight units, the Bruce site produces approximately 800-1,000 grams of

tritium annually under normal operations — equivalent to the total global production of tritium from all light water reactors of the same combined output. Tritium is released to the environment through permitted atmospheric and liquid release pathways. It enters the food chain, it dissolves in drinking water, and in its organically bound form it incorporates into DNA.

The health risk from tritium is therefore the central radiological health question for any Bruce C assessment. It is not a secondary or ancillary concern. It is the primary emission of the reactor type proposed, released in quantities that dwarf those of any alternative reactor design, into a watershed — Lake Huron — that provides drinking water for approximately 40 million Canadians and Americans. If the health risk from tritium cannot be adequately assessed, the health risk from Bruce C cannot be adequately assessed. And the CNSC's own scientists formally acknowledged in 2010 that the health risk from tritium cannot be adequately assessed.

What CNSC INFO-0799 (2010) Actually Said

In 2010, the Canadian Nuclear Safety Commission published a document designated INFO-0799. The document was produced by CNSC's own scientific staff. Its subject was the adequacy of the evidence base for estimating tritium health risks. Its conclusions, stated in the CNSC's own words, were:

- The evidence base was insufficient to estimate tritium health risks with confidence.
- An international collaborative research study was required before confident risk estimates could be produced.
- Existing epidemiological studies of tritium-exposed populations had inadequate statistical power to detect the effect sizes of concern.
- The biological behaviour of organically bound tritium in fetal tissue was inadequately characterised in the available scientific literature.
- The dose conversion factors used in Health Canada's 7,000 Bq/L tritium drinking water guideline did not adequately account for the differential sensitivity of pregnant women, fetuses, and infants to tritium exposure.
- An international collaborative programme analogous to those funded by the United States Congress under the Energy Policy Act was needed.

These are not contested characterisations of INFO-0799. They are what the document says. The document is on the CNSC's own published record and has been available to IAAC throughout this assessment. It is the CNSC's own scientists' formal acknowledgment that they could not reliably estimate how dangerous the primary emission of the reactor type they are asked to regulate actually is.

What the CNSC Did Next — Nothing

In the sixteen years following INFO-0799, no international collaborative tritium health risk research programme was commissioned by the CNSC. The United States Congress funded analogous research under the Energy Policy Act; the CNSC did not participate. The CNSC had statutory authority under section 9(b) of the Nuclear Safety and Control Act to fund research necessary to discharge its regulatory mandate. The CNSC had an annual budget exceeding $350 million

throughout this period. Its own scientists told it in 2010 exactly what research was needed. The CNSC did not commission that research.

As of the date of this submission — March 2026, sixteen years after INFO-0799 — the research gaps identified by the CNSC's own scientists in 2010 remain unfilled. The evidence base is not materially better than it was when CNSC staff acknowledged it was insufficient. The CNSC's response to this situation has not been to acknowledge the continuing inadequacy. It has been to publish a tritium fact sheet that contradicts INFO-0799.

The Six Irreconcilable Representations

CNSC's published tritium fact sheet contains six representations that cannot be reconciled with the conclusions of INFO-0799. Full documentation of each is provided in Appendix C. In summary:

The fact sheet presents the 7,000 Bq/L tritium drinking water guideline as reflecting current scientific consensus on safe tritium levels. INFO-0799 stated that the evidence base was insufficient to support confident risk estimates and that the guideline was inadequate for the most sensitive population subgroups. The fact sheet presents confident health risk characterisations that INFO-0799 explicitly said the evidence base could not support. The fact sheet does not disclose that the Ontario Drinking Water Advisory Committee — an independent scientific body convened by Ontario's Ministry of the Environment — reviewed the same evidence in 2009 and recommended a 350-fold reduction in the tritium guideline, from 7,000 Bq/L to 20 Bq/L, on the basis of the inadequate protection of pregnant women, fetuses, and infants. The fact sheet does not disclose the organically bound tritium fetal DNA incorporation mechanism that underpinned ODWAC's recommendation. The fact sheet does not disclose the relative biological effectiveness question addressed in Bruce Stopper 4. The fact sheet does not disclose that the international collaborative research INFO-0799 called for has never been commissioned.

The ODWAC 2009 Recommendation

The Ontario Drinking Water Advisory Committee was convened by the Ontario Ministry of the Environment specifically to review the scientific adequacy of the tritium drinking water guideline. It was an independent body — not a federal body, not a nuclear industry body, not the CNSC. It examined the same scientific literature available to the CNSC and reached different conclusions.

ODWAC's 2009 report recommended reducing the maximum acceptable concentration for tritium in drinking water from 7,000 Bq/L to 20 Bq/L — a 350-fold reduction. This was not a precautionary excess. It was the result of applying standard health protection methodology to the organically bound tritium exposure pathway for the most sensitive population subgroup — the developing fetus in the first trimester of pregnancy. ODWAC found that the dose conversion factors used to calculate the 7,000 Bq/L standard were inadequate for this subgroup because they did not account for the specific biological mechanisms by which OBT incorporates into fetal DNA during rapid cell division.

ODWAC's recommendation has not been implemented. It was issued seventeen years before the date of this submission. Ontario's own independent scientific advisory body told the provincial government seventeen years ago that the tritium guideline was inadequate for the most sensitive members of the population. The CNSC still presents 7,000 Bq/L as the appropriate compliance

benchmark. The Bruce C Impact Statement will be required to assess tritium risk at 7,000 Bq/L. Under the current TISG, it will not be required to address ODWAC 2009 at all.

Why This Matters Specifically for the Bruce C Site

The Bruce site has been releasing CANDU-characteristic tritium quantities into the Lake Huron watershed for approximately fifty years. Lake Huron, and particularly Georgian Bay into which the Bruce site discharges, provides drinking water to communities on both sides of the Canada-US border. The existing tritium loading of the watershed — accumulated over fifty years of CANDU operation at the Bruce site — is the largest existing radiological baseline in any Canadian nuclear facility assessment. Calculating the incremental tritium risk from Bruce C against the inadequate 7,000 Bq/L standard, without characterising the existing watershed baseline, and without addressing ODWAC 2009's finding that the standard is inadequate for the most sensitive population group, produces an Impact Statement with a tritium risk assessment that is scientifically inadequate at every level simultaneously.

> **FINDING: The CNSC's own scientists formally acknowledged in 2010 that the evidence base was insufficient to estimate tritium health risks with confidence and called for international collaborative research. That research was never commissioned. The CNSC then published a tritium fact sheet containing six representations irreconcilable with INFO-0799's conclusions. ODWAC 2009 recommended a 350-fold reduction in the tritium guideline on the basis of inadequate protection of pregnant women and fetuses — a recommendation unimplemented for seventeen years. The Bruce C Impact Statement will be required to assess tritium risk at 7,000 Bq/L and will not be required to address ODWAC 2009, INFO-0799, or the existing fifty-year tritium loading of the Lake Huron watershed. This is the most acute tritium assessment failure in any current Canadian nuclear proceeding.**

> **IAAC TRAP: IAAC is trapped: if it accepts a compliant Impact Statement assessing tritium risk at 7,000 Bq/L only, it accepts a public interest determination on the primary CANDU emission using a guideline its own province's advisory body said was inadequate seventeen years ago, and using a scientific framework the CNSC's own staff acknowledged in 2010 was insufficient. If it requires a dual-guideline assessment at 7,000 Bq/L and 20 Bq/L with independent expert review — as ODWAC 2009 requires — it must amend the TISG, because the current TISG does not require this. The record is now before IAAC. IAAC cannot claim not to know.**

BRUCE STOPPER 4 — THE DOSE MODELS ARE STRUCTURALLY WRONG — RBE 1.0 APPLIED AGAINST THE CNSC'S OWN INTERNAL RECOMMENDATION OF 2.2 (SS4)

The Linear No-Threshold Model and Its Origin

The dose-response model at the centre of every nuclear facility health risk assessment in Canada is the Linear No-Threshold model. The LNT model assumes that the relationship between radiation dose and cancer risk is linear — twice the dose means twice the cancer risk — and that there is no threshold below which radiation exposure is harmless. These are not unreasonable assumptions for a conservative regulatory model. The problem is not with the assumptions themselves. The problem is with the data on which the model was calibrated and the population to which it is being applied.

The LNT model was calibrated primarily on data from the Life Span Study of survivors of the atomic bombings of Hiroshima and Nagasaki in 1945. That study population was exposed to a single, acute, external dose of gamma radiation — a brief, intense burst of energy from outside the body. The study population was predominantly adult and male — the population that happened to survive the bombings and be available for follow-up. The baseline against which the survivors' cancer rates are measured is a Japanese urban population in the postwar period. This is the population and the exposure scenario from which the model's risk coefficients are derived.

The exposure scenario at the Bruce C site is different in every material respect. The relevant exposure is chronic, low-dose, internal emitter exposure from tritium and other CANDU-specific radionuclides. The relevant population is a Canadian rural community including children, pregnant women, and infants. The exposure route is inhalation of atmospheric HTO and ingestion of food-chain OBT. The baseline is a community that has already been chronically exposed for fifty years. The CNSC applies the LNT model to this scenario by making four extrapolation steps from the model's validated domain — none of which are validated in the peer-reviewed literature for the specific conditions created by CANDU operation.

The Four Extrapolation Steps

Step 1: From Acute External High-Dose to Chronic Low-Dose Internal Emitter

The LNT model was calibrated on acute external high-dose exposure. Applying it to chronic low-dose internal emitter exposure requires an adjustment factor — the Dose and Dose Rate Effectiveness Factor (DDREF) — that accounts for the difference in biological damage per unit dose between acute and chronic exposure. The peer-reviewed literature on DDREF ranges from 1.5 to 10 across published estimates. The BEIR VII report, produced by the US National Academies of Sciences, used a central DDREF estimate of 1.5 for low-dose rate exposure. Some published estimates for chronic internal emitters reach as high as 10. The CNSC applies a DDREF of approximately 2.0. At the upper range of the peer-reviewed literature, cancer risk from chronic internal emitter exposure could be five times higher than CNSC's estimates. The CNSC does not disclose the DDREF it uses, the range of estimates in the literature, or the sensitivity of its risk calculations to this parameter.

Step 2: From an Adult Male Survivor Population to a Canadian Community

The BEIR VII report — which forms part of the scientific foundation for CNSC's dose-risk coefficients — establishes clearly that women face approximately 40 to 50 per cent higher radiation-induced cancer risk per unit dose than men, and that children face approximately two to three times the adult cancer risk per unit dose. Infants and fetuses, whose cells are dividing most rapidly, face the highest risk per unit dose of any population subgroup. The Life Span Study cohort is predominantly adult and male. Applying risk coefficients derived from this population to a Canadian community that includes women, girls, pregnant women, fetuses, infants, and children systematically underestimates the risk to the most vulnerable members of that community. The CNSC does not disaggregate its health risk estimates by sex, age cohort, or pregnancy status. It presents aggregate population risk figures that conceal the differential risk to sensitive subgroups.

Step 3: From External Gamma Radiation to CANDU-Specific Internal Emitters

The LNT model was calibrated on external gamma radiation. CANDU reactors emit tritium, carbon-14, krypton-85, and iodine-131, among other radionuclides. Each has a different biological distribution in the human body, a different retention time, and a different emission characteristic that determines how much energy it deposits in what tissue. Tritium, in its organically bound form, incorporates directly into DNA during cell division — a fundamentally different mechanism from external gamma irradiation. The relative biological effectiveness of tritium beta radiation relative to gamma radiation — the RBE — determines how much biological damage tritium causes per unit absorbed dose.

The CNSC applies an RBE of 1.0 for tritiated water and organically bound tritium. An RBE of 1.0 means the CNSC assumes tritium beta radiation causes exactly the same biological damage per unit dose as the gamma radiation on which the LNT model was calibrated. The CNSC's own internal scientific record contains a recommendation that an RBE of 2.2 should be applied. The published peer-reviewed literature contains estimates of tritium RBE ranging from 1.0 to 5.0 or higher for OBT in fetal tissue, depending on cell type, cell cycle stage, and exposure pathway. By applying 1.0 rather than its own recommended 2.2, the CNSC understates every tritium cancer risk calculation in its published framework by at minimum a factor of 2.2. This is not a small calibration error. It is a systematic understatement of the risk from the primary emission of the reactor type under assessment.

Step 4: From an Unexposed Baseline to the Bruce Site's Fifty-Year Chronic Exposure Population

The Life Span Study cohort was not previously exposed to the type of radiation being studied — they were exposed to a single acute event against a clean baseline. The LNT model's risk coefficients describe the incremental cancer risk from a specified dose imposed on a population with no prior relevant radiological exposure. Applying these coefficients to the Bruce-proximate population — which has been chronically exposed to CANDU radionuclide emissions for fifty years — requires the additional assumption that prior chronic exposure does not alter the population's sensitivity to further exposure. This assumption has not been validated in the peer-reviewed literature for this exposure scenario. The CNSC does not disclose it.

What the CNSC Does Not Tell the Review Panel

The CNSC's published health risk guidance — the documents that will form the foundation of the Bruce C Impact Statement — does not disclose any of these four extrapolation steps. It does not present sensitivity analyses showing the range of risk estimates that would result from applying the upper and lower bounds of the peer-reviewed literature for each parameter. It presents a single central estimate derived from a model whose application to the Bruce C scenario involves four undisclosed extrapolation steps from its validated domain. The Review Panel, exercising its independent section 46 powers, cannot evaluate the adequacy of the proponent's health risk assessment without knowing what the range of scientifically supportable estimates is. The current TISG does not require the proponent to provide this information.

#	Extrapolation	From	To	Uncertainty range in literature
1	Dose rate and type	Acute external high-dose gamma (atomic bomb)	Chronic low-dose internal beta emitter (CANDU)	DDREF 1.5-10; CNSC uses ~2.0; at upper bound, risk is 5x CNSC estimate
2	Population demographics	Predominantly adult male atomic bomb survivors	Canadian community: women, children, infants, pregnant women, fetuses	Women 40-50% higher risk/unit dose; children 2-3x; fetal/infant highest — none disclosed by CNSC
3	Radiation type	External gamma radiation	CANDU internal emitters: tritium HTO/OBT, C-14, Kr-85, I-131	Tritium RBE 1.0-5.0+; CNSC applies 1.0 against own recommendation of 2.2
4	Baseline population	Unexposed atomic bomb survivor baseline	Bruce-proximate population with 50-year chronic exposure history	No validated methodology for applying LNT to chronically pre-exposed baseline; not disclosed by CNSC

FINDING: The LNT model as applied by the CNSC to the Bruce C assessment involves four extrapolation steps from its validated domain, none of which are validated in the peer-reviewed literature for CANDU chronic internal emitter exposure conditions. The CNSC applies an RBE of 1.0 for tritium against its own internal recommendation of 2.2 — understating every tritium cancer risk calculation by at minimum a factor of 2.2 at the lower bound, and potentially by a factor of 5 or more for the most sensitive exposure pathway. The CNSC does not disclose any of these extrapolation steps or the uncertainty ranges they introduce. The Review Panel cannot independently evaluate the proponent's health risk assessment without this information. The current TISG does not require the proponent to provide it.

IAAC TRAP: IAAC is trapped: if it accepts a compliant Impact Statement built on the undisclosed four-step LNT extrapolation and RBE of 1.0, it accepts a health risk assessment that systematically understates risk to the most sensitive population subgroups by factors ranging from 2.2 to potentially 5 or more — using a methodology whose limitations are acknowledged in the CNSC's own internal documents. If it requires disclosure of the extrapolation steps and sensitivity analysis — as the Review Panel's s.46 independent function demands — it must amend the TISG, because the current TISG does not require this disclosure.

BRUCE STOPPER 5 — THE REQUIRED RESEARCH HAS NOT BEEN DONE — SIXTEEN YEARS OF ACKNOWLEDGED GAPS, NO ACTION

(SS5)

The Research Gaps the CNSC Acknowledged

Bruce Stopper 3 established that CNSC INFO-0799 (2010) formally acknowledged that the evidence base was insufficient to estimate tritium health risks with confidence and called for international collaborative research. Bruce Stopper 4 established that the application of the LNT model to CANDU chronic internal emitter exposure involves four extrapolation steps from its validated domain — each introducing uncertainty that is acknowledged in the peer-reviewed literature but not disclosed in CNSC's published guidance. These two Bruce Stoppers identify specific, named research gaps that the CNSC's own scientists and the international scientific literature have identified as material to radiological health risk assessment. This Bruce Stopper addresses a different but related question: why those gaps remain open sixteen years after they were formally identified.

The answer is not that the research was commissioned and is ongoing. The answer is not that the gaps were found to be smaller than expected upon further investigation. The answer is that the CNSC — which had both the statutory authority and the financial capacity to commission the required research, and which was told by its own scientists exactly what was needed — took no action for sixteen years.

The CNSC's Statutory Authority and Financial Capacity

Section 9(b) of the Nuclear Safety and Control Act gives the CNSC explicit authority to fund research necessary to discharge its regulatory mandate. The CNSC's mandate includes, expressly, the protection of the health and safety of persons. Research into the health risks of the primary emission of the reactor type it regulates is squarely within the mandate for which section 9(b) provides research funding authority. The CNSC is not dependent on government appropriations for this purpose — it has this authority within its own statutory mandate.

The CNSC's annual budget has exceeded $350 million for over a decade. Of this budget, a significant proportion is funded by licence fees from the nuclear industry the CNSC regulates. An institution with a $350 million annual budget and a statutory mandate to protect human health,

which has been told by its own scientists that the evidence base for estimating the health risks of its primary regulated substance is insufficient, has no financial justification for failing to commission the required research. The failure is not financial. It is a choice.

What the United States Did

The United States Congress, through the Energy Policy Act, funded a national programme of research into the health effects of low-level radiation exposure from nuclear facilities, including specific research into tritium health risks. This programme produced peer-reviewed publications that have advanced the scientific understanding of low-dose radiation health effects. The CNSC was aware of this programme. It did not participate. It did not commission comparable Canadian research. It relied instead on the existing evidence base that its own scientists said in 2010 was insufficient.

The Regulatory Consequence

The consequence of this sixteen-year failure to act is that the Bruce C Impact Statement will be assessed on a radiological health risk framework that the CNSC's own scientists acknowledged was inadequate before the assessment began. The tritium risk assessment will use a framework whose evidence base INFO-0799 said was insufficient. The cancer risk estimates will use an LNT model applied through four extrapolation steps whose uncertainty ranges are documented in the literature but have not been reduced by the research INFO-0799 called for.

This is not a criticism of the Bruce Power proponent. The proponent is not responsible for the CNSC's failure to fund required research. But the proponent's Impact Statement will be built on the same inadequate framework, and the Review Panel will be asked to make independent scientific judgments using an evidentiary record whose inadequacy was acknowledged before the assessment commenced.

The IAA Section 6 Precautionary Principle Consequence

Section 6(1)(a) of the Impact Assessment Act codifies the precautionary principle. In 114957 Canada Ltée (Spraytech) v Hudson, [2001] 2 SCR 241, the Supreme Court of Canada confirmed that the precautionary principle is an operative legal obligation in Canadian environmental law, not merely a policy aspiration. The precautionary principle provides that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation. It also allocates the burden of proof: the burden of demonstrating the absence of significant adverse effects rests on the proponent, not on communities or intervenors.

The CNSC's own INFO-0799 establishes that there is lack of full scientific certainty about the health risks of tritium — the primary emission of the proposed facility. The precautionary principle, as a matter of law, requires that this acknowledged uncertainty be addressed before a new CANDU facility is approved, not after. The failure to commission the required research over sixteen years means that the uncertainty acknowledged in 2010 has not been reduced by the time the Bruce C assessment is conducted. The precautionary principle obligation therefore remains unaddressed.

FINDING: The CNSC acknowledged in INFO-0799 (2010) that the evidence base for estimating tritium health risks was insufficient and called for international collaborative research. The CNSC had statutory authority under NSCA s.9(b) and financial capacity (over $350 million annual budget) to commission this research. It did not do so for sixteen years. The research gaps acknowledged in 2010 remain open at the time of the Bruce C assessment. The Bruce C Impact Statement will be built on a health risk framework whose inadequacy the CNSC's own scientists formally documented before the assessment commenced. The precautionary principle under IAA s.6(1)(a), as confirmed in 114957 Canada Ltée v Hudson, requires that acknowledged scientific uncertainty be addressed before a new facility is approved — not after.

IAAC TRAP: IAAC is trapped: if it proceeds to accept an Impact Statement built on an acknowledged inadequate framework, it proceeds with knowledge that the precautionary principle obligation under IAA s.6(1)(a) has not been discharged. If it requires the research gaps to be filled before the Impact Statement is accepted, it faces a years-long delay with no clear endpoint — because the research INFO-0799 called for has not been commissioned and cannot be completed on the Impact Statement timeline. The only available path that does not produce an unlawful outcome is to require the proponent to address the gaps in the current evidence base independently — using independent expert review, full literature disclosure, and sensitivity analysis — which requires TISG amendment.

BRUCE STOPPER 6 — ABSENCE OF EVIDENCE IS NOT EVIDENCE OF ABSENCE — UNDERPOWERED STUDIES PRESENTED AS SAFETY EVIDENCE (SS6)

The Logical Distinction That Determines Everything

In scientific and regulatory contexts, there is a fundamental difference between two types of negative findings. A powered negative finding is one produced by a study designed with enough statistical power to detect a specified effect size if it exists, which does not detect that effect. A study of this type, if it finds no significant association, is genuine evidence that the effect does not exist — or at least that it does not exist at or above the minimum detectable magnitude. An underpowered null result is one produced by a study that would have been unlikely to detect the effect even if the effect existed — a study too small, or run for too long a period over too dispersed a population, to detect the effect sizes of interest. A study of this type that finds no significant association tells us only that the study was not capable of detecting what it was looking for. It is not evidence that the effect does not exist. It is a measurement failure presented as a conclusion.

The CNSC's response to the forty-year evidence record documented in Bruce Stopper 1 — and particularly to the KiKK study's finding of doubled childhood leukemia rates near nuclear plants — is to cite Canadian epidemiological studies finding no statistically significant elevated cancer risk near Canadian nuclear facilities, and to characterise these as evidence that Canadian nuclear plants do not pose elevated cancer risk. This characterisation depends entirely on whether the

Canadian studies were powered to detect the effect sizes documented in the international literature. They were not. The Canadian studies are underpowered null results. They are measurement failures. They are not safety evidence.

What Statistical Power Means

Statistical power is the probability that a study will detect a true effect of a specified size. Power depends on three factors: the size of the effect being sought, the size of the study population, and the confidence threshold used to call a finding significant. A study with 80 per cent power to detect a doubling of childhood leukemia risk has an 80 per cent probability of detecting that doubling if it truly exists. A study with 10 per cent power to detect the same doubling has only a 10 per cent probability of detecting it — meaning that even if the doubling exists, the study is more likely than not to produce a null result purely by chance.

To detect a doubling of childhood leukemia rates in a defined proximity zone around a nuclear facility, with reasonable statistical power, a study must cover a population large enough to generate enough childhood leukemia cases in that zone to distinguish a doubling from background variation. Childhood leukemia is a rare disease — approximately 4 cases per 100,000 children per year. To generate 10 cases per year in the closest proximity zone, you need a population of approximately 250,000 children within the relevant distance. To detect a doubling with 80 per cent power over a study period of 20 years, the required population is substantially larger still.

The Population Near the Bruce Site

The Municipality of Kincardine has a population of approximately 12,000 persons. The town of Port Elgin, adjacent to the Bruce site, has a population of approximately 7,000. The total population within five kilometres of the Bruce site is substantially smaller than the minimum required to conduct a statistically powered study of childhood leukemia rates at the Bruce site specifically. No Canadian epidemiological study of cancer rates near the Bruce site specifically has been powered to detect the effect sizes documented in the KiKK and GEOCAP studies.

The Canadian studies that the CNSC cites as evidence of safety are not studies of the Bruce site specifically. They are aggregate studies of cancer rates near nuclear facilities in Canada generally, pooling populations from multiple sites. Even pooled across multiple Canadian sites, the total population in relevant proximity zones is substantially smaller than the German national case-control study design that produced the KiKK findings. A pooled Canadian study that fails to detect a statistically significant elevation is not evidence that no elevation exists. It may simply be evidence that the Canadian study population is too small to detect an elevation of the magnitude documented in Germany, France, and the United Kingdom.

The CNSC's Failure of Disclosure

The CNSC presents its Canadian epidemiological studies as evidence of safety — as support for the proposition that no elevated cancer risk has been found near Canadian nuclear facilities. It does not, in those publications, disclose the statistical power calculations that would allow a reader to evaluate whether the study was capable of detecting the effect sizes of interest. The

distinction between a powered negative finding and an underpowered null result requires knowing the power of the study. Without that disclosure, a reader cannot evaluate the evidentiary weight of a null result. The CNSC's failure to disclose the power calculations in its published guidance is a failure of scientific transparency that prevents independent evaluation of the evidentiary weight of the studies it presents as safety evidence.

This is not a minor technical omission. The distinction between powered negative findings and underpowered null results is the central methodological question in nuclear epidemiology. The CNSC's published materials present null results without disclosing the power calculations that would allow readers to evaluate them. The Review Panel, exercising its independent section 46 powers, must have access to those power calculations to evaluate the CNSC's epidemiological claims. The current TISG does not require the proponent to disclose them, and the Impact Statement produced under the current TISG will cite the CNSC's null studies as safety evidence without disclosing the power calculations that would reveal them as measurement failures.

The Bruce C Specific Consequence

The population in the Municipality of Kincardine and surrounding communities within five kilometres of the Bruce site is too small to conduct a statistically powered prospective study of childhood leukemia rates at the Bruce site specifically. If elevated cancer rates develop in the Bruce-proximate community as a result of the combined emissions from Bruce A, B, and C over the next fifty years, the monitoring programme attached as a condition to any Bruce C approval will almost certainly be underpowered to detect them. The monitoring condition will produce a series of annual reports finding no statistically significant elevation — not because no elevation exists, but because the programme was never powered to detect one. This is the irreversibility problem addressed in Bruce Stopper 22: once the facility is approved and built, the harm cannot be detected in time to be remedied.

FINDING: The Canadian epidemiological studies the CNSC cites as evidence of no elevated cancer risk near Canadian nuclear facilities are underpowered null results — studies too small to detect the effect sizes documented in the international literature regardless of whether those effects exist. They are measurement failures presented as conclusions. The CNSC does not disclose the power calculations that would allow this distinction to be made. The Review Panel cannot evaluate the CNSC's epidemiological evidence without those calculations. The current TISG does not require the proponent to provide them, and the Impact Statement will cite underpowered null results as safety evidence without disclosing their limitations.

IAAC TRAP: IAAC is trapped: if it accepts a compliant Impact Statement that cites CNSC null studies as safety evidence without power calculation disclosure, it accepts a public interest determination made on evidence that may be measurement failures rather than genuine safety evidence. Under Vavilov, a decision based on an indefensible factual foundation — one where the factual foundation is presented as more probative than it actually is — is unreasonable. If IAAC requires disclosure of statistical power calculations and independent evaluation of whether Canadian studies are adequately powered to detect the effect

sizes of international concern, it must require what the current TISG does not — which requires TISG amendment or supplementary instructions.

BRUCE STOPPER 7 — SEVEN CNSC PUBLISHED DOCUMENTS CONTAIN REPRESENTATIONS IRRECONCILABLE WITH THE CNSC'S OWN INTERNAL SCIENTIFIC RECORD (SS7)

Why This Matters for the Bruce C Assessment

The Bruce C Impact Statement will be built substantially on CNSC-published documents. Bruce Power's consultants will cite CNSC fact sheets, guidance documents, and regulatory conclusions as the scientific foundation for their health risk assessment, accident consequence analysis, and dose calculations. If those CNSC-published documents contain representations that are irreconcilable with the CNSC's own internal scientific record — representations that present as settled consensus positions that the CNSC's own scientists have acknowledged are not supportable — then the Impact Statement will inherit those misrepresentations. The Review Panel will receive an evidentiary record built on a foundation that is internally contradictory with the CNSC's own documents.

This Bruce Stopper identifies seven CNSC-published documents and, for each, the specific representation it contains that is irreconcilable with the CNSC's own internal scientific record. The documentation is provided in detail in Appendix E. This is not a general criticism of CNSC publications. It is a specific, named identification of seven documents with specific, identifiable internal contradictions.

Document 1: The KiKK Fact Sheet

The CNSC's published KiKK fact sheet states, in substance, that the KiKK study's finding of elevated childhood leukemia rates near German nuclear power plants is 'unfounded' and that there is no increased cancer risk for Canadians living near nuclear facilities. Bruce Stoppers 1 and 6 address the scientific basis for these claims. The internal contradiction specific to this document is the following: in the same fact sheet, the CNSC identifies population mixing — the Kinlen hypothesis — as 'the most plausible explanation' for the observed childhood leukemia signal near nuclear plants.

These two statements, in the same document, are irreconcilable. If the KiKK signal is 'unfounded' — if no genuine excess childhood leukemia risk near nuclear plants exists — then there is no signal to explain. You cannot characterise a finding as unfounded and simultaneously offer an explanation for it. The CNSC's own text concedes the existence of the signal that it simultaneously characterises as unfounded. This internal contradiction is not a matter of interpretation. It is in the text of the document.

Document 2: The Tritium Fact Sheet

As established in Bruce Stopper 3, the CNSC's tritium fact sheet contains six representations irreconcilable with INFO-0799 (2010): it presents the 7,000 Bq/L guideline as reflecting current scientific consensus when INFO-0799 said the evidence base was insufficient to support confident risk estimates; it presents confident health risk characterisations that INFO-0799 said could not be supported; it does not disclose ODWAC 2009's recommendation for a 350-fold reduction; it does not disclose the OBT fetal DNA pathway; it does not disclose the RBE debate; and it does not disclose that the international collaborative research INFO-0799 called for has never been commissioned.

Document 3: The Pickering Tritium Study

The CNSC has published or cited analyses of cancer rates near the Pickering nuclear generating station as evidence that tritium emissions from CANDU facilities do not produce elevated cancer rates in proximate communities. The internal contradiction in this document is the one identified in Bruce Stopper 6: the study is presented as evidence of no effect without disclosing the statistical power calculations that would allow a reader to evaluate whether the study was capable of detecting the effect sizes of concern. A study too small to detect an elevation of the magnitude documented internationally — presented as a finding of no elevation — is a measurement failure. Presenting it as safety evidence without disclosing its power limitations is a misrepresentation of its evidentiary weight.

Document 4: The RADICON/Cardis Reanalysis

The CNSC's accident consequence assessments rely on the RADICON model for radioiodine source term values — the amount of radioiodine released under various accident scenarios. In 2017, CNSC Executive Vice-President Ramzi Jammal publicly acknowledged, in response to documented scientific criticism, that the RADICON source term for radioiodine was false. The specific error was in the iodine speciation — the proportion of radioiodine released in volatile versus particulate form under accident conditions. The volatile fraction is more dangerous to the public because it disperses further and is more readily inhaled. The CNSC's RADICON model understated the volatile fraction. The consequence is that every EPZ sizing calculation and accident consequence assessment based on RADICON values understates the dose to the public under accident scenarios.

The RADICON values have not been corrected in subsequently published CNSC documents. EVP Jammal's acknowledgment is on the public record. The fact that the acknowledged false values remain in published guidance documents is an irreconcilable internal contradiction: the CNSC's public acknowledgment that the values are false, and the continued publication of those values in its guidance documents.

Separately, the Cardis 15-country study of low-dose radiation and cancer risk is relevant to the CNSC's published health risk framework. In its earlier published form, the Cardis et al. dataset showed a statistically significant association between low-dose radiation exposure and cancer mortality. In subsequent analyses cited by CNSC, the finding was revised to a null result. This revision — from statistical significance to null — has never been independently audited. The

CNSC cites the null result as support for its health risk framework without disclosing the unaudited nature of the revision from the earlier significant finding.

Document 5: The Chernobyl Fact Sheet

The CNSC's published Chernobyl fact sheet presents the health consequences of the Chernobyl accident in terms consistent with the lower-end estimates historically associated with the International Atomic Energy Agency's Chernobyl Forum report. The internal contradiction arises from the CNSC's characterisation of Chernobyl health effects relative to WHO's International Agency for Research on Cancer. IARC has published substantially higher estimates of Chernobyl-attributable cancer deaths than the figures the CNSC's Chernobyl fact sheet presents as consensus. The CNSC presents a health consequences characterisation as if it represents scientific consensus, while materially diverging from the positions of the WHO's own cancer research agency.

Document 6: The Understanding Radiation Fact Sheet

CNSC's 'Understanding Radiation' public communication document presents the LNT dose-response model and the associated risk coefficients as established science without disclosing the DDREF range (1.5-10 in the peer-reviewed literature), the tritium RBE range (1.0-5.0+ in the peer-reviewed literature for OBT in fetal tissue), or the four extrapolation steps identified in Bruce Stopper 4. The document presents a single central estimate of radiation risk as if it represents the settled scientific position, without disclosing that the scientific literature supports a range of estimates that span orders of magnitude for the specific exposure conditions created by CANDU operation.

Document 7: Published Regulatory Communications

CNSC's published regulatory communications — including materials produced for this and other impact assessments — present the CNSC's health risk framework as scientifically adequate and as reflecting the current state of knowledge. They do not disclose INFO-0799's acknowledgment that the tritium evidence base was insufficient in 2010. They do not disclose the sixteen-year failure to commission the required research. They do not disclose the four LNT extrapolation steps. They do not disclose the RBE discrepancy. They present a settled, confident regulatory framework to IAAC, to affected communities, and to this proceeding — without disclosing that the CNSC's own scientists acknowledged that framework was built on an insufficient evidence base before this assessment commenced.

Document	Representation in document	CNSC internal record contradiction	Bruce C IS consequence
KiKK Fact Sheet	KiKK finding 'unfounded'; no increased cancer risk near Canadian nuclear facilities	Same document: population mixing is 'most plausible explanation' for the signal — conceding signal exists	Health risk chapter built on 'unfounded' characterisation excludes 14 of 26 studies confirming signal

Document	Representation in document	CNSC internal record contradiction	Bruce C IS consequence
Tritium Fact Sheet	7,000 Bq/L reflects current scientific consensus; confident tritium health risk characterisation	INFO-0799 (2010): evidence base insufficient to estimate tritium health risks; international collaborative research required	Tritium risk assessment built on representations CNSC's own scientists said were unsupportable
Pickering Tritium Study	No elevated cancer risk from CANDU tritium near Pickering	Study too small to detect effect sizes documented internationally; power calculations not disclosed	Measurement failure presented as safety evidence without power disclosure
RADICON/Cardis	RADICON source term values; Cardis null result cited as support for low-dose linearity	EVP Jammal 2017: RADICON radioiodine source term is false. Cardis revision from significant to null never independently audited	Accident consequence assessments built on acknowledged false source term; unaudited dataset revision
Chernobyl Fact Sheet	Chernobyl health consequences characterised consistently with IAEA Forum lower-end estimates	WHO IARC publishes substantially higher estimates of Chernobyl-attributable cancer deaths	Accident severity benchmarking does not reflect WHO IARC findings
Understanding Radiation	Single central LNT risk estimate presented as established science	DDREF range 1.5-10 in literature; tritium RBE range 1.0-5.0+; four extrapolation steps — none disclosed	IS built on undisclosed model uncertainty range spanning orders of magnitude
Regulatory Communications	CNSC health risk framework presented as scientifically adequate and current	INFO-0799: framework built on insufficient evidence base; 16-year failure to commission required research	All CNSC advisory inputs to this proceeding inherit the undisclosed framework inadequacy

FINDING: Seven CNSC-published documents contain representations that are irreconcilable with the CNSC's own internal scientific record. These documents will form the scientific foundation of the Bruce C Impact Statement. The Review Panel will receive an evidentiary record built on documents that are internally contradictory with the CNSC's own published and internal scientific conclusions. This is a specific, named, documentable failure — not a general criticism. The duty of candor grounded in Baker, Dunsmuir, and Vavilov requires that material qualifications to conclusions presented to a quasi-judicial body be disclosed. The

failure to disclose the internal contradictions identified in this Bruce Stopper is a breach of that duty.

IAAC TRAP: IAAC is trapped: if it accepts a compliant Impact Statement built on CNSC documents that contain representations irreconcilable with the CNSC's own internal record — without requiring independent scientific validation — it accepts a public interest determination built on documents whose reliability has been specifically and documentably called into question. If it requires independent expert review of the scientific foundation the proponent proposes to use — as Amendment P1-A in the First Amendment Request requires — it must amend the TISG, because the current TISG does not require this. The duty of candor means IAAC cannot proceed without acknowledging this finding on the record.

BRUCE STOPPER 8 — SIX MAJOR PEER-REVIEWED STUDIES PUBLISHED 2024-2026 HAVE NOT BEEN ACKNOWLEDGED OR ACTED UPON (SS15)

Why Recent Literature Matters

An impact assessment is required by statute to be based on the best available science. Section 22(1)(j) of the IAA requires that the assessment take into account the best available information, including Indigenous knowledge. The IAA's precautionary principle under section 6(1)(a) requires that uncertainty about potential adverse effects not be used as a reason for inaction. Together, these provisions require that the Impact Statement address the most significant recent scientific developments bearing on the health risk assessment — not only the literature available at the time the CNSC's regulatory framework was last updated.

Between August 2024 and March 2026, six peer-reviewed studies of high scientific significance were published that directly bear on the radiological health risk questions at the centre of the Bruce C assessment. The CNSC has not acknowledged any of these studies in its regulatory framework, has not updated its published guidance to reflect their findings, and has not disclosed them to IAAC in its advisory role in this proceeding. The Bruce C TISG does not require the proponent to address them. The Impact Statement produced under the current TISG will present a health risk assessment based on the pre-2024 literature — excluding the most significant recent scientific developments in the field.

Study 1: INWORKS Haematological Cancer Study — Lancet Haematology, August 2024

The INWORKS study is an international collaborative cohort study of cancer risk in nuclear workers — one of the largest occupational radiation epidemiology studies ever conducted. The August 2024 publication in Lancet Haematology reported an excess relative risk of 2.68 per Gray for leukemia in nuclear workers exposed to low doses of ionising radiation over their working careers. An ERR of 2.68/Gy means that for every Gray of cumulative dose, leukemia risk increases by 268 per cent relative to the baseline. This finding is substantially higher than the risk predictions of the LNT model as applied by the CNSC. The CNSC acknowledged the earlier 2023

INWORKS publications and took no regulatory action. The 2024 haematological cancer publication, with its higher ERR finding, has received no published response from the CNSC.

Study 2: 47-Study Meta-Analysis — Current Environmental Health Reports, 2024

A comprehensive meta-analysis published in Current Environmental Health Reports in 2024 synthesised the findings of 47 peer-reviewed studies of cancer risk near nuclear facilities. The meta-analysis found consistent patterns of elevated cancer risk — particularly childhood leukemia — across multiple countries, multiple study designs, and multiple decades of data. A 47-study meta-analysis finding consistent patterns of elevated risk is a higher level of evidence than any single study. The weight of the international epidemiological evidence, synthesised across 47 independent research programmes, is inconsistent with the CNSC's characterisation of nuclear proximity cancer risk as 'unfounded.' This meta-analysis has not been acknowledged in any CNSC published regulatory document.

Study 3: Harvard Environmental Health Study — 2025

A 2025 study from Harvard University's environmental health programme examined cancer rates in populations near nuclear facilities in the United States using updated methodology specifically designed to address the statistical power limitations identified in Bruce Stopper 6 — the problem of underpowered studies producing null results. By aggregating populations across multiple US facilities and using methods designed to detect smaller effect sizes, the study found elevated cancer rates near nuclear facilities. This study is significant because it directly addresses the main methodological objection to prior null findings — that they were underpowered — and produces a significant finding using methods designed to overcome that limitation. It has not been acknowledged in any CNSC published regulatory document.

Study 4: Harvard Nature Communications — 2026

In 2026, a study published in Nature Communications by Harvard University researchers estimated approximately 6,400 excess cancer deaths per year near nuclear facilities in the United States. Nature Communications is one of the highest-impact peer-reviewed scientific journals in the world. A finding of 6,400 excess cancer deaths per year in the US context — if the effect size applies in Canada proportionally — would represent one of the largest ongoing public health harms attributable to a regulated industry in Canadian history. The study has not been acknowledged in any CNSC published document. It has not been disclosed to IAAC. The Bruce C TISG does not require the proponent to address it. An Impact Statement that does not address the Nature Communications (2026) finding cannot claim to be based on the best available science.

Study 5: IJMS Epigenetic Transgenerational Study — March 2025

A study published in the International Journal of Molecular Sciences in March 2025 documented transgenerational epigenetic effects from low-dose radiation exposure — heritable changes to gene expression patterns that are passed from exposed individuals to their offspring without alteration to the DNA sequence itself. The significance of this finding is that it identifies a category of health harm from nuclear facility emissions that is entirely outside the scope of the LNT model. The LNT model assesses cancer risk in directly exposed individuals. Transgenerational

epigenetic effects affect individuals who were never themselves exposed. This study opens a category of harm that the entire regulatory framework, including the health risk assessment methodology used for Bruce C, is structurally incapable of assessing. It has not been acknowledged in any CNSC published regulatory document.

Study 6: EJE INWORKS Solid Cancer Reanalysis — November 2024

A November 2024 publication in the European Journal of Epidemiology presented an updated analysis of the INWORKS cohort data for solid cancers — extending the INWORKS findings beyond haematological malignancies. The study found elevated solid cancer risk at dose ranges relevant to populations living near nuclear facilities. This is significant because the earlier INWORKS publications had focused primarily on haematological cancers; the extension to solid cancers broadens the category of concern. Combined with the August 2024 haematological cancer publication, the INWORKS programme now documents elevated risk across both haematological and solid cancer categories at doses relevant to nuclear facility populations.

The Pattern: Acknowledgment Without Action

The CNSC acknowledged the 2023 INWORKS findings — an earlier phase of the same research programme — and took no regulatory action. No update to published guidance was issued. No update to the CNSC's health risk framework was made. No disclosure to affected communities or to impact assessment proceedings was provided. The pattern of acknowledging significant scientific findings and taking no regulatory action means that the CNSC's published framework — and the Impact Statement that will be built on it — will lag the current scientific literature by years, regardless of what new evidence emerges.

The six studies listed above are not obscure or peripheral. Three are from Harvard University. One is published in Nature Communications — one of the highest-impact journals in science. One is from the INWORKS programme — the largest international nuclear worker cohort study in the world. A health risk framework that does not address these publications is not based on the best available science. A TISG that does not require the proponent to address them does not produce an Impact Statement that can support a lawful public interest determination.

Study	Key Finding	Inconsistency with CNSC Framework	Regulatory Action Not Taken
INWORKS haematological (Lancet Haematology, Aug 2024)	ERR 2.68/Gy for leukemia in nuclear workers	Substantially higher than CNSC LNT model predictions for this dose range	No framework update; no guidance revision; no disclosure to IAAC
47-study meta-analysis (Curr Enviro Health Reports, 2024)	Consistent patterns of elevated cancer risk near nuclear facilities across 47 studies	Weight of 47 studies is inconsistent with CNSC 'unfounded' characterisation	Not acknowledged in any CNSC regulatory document

Study	Key Finding	Inconsistency with CNSC Framework	Regulatory Action Not Taken
Harvard Environmental Health (2025)	Elevated cancer rates near US nuclear facilities using methodology addressing power limitation	Directly addresses and overcomes the power limitation Bruce Stopper 6 identifies in CNSC null studies	Not acknowledged in any CNSC regulatory document
Harvard Nature Communications (2026)	~6,400 excess cancer deaths/year near US nuclear facilities	Contradicts the CNSC's fundamental claim that nuclear facility emissions do not cause measurable harm at regulatory limits	Not acknowledged; not disclosed to IAAC; not required to be addressed in Bruce C TISG
IJMS epigenetic transgenerational (March 2025)	Heritable epigenetic effects from low-dose radiation — harm to non-exposed offspring	Identifies a category of harm entirely outside the LNT model and CNSC's HIA scope	Not acknowledged; no framework update; no disclosure to IAAC
EJE INWORKS solid cancer (Nov 2024)	Elevated solid cancer risk in INWORKS cohort at doses relevant to nuclear facility populations	Extends INWORKS findings beyond haematological cancers; broadens category of concern	Not acknowledged despite acknowledgment of 2023 INWORKS publication with no action taken

FINDING: Six major peer-reviewed studies published between August 2024 and March 2026 — including publications in Nature Communications and Lancet Haematology, three studies from Harvard University, and two analyses of the INWORKS international nuclear worker cohort — document elevated cancer risk from nuclear facility radiation exposure that is inconsistent with the CNSC's published regulatory framework. None have been acknowledged in CNSC regulatory documents or disclosed to IAAC. The Bruce C TISG does not require the proponent to address them. An Impact Statement produced under the current TISG will present a health risk assessment based on pre-2024 science, claiming to represent the best available science while excluding the most significant recent developments in the field. Under IAA s.22(1) and the precautionary principle, this is not a defensible position.

IAAC TRAP: IAAC is trapped: if it accepts a compliant Impact Statement that does not address the six studies, it accepts a best-available-science assessment that excludes the most significant recent scientific publications in nuclear epidemiology — including a Nature Communications study estimating 6,400 excess cancer deaths per year near US nuclear facilities. If IAAC requires the proponent to address these studies — as the best-available-science requirement demands — it must

amend the TISG or issue supplementary instructions, because the current TISG does not require this. The CNSC's failure to disclose these studies to IAAC is a breach of the duty of candor that compounds the structural problem.

BRUCE STOPPER 9 — THE LAKE HURON CUMULATIVE TRITIUM PATHWAY IS THE LARGEST UNCHARACTERISED RADIOLOGICAL BASELINE IN CANADA

CANDU Tritium Production at the Bruce Site — The Documented Facts

CANDU pressurised heavy water reactors produce tritium as an inherent operational byproduct through neutron activation of deuterium in the heavy water moderator and coolant system. This process cannot be engineered away — it is a direct consequence of using heavy water as the moderator and coolant. The tritium production rate is determined by the neutron flux and the deuterium inventory in the system. CNSC's own Independent Environmental Monitoring Programme data for the Bruce A and B stations documents tritium production at approximately 100-130 grams per CANDU unit per year. This is not an estimate or a model output. It is measured data from CNSC's own monitoring programme, published on CNSC's website.

The Bruce site has operated eight CANDU units across Bruce A and Bruce B for approximately fifty years. At 100-130 grams per unit per year across eight units, the site has produced on the order of 40,000 to 52,000 grams — 40 to 52 kilograms — of tritium over its operational history. A fraction of this tritium is captured and stored in the tritium removal facility. The remaining fraction is released to the environment through two pathways: atmospheric releases as tritiated water vapour (HTO), and liquid releases to Lake Huron through the cooling water discharge system. Both pathways are permitted under CNSC licensing and are documented in annual CNSC IEMP reports.

For comparison: the annual tritium production from a light water reactor of equivalent generating capacity is approximately 1-3 grams per unit per year — roughly two orders of magnitude less than a CANDU unit. The Bruce site's eight CANDU units produce more tritium per year than the combined output of the entire fleet of light water reactors in the United States at comparable generating capacity. The Bruce C project, if it uses a CANDU-lineage design, will add to this tritium loading. If it uses a light water design, the incremental addition will be two to three orders of magnitude smaller — but the existing fifty-year CANDU loading remains as the baseline regardless of which technology is selected.

Georgian Bay and the Near-Shore Concentration Problem

The Bruce site's liquid effluent releases enter Georgian Bay through the facility's cooling water discharge systems. Georgian Bay is a semi-enclosed water body — a distinct arm of Lake Huron — with a surface area of approximately 15,000 square kilometres and restricted water exchange with the main body of Lake Huron through the passage at Tobermory. Georgian Bay does not mix instantaneously with the main volume of Lake Huron. It has its own hydrodynamic circulation driven by thermal gradients, seasonal stratification, wind-driven currents, and the geometry of its semi-enclosed basin.

The consequence is that tritium discharged at the Bruce site does not immediately dilute to bulk Lake Huron concentrations. It creates a near-shore discharge plume in Georgian Bay with elevated tritium concentrations in the waters adjacent to the discharge point. The near-shore plume is the relevant exposure zone for drinking water intakes, recreational water contact, and the aquatic food chain in the affected region. Bulk Lake Huron dilution — Lake Huron has a volume of approximately 3,540 cubic kilometres — is not the relevant metric for assessing the health risk to populations drawing water from Georgian Bay near-shore intakes.

The TISG requires the proponent to assess the Lake Huron watershed as part of its environmental effects assessment. It does not require the proponent to: characterise the existing tritium concentration profile in Georgian Bay near-shore zones adjacent to the Bruce site; identify the location and depth of all drinking water intakes drawing from the affected zone; assess organically bound tritium accumulation in Georgian Bay fish species and aquatic organisms; or model the near-shore plume dynamics for routine operational and accident-release tritium scenarios. These are the assessments required to evaluate the incremental impact of Bruce C on a watershed already receiving fifty years of CANDU tritium loading. The TISG requires none of them.

The Food Chain Pathway — OBT Accumulation

Tritium released to the atmosphere as HTO undergoes atomic exchange with hydrogen in all biota — crops, livestock, fish, and humans — in the surrounding area. In biological tissues, a fraction of this tritium becomes organically bound tritium (OBT), incorporated into organic molecules including carbohydrates, fats, proteins, and DNA. OBT has a biological residence time approximately 20-50 times longer than HTO, depending on tissue type and metabolic activity. In rapidly dividing fetal cells — the cells with the highest OBT sensitivity — the residence time is longest and the biological consequences are most significant.

The OBT accumulation in the Georgian Bay food chain — in fish consumed by local communities, in vegetables grown in the region, in livestock raised on local feed — represents a chronic, ongoing exposure pathway for the Bruce-proximate population that has operated for fifty years. The Bruce C assessment must establish the existing OBT concentration in the local food chain as the baseline from which Bruce C's incremental OBT contribution is assessed. The TISG does not require this characterisation.

The Great Lakes Water Quality Agreement

Canada and the United States are parties to the Great Lakes Water Quality Agreement of 1978, as amended. The Agreement is a binding international treaty establishing the obligations of both countries to restore and maintain the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. Article VI establishes specific water quality objectives applicable to both countries. Article IX establishes the International Joint Commission as the coordinating body for implementing the Agreement and investigating disputes.

The Great Lakes — including Lake Huron and Georgian Bay — provide drinking water to approximately 40 million people across Ontario, Michigan, Ohio, Indiana, Pennsylvania, and New York. A severe accident at the Bruce C site that resulted in a significant radiological release to Lake Huron would trigger Canada's notification obligations under the Agreement and potentially

the US EPA's rights to transboundary pollution consultation under Article IX. The International Joint Commission would have authority to investigate the matter if referred by either government.

No other proposed nuclear facility in Canada sits on a watershed governed by a binding bilateral treaty with an active international enforcement mechanism and a 40-million-person affected population on both sides of the international border. This is not merely an environmental consideration — it is an international legal obligation that creates specific procedural and substantive requirements for Canada as a party to the Agreement. The TISG does not require the proponent to assess Canada's obligations under the Great Lakes Water Quality Agreement, to quantify the transboundary liability from a severe accident contaminating Lake Huron, or to identify the notification triggers applicable to the Bruce C site. This failure is documented in detail in Appendix J.

Why This Is the Most Acute Tritium Assessment in Canada

The Bruce C tritium assessment is more complex and more consequential than any other current Canadian nuclear assessment for four reasons that compound each other. First, the CANDU design produces two to three orders of magnitude more tritium per unit than any light water alternative — making tritium the primary emission concern. Second, fifty years of CANDU operation at the site has created an existing tritium baseline in the Georgian Bay watershed that has never been comprehensively characterised. Third, the drinking water affected by this baseline is consumed by approximately 40 million people under a binding bilateral treaty. Fourth, ODWAC 2009 specifically identified inadequate protection of the most sensitive population subgroups from CANDU tritium emissions at the existing 7,000 Bq/L guideline. All four of these factors are present simultaneously at the Bruce site and nowhere else in Canada.

FINDING: The Bruce site has produced approximately 40-52 kilograms of tritium over fifty years of CANDU operation, entering the Georgian Bay watershed through permitted atmospheric and liquid release pathways documented in CNSC's own IEMP data. This represents the largest existing uncharacterised radiological baseline in any current Canadian nuclear assessment. The TISG does not require: characterisation of existing tritium concentrations in Georgian Bay near-shore zones; OBT accumulation in the local food chain; near-shore plume dynamics modelling; identification of drinking water intakes in the affected zone; or assessment of Canada's obligations under the Great Lakes Water Quality Agreement. Bruce C's incremental tritium contribution cannot be meaningfully assessed without this baseline. The omission is the most acute tritium assessment failure in any current Canadian nuclear proceeding.

IAAC TRAP: IAAC is trapped: a Bruce C Impact Statement that assesses incremental tritium risk against bulk Lake Huron dilution calculations, without characterising the Georgian Bay near-shore baseline from fifty years of CANDU operation, will produce a tritium risk figure that is meaningless as a measure of the risk to populations drawing water from Georgian Bay intakes. If IAAC accepts this figure as adequate for a s.63 public interest determination affecting the drinking water of 40 million people under a binding bilateral treaty, it accepts a determination made without a lawful evidentiary foundation. If it requires the near-shore baseline characterisation and Great Lakes Agreement assessment, it must amend the TISG.

BRUCE STOPPER 10 — EVERY COMPARATOR JURISDICTION HAS REACHED A MORE QUALIFIED CONCLUSION FROM THE SAME EVIDENCE (SS9)

The Significance of International Regulatory Divergence

Scientific questions in regulatory contexts are not resolved by vote. A single jurisdiction that reaches a different conclusion from all other sophisticated jurisdictions is not necessarily wrong. What is required, however, is an explanation: if Canada's nuclear regulator has characterised the KiKK childhood leukemia signal as 'unfounded' while every other major nuclear jurisdiction that has examined the same evidence has reached a more qualified conclusion, Canada must be able to point to Canada-specific scientific data or analytical reasoning that justifies the divergence. The CNSC has never provided this justification. The divergence is unexplained.

This is not a minor procedural point. The 'unfounded' characterisation is the CNSC's most consequential published scientific conclusion on nuclear health risk. It is the word that determines whether the precautionary principle is triggered: if a finding is 'unfounded,' there is no threat of serious damage, and the precautionary principle does not require action. If the finding is not unfounded — if the signal is real even if its cause is unknown — the precautionary principle requires that the uncertainty be addressed before a new nuclear facility is approved in a proximate community. The 'unfounded' characterisation is therefore not merely a scientific description. It is a legal instrument that determines whether the most important statutory obligation in this assessment — the precautionary principle under IAA section 6(1)(a) — applies. See Appendix G for the detailed international comparison.

Germany: The Commissioning Jurisdiction

Germany commissioned the KiKK study through its Federal Office for Radiation Protection precisely to investigate the childhood leukemia signal near German nuclear plants. The study found an odds ratio of 2.19. Germany's own Scientific Committee on Radiation Protection (SSK) reviewed the full study in 2008 and concluded that the results were statistically robust, could not be explained by methodological artifact or confounding, and warranted investigation of the cause. The SSK did not characterise the KiKK finding as 'unfounded.' Germany subsequently shut down its nuclear power fleet — a decision with multiple causes, but one that was made against the

background of an acknowledged, unexplained childhood leukemia signal near German nuclear plants.

France: Independent National Replication

France's Institute for Radiation Protection and Nuclear Safety (IRSN) — the French equivalent of the CNSC — examined the KiKK findings and supported further investigation. France's national GEOCAP study, conducted independently by INSERM, found an odds ratio of approximately 1.9 for childhood leukemia near French nuclear plants in the closest proximity subgroup. France's regulatory body did not characterise the KiKK signal as 'unfounded.' It acknowledged the signal and conducted its own national study that produced a consistent finding.

United Kingdom: Twenty Years of Investigation

The United Kingdom's Committee on Medical Aspects of Radiation in the Environment has been investigating childhood cancer near UK nuclear facilities since 1986, following the Black Report's finding of ten-times-background childhood leukemia rates in Seascale. COMARE's 14th Report reviewed the KiKK findings in detail and concluded they were statistically significant and warranted investigation of the cause. Across its entire body of work, COMARE documented approximately a 20 per cent excess leukemia risk within five kilometres of UK nuclear installations. The UK's regulatory and scientific bodies did not characterise the KiKK signal as 'unfounded.' They acknowledged it as real and called for research into its explanation.

World Health Organization / IARC

The World Health Organization's International Agency for Research on Cancer has acknowledged the KiKK findings in its radiological risk assessments without characterising them as 'unfounded.' WHO and IARC have not endorsed the CNSC's characterisation of the signal as unfounded. The international public health body with primary global responsibility for cancer risk assessment does not agree with the CNSC's most consequential radiological health risk conclusion.

Austria and Switzerland

Both Austria and Switzerland have examined the KiKK evidence and reached conclusions more qualified than the CNSC's. Neither has applied the 'unfounded' characterisation to a replicated empirical signal of this magnitude and methodological quality. Both have acknowledged the signal as warranting continued investigation.

The Unexplained Divergence

In every case, the divergence between the CNSC's position and the position of every other sophisticated nuclear jurisdiction can be stated precisely: the CNSC says 'unfounded'; every comparator jurisdiction says 'real signal, cause unknown, warrants investigation.' The divergence is not explained by Canadian-specific scientific data. The CNSC has not published any Canadian epidemiological or dosimetric data that would justify reaching a more dismissive conclusion than Germany, France, the United Kingdom, the WHO, Austria, and Switzerland. The divergence is simply stated, without justification, in the CNSC's published KiKK fact sheet.

Under the legal framework that governs this assessment, this divergence has direct consequences. Section 6(1)(a) of the IAA codifies the precautionary principle. If the signal is 'unfounded,' the precautionary principle is not engaged. If the signal is real — as every comparator jurisdiction has concluded — the precautionary principle requires that the uncertainty about its cause be addressed before a new nuclear facility is approved in a proximate community. The CNSC's 'unfounded' characterisation is the mechanism by which the precautionary principle obligation is avoided. That mechanism does not survive scrutiny against the international scientific consensus from which it diverges without explanation.

FINDING: The CNSC's characterisation of the KiKK childhood leukemia signal as 'unfounded' diverges from the published positions of Germany's SSK, France's IRSN and INSERM, the UK's COMARE, WHO's IARC, and the regulatory bodies of Austria and Switzerland — every major nuclear jurisdiction that has examined the same evidence. The divergence is unexplained by any Canadian-specific scientific data the CNSC has published. The 'unfounded' characterisation is a legal instrument that prevents IAA s.6(1)(a)'s precautionary principle from being triggered. It cannot survive scrutiny against the international scientific consensus from which it diverges without explanation. The Review Panel, exercising its independent s.46 powers, is not bound by this characterisation and must evaluate it against the full international record.

IAAC TRAP: IAAC is trapped: if it defers to the CNSC's 'unfounded' characterisation despite the unexplained divergence from every comparator jurisdiction, it accepts a precautionary principle determination — that no significant threat of harm exists — that cannot be defended against the international scientific record. Under Vavilov, accepting a factual foundation that is contradicted by the published positions of every comparator jurisdiction without explanation is accepting an indefensible factual foundation. If IAAC requires the proponent to address the international divergence — why Canada's regulator reached a conclusion no other sophisticated jurisdiction was willing to reach from the same evidence — it must require what the current TISG does not, which requires TISG amendment.

BRUCE STOPPER 11 — THE DARLINGTON SMR IS A MANDATORY REGDOC-2.5.2 §2.2.1 COMPARATOR THAT HAS NOT BEEN REQUIRED

The Mandatory Requirement

CNSC REGDOC-2.5.2, Design of Reactor Facilities, Version 2.1, section 2.2.1 states: 'Societal risks to life and health from reactor facility operation shall be comparable to or less than the risks of generating electricity by viable competing technologies, and shall not significantly add to other societal risks.' The word 'shall' is confirmed as expressing a mandatory requirement by REGDOC-3.5.3, Regulatory Fundamentals. This requirement applies to every new reactor facility licence application in Canada. It is not discretionary. It does not apply only in Alberta or only to CANDU designs. It applies to Bruce C.

The requirement has three components. First, the proponent must identify the viable competing technologies for generating electricity in the relevant jurisdiction — Ontario. Second, the proponent must calculate the societal risk of those competing technologies using consistent methodology. Third, the proponent must demonstrate quantitatively that the proposed reactor facility's societal risk is comparable to or less than those comparators. None of these three components appear in the Bruce C TISG. The TISG requires a probabilistic safety assessment under REGDOC-2.4.2, but it does not require the PSA outputs to be compared against any competing technology. The current TISG therefore cannot produce an Impact Statement that satisfies the mandatory CNSC licensing requirement under REGDOC-2.5.2 §2.2.1.

Why the Darlington SMR Is the Most Significant Comparator

The Ontario electricity market has a specific and uniquely significant viable competing technology: the Darlington BWRX-300 small modular reactor. On April 4, 2025, the Canadian Nuclear Safety Commission issued a Licence to Construct to Ontario Power Generation for one BWRX-300 reactor at the Darlington New Nuclear site in Clarington, Ontario. As of the date of this submission, the Darlington SMR is under construction. Its Probabilistic Safety Assessment and design basis are documented in publicly available CNSC Commission member documents from the January 2025 public hearing that preceded the licence decision. Operating experience data from the equivalent Vogtle 3 and 4 reactors in Georgia, USA — both operational since 2023-2024 — provides empirical validation data for the PSA.

The Darlington SMR is not a hypothetical future technology. It is a licensed, documented, under-construction nuclear project in Ontario — the same province as Bruce C, regulated by the same CNSC, and proposed to meet the same Ontario electricity demand. It is the most directly comparable available technology. REGDOC-2.5.2 §2.2.1 requires the proponent to demonstrate that Bruce C's societal risk is comparable to or less than the societal risk of viable competing technologies. The Darlington SMR's societal risk is documented in the public CNSC record. It is the obvious and primary comparator.

If Bruce C's selected technology produces higher societal risk than the Darlington SMR on any material metric — core damage frequency, small release frequency, large release frequency, individual fatality risk, routine emission health risk — that finding is directly material to the section 63 public interest determination. The public interest question — whether the adverse effects of Bruce C are justified — cannot be answered without knowing how Bruce C's risk profile compares to the alternative of building more Darlington-type SMRs instead. The TISG does not require this comparison.

The Full Set of Ontario Viable Competing Technologies

The REGDOC-2.5.2 §2.2.1 analysis for Bruce C must address the full set of viable competing technologies in the Ontario context, not only the Darlington SMR. A viable competing technology is one that is technically and economically feasible in the relevant jurisdiction. The following technologies satisfy this standard for Ontario:

- Darlington SMR (BWRX-300): Licence to Construct issued April 4, 2025; under construction; PSA on public record; Vogtle operating data available. The most significant nuclear comparator.
- Bruce A and B refurbishment: Ontario Power Generation is completing refurbishment of Darlington units; Bruce Power itself is completing the Bruce A and B life extension programme. Additional capacity from refurbishment is firm, scheduled, and requires no new land or environmental assessment. The Bruce C assessment must address why new greenfield nuclear capacity is needed when existing licensed capacity is being extended.
- Renewable generation plus storage: The IESO's 2024 Annual Planning Outlook identifies significant renewable generation capacity in the IESO interconnection queue. Grid-scale battery energy storage projects have received IESO Need Identification Document approval in 2024-2025. The combination of renewable generation plus long-duration storage constitutes a viable competing technology portfolio for Ontario load growth.
- Natural gas with CCS: Existing Ontario gas infrastructure; CCS operational at analogous facilities in Saskatchewan (Boundary Dam). Provides firm dispatchable capacity. The societal risk profile — no radiological hazard, no EPZ, no long-lived radioactive waste, no NLCA liability cap — is categorically different from nuclear.

The comparative societal risk assessment methodology required by REGDOC-2.5.2 §2.2.1 for the Ontario context is described in detail in Appendix I. That appendix provides the specific parameter table for the mandatory comparison, the Alberta-specific carbon intensity calculation methodology, and the required PSA-equivalent risk quantification for non-nuclear alternatives. The TISG requires none of this.

The IAAC SOI Departure

The IAAC's own Summary of Issues for the Bruce C project identified, as a concern, whether other technologies may be more appropriate for meeting Ontario's electricity needs. This is a verbatim identification of the alternatives question as a relevant issue under IAA sections 22(1)(f) and (i). IAAC identified the concern in its SOI and then produced a final TISG that does not require alternatives assessment. Under Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65, an administrative decision-maker who departs from its own previously stated position must justify that departure with transparent and intelligible reasons. No such justification appears in the finalization documents on the Bruce C registry record. The departure from the SOI is unexplained and is therefore unreasonable.

FINDING: REGDOC-2.5.2 §2.2.1 imposes a mandatory 'shall' requirement that the proposed reactor facility's societal risk be demonstrated comparable to or less than viable competing technologies in the Ontario market. The Darlington SMR, with its Licence to Construct issued April 4, 2025, is the most significant specific Ontario comparator — a licensed, under-construction nuclear project with its PSA on the

public CNSC record. The Bruce C TISG does not require the proponent to compare its proposed facility's societal risk against the Darlington SMR or any other Ontario competing technology. Without this comparison, the Impact Statement cannot satisfy the mandatory CNSC licensing standard, and the CNSC cannot issue a Licence to Prepare Site on the basis of it. This is the single most straightforward legal deficiency in the current TISG: a mandatory 'shall' requirement exists; the TISG does not require it to be satisfied.

IAAC TRAP: IAAC is trapped: if it accepts a compliant Impact Statement that does not include the REGDOC-2.5.2 §2.2.1 mandatory comparative societal risk demonstration, it accepts an IS on which the CNSC cannot legally issue a Licence to Prepare Site — because the mandatory licensing standard has not been met. IAAC will have conducted an assessment that cannot produce a licensable outcome. Additionally, IAAC's departure from its own SOI concern about alternatives — without explanation — is directly reviewable under Vavilov. Both the mandatory regulatory requirement and the unexplained SOI departure independently require TISG amendment. The CNSC, as co-author of the TISG, cannot defend the omission of its own mandatory 'shall' requirement.

PART TWO — THE INSTITUTION

Part One established the empirical and scientific foundation: the forty-year evidence record showing elevated cancer rates near nuclear plants that the models cannot predict, the specific problems of the Bruce site's fifty-year exposure baseline, the inadequacy of tritium risk assessment, the structural failures of the dose models, and the accumulated evidence that null studies are measurement failures rather than safety evidence. Part Two addresses a different but equally fundamental question: why these problems have persisted.

The answer is institutional. The Canadian Nuclear Safety Commission — the body upon which the Bruce C assessment depends for technical guidance, health risk methodology, and accident consequence analysis — has structural features that prevent it from producing the independent science that IAA section 46 requires. Those features are not allegations of individual bad faith. They are documented, named, institutional design problems: a funding structure that creates a direct financial dependency on the industry being regulated, a dual mandate that has been unresolved for thirty-four years, a documented history of executive override by Parliament, a pattern of acknowledging research gaps and taking no action for sixteen years, and a failure to define a harm threshold that makes the section 63 public interest question formally unanswerable by the institution asked to address it.

Understanding these institutional features is necessary for evaluating the evidentiary weight that should be placed on the CNSC's technical submissions in this proceeding. Section 46 of the IAA exists precisely because Parliament recognised that the CNSC is not a disinterested scientific body. The institutional features documented in Part Two are the reason Parliament created section 46. They are also the reason the current TISG — which directs the proponent toward

CNSC published science as its evidentiary baseline — defeats the statutory purpose of section 46.

BRUCE STOPPER 12 — THE CNSC HAS A STRUCTURAL CONFLICT OF INTEREST THAT PREVENTS IT FROM PRODUCING INDEPENDENT SCIENCE (SS8)

What a Structural Conflict of Interest Is — and Is Not

A structural conflict of interest is not an allegation that any individual CNSC employee acts in bad faith, takes bribes, or consciously distorts scientific findings. It is a description of the institutional design features that create systematic pressure toward particular conclusions — pressure that operates at the institutional level regardless of the intentions of any individual staff member. Structural conflicts of interest are well-documented in regulatory science: an institution whose operational revenue depends on the continued operation and expansion of the industry it regulates faces systematic institutional pressure toward conclusions that facilitate licensing and away from conclusions that impede it. This pressure does not require any individual to make a corrupt choice. It operates through the normal mechanisms of institutional culture, funding allocation, research priority-setting, and publication decision-making.

The CNSC's structural conflict of interest has three documented components: its licence-fee funding structure, its unresolved dual mandate, and the documented historical override of its operational independence by Parliament. Each is a named, documented feature of the institutional design that has been on the public record for years. None has been resolved.

Licence-Fee Funding: Revenue Dependent on the Industry Being Regulated

The CNSC is funded primarily by fees from the nuclear industry it regulates. Licence fees from nuclear facility operators — including Bruce Power — account for a large proportion of the CNSC's operating revenues. The CNSC's most recent published annual reports document this funding structure. The CNSC is not primarily funded by consolidated revenue — by general taxpayer money allocated through the parliamentary appropriations process. It is primarily funded by the fees it collects from the entities it licences.

This creates a structural institutional dynamic — not an individual corruption dynamic — in which the CNSC's operating budget depends on the continued licensing and expansion of the nuclear facilities it regulates. An institution in this position faces systematic pressure, operating at the institutional level, toward conclusions that facilitate licensing. Conclusions that impede licensing — that find safety standards inadequate, that require additional research before licences can be issued, that characterise radiological risks as higher than previously assessed — threaten the revenue stream on which the institution depends. Conclusions that facilitate licensing support it. This is the structural reality, regardless of the intentions of any individual at the CNSC.

The structural conflict does not mean the CNSC's conclusions are wrong. It means they cannot be treated as the conclusions of a disinterested scientific body. When a party with a financial interest in a particular outcome presents technical evidence in support of that outcome, the weight to be placed on that evidence by a deciding body is materially less than the weight that would be placed on evidence from a genuinely independent source. This is the logic of the adversarial

process and of the independent expert witness in judicial proceedings. It is the logic that underlies section 46 of the IAA.

The Dual Mandate: Promoting and Regulating the Same Industry Simultaneously

The Nuclear Safety and Control Act gave the CNSC a dual mandate: to regulate the use of nuclear energy and materials to protect the environment and the health and safety of persons, and to promote the peaceful use of nuclear energy in Canada. These two functions are in structural tension with each other. A regulator committed to promoting nuclear energy has a systematic institutional interest in not finding that nuclear energy poses health risks that would impede that promotion. A regulator whose budget depends on licence fees from nuclear operators has a further financial interest in the same direction.

The dual mandate has been in the NSCA since the CNSC was established. It has never been resolved. Thirty-four years after the CNSC's creation, the institution continues to hold both a protective mandate — to protect health and safety — and a promotional mandate — to promote nuclear energy. These mandates cannot both be fully discharged simultaneously when evidence of health risk emerges from the industry being promoted. The history of CNSC's handling of the KiKK signal — characterising a replicated empirical finding as 'unfounded' without providing a scientific justification that any comparator jurisdiction accepted — is consistent with the institutional pressure that a dual mandate creates.

Parliamentary Override: The NRU Incident

In 2007-2008, an incident occurred that directly and documentably demonstrated that the CNSC's operational independence from government nuclear policy is not structurally guaranteed. The CNSC had ordered the Chalk River nuclear research reactor — the NRU reactor — to shut down for safety reasons. The NRU reactor was the primary global supplier of medical radioisotopes used in diagnostic imaging. Its shutdown created a medical isotope shortage that generated significant political pressure.

Parliament passed legislation — the Nuclear Safety and Control Act Amendment — that directed the CNSC to restart the NRU reactor on terms that the CNSC itself had not approved as satisfying its safety requirements. The CNSC was overridden by direct legislative action. The Chair of the CNSC at the time, Linda Keen, was subsequently removed from her position by the federal government. The sequence of events — CNSC safety order, political pressure from isotope shortage, parliamentary override, CNSC chair removal — is documented in parliamentary records, public testimony, and news media from the period.

The NRU incident demonstrates, as a matter of documented historical fact, that the CNSC's operational independence from government nuclear policy is not structurally guaranteed. When there is sufficient political pressure to maintain nuclear operation, the CNSC's safety determinations can be and have been overridden by direct parliamentary action. This is not an

abstract structural concern. It is a documented, on-the-record demonstration of the limits of CNSC independence.

Why Section 46 Exists

Parliament gave the Review Panel independent Commission powers under section 46 of the IAA rather than simply asking the CNSC to conduct the Bruce C assessment. The three institutional features documented in this Bruce Stopper — licence-fee funding, dual mandate, and the NRU parliamentary override — are the structural reasons why Parliament made this choice. Parliament recognised that the CNSC, as a regulatory body with financial dependencies on the nuclear industry, an unresolved promotional mandate, and a history of executive override, cannot be treated as a disinterested scientific body for the purpose of making the public interest determination that section 63 requires.

The Review Panel, exercising independent Commission powers, is not bound by the CNSC's published conclusions. It must evaluate them on their merits against the full scientific record. A TISG that directs the proponent toward CNSC published science as its evidentiary baseline defeats this purpose. It pre-determines the evidentiary foundation of the Panel's assessment in favour of an institution that has structural reasons to reach particular conclusions. The full institutional analysis is provided in Appendix H.

FINDING: The CNSC has three documented structural features that prevent it from functioning as a disinterested scientific body: (1) licence-fee funding from the industry it regulates creates systematic institutional pressure toward conclusions that facilitate licensing; (2) an unresolved dual mandate to both regulate and promote nuclear energy creates systematic institutional pressure away from health risk findings that would impede promotion; (3) the documented parliamentary override of CNSC's operational independence in the NRU incident demonstrates that CNSC safety determinations can be and have been overridden by executive and legislative action when nuclear operation is politically important. Parliament created section 46 of the IAA specifically because of these structural features. A TISG that directs the proponent toward CNSC published science as its evidentiary baseline defeats the statutory purpose of section 46.

IAAC TRAP: IAAC is trapped: if it accepts an Impact Statement whose health risk foundation is built on CNSC published science as the settled evidentiary baseline — without requiring independent expert validation — it defeats section 46's purpose while claiming to discharge it. The Review Panel will exercise independent Commission powers against an evidentiary record that has been pre-determined by an institution with documented structural reasons to reach particular conclusions. Under Vavilov, accepting a decision-making process whose evidentiary foundation is structurally compromised before the evidence is gathered is accepting a process that cannot produce a reasonable outcome. If IAAC requires independent expert validation — as section 46 demands — it must amend the TISG.

BRUCE STOPPER 13 — REGULATORY ABDICATION — THE CNSC KNEW ABOUT EVERY DEFICIENCY FOR THIRTEEN YEARS AND TOOK NO ACTION (SS13)

What Was Known, When, and What Was Required

The deficiencies documented in Bruce Stoppers 1 through 12 are not recent discoveries. They are not the product of new research that emerged after the CNSC had established its regulatory framework. They were known — formally, specifically, and on the CNSC's own published record — for at least thirteen years before the Bruce C assessment commenced. The CNSC had statutory authority to require remediation. It had financial capacity to commission the required research. It was told by its own scientists exactly what was needed. It took no action.

This Bruce Stopper documents the specific timeline of what was known, what authority existed, what resources were available, and what action was not taken. It is not a general criticism of the CNSC's regulatory performance. It is a specific, chronologically documented account of regulatory abdication — the deliberate maintenance of an inadequate framework over thirteen years of acknowledged deficiencies, while presenting that framework to affected communities, to IAAC, and to this proceeding as scientifically adequate.

The 2010 Baseline: What INFO-0799 Established

In 2010, CNSC published INFO-0799. As documented in Bruce Stopper 3, this document formally acknowledged that the evidence base was insufficient to estimate tritium health risks with confidence and that an international collaborative research programme was required. By the time INFO-0799 was published in 2010, the following additional deficiencies were also on the record: the KiKK study had been published in 2008 and Germany's SSK had reviewed it and found it robust; COMARE had documented elevated childhood leukemia rates near UK nuclear facilities; the pre-KiKK ecological studies had documented elevated rates in multiple countries; ODWAC 2009 had recommended a 350-fold reduction in the tritium drinking water guideline; the RBE debate was documented in the peer-reviewed literature; and the underpowered-study problem had been identified by epidemiologists critical of Canadian null studies.

In 2010, the CNSC had before it: INFO-0799's acknowledgment that tritium health risk assessment was inadequate; the KiKK study and its independent validation by SSK; ODWAC 2009's recommendation; and the documented statistical power problems with its Canadian epidemiological studies. It knew, in 2010, about every scientific deficiency identified in Bruce Stoppers 1 through 6.

The Authority That Was Available

Section 9(b) of the Nuclear Safety and Control Act gives the CNSC explicit authority to fund research necessary to discharge its regulatory mandate. Protecting the health and safety of persons is the first-listed purpose of the NSCA. Research into the health risks of the primary emission of the reactor type the CNSC regulates is squarely within this mandate. The CNSC did not need parliamentary approval to commission tritium health risk research. It had the statutory authority within its own mandate.

Sections 24 and 35 of the NSCA give the CNSC authority to impose conditions on licences and to require licence holders to provide information. The CNSC could have required, as a condition of any licence renewal for any operating Canadian nuclear facility, that the licensee commission independent health risk studies addressing the gaps identified in INFO-0799. It did not.

The Budget That Was Available

The CNSC's annual budget has exceeded $350 million for over a decade. The cost of commissioning the international collaborative tritium health risk research programme that INFO-0799 called for — involving epidemiological studies, OBT mechanism research, and dose conversion factor validation — would have been a small fraction of this annual budget. The CNSC was not resource-constrained. It chose not to commission the research.

What Was Not Done — The Thirteen-Year Chronology

From 2010 to 2023 — thirteen years — the CNSC did not commission international collaborative tritium health risk research. It did not update its RADICON source term values following EVP Jammal's 2017 acknowledgment that they were false. It did not implement ODWAC 2009's recommendation. It did not update its published guidance to reflect the RBE debate. It did not revise its cancer-only HIA scope to address the six additional endpoint categories documented in UNSCEAR literature. It did not develop a statistical power disclosure standard for its Canadian epidemiological studies. It did not define a harm threshold that would make the IAA section 63 public interest question answerable.

In the same period, the CNSC published fact sheets — the seven documents identified in Bruce Stopper 7 — that presented its health risk framework as scientifically adequate and current, without disclosing any of the deficiencies its own scientists had acknowledged in 2010 and that had remained unaddressed through the thirteen intervening years. The framework entering the Bruce C assessment in 2025 is substantively the same framework the CNSC's own scientists said was inadequate in 2010. The Bruce C Impact Statement will be built on an acknowledged inadequate framework — not because the proponent chose an inadequate framework, but because the CNSC, which had the authority and resources to update it, chose not to.

Why This Is Regulatory Abdication

Regulatory lag is the inevitable delay between the emergence of new scientific evidence and its incorporation into regulatory frameworks. It is not misconduct. It is a structural feature of regulatory systems that must balance scientific uncertainty against operational predictability. Regulatory abdication is different: it is the deliberate maintenance of an inadequate framework despite specific, documented knowledge of the inadequacy, the availability of authority and resources to address it, and the formal identification of what remediation is required. The CNSC's thirteen-year failure to act on INFO-0799 is regulatory abdication by this definition.

The consequence is that the Bruce C assessment is conducted on a framework that the CNSC's own scientists acknowledged was inadequate before the assessment began. The Review Panel will be asked to evaluate the proponent's Impact Statement against a health risk framework whose limitations were formally documented in 2010 and have not been remediated in the sixteen years

since. The IAAC cannot remedy this failure by proceeding with the assessment as if it had not occurred.

FINDING: The CNSC knew about every scientific deficiency documented in Bruce Stoppers 1 through 6 for at least thirteen years before the Bruce C assessment commenced. INFO-0799 (2010) formally documented the tritium evidence inadequacy. The CNSC had statutory authority under NSCA ss.9, 24, and 35 to require remediation and commission research. Its annual budget exceeded $350 million throughout this period. It took no action for thirteen years. The health risk framework entering the Bruce C assessment is substantively the same framework the CNSC's own scientists said was inadequate in 2010. The proponent's Impact Statement will be built on an acknowledged inadequate foundation, through no fault of the proponent. This is regulatory abdication: not lag, but the deliberate maintenance of an inadequate framework over thirteen years of acknowledged deficiency.

IAAC TRAP: IAAC is trapped: if it accepts an Impact Statement built on a health risk framework that the CNSC's own scientists acknowledged was inadequate in 2010 and that remains unremediated in 2026, it conducts a public interest assessment on a foundation whose inadequacy was formally documented before the assessment commenced. Under Vavilov, proceeding with knowledge that the evidentiary foundation is inadequate — without requiring the inadequacy to be addressed — is not a reasonable exercise of statutory authority. It is the acceptance of an indefensible factual foundation. IAAC cannot remedy this by proceeding; it can only remedy it by requiring the gaps to be addressed before the Impact Statement is accepted.

BRUCE STOPPER 14 — NO HARM STANDARD HAS EVER BEEN DEFINED — ALARA HAS NO UPPER BOUND (SS16)

The Question the Review Panel Must Answer

Section 63 of the Impact Assessment Act requires the Minister to determine whether the adverse effects of the Bruce C project within federal jurisdiction are in the public interest. This is the central statutory question of this proceeding. Answering it requires weighing the adverse effects of the project — including its radiological health effects — against its benefits, taking into account the factors listed in section 63(4). It is, at its core, a question about whether the harm caused by the project is acceptable in light of the benefits it provides.

That question cannot be answered by an institution that has never defined what level of harm is unacceptable. If there is no defined upper bound of acceptable harm, there is no standard against which the harm from Bruce C can be measured and found either acceptable or unacceptable. The section 63 public interest question becomes unanswerable — not because the question is difficult, but because the institution that has been advising on health risk has never established the reference point against which that risk must be evaluated.

What ALARA Is and What It Is Not

The CNSC's primary radiological protection standard for the public is ALARA — As Low As Reasonably Achievable. ALARA requires that radiation doses to the public from nuclear facility operations be reduced as far as reasonably practicable below the maximum permissible dose limits. It is a cost-optimisation tool: reduce doses as far as you can, given available resources and practical constraints, subject to the overall constraint that doses remain below the prescribed limits.

ALARA is not a harm standard. It has no upper bound. It does not define a level of radiation exposure above which harm is unacceptable and below which it is acceptable. It operates entirely within the space defined by the maximum permissible dose limits and requires optimisation within that space. The maximum permissible dose limits themselves are not harm thresholds — they are reference levels established on the basis of risk-benefit analysis, not on the basis of a finding that exposure below the limit causes no harm.

The absence of a defined harm threshold means that the CNSC can always say that any dose is being managed ALARA — reduced as far as reasonably achievable — without ever being required to say whether the remaining dose is acceptable in absolute terms. A facility operating ALARA might be causing measurable harm to the surrounding community. The CNSC's framework provides no mechanism for determining this, because it has never defined what level of harm is unacceptable.

The Section 63 Consequence

The Review Panel's section 63 function requires it to determine whether the adverse effects of the project are in the public interest. This is a substantive weighing, not a procedural compliance check. The Panel cannot discharge this function by determining that the proponent is operating ALARA. It must determine whether the remaining harm — after ALARA optimisation — is

acceptable in the public interest. This requires a reference point: what level of radiological harm is unacceptable? The CNSC has never established this reference point.

The Federal Court confirmed in CARN v BWXT Nuclear Energy Canada Inc., 2022 FC 849, at paragraphs 47-53, that the benefits-outweigh-harm standard is not a binding legal obligation on the CNSC in its licensing decisions. The CNSC had previously formally rejected an IAEA Integrated Regulatory Review Service suggestion that it adopt this standard, recording its institutional position as 'Not accepted.' The CNSC has therefore formally declined to adopt the standard that the IAA section 63 public interest determination most directly requires. It has not disclosed this institutional position to IAAC in the Bruce C proceeding.

The consequence is that the most important institutional participant in this assessment — the body advising on radiological health risk — has formally rejected the benefits-outweigh-harm analytical framework that the statute requires the Minister to apply, has never defined a harm threshold that would make the public interest question answerable, and has not disclosed either of these positions to IAAC or to this proceeding.

The Precautionary Principle Dimension

The absence of a defined harm threshold also compounds the precautionary principle problem identified in Bruce Stopper 15. The precautionary principle under section 6(1)(a) of the IAA requires that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation. Applying this principle requires the decision-maker to identify what would constitute 'serious or irreversible damage' in the radiological context. Without a defined harm threshold, there is no reference point for making this determination. The CNSC's framework makes the precautionary principle formally inapplicable to nuclear facility assessments by refusing to define the threshold that would trigger it.

FINDING: The CNSC has never defined a level of radiological harm that would be unacceptable. ALARA is a cost-optimisation tool with no upper bound — it tells operators to reduce doses as far as reasonably practicable but does not define when the remaining dose is too much. The Federal Court confirmed in CARN v BWXT (2022 FC 849, ¶¶47-53) that the benefits-outweigh-harm standard is not binding on the CNSC. The CNSC formally rejected the IAEA's suggestion that it adopt this standard and has not disclosed this institutional position to IAAC or this proceeding. The section 63 public interest question — whether the adverse effects of Bruce C are in the public interest — cannot be answered by an institution that has never defined what level of radiological harm is unacceptable. The Review Panel faces the most important statutory question in this proceeding without a defined harm reference point from the institution that has advised on health risk throughout the assessment.

IAAC TRAP: IAAC is trapped: if it accepts the CNSC's ALARA-based framework as adequate for the section 63 public interest determination, it accepts a framework that provides no reference point against which the harm from Bruce C can be found acceptable or unacceptable. The public interest determination will be made without the harm standard it requires. If IAAC requires the CNSC to define a harm threshold — as the section 63 function demands — it requires what the CNSC has formally refused to provide, what the Federal Court has confirmed it is not legally required to provide, and what the current TISG does not require the proponent to address. IAAC must either accept a structurally incomplete public interest analysis or require a fundamental reframing of the health risk assessment methodology.

BRUCE STOPPER 15 — THE PRECAUTIONARY PRINCIPLE HAS BEEN SYSTEMATICALLY INVERTED — THE BURDEN OF PROOF RUNS THE WRONG WAY (SS10)

The Precautionary Principle as a Legal Obligation

Section 6(1)(a) of the Impact Assessment Act codifies the precautionary principle as an operative obligation in Canadian impact assessment law. It provides that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation. This is not a policy aspiration or a guiding principle. It is a statutory provision that creates a legal obligation on decision-makers conducting impact assessments.

In 114957 Canada Ltée (Spraytech) v Hudson, [2001] 2 SCR 241, the Supreme Court of Canada confirmed that the precautionary principle is operative in Canadian environmental law. The Court's analysis establishes that the precautionary principle has two components that are directly relevant to the Bruce C assessment. First, it allocates the burden of proof: the burden of demonstrating the absence of significant adverse effects rests on the proponent, not on communities or intervenors. Second, it specifies the threshold for action: scientific uncertainty about potential harm is not a reason to delay precautionary measures when there are threats of serious or irreversible damage.

How the CNSC Inverts the Burden of Proof

The CNSC's application of the precautionary principle in nuclear facility assessments inverts both of its components. On the burden of proof, the CNSC treats the absence of demonstrated harm near nuclear facilities as evidence of safety — requiring communities to prove that harm exists rather than requiring the proponent to demonstrate that harm is absent. The underpowered-study problem documented in Bruce Stopper 6 is the mechanism by which this inversion operates in practice: studies that are structurally incapable of detecting harm at the effect sizes of concern are cited as evidence of no harm, effectively shifting the burden onto communities to produce the evidence that the CNSC's own monitoring framework is designed not to detect.

On the threshold for action, the CNSC's 'unfounded' characterisation of the KiKK signal serves as the mechanism by which the precautionary principle is prevented from being triggered. The

precautionary principle applies where there are threats of serious damage. If the KiKK signal is 'unfounded,' there is no threat — and the precautionary principle is not engaged. The 'unfounded' characterisation is therefore not merely a scientific description. It is a legal instrument that determines whether the most important statutory obligation in this proceeding applies. As Bruce Stopper 10 documents, this characterisation diverges from the position of every comparator jurisdiction without explanation. The mechanism by which the precautionary principle is disabled in CNSC-advised nuclear assessments is the unexplained 'unfounded' characterisation of a replicated empirical signal.

The Six Scientific Uncertainties That Trigger the Precautionary Principle

The precautionary principle is engaged when there are threats of serious or irreversible damage and scientific uncertainty about those threats. The following six scientific uncertainties, each documented in preceding Bruce Stoppers, independently engage the precautionary principle for the Bruce C assessment:

- The cause of the forty-year internationally replicated childhood leukemia signal near nuclear plants is scientifically uncertain. The signal is real; its cause — radiation, population mixing, or another mechanism — is unknown. Scientific uncertainty about the cause of an observed health harm is precisely the type of uncertainty that triggers the precautionary principle.
- The health risk from tritium at doses below 7,000 Bq/L is scientifically uncertain. INFO-0799 acknowledged this directly. ODWAC 2009 found the existing standard inadequate. Scientific uncertainty about the health risk from the primary emission of the proposed facility triggers the precautionary principle.
- The appropriate RBE for tritium is scientifically uncertain. The peer-reviewed literature spans 1.0 to 5.0 or higher. Scientific uncertainty about the biological effectiveness of the primary emission triggers the precautionary principle for the most sensitive exposure pathway — OBT in fetal tissue.
- The health effects of chronic low-dose radiation beyond cancer are scientifically uncertain and inadequately characterised. Six endpoint categories are documented in UNSCEAR literature but excluded from the CNSC's HIA scope. Scientific uncertainty about the full scope of health effects triggers the precautionary principle.
- The transgenerational epigenetic effects documented in the March 2025 IJMS study are scientifically uncertain in their magnitude and mechanism. Harm to non-exposed offspring represents a category of irreversible damage that triggers the precautionary principle.
- The health effects of the existing fifty-year CANDU tritium loading of the Lake Huron watershed are scientifically uncertain — no comprehensive baseline characterisation exists. Scientific uncertainty about the existing baseline harm triggers the precautionary principle for any incremental addition.

Each of these uncertainties independently satisfies the threshold for precautionary principle engagement. All six are present simultaneously in the Bruce C assessment. The CNSC's framework does not engage the precautionary principle on any of them. It presents settled conclusions in each domain rather than acknowledging the scientific uncertainty that the precautionary principle requires to be addressed.

The Correct Allocation of the Burden of Proof

The precautionary principle as confirmed in Spraytech places the burden of demonstrating the absence of significant adverse effects on the proponent. This is not a reversal of the ordinary scientific burden — it is the correct allocation of the regulatory burden in a context where scientific uncertainty exists about a potential serious harm. The proponent of a new nuclear facility in a community that has already been nuclear-proximate for fifty years, proposing to add to a tritium baseline that cannot currently be fully assessed, in the vicinity of a watershed providing drinking water to forty million people, must demonstrate that the combination of existing and incremental exposure does not create a significant adverse health effect. The CNSC's framework requires the opposite: it requires communities to demonstrate that harm exists, while presenting the proponent's technical submissions as evidence of safety.

FINDING: Section 6(1)(a) of the IAA codifies the precautionary principle as a statutory obligation. As confirmed in 114957 Canada Ltée (Spraytech) v Hudson [2001] 2 SCR 241, the burden of demonstrating the absence of significant adverse effects rests on the proponent. The CNSC systematically inverts this burden: it uses underpowered null studies as evidence of safety, characterises a replicated empirical signal as 'unfounded' to prevent the precautionary principle from being triggered, and presents its health risk framework as settled rather than acknowledging the six documented scientific uncertainties that independently engage the precautionary principle obligation. Six independent scientific uncertainties — the childhood leukemia signal, tritium health risk below 7,000 Bq/L, tritium RBE, non-cancer endpoints, transgenerational effects, and the existing Lake Huron baseline — each separately trigger the precautionary principle. The current TISG engages none of them.

IAAC TRAP: IAAC is trapped: if it accepts the CNSC's framework as the basis for the Bruce C precautionary principle assessment, it accepts an inversion of the statutory burden of proof. The proponent will present its Impact Statement as demonstrating safety; the communities will be left to prove harm from a position with no resources, no monitoring data, and against a framework that characterises forty years of international evidence as 'unfounded.' Under Vavilov and Spraytech, accepting a public interest determination made on an incorrectly allocated burden of proof is accepting an unreasonable decision. If IAAC requires the burden to be correctly placed on the proponent — as the statute requires — it must require the TISG to be structured so that the proponent must affirmatively demonstrate the absence of significant adverse health effects, not merely demonstrate compliance with CNSC standards.

BRUCE STOPPER 16 — THE MONITORING FRAMEWORK IS STRUCTURALLY INCAPABLE OF DETECTING HARM AT THE BRUCE SITE POPULATION SCALE (SS12)

What a Monitoring Framework Can and Cannot Do

A monitoring condition attached to a project approval is a mechanism for detecting harm after approval, if harm occurs. It is a safeguard — a mechanism for triggering regulatory intervention if the predicted safety performance is not achieved. For a monitoring condition to function as a genuine safeguard, it must be capable of detecting the harm it is meant to safeguard against. A monitoring programme that is statistically incapable of detecting the relevant harm is not a safeguard. It is documentation of the appearance of oversight without the substance of it.

The monitoring framework the CNSC applies to nuclear facility communities in Canada measures radionuclide concentrations in environmental samples — air, water, soil, vegetation — and compares them to regulatory limits. It does not include epidemiological monitoring of cancer incidence in proximate communities with sufficient statistical power to detect the effect sizes documented in the international literature. The independent environmental monitoring programme for Bruce A and B measures tritium in air and water. It does not track childhood cancer incidence in the Municipality of Kincardine against a powered epidemiological baseline.

The Statistical Power Problem at the Bruce Site

As documented in Bruce Stopper 6, detecting a doubling of childhood leukemia rates near a nuclear facility requires a population in the relevant proximity zone large enough to generate sufficient childhood leukemia cases to distinguish a doubling from background statistical variation. The Municipality of Kincardine has a population of approximately 12,000 people. Even including all communities within a 25-kilometre radius of the Bruce site, the total population is well under the threshold required for a statistically powered prospective study of childhood leukemia incidence. If childhood leukemia rates in the Bruce-proximate community double following the commissioning of Bruce C — as the international evidence suggests is a plausible outcome near nuclear plants — a monitoring programme based on the population within the local catchment area will almost certainly not detect it within any regulatory timeframe.

The mathematics are straightforward. Childhood leukemia incidence is approximately 4 cases per 100,000 children per year. With a child population of perhaps 2,000-3,000 in the immediate Bruce-proximate area, the expected number of childhood leukemia cases per year is less than 1. Detecting a doubling — from under 1 expected case to under 2 expected cases per year — requires either a very large population or a very long observation period, and even then requires careful statistical analysis to distinguish from background variation. A monitoring programme that will generate 1-2 childhood leukemia cases in the relevant proximity zone per decade cannot detect a doubling of childhood leukemia rates with any statistical confidence. It will produce annual reports finding no statistically significant elevation. Those reports will look like evidence of safety. They will be measurement failures.

Why a Monitoring Condition Cannot Cure This Problem

The standard regulatory response to uncertainty about a project's health impacts is to attach a monitoring condition to the approval: require the proponent to monitor environmental and health outcomes and report annually, with a commitment to revisit the approval if monitoring reveals unexpected harm. This response is appropriate when the monitoring programme is capable of detecting the harm it is meant to detect. It is not appropriate — and does not constitute a genuine safeguard — when the monitoring programme is structurally incapable of detecting the relevant harm.

The Bruce C monitoring programme, based on the population sizes and epidemiological designs available at the Bruce site, will not be capable of detecting elevated childhood leukemia rates attributable to Bruce C emissions within any regulatory timeframe. Attaching a monitoring condition to the Bruce C approval will create the appearance of an ongoing safety check — annual reports, public communication, environmental data — without creating a genuine mechanism for detecting harm if harm occurs. The monitoring condition will perform a public reassurance function while the community lives beside a facility whose health impact on that community cannot be measured by the tools available.

The Irreversibility Connection

The monitoring incapacity documented in this Bruce Stopper connects directly to the irreversibility argument in Bruce Stopper 22. If harm occurs and the monitoring programme cannot detect it, the harm will not be detected until it has operated for long enough to produce statistical signals that override the power limitations of the small-population monitoring design — potentially decades. By that time, the harm will have been operating for years or decades, the facility will have been in operation and will have generated substantial sunk costs, and the community will have been exposed to whatever health consequences the facility creates. The combination of monitoring incapacity and irreversibility means that if the Bruce C approval is wrong — if the facility does create elevated health risks in the proximate community — the error cannot be corrected in time to prevent harm. The monitoring condition provides false assurance rather than genuine protection.

FINDING: The CNSC's monitoring framework for nuclear facility communities is structurally incapable of detecting elevated childhood leukemia rates near the Bruce site within any regulatory timeframe, given the population size of the Bruce-proximate community. The Municipality of Kincardine and surrounding area does not have a large enough child population to generate statistically detectable signals of the effect sizes documented in the international literature. A monitoring condition attached to the Bruce C approval will produce annual reports finding no statistically significant elevation — not because no elevation exists, but because the monitoring programme was never powered to detect one. This is documentation of the appearance of oversight without the substance of it. It provides false assurance rather than genuine protection.

IAAC TRAP: IAAC is trapped: if it attaches a monitoring condition to a Bruce C approval as a response to radiological health risk uncertainty — the standard regulatory approach — it attaches a condition that cannot function as a genuine safeguard given the population size of the Bruce-proximate community. Under Vavilov, accepting that a monitoring condition constitutes adequate response to documented scientific uncertainty when the monitoring programme is structurally incapable of detecting the relevant harm is accepting a condition that is not rationally connected to the regulatory objective it is meant to achieve. If IAAC requires a statistically adequate epidemiological monitoring programme as a condition — one powered to detect the effect sizes documented internationally — it requires infrastructure that does not exist and cannot be created from the Bruce-proximate population alone, which means pooling across multiple nuclear facility communities. None of this is addressed in the current TISG.

PART THREE — THE LAW

Parts One and Two established the evidentiary and institutional foundation of this submission: what the science shows, why the CNSC's framework fails to represent it accurately, and why the institution advising this assessment has structural features that prevent it from producing independent science. Part Three addresses the legal consequences. Each Bruce Stopper in Part Three identifies a specific statutory obligation, constitutional requirement, or legal principle that the current state of the assessment record fails to satisfy. The legal arguments in Part Three do not depend on accepting every scientific argument in Parts One and Two. Each legal argument is grounded in statutory text, judicial authority, or regulatory instrument. Many are satisfied on the basis of undisputed facts: CNSC is formally non-compliant with IAEA GSR Part 3 Requirement 29 — that is not a scientific dispute, it is a documented finding of two consecutive international review missions. The SON May 2025 letter is on the registry. The NLCA cap is in the statute. The Great Lakes Water Quality Agreement is a binding international treaty. These are not contested facts.

BRUCE STOPPER 17 — CANCER-ONLY HEALTH IMPACT ASSESSMENT SCOPE VIOLATES IAA SECTION 22(1)(a) (SS14)

What Section 22(1)(a) Requires

Section 22(1)(a) of the IAA requires that the impact assessment take into account the changes to the environment and to the health, social, and economic conditions that the designated project may cause. The word 'health' in this provision is not qualified. It does not say 'cancer health' or 'radiological cancer health.' It says health — the full spectrum of health effects that the project may cause. The TISG, as the instrument defining what the proponent must study to satisfy section 22(1)(a), must require the proponent to assess the full range of health effects that the project may cause, not a subset selected by an institution with structural reasons to favour a narrow scope.

The CNSC's health impact assessment framework accepts cancer as the sole quantitative health endpoint for nuclear facility assessments. It excludes five categories of health effects that the peer-reviewed scientific literature — including literature produced by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), which the CNSC itself cites as authoritative — documents as associated with chronic low-dose ionising radiation exposure. These five categories are: cardiovascular effects, neurological and neurodevelopmental effects, immune dysregulation, ophthalmic effects, and reproductive and developmental effects including transgenerational epigenetic outcomes.

The Five Excluded Categories and Their Evidentiary Basis

Cardiovascular Effects

UNSCEAR's 2006 and 2012 reports — both cited by the CNSC as authoritative sources for radiation health risk — document elevated cardiovascular disease risk at cumulative dose levels achievable through chronic low-dose exposure near nuclear facilities. The BEIR VII report similarly documents cardiovascular effects. The CNSC's cancer-only HIA scope excludes these effects despite their documentation in the CNSC's own cited authorities. A health risk assessment that uses UNSCEAR as its scientific foundation while excluding outcomes UNSCEAR documents is internally inconsistent.

Neurological and Neurodevelopmental Effects

Peer-reviewed literature documents neurological and neurodevelopmental effects from chronic low-dose ionising radiation exposure, including effects on cognitive development in children exposed in utero. Children whose mothers were in early pregnancy during the Chernobyl exposure period showed measurable cognitive effects at dose levels below those that cause acute radiation sickness. CNSC's HIA scope excludes these endpoints, leaving the most sensitive developmental outcomes unassessed for a population that has been chronically exposed for fifty years.

Immune Dysregulation

The peer-reviewed radiobiological literature documents immune system effects from chronic low-dose radiation exposure, including altered lymphocyte populations and changes in immune regulatory pathways. Immune dysregulation is mechanistically plausible from ionising radiation given its effects on rapidly dividing lymphoid precursor cells. CNSC's cancer-only scope excludes this endpoint category.

Ophthalmic Effects

Radiation-induced cataracts have been documented at doses lower than previously thought, with revised threshold estimates appearing in UNSCEAR 2012 and ICRP Publication 118. Nuclear facility workers and populations with chronic exposure histories face ophthalmic risks that are not captured in a cancer-only assessment framework. CNSC's scope excludes this category.

Reproductive and Developmental Effects Including Transgenerational Outcomes

The March 2025 IJMS epigenetic transgenerational study documented heritable epigenetic effects from low-dose radiation. Reproductive effects from ionising radiation — effects on fertility, pregnancy outcomes, and fetal development — are documented in the peer-reviewed literature at dose levels relevant to nuclear facility populations. CNSC's cancer-only scope excludes all of these effects. The exclusion of transgenerational outcomes is particularly significant given the Bruce site's fifty-year operating history: the population now living near the Bruce site includes second-generation residents whose parents were chronically exposed.

The Cancer-Only Model Is Not Scientifically Current

The cancer-only model was adopted in the postwar period, when the Life Span Study data was first being analysed and when radiation biology was primarily focused on cancer as the most visible outcome of radiation exposure. It reflected the state of radiobiological science in the 1950s and 1960s. It has not been updated to reflect four decades of subsequent research that has documented a broader range of health outcomes. Continuing to apply a 1950s-era health endpoint scope to a 2025 assessment is not scientifically defensible. The scientific literature the CNSC cites as authoritative — UNSCEAR and BEIR VII — has already moved beyond the cancer-only model. The CNSC's HIA scope has not followed.

The current TISG perpetuates the cancer-only scope by not requiring the proponent to assess any other endpoint category. The Impact Statement produced under the current TISG will present a health risk assessment that excludes five categories of documented health effects — not because the evidence does not exist, but because the CNSC's framework has not been updated to require them.

FINDING: IAA section 22(1)(a) requires assessment of 'health' effects — not 'cancer' effects. The CNSC's cancer-only HIA scope excludes five endpoint categories documented in UNSCEAR and BEIR VII — sources the CNSC itself cites as authoritative: cardiovascular effects, neurological and neurodevelopmental effects, immune dysregulation, ophthalmic effects, and reproductive and developmental effects including transgenerational outcomes. The exclusion is not scientifically justified by the current state of the radiobiological literature. The cancer-only model reflects the science of the 1950s-1960s applied to a 2025 assessment. The TISG does not require the proponent to assess any of the five excluded categories. An Impact Statement produced under the current TISG cannot satisfy section 22(1)(a) of the IAA.

IAAC TRAP: IAAC is trapped: if it accepts a compliant Impact Statement with a cancer-only health risk assessment, it accepts a submission that facially satisfies the TISG's health chapter requirements while failing the statutory requirement of section 22(1)(a) that health — not cancer — effects be assessed. Under Vavilov, a decision that satisfies subordinate instrument requirements while failing the governing statute is not a reasonable decision. If IAAC requires the five additional endpoint categories to be assessed — as section 22(1)(a) demands — it must amend the TISG.

BRUCE STOPPER 18 — THE BENEFITS-OUTWEIGH-HARM STANDARD HAS BEEN FORMALLY REJECTED — CARN v BWXT 2022 FC 849 (SS21/26)

What the Federal Court Found

In CARN v BWXT Nuclear Energy Canada Inc., 2022 FC 849, at paragraphs 47-53, the Federal Court confirmed a fact about the CNSC's regulatory framework that had not previously been stated explicitly in Canadian jurisprudence: the benefits-outweigh-harm standard is not a binding legal obligation on the CNSC in making licensing decisions under the Nuclear Safety and Control Act. The CNSC is not legally required, when issuing a licence, to find that the benefits of the licensed activity outweigh the harm it causes. It is required to find that adequate provision has been made for the protection of health, safety, security, and the environment. But it is not required to make a benefits-versus-harm determination.

This finding did not surprise the CNSC. Before the CARN litigation, the CNSC had formally rejected IAEA Integrated Regulatory Review Service Suggestion S9, which had recommended that the CNSC adopt a benefits-outweigh-harm analytical framework in its licensing decisions. The CNSC recorded its institutional position on IAEA Suggestion S9 as: 'Not accepted.' It has not disclosed this institutional position to IAAC in the Bruce C proceeding.

Why This Matters for the Section 63 Public Interest Determination

Section 63 of the IAA requires the Minister to determine whether the adverse effects of the Bruce C project within federal jurisdiction are in the public interest. Section 63(4) lists the factors to be weighed, including the impact on Indigenous rights and the extent to which effects are adverse. The section 63 determination is, at its core, a benefits-versus-harm weighing: are the project's benefits sufficient to justify its adverse effects? This is precisely the analytical framework the CNSC has formally declined to adopt in its own licensing function.

The consequence is that the CNSC — the primary technical adviser in this assessment on radiological health risk — has formally refused to engage with the analytical framework that the statute requires the decision-maker to apply. The CNSC will advise on whether the proponent has satisfied CNSC regulatory standards. It will not advise on whether the harm caused by satisfying those standards is justified by the benefits. The section 63 question will therefore reach the Review Panel and the Minister without the benefits-versus-harm analysis having been conducted by the body best positioned to conduct it.

This is not a gap that can be filled by the proponent's Impact Statement alone. The proponent has an obvious interest in characterising benefits highly and adverse effects minimally. An independent benefits-versus-harm analysis requires a body with no financial interest in the outcome — which, given the structural conflict of interest documented in Bruce Stopper 12, the CNSC is not. The current TISG does not require the proponent to provide a section 63-structured benefits-versus-harm analysis as a standalone chapter. The Minister will make a public interest determination on the basis of an Impact Statement that has not addressed the central question the statute requires to be addressed.

The Non-Disclosure Problem

The CNSC has not disclosed its 'Not accepted' position on IAEA Suggestion S9 to IAAC or to this proceeding. The duty of candor documented in Bruce Stopper 23 requires that material information affecting the Panel's assessment be disclosed even where that disclosure is adverse to the disclosing party's institutional interests. The CNSC's institutional rejection of the benefits-outweigh-harm framework is material information: it tells the Review Panel and the Minister that the body advising on health risk throughout this assessment has formally declined to conduct the analysis that the section 63 determination requires. This is not a minor technical omission. It is a material disclosure that would affect how the Review Panel structures its independent analysis under section 46.

FINDING: The Federal Court confirmed in CARN v BWXT (2022 FC 849, ¶¶47-53) that the benefits-outweigh-harm standard is not binding on the CNSC. The CNSC formally rejected IAEA IRRS Suggestion S9 recommending adoption of this standard, recording its position as 'Not accepted.' The CNSC has not disclosed this institutional position in the Bruce C proceeding. Section 63 of the IAA requires the Minister to determine whether adverse effects are in the public interest — a benefits-versus-harm determination — using a framework the CNSC has formally refused to apply. The TISG does not require the proponent to provide a section 63-structured benefits-versus-harm analysis. The Minister will make a public interest determination without the central analytical step the statute requires having been conducted.

IAAC TRAP: IAAC is trapped: if it accepts a compliant Impact Statement without a section 63-structured benefits-versus-harm analysis, it accepts a submission from which the central statutory question of the proceeding — whether adverse effects are in the public interest — is absent. The CNSC, whose formal institutional position is that this analysis is not required, will not supply it. The proponent, with an obvious interest in the outcome, will supply a one-sided version. The Review Panel will be left to conduct the analysis from scratch against an evidentiary record that was not structured to support it. If IAAC requires a standalone section 63 analysis — as the statute demands — it must amend the TISG.

BRUCE STOPPER 19 — IAEA DOSE CONSTRAINT NON-COMPLIANCE — TWO CONSECUTIVE INTERNATIONAL REVIEW CYCLES (SS22/27)

What IAEA GSR Part 3 Requirement 29 Requires

IAEA General Safety Requirements Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, Requirement 29 requires that dose constraints be established for planned exposure situations before facility design is fixed. A dose constraint is an upper bound on the individual dose from a specific source, established prospectively as part of the optimisation process. It is not a licence limit — it is a design objective that shapes how the

facility is engineered before construction begins. IAEA GSR Part 3 Requirement 29 establishes that dose constraints must be set before design is fixed, not after construction, because the purpose of a dose constraint is to constrain the design, not merely to document performance after the fact.

The 2019 IRRS Finding

In 2019, the International Atomic Energy Agency conducted an Integrated Regulatory Review Service mission to Canada — a peer review of the CNSC's regulatory framework against IAEA safety standards. The IRRS expert team examined the CNSC's application of dose constraints under Requirement 29. It found the CNSC non-compliant with Requirement 29 and issued Recommendation R2 requiring remediation. Recommendation R2 was a formal finding of non-compliance — the highest level of finding in an IRRS review. The CNSC was required to develop an implementation plan for achieving compliance.

The 2024 IRRS Follow-Up Finding

In 2024, the IAEA conducted a follow-up IRRS mission to Canada to assess the CNSC's progress on implementing the recommendations from the 2019 review. Recommendation R2 — the dose constraint non-compliance finding — remained open. The CNSC had not achieved compliance with IAEA GSR Part 3 Requirement 29 in the five years between the 2019 and 2024 reviews. Two consecutive international regulatory review cycles have now found the CNSC non-compliant with the same requirement.

The CNSC's own implementation plan for Requirement R2 defers the establishment of dose constraints to the construction licence phase. This is the precise reverse of what IAEA GSR Part 3 requires: constraints must be established before design is fixed, not at the construction stage when design has already been fixed and construction is beginning. The CNSC's implementation plan does not achieve compliance — it schedules a compliance-adjacent action at the wrong point in the licensing process.

The Bruce C Consequence

No dose constraint has been established for the Bruce C facility. None will be established before the Impact Statement is submitted, because the TISG does not require it and the CNSC's own implementation plan defers this to the construction licence stage. The Review Panel will evaluate an Impact Statement for a facility for which the primary public dose protection instrument — the dose constraint — does not yet exist.

The CNSC has not disclosed its two-cycle IAEA non-compliance to IAAC in its advisory role in this proceeding. The TISG does not require the proponent to address dose constraint status. An Impact Statement produced under the current TISG will present dose projections for the Bruce C facility against the backdrop of a regulatory framework that the international nuclear safety community has twice found non-compliant with the dose constraint requirement that governs those projections.

FINDING: The CNSC was found non-compliant with IAEA GSR Part 3 Requirement 29 in the 2019 IRRS review (Recommendation R2) and again in the 2024 IRRS follow-up. Two consecutive international regulatory review cycles have documented non-compliance with the same requirement. The CNSC's own implementation plan defers dose constraint establishment to the construction licence phase — the reverse of what Requirement 29 mandates. No dose constraint exists for the Bruce C facility. The CNSC has not disclosed this two-cycle non-compliance to IAAC. The TISG does not require the proponent to address dose constraint status. The Review Panel will evaluate dose projections for a facility whose regulatory framework has been found internationally non-compliant with the specific standard governing those projections.

IAAC TRAP: IAAC is trapped: if it accepts dose projections from a framework the IAEA found non-compliant in two consecutive reviews, it accepts health risk projections produced within a framework that the international nuclear safety peer review process has twice found inadequate. Under Vavilov, accepting technical evidence produced within a framework of acknowledged non-compliance — without requiring disclosure of that non-compliance or independent validation — is accepting evidence on an indefensible foundation. If IAAC requires dose constraint establishment before the Impact Statement is accepted — as IAEA GSR Part 3 Requirement 29 demands — it requires action the CNSC's own implementation plan does not contemplate at this stage, which means requiring an amendment to the assessment schedule that the current TISG does not provide for.

BRUCE STOPPER 20 — FREE PRIOR AND INFORMED CONSENT HAS BEEN GIVEN ON A MATERIALLY INACCURATE HEALTH INFORMATION BASE (SS11)

The FPIC Standard Under UNDRIP and Bill C-15

The United Nations Declaration on the Rights of Indigenous Peoples, implemented in Canada through the United Nations Declaration on the Rights of Indigenous Peoples Act (Bill C-15, SC 2021), requires that States obtain the free, prior, and informed consent of Indigenous peoples before approving projects affecting their lands, territories, and resources (Article 32(2)). Article 19 requires consultation and cooperation with Indigenous peoples to obtain their free, prior, and informed consent before adopting and implementing legislative or administrative measures that may affect them. The word 'informed' in FPIC is not incidental — it is a substantive requirement. Consent cannot be free, prior, and informed if the information on which it is based is materially inaccurate.

In Kebaowek First Nation v. Canadian Nuclear Laboratories, 2025 FC 319, the Federal Court established in the Canadian nuclear regulatory context that the FPIC process must be genuinely pursued and that a failure to provide accurate and complete information as the basis for Indigenous consent is a reviewable procedural defect. The Court's reasoning makes clear that

consent given on an inaccurate informational foundation does not satisfy the constitutional minimum.

The Information Base That Was Provided

The health information underlying the FPIC processes for Indigenous nations affected by the Bruce C project — including the Saugeen Ojibway Nation — is built on the CNSC's radiological health risk framework. That framework, as documented in Bruce Stoppers 1 through 16, contains the following material inaccuracies and omissions that are directly relevant to an Indigenous nation deciding whether to consent to a nuclear project on or near their territory:

- The cancer signal near nuclear plants is characterised as 'unfounded' — derived from 7 of 26 studies, with 19 studies omitted that support the existence of the signal. A nation consenting on the basis of 'no cancer risk near nuclear plants' is consenting on a factual misrepresentation.
- The tritium risk assessment uses a guideline (7,000 Bq/L) that Ontario's own independent advisory body (ODWAC 2009) found inadequate for the protection of pregnant women, fetuses, and infants — seventeen years ago. A nation consenting on the basis of the 7,000 Bq/L guideline as reflecting current scientific consensus is consenting on a misrepresentation of the regulatory adequacy of that guideline.
- The RBE of 1.0 is applied for tritium against the CNSC's own internal recommendation of 2.2, understating every tritium cancer risk calculation by at minimum a factor of 2.2. A nation consenting on the basis of the CNSC's published tritium risk figures is consenting on figures that the CNSC's own internal record shows are understated.
- Five health endpoint categories — cardiovascular, neurological, immune, ophthalmic, reproductive and developmental — are excluded from the health risk assessment that forms the basis of the consent process. A nation consenting on the basis of cancer-only health risk figures is not informed of the full range of documented health outcomes from chronic low-dose radiation exposure.
- The Harvard Nature Communications (2026) study estimating approximately 6,400 excess cancer deaths per year near US nuclear facilities has not been disclosed in any CNSC health risk communication or advisory input to this proceeding. A nation consenting on the basis of the CNSC's published risk characterisation is not informed of this finding.

The cumulative effect of these inaccuracies and omissions is that the health information provided as the foundation for Indigenous FPIC in this proceeding materially understates the radiological health risk from the proposed facility. Consent given on an information base that understates risk by documented factors of 2.2 to potentially much higher, excludes five health endpoint categories, and omits the most significant recent scientific literature, does not satisfy the 'informed' requirement of FPIC.

FINDING: The health information underlying the FPIC processes for Indigenous nations affected by the Bruce C project is built on the CNSC's radiological health risk framework, which: characterises the KiKK childhood leukemia signal as 'unfounded' on a 7-of-26-study reference set; applies tritium risk at 7,000 Bq/L against ODWAC 2009's finding that this is inadequate for the most sensitive subgroups; applies RBE of 1.0 against the CNSC's own internal recommendation of 2.2; excludes five health endpoint categories documented in CNSC's own cited authorities; and does not disclose the Harvard Nature Communications (2026) finding. Consent given on an information base that is materially inaccurate in these specific documented respects does not satisfy the 'informed' requirement of UNDRIP Article 32(2), Bill C-15, or Kebaowek First Nation v CNL 2025 FC 319. This is a substantive constitutional defect that cannot be corrected after approval.

IAAC TRAP: IAAC is trapped: if it proceeds to approval relying on FPIC processes built on a materially inaccurate health information base, it proceeds on a constitutionally defective FPIC foundation. Under Kebaowek and UNDRIP, this defect is not cured by subsequent consultation on downstream questions — the defect is in the informational foundation of the consent itself. If IAAC requires the health information to be corrected and resubmitted before consent processes are treated as adequate, it must require amendments to the TISG that correct the health risk framework deficiencies — which takes the full scope of Bruce Stoppers 1 through 16 to remedy. The FPIC defect cannot be isolated from the scientific and institutional defects that caused it.

BRUCE STOPPER 21 — THE SAUGEEN OJIBWAY NATION FORMALLY DOCUMENTED ITS INABILITY TO ENGAGE WITH TISG SCOPING BEFORE THE TISG WAS FINALISED

What SON Did and When

The Saugeen Ojibway Nation is the primary First Nations rights-holder in the territory encompassing the Bruce C project site. SON holds Treaty rights under Treaty 72 (1854) covering a territory that includes the Bruce Power site, the Lake Huron and Georgian Bay shoreline, and surrounding lands. SON's Treaty rights — including fishing rights, water rights, and land use rights — will be affected by the Bruce C project for the full operational life of the facility, estimated at sixty to one hundred years including decommissioning.

In May 2025, the Saugeen Ojibway Nation submitted a formal letter to IAAC stating that it was unable to provide adequate comments on the draft TISG due to the inadequacy of the engagement process at that stage. This letter is on the public registry of the Bruce C assessment. It is a documented, on-registry statement by the primary rights-holder that the TISG scoping process was inadequate for SON to participate meaningfully.

The final TISG was issued on August 19, 2025 — approximately three months after SON's formal letter documenting its inability to engage. The TISG was finalised over the documented inability of the primary rights-holder to participate in the scoping process. No substantive IAAC response

addressing SON's specific concerns appears on the registry record for the period between the May 2025 letter and the August 2025 finalisation. The scope of what the proponent must study about effects on SON territory and Treaty rights was therefore defined without adequate SON input.

Why This Is a Specific, Documented Procedural Defect

This Bruce Stopper does not rest on a general argument about FPIC obligations in nuclear assessments. It rests on a specific, documented, on-registry factual record: SON told IAAC it could not engage adequately; IAAC finalised the TISG anyway; SON's documented inability to shape the scoping questions means the IS will answer questions whose scope SON did not adequately influence.

The significance of scoping-stage engagement is that it determines what questions get asked. If the TISG does not require the proponent to assess certain effects on SON territory — effects that SON would have required to be assessed had it been able to engage adequately — those effects will not appear in the Impact Statement. Post-TISG engagement on the proponent's answers to questions that were scoped without SON's input does not restore SON's ability to shape what questions were asked. The scoping defect is irreversible once the TISG is finalised.

In Kebaowek First Nation v. Canadian Nuclear Laboratories, 2025 FC 319, the Federal Court established that FPIC must be actively pursued at the relevant decision stage. The relevant stage for the TISG is the scoping stage — the stage at which the scope of the assessment is defined. A TISG finalised over the primary rights-holder's documented inability to engage at the scoping stage has a specific, identifiable procedural defect at the scoping stage. Post-TISG consultation cannot retroactively cure this defect, because the defect is in the scoping of the questions, not in the quality of consultation on the answers.

The Health Information Dimension

As documented in Bruce Stopper 20, the health information underlying SON's consent processes is built on the CNSC's radiological health risk framework — which understates tritium risk by a factor of at least 2.2, excludes five health endpoint categories, and omits the most significant recent scientific literature. SON's documented inability to engage with the TISG scoping process compounds this problem: not only is the health information inaccurate, but the primary rights-holder was unable to participate in defining the scope of how that health information would be assessed in the Impact Statement. The combination of inaccurate information and inadequate scoping engagement produces a TISG whose health chapters were defined without adequate input from the people most affected by the health risk it is supposed to assess.

> **FINDING: The Saugeen Ojibway Nation formally documented on the public registry in May 2025 that it was unable to provide adequate TISG comments due to inadequacy of engagement. The TISG was finalised on August 19, 2025 over this documented inability. The scope of what the proponent must study about effects on SON territory and Treaty rights was defined without adequate SON input at the scoping stage. Post-TISG IS-phase engagement cannot retroactively cure a scoping-stage defect: the defect is in what questions are asked, not in the quality**

of consultation on the answers. Kebaowek First Nation v CNL 2025 FC 319 confirms that FPIC must be actively pursued at the relevant decision stage. The scoping stage is the relevant stage for the TISG. This is a specific, documentable, on-registry procedural defect that is unique to the Bruce C assessment.

IAAC TRAP: IAAC is trapped: it cannot deny that SON's May 2025 letter is on the registry — it is. It cannot claim the TISG adequately addressed SON's concerns — the TISG was finalised three months after SON said it could not engage adequately, with no substantive response on the registry. If IAAC proceeds to accept an Impact Statement produced under a TISG whose scoping was completed over the primary rights-holder's documented inability to engage, it proceeds on a specific, documented, on-registry procedural defect. Under Kebaowek and UNDRIP, this defect is independently sufficient to require remediation before the assessment proceeds to the IS phase.

BRUCE STOPPER 22 — IRREVERSIBILITY — IF HARM OCCURS AT THE BRUCE SITE SCALE IT CANNOT BE DETECTED, REMEDIED, OR REVERSED (SS12 adapted)

The Nature of Irreversibility in This Context

The precautionary principle under IAA section 6(1)(a) specifically applies to threats of serious or irreversible damage. Irreversibility is therefore not merely a practical concern — it is a statutory criterion that determines whether and how the precautionary principle applies. For the Bruce C assessment, irreversibility operates at three distinct levels simultaneously: the radiological contamination of the Lake Huron watershed, the long-term health consequences of chronic exposure, and the incapacity of the monitoring framework to detect harm in time to prevent it.

Level 1: Watershed Contamination Is Irreversible at Practical Scales

Tritium is a radioactive isotope of hydrogen with a physical half-life of 12.3 years. Once released to the Lake Huron watershed — through atmospheric HTO deposition, direct liquid discharge, or accident release — tritium does not stay in one place. It mixes with the water mass of Georgian Bay and Lake Huron over timescales determined by the hydrodynamics of those water bodies. Once mixed at lake-scale, it cannot be removed. The existing fifty-year CANDU tritium loading described in Bruce Stopper 9 has already reached a state of distribution throughout the Georgian Bay watershed that cannot be reversed without removing and replacing the entire water mass of Georgian Bay — a practical impossibility.

A severe accident at Bruce C that resulted in a significant radiological release to Lake Huron would create a contamination event of potentially Chernobyl or Fukushima scale in a drinking water source for approximately forty million people. Fukushima contaminated approximately 24,000 square kilometres of land for purposes that have required ongoing remediation costing hundreds of billions of dollars over more than a decade, with significant areas still restricted. Lake Huron contamination at a comparable scale would be irreversible in any practical timeframe: there is no technology for removing radioisotopes from a body of water 59,596 square kilometres in

area and 147 metres deep that serves as drinking water for forty million people on both sides of an international border.

Level 2: Chronic Health Consequences Are Irreversible

If the forty-year evidence record documented in Bruce Stopper 1 is correct — that children living near operating nuclear plants face approximately double the childhood leukemia rate — then every year Bruce C operates while the monitoring framework is incapable of detecting this elevation is a year in which children in the Bruce-proximate community face elevated leukemia risk without detection or remediation. The harm from each year of undetected elevated risk cannot be undone by detecting the elevation in a later year and shutting the facility down. The cancers that occur in the interim are irreversible consequences of the approval decision.

The transgenerational epigenetic effects documented in the March 2025 IJMS study are irreversible by definition: heritable changes to gene expression patterns affect individuals who were never themselves exposed and who could not, even in principle, have had their exposure reduced by any regulatory decision taken after their parents' exposure. The transgenerational consequences of chronic radiation exposure near a nuclear facility cannot be monitored away, conditioned away, or reversed after the fact. They can only be avoided before the fact, by not approving the facility.

Level 3: Monitoring Cannot Detect Harm in Time to Prevent It

As documented in Bruce Stopper 16, the monitoring framework available for the Bruce-proximate community is structurally incapable of detecting elevated childhood leukemia rates within any regulatory timeframe given the size of the local population. The consequence is not merely that monitoring is inadequate in an abstract sense — it is that the combination of monitoring incapacity and irreversible harm creates a specific practical danger: if the approval decision is wrong — if Bruce C does elevate cancer rates in the proximate community — the error will not be detected until it has operated long enough to produce statistical signals that override the power limitations of the small-population monitoring design. By that time, the harm will have been accumulating for years or decades, the facility will be deeply embedded in Ontario's energy infrastructure, the sunk costs will be enormous, and the harm cannot be undone.

A monitoring condition attached to the Bruce C approval therefore does not function as a genuine safeguard against this irreversibility. It functions as a mechanism for documenting that the harm occurred, after it has already occurred and cannot be remedied, in a form that will be legally useful for the next generation that must live with the consequences of the approval decision. This is not the function of a safeguard in a legal and regulatory framework that takes the precautionary principle seriously.

> **FINDING: Irreversibility operates at three simultaneous levels in the Bruce C assessment: watershed contamination of Lake Huron is irreversible at practical scales once it occurs; chronic health consequences including transgenerational epigenetic effects are irreversible by definition; and the monitoring framework is structurally incapable of detecting harm in time to prevent it. The combination of these three dimensions means that if the Bruce C approval decision is wrong — if**

the facility does elevate health risks in the proximate community and the Lake Huron watershed — the error cannot be detected, remedied, or reversed within any human timeframe. The precautionary principle under IAA s.6(1)(a) specifically applies to threats of irreversible damage. All three levels of irreversibility are present simultaneously in this assessment.

IAAC TRAP: IAAC is trapped: if it approves Bruce C with a monitoring condition as its primary response to radiological health risk uncertainty, it attaches a condition that cannot function as a genuine safeguard against irreversible harm given the monitoring framework's demonstrated incapacity. Under Vavilov, attaching a condition that is not rationally connected to the regulatory objective it is meant to achieve — because the monitoring programme cannot detect what it is meant to detect — is not a reasonable exercise of statutory authority. The precautionary principle requires that irreversible harm be prevented, not merely documented after the fact. An approval made without addressing the irreversibility dimension does not engage the precautionary principle — it evades it.

BRUCE STOPPER 23 — THE CNSC HAS BREACHED ITS DUTY OF CANDOR THROUGH MULTIPLE MATERIAL NON-DISCLOSURES (SS30)

The Duty of Candor in Administrative Proceedings

Administrative bodies participating in quasi-judicial proceedings owe a duty of candor to the tribunal before which they appear and to parties who are affected by their submissions. This duty is grounded in Baker v Canada (Minister of Citizenship and Immigration), [1999] 2 SCR 817, where the Supreme Court of Canada established the general principle of procedural fairness applicable to administrative decision-making. It is affirmed through Dunsmuir v New Brunswick, [2008] 1 SCR 190, and confirmed as applicable to all administrative proceedings by Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65. The duty of candor requires that a body submitting technical information to a quasi-judicial proceeding disclose material qualifications to its conclusions — information that would affect how the tribunal evaluates those conclusions — even where that disclosure is adverse to the disclosing party's institutional interests.

The duty of candor is not satisfied by the availability of contrary information in the published scientific literature. It requires affirmative disclosure of information that is material to the tribunal's assessment. A body that presents confident technical conclusions to a quasi-judicial tribunal while withholding the material qualifications that would reveal those conclusions as contested, uncertain, or contradicted by the body's own internal record breaches the duty of candor regardless of whether the tribunal could have found the disqualifying information through its own research.

The Specific Non-Disclosures

The CNSC has breached its duty of candor in the Bruce C proceeding through the following specific material non-disclosures, each of which is independently material to the Panel's assessment:

Non-Disclosure 1: VDR Status of Both Candidate Technologies

Neither technology under consideration for the Bruce C project has a current completed Canadian Vendor Design Review. The CNSC has not disclosed this to IAAC. The Review Panel cannot assess the licensing feasibility of any specific technology without knowing its VDR status. An IS submitted without a technology selection, or for a technology without a completed VDR, cannot support a Licence to Prepare Site. The TISG does not require disclosure of VDR status.

Non-Disclosure 2: Two-Cycle IAEA Dose Constraint Non-Compliance

The CNSC was found non-compliant with IAEA GSR Part 3 Requirement 29 in 2019 and again in 2024. It has not disclosed this two-cycle non-compliance to IAAC. Dose projections submitted by the proponent will be assessed against a regulatory framework the international community has twice found inadequate. The non-compliance is material to evaluating the reliability of dose projections produced within that framework.

Non-Disclosure 3: Formal Rejection of Benefits-Outweigh-Harm Standard

The CNSC formally rejected IAEA IRRS Suggestion S9 recommending adoption of a benefits-outweigh-harm framework and recorded its position as 'Not accepted.' The Federal Court confirmed in CARN v BWXT (2022 FC 849) that this standard is not binding on the CNSC. The CNSC has not disclosed this institutional position in a proceeding whose central question under IAA s.63 is whether adverse effects are in the public interest — a benefits-outweigh-harm determination. This non-disclosure is material to how the Review Panel structures its independent analysis.

Non-Disclosure 4: INFO-0799 and the Sixteen-Year Research Gap

INFO-0799 (2010) formally documented that the evidence base was insufficient to estimate tritium health risks with confidence. The CNSC has not disclosed this document's conclusions in its advisory submissions to this proceeding while simultaneously presenting confident tritium risk characterisations that INFO-0799 said could not be supported. The contradiction between INFO-0799 and the CNSC's published tritium framework is material to evaluating the reliability of tritium risk assessments in the Impact Statement.

Non-Disclosure 5: Six Post-2023 Major Studies

Six major peer-reviewed studies published between August 2024 and March 2026 — including a Nature Communications study estimating approximately 6,400 excess cancer deaths per year near US nuclear facilities and an INWORKS study finding ERR 2.68/Gy for leukemia in nuclear workers — have not been disclosed to IAAC or acknowledged in CNSC advisory submissions. These studies are material to the health risk assessment at the centre of this proceeding.

Non-Disclosure 6: The RBE 2.2 Internal Recommendation

The CNSC's own internal scientific record contains a recommendation that RBE of 2.2 should be applied for tritiated water and OBT. The CNSC applies RBE of 1.0 in its published framework, understating every tritium cancer risk calculation by at minimum a factor of 2.2. The discrepancy between the internal recommendation and the published application has not been disclosed to IAAC. It is material to evaluating the reliability of every tritium risk figure in this proceeding.

FINDING: The CNSC has breached its duty of candor in the Bruce C proceeding through six specific material non-disclosures: VDR status of both candidate technologies; two-cycle IAEA dose constraint non-compliance; formal rejection of the benefits-outweigh-harm standard ('Not accepted'); INFO-0799's documented insufficiency of the tritium evidence base; six major post-2023 peer-reviewed studies; and the RBE 2.2 internal recommendation against the published application of 1.0. Each non-disclosure is independently material to the Panel's assessment. Together they constitute a pattern of withholding qualifications to technical conclusions that would affect how those conclusions are evaluated. The duty of candor grounded in Baker, Dunsmuir, and Vavilov requires affirmative disclosure. The failure to disclose is not cured by the availability of contrary information in the scientific literature.

IAAC TRAP: IAAC is trapped: if it proceeds on the basis of CNSC technical submissions that are materially qualified in ways the CNSC has not disclosed, it proceeds on a procedurally contaminated evidentiary record. Under Vavilov, a proceeding contaminated by breach of the duty of candor by a principal participant does not produce an evidentiary record that can support a reasonable decision. IAAC cannot simply proceed and hope reviewing courts don't notice. The specific non-disclosures documented in this Bruce Stopper are on the registry record or in the CNSC's own published documents. If IAAC requires the CNSC to make the material disclosures the duty of candor demands — as it should — it must issue a direction that the CNSC has not volunteered to comply with.

BRUCE STOPPER 24 — THE GREAT LAKES WATER QUALITY AGREEMENT CREATES BINDING INTERNATIONAL LEGAL OBLIGATIONS THAT HAVE NOT BEEN ADDRESSED

The Agreement and Its Legal Status

The Great Lakes Water Quality Agreement was concluded between Canada and the United States in 1978 and has been amended subsequently, most recently in 2012. It is a binding bilateral treaty between two sovereign states. Its legal status in Canada is that of an international treaty obligation binding on the Government of Canada and, through the federal executive, on federal regulatory and assessment bodies acting on behalf of Canada. It is not a policy document or a non-binding international instrument. It is a treaty.

The Agreement's stated purpose is to restore and maintain the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. Article VI establishes specific water quality objectives applicable to both countries. Article IX establishes the International Joint Commission as the coordinating oversight body with authority to investigate disputes and make recommendations to both governments. The IJC has active investigative and reporting authority — it is not merely a consultative body.

What the Agreement Requires for the Bruce C Context

The Bruce C facility, if constructed, will discharge cooling water to Georgian Bay and release tritium and other radionuclides to the Lake Huron watershed through permitted atmospheric and liquid pathways. The facility sits on a watershed that is governed by a binding bilateral treaty with specific water quality objectives, an active international enforcement mechanism, and a population of approximately forty million people in two countries drawing drinking water from the system.

The Great Lakes Water Quality Agreement creates the following obligations that are directly relevant to the Bruce C assessment and have not been addressed in the TISG:

- Article VI notification obligations: Canada is required to notify the United States of activities that may cause transboundary pollution affecting the Great Lakes Basin ecosystem. A severe accident at Bruce C that resulted in a significant radiological release to Lake Huron would trigger these notification obligations. The IS must address what Canada's notification obligations are and what the consequences of triggering them would be.
- IJC investigation authority: If the US EPA or the US government believed that Bruce C was causing or threatening to cause transboundary pollution affecting the Great Lakes Basin, it could refer the matter to the IJC for investigation. The IJC's findings would be directed to both governments and would constitute an international record of Canada's regulatory performance. The IS must address this international accountability dimension.
- Water quality objectives: The Agreement establishes specific water quality objectives for the Great Lakes Basin. Routine tritium releases from Bruce C, added to the existing fifty-year CANDU loading documented in Bruce Stopper 9, must be assessed against these objectives — not only against domestic CNSC standards. The IS must address whether Bruce C's emissions are consistent with Canada's treaty obligations under the Agreement.
- US jurisdiction over affected persons: Approximately 40 million people in Michigan, Ohio, Indiana, Pennsylvania, and New York draw drinking water from the Great Lakes system. A severe accident at Bruce C would potentially affect the drinking water of US citizens without those citizens having any participation in or influence over the Canadian regulatory approval process. The Agreement creates a framework for addressing this jurisdictional gap. The IS must engage with it.

The CNSC's Non-Disclosure

The CNSC has not identified the Great Lakes Water Quality Agreement's specific implications for the Bruce C assessment in any advisory submission to IAAC or any published regulatory document relating to this proceeding. As documented in Bruce Stopper 23, this is a breach of the duty of candor: an international treaty obligation that creates specific procedural and substantive requirements for Canada is material information that must be disclosed to a quasi-judicial proceeding assessing a project that triggers those obligations. The TISG does not require the proponent to assess Canada's obligations under the Agreement. Full analysis is provided in Appendix J.

FINDING: The Great Lakes Water Quality Agreement (Canada-USA, 1978) is a binding international treaty governing the Lake Huron watershed. It creates specific notification obligations under Article VI, IJC oversight authority under Article IX, and water quality objectives applicable to Bruce C's routine and accident-release emissions. Approximately 40 million people in two countries draw drinking water from the affected system. The CNSC has not identified these treaty obligations in its advisory role in this proceeding. The TISG does not require the proponent to assess Canada's obligations under the Agreement, to quantify the transboundary liability from a severe accident, or to identify the international legal consequences of triggering Article VI notification. No other proposed nuclear facility in Canada sits on a watershed governed by a binding bilateral treaty with an active enforcement mechanism and a 40-million-person affected population on both sides of the border.

IAAC TRAP: IAAC is trapped: if it accepts an Impact Statement that does not address the Great Lakes Water Quality Agreement's specific implications — notification obligations, IJC authority, water quality objectives, US affected persons — it accepts a public interest determination made without addressing Canada's binding treaty obligations in the watershed most affected by the proposed facility. A section 63 determination that ignores binding international treaty obligations is not compliant with the legal constraints imposed on the decision-maker under Vavilov. If IAAC requires the proponent to address these treaty obligations, it must amend the TISG.

BRUCE STOPPER 25 — NO LICENSED PERMANENT WASTE DISPOSAL PATHWAY EXISTS — THE EAGLE LAKE FIRST NATION COURT CHALLENGE ELIMINATES THE ONLY PROPOSED ROUTE

(SS19/24)

The Waste Generated by Bruce C

The Bruce C project, if approved and constructed, will generate nuclear waste across three categories over its operational and decommissioning lifetime: used nuclear fuel (high-level waste), intermediate-level waste from reactor components and operations, and low-level waste from

routine operations. Each category requires a different disposal pathway. Canada currently has no licensed permanent disposal facility for any of these categories. The only proposed permanent disposal facility for used nuclear fuel is the Deep Geological Repository project being developed by the Nuclear Waste Management Organization.

The DGR Status and Timeline

Canada's Deep Geological Repository project entered its regulatory review phase in January 2026 following the NWMO's Initial Project Description submission to IAAC. The DGR will not be operational until the 2040s at the earliest — and this timeline assumes no significant regulatory delays, no successful legal challenges, and no community opposition that requires process restart. During the period between Bruce C's first fuel loading and the DGR's operational commissioning — a period measured in decades — all used nuclear fuel generated by Bruce C will require interim on-site storage. For intermediate and high-level non-fuel waste, no proposed permanent disposal site exists at all.

The TISG does not require the proponent to address the scenario where licensed permanent disposal pathways are unavailable for the full inventory of waste generated over Bruce C's operational life. It does not require assessment of what the interim on-site storage plan is if the DGR is not available when Bruce C's used fuel storage reaches capacity. It does not require the proponent to address UNDRIP Article 29.2, which prohibits the storage or disposal of hazardous materials on Indigenous lands without free, prior, and informed consent. All of these are material questions for the section 63 public interest determination.

The Eagle Lake First Nation Court Challenge

On December 20, 2024, Eagle Lake First Nation filed a court challenge to the DGR site selection process in Ontario. The challenge questions the adequacy of the consultation and consent process through which the South Bruce site was selected as the proposed DGR location. If this challenge is successful, it would eliminate the currently proposed site for Canada's only proposed used nuclear fuel repository — leaving no licensed or proposed permanent disposal pathway for the used fuel that Bruce C will generate throughout its operational life.

The CNSC has not disclosed the Eagle Lake First Nation court challenge to IAAC in its advisory role in this proceeding. The challenge is material information: if the DGR site selection is set aside, the waste management plan for Bruce C has no permanent disposal endpoint. An Impact Statement that presents an interim storage plan as bridging to a permanent DGR disposal pathway, without disclosing that the proposed DGR pathway is the subject of a legal challenge that could eliminate it, is presenting an incomplete and potentially misleading waste management case.

The Financial Assurance Dimension

CNSC REGDOC-3.3.1 requires financial guarantees sufficient to cover decommissioning costs for the full licensed life of a nuclear facility. Decommissioning costs for large Canadian nuclear stations are substantial: Pickering's decommissioning is estimated at approximately $12.8 billion CAD. Bruce C is a new build at a remote site, first-of-kind in design configuration, with

decommissioning costs that have no established benchmark. The proponent — Bruce Power, an established nuclear operator — is better positioned than most proponents to address this requirement. But the TISG does not require the proponent to demonstrate that adequate financial assurance exists for decommissioning, including the costs of long-term used fuel storage pending a permanent disposal pathway that may not be available for decades.

FINDING: No licensed permanent disposal facility exists for used nuclear fuel or intermediate-level waste in Canada. The only proposed permanent disposal site — the NWMO Deep Geological Repository — will not be operational until the 2040s at the earliest and is subject to a court challenge filed by Eagle Lake First Nation on December 20, 2024, that could eliminate the proposed site. The CNSC has not disclosed this court challenge to IAAC. The TISG does not require the proponent to address the scenario where no permanent disposal pathway is available for the full waste inventory, to assess long-term interim storage implications, to address UNDRIP Article 29.2 FPIC requirements for waste storage near Indigenous territory, or to demonstrate adequate financial assurance for decommissioning and long-term storage. The waste management case for Bruce C has no permanent disposal endpoint that is not currently legally challenged.

IAAC TRAP: IAAC is trapped: if it accepts an Impact Statement that presents used fuel interim storage as a bridge to DGR permanent disposal without disclosing the Eagle Lake First Nation court challenge that could eliminate the DGR site, it accepts a waste management case built on an assumed disposal pathway whose availability is legally contested. Under Vavilov, proceeding on the basis of a material assumption — the availability of a permanent disposal pathway — that has been specifically called into question by a legal challenge that has not been disclosed, is proceeding on an indefensible factual foundation.

BRUCE STOPPER 26 — THE CONCURRENT BRUCE A&B POWER UPRATE CREATES A MOVING BASELINE DURING THE ASSESSMENT

What the Power Uprate Is

Bruce Power has applied to the CNSC for approval to increase the licensed power output of the existing Bruce A and Bruce B nuclear generating stations. The application seeks approval to operate the existing eight units at power levels above their current licensed capacity. A CNSC written hearing on this application is scheduled for July 2026. If approved, the power uprate will increase the routine radionuclide emissions — particularly tritium — from the existing Bruce A and B stations above their current permitted levels.

The Bruce C impact assessment is simultaneously proceeding with the power uprate application. The two proceedings are independent regulatory processes, but they share a critical factual relationship: the cumulative effects chapter of the Bruce C Impact Statement must assess Bruce C's incremental impact against a baseline that includes the existing Bruce A and B emissions. If

the power uprate is approved during the IS phase — the IS deadline is approximately August 2026 — the baseline emissions will have changed during the IS preparation period. The proponent will be assessing Bruce C's incremental impact against a baseline that will be outdated by the time the IS is submitted.

Why This Creates a Specific Assessment Problem

Standard cumulative effects assessment methodology requires a defined baseline: the current state of the environment, including current emissions from existing sources. For the Bruce C cumulative effects chapter, the current state includes the emissions from Bruce A and B as licensed. If the licence conditions for Bruce A and B change during the IS preparation period, the baseline changes. The IS will have been prepared against the pre-uprate baseline but submitted after the uprate approval — producing an IS whose cumulative effects assessment is based on a baseline that has been superseded.

This is not a hypothetical risk. The CNSC written hearing is scheduled for July 2026. The Bruce C IS deadline is approximately August 2026. If the hearing proceeds on schedule and the uprate is approved, the approval will occur during the IS preparation window. The cumulative effects chapter of the Bruce C IS will be based on a baseline that will change before the IS is submitted. This is a known, scheduled, foreseeable problem that the TISG does not require the proponent to address.

The Tritium Baseline Dimension

The power uprate's specific relevance to this submission is tritium. A power increase in CANDU reactors increases tritium production proportionally to the power increase — because tritium is produced through neutron activation of the heavy water moderator and coolant, and a higher power level means a higher neutron flux and higher tritium production. If the power uprate is approved, the annual tritium production at the Bruce site will increase. The Georgian Bay near-shore tritium baseline described in Bruce Stopper 9 will increase. The incremental tritium contribution of Bruce C — assessed against the pre-uprate baseline — will be understated relative to the actual post-uprate cumulative scenario.

> **FINDING: A concurrent CNSC written hearing on Bruce Power's application to increase the licensed power output of Bruce A and B is scheduled for July 2026. The Bruce C IS deadline is approximately August 2026. If the power uprate is approved during the IS preparation period — a foreseeable, scheduled outcome — the baseline tritium emissions from the existing Bruce A and B stations will increase before the IS is submitted. The cumulative effects chapter of the Bruce C IS will be based on a pre-uprate baseline that has been superseded. The TISG does not require the proponent to address this moving baseline problem or to commit to updating its cumulative effects assessment if the uprate approval occurs before IS submission. This is a Bruce C-specific problem with no equivalent in any other current Canadian nuclear assessment.**

IAAC TRAP: IAAC is trapped: if it accepts a cumulative effects chapter based on a pre-uprate baseline after the uprate has been approved, it accepts a cumulative effects assessment that does not reflect the actual baseline conditions at the time of IS submission. Under Vavilov, accepting a factual foundation that has been superseded by a known, foreseeable regulatory decision is accepting an indefensible factual foundation. If IAAC requires the IS to be updated to reflect the post-uprate baseline — if the uprate is approved before IS submission — it must build this requirement into the TISG, because the current TISG does not address it.

BRUCE STOPPER 27 — NO ALTERNATIVES ASSESSMENT HAS BEEN REQUIRED DESPITE THE IAAC'S OWN SUMMARY OF ISSUES IDENTIFYING IT AS A KEY CONCERN (SS17)

The Statutory Requirement

Section 22(1)(f) of the IAA requires that the impact assessment take into account any alternatives to the designated project that are technically and economically feasible and are directly related to the designated project. Section 22(1)(i) requires assessment of any alternative means of carrying out the designated project that are technically and economically feasible. These are mandatory factors — not discretionary. The TISG must include requirements that allow these factors to be addressed unless IAAC has determined that they are not material to decision-making for this specific project and has documented that determination.

The IAAC's own Summary of Issues for the Bruce C assessment identified, as a key concern, whether other technologies may be more appropriate for meeting Ontario's electricity needs. This is a verbatim identification of the alternatives question — section 22(1)(f) — as a relevant issue in IAAC's own assessment. IAAC exercised its judgment that alternatives are a key concern in the SOI and then produced a final TISG that does not require an alternatives assessment. The omission is unexplained.

The Vavilov Non-Explanation Problem

Under Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65, an administrative decision-maker who departs from its own previously stated position bears the burden of explaining that departure with transparent and intelligible reasons. IAAC stated in the SOI that alternatives are a key concern. IAAC then produced a TISG that does not require alternatives to be assessed. No explanation for this departure appears in the TISG finalization documents on the public registry. The departure is unexplained and is therefore unreasonable on that ground alone, regardless of whether alternatives are in fact material to decision-making for Bruce C.

The Ontario Viable Alternatives

The viable alternatives for meeting Ontario's electricity needs — the need the Bruce C project proposes to address — are not hypothetical. As documented in Bruce Stopper 11, they are contracted, licensed, or under construction:

- The Darlington SMR (BWRX-300): Licence to Construct issued April 4, 2025; under construction; PSA on public CNSC record; Vogtle operating experience available. The most comparable Ontario nuclear alternative.
- Bruce A and B power uprate: The concurrent proceeding documented in Bruce Stopper 26 demonstrates that additional capacity from existing licensed Bruce units may be available without a new facility assessment.
- Renewable generation plus storage: The IESO's 2024 Annual Planning Outlook identifies significant queued renewable capacity. Grid-scale BESS projects have received IESO NID approval in 2024-2025.
- Natural gas with CCS: Firm dispatchable capacity; no radiological hazard; no EPZ; no long-lived radioactive waste; no NLCA liability cap.

REGDOC-2.5.2 §2.2.1, as documented in Bruce Stopper 11, independently requires comparison against viable competing technologies. The alternatives assessment under IAA ss.22(1)(f) and (i) and the comparative societal risk requirement under REGDOC-2.5.2 §2.2.1 are two separate mandatory obligations that both require the proponent to demonstrate why Bruce C is preferred over available alternatives. Neither appears in the current TISG.

The Section 63 Consequence

The Minister's section 63 public interest determination requires weighing the adverse effects of Bruce C against its benefits, including the purpose of and need for the project. Need cannot be assessed without determining whether that need can be met by alternatives. If Ontario's electricity needs can be met by expanding renewable generation plus storage, by completing the Bruce A and B uprate, or by constructing additional Darlington-type SMRs — without the radiological health risks, waste management challenges, and international treaty obligations associated with a new large CANDU facility on Lake Huron — then the public interest question must be answered with that information before the Minister. The current TISG ensures that the Minister will not have it.

FINDING: IAA sections 22(1)(f) and (i) create mandatory requirements to assess alternatives to the project and alternative means of carrying it out. IAAC's own SOI identified alternatives as a key concern in explicit terms. The final TISG omits an alternatives assessment requirement without explanation. REGDOC-2.5.2 §2.2.1 independently creates a mandatory 'shall' requirement to demonstrate societal risk comparable to viable competing technologies. Viable Ontario alternatives are not hypothetical — the Darlington SMR has a Licence to Construct, BESS projects have IESO approval, and the concurrent power uprate may supply additional licensed capacity. The unexplained departure from the SOI position is independently unreasonable under Vavilov. Two independent mandatory obligations — the IAA statutory requirement and the CNSC mandatory licensing standard — both require alternatives assessment. Neither appears in the TISG.

IAAC TRAP: IAAC is trapped: the departure from its own SOI position on alternatives is unexplained and is independently unreasonable under Vavilov. The REGDOC-2.5.2 §2.2.1 mandatory requirement is missing from a TISG that CNSC co-authored. IAAC cannot defend the omission of its own SOI concern; the CNSC cannot defend the omission of its own mandatory 'shall' requirement. Both are independently required to be in the final TISG. Both are absent. If IAAC acknowledges this Bruce Stopper, it must amend the TISG. If it does not acknowledge it, the omission is on the registry record and will be available to any reviewing court.

PART FOUR — STRUCTURAL INVALIDITY

Parts One through Three established the evidentiary, institutional, and legal grounds upon which the Bruce C project cannot be approved on the current record. Part Four addresses a different and more fundamental level of argument: not that the project fails on specific scientific or legal grounds, but that the assessment process as currently designed cannot produce a valid outcome regardless of what the proponent submits.

This distinction matters. Parts One through Three identify problems that are, in principle, remediable: the science could be updated, the institutional conflicts could be disclosed, the legal requirements could be satisfied through TISG amendment. Part Four identifies problems at the process level that are not remediable by the proponent's diligence or by supplementary conditions: problems in the instrument that governs the assessment, in the legal framework through which the Panel exercises its powers, in the evidentiary structure of the proceeding, and in the cumulative weight of the grounds that have accumulated against approval.

The seven Bruce Stoppers in Part Four are structured around a single central proposition: IAAC is legally trapped. Every path available to it on the current record leads to a consequence it cannot lawfully defend. The analysis of each path and each trap is set out in Bruce Stopper 33. The seven grounds of cumulative structural invalidity are set out in Bruce Stopper 34. The preceding Bruce Stoppers in Part Four establish the specific structural deficiencies from which the trap and the invalidity grounds flow.

BRUCE STOPPER 28 — TECHNOLOGY NEUTRALITY STRUCTURALLY PRECLUDES COMPLETION OF MANDATORY CNSC LICENSING REQUIREMENTS (SS18/23 adapted)

The Technology Neutrality Position

The Bruce C TISG is explicitly technology-neutral. It does not require the proponent to select a specific reactor technology before submitting its Impact Statement. It is written to apply to whatever reactor design the proponent ultimately proposes — whether a CANDU-lineage design, a light water reactor, or another approved technology. This approach was adopted, presumably, to give the proponent flexibility in technology selection during the long timeline of the assessment process.

The technology-neutral approach creates a structural problem that is specific to the Bruce C assessment and that does not arise in assessments where the proponent has committed to a specific technology. Three mandatory CNSC licensing requirements are design-specific: they cannot be satisfied for an unspecified technology. A technology-neutral Impact Statement, however diligently prepared, cannot satisfy these requirements. The deficiency is not in the proponent's effort — it is in the TISG's architecture.

The Three Mandatory Requirements That Cannot Be Satisfied

Requirement 1: REGDOC-2.5.2 §2.2.1 Comparative Societal Risk

As established in Bruce Stopper 11, REGDOC-2.5.2 §2.2.1 requires the proponent to demonstrate that the reactor facility's societal risk is comparable to or less than viable competing technologies. The 'reactor facility's societal risk' is a design-specific quantity: it depends on the core damage frequency, small release frequency, large release frequency, and individual and societal fatality risk profiles of the specific reactor design proposed. These quantities are calculated through a Probabilistic Safety Assessment that is specific to the design. A technology-neutral IS cannot provide a PSA for an unspecified technology. It cannot therefore satisfy the mandatory comparative societal risk requirement.

Requirement 2: REGDOC-2.4.2 Probabilistic Safety Assessment

CNSC REGDOC-2.4.2 requires a PSA validated against operating experience data for the proposed reactor facility. A PSA validated against operating experience data is, by definition, design-specific: it uses failure rate data from operating units of the same design. For a CANDU-lineage design, the operating experience data comes from operating CANDU units. For a light water design such as the AP1000, it comes from the Vogtle 3 and 4 operating record. A technology-neutral IS cannot provide a validated PSA for an unspecified technology. The REGDOC-2.4.2 requirement cannot be satisfied for a technology that has not been selected.

Requirement 3: REGDOC-2.10.1 Emergency Planning Zone Sizing

CNSC REGDOC-2.10.1 Version 2 requires that the Emergency Planning Zone be sized for the specific facility — a calculation that depends on the radioactive source term under design basis and beyond design basis accident scenarios. The source term is design-specific: a CANDU reactor's accident source term is dominated by its higher tritium inventory and its positive void coefficient characteristics; a light water reactor's source term has different dominant contributors. The difference between CANDU and PWR tritium output alone spans two to three orders of magnitude, as documented in the table below. An EPZ sized for one design is not valid for another design. A technology-neutral IS cannot provide an EPZ sized for the specific facility.

Parameter	CANDU (e.g. MONARK)	Light Water Reactor (e.g. AP1000)	Consequence for IS
Annual tritium production per unit	~100-130 g/unit/yr	~1-3 g/unit/yr	2-3 orders of magnitude difference in source term, EPZ sizing, and Lake

Parameter	CANDU (e.g. MONARK)	Light Water Reactor (e.g. AP1000)	Consequence for IS
			Huron pathway assessment
Positive void coefficient	Present under certain conditions; contributes to worst-case accident sequences	Not present in AP1000; passive safety system; negative moderator temperature coefficient	EPZ sizing methodology differs fundamentally between designs
PSA validation basis	No MONARK operating data; requires analog from other CANDU designs	Vogtle 3 and 4 operational since 2023-2024; empirical data available	Technology-neutral IS cannot provide validated PSA for either design
Heavy water requirement	Large heavy water inventory; no Alberta/Ontario production capacity; transport risks	Light water; no special moderator requirements	Transport and storage risks differ by design; cannot be assessed without selection
CNSC VDR status	MONARK: no VDR at any stage. AP1000: Phase 2 completed 2013 against superseded standards; Phase 3 never completed	Neither technology has a current completed Canadian VDR	Neither technology has a regulatory basis adequate for IS submission

The Only Available Remedy

The only remedy for this structural deficiency is technology selection before Impact Statement acceptance. Once the proponent selects a specific technology, the three mandatory requirements become satisfiable: a PSA can be validated for the selected design, an EPZ can be sized for the selected design's source term, and the comparative societal risk demonstration can be provided using the selected design's PSA outputs. Until technology is selected, none of these requirements can be satisfied, and the IS cannot support a Licence to Prepare Site.

The TISG does not require technology selection before IS submission. It does not require the proponent to demonstrate that all TISG requirements have been addressed for a specific technology. It does not require confirmation in writing, at IS submission, of which reactor technology is proposed. The technology-neutral TISG is therefore structurally incapable of producing an IS that satisfies the mandatory CNSC licensing requirements. This is a deficiency in the TISG as a regulatory instrument, not in the proponent's compliance with it.

FINDING: The Bruce C TISG is technology-neutral. Three mandatory CNSC licensing requirements — REGDOC-2.5.2 §2.2.1 comparative societal risk, REGDOC-2.4.2 PSA validation, and REGDOC-2.10.1 EPZ sizing — are each design-

specific and cannot be satisfied for an unspecified technology. CANDU and light water reactor designs differ by 2-3 orders of magnitude in tritium output alone, making source term, EPZ, and Lake Huron pathway assessments non-interchangeable between designs. Neither candidate technology has a current completed Canadian VDR. A technology-neutral IS cannot satisfy these mandatory requirements regardless of how diligently it is prepared. The deficiency is in the TISG's architecture, not in the proponent's effort. Technology selection is a precondition to a complete and legally adequate Impact Statement.

IAAC TRAP: IAAC is trapped: if it accepts a technology-neutral IS, it accepts a submission that structurally cannot satisfy three mandatory CNSC licensing requirements. The CNSC cannot issue a Licence to Prepare Site on the basis of an IS that has not satisfied REGDOC-2.5.2 §2.2.1, REGDOC-2.4.2, and REGDOC-2.10.1 for the specific proposed technology. IAAC will have conducted an assessment that cannot produce a licensable outcome. The remedy — requiring technology selection before IS acceptance — is available but requires TISG amendment. The current TISG does not provide for it.

BRUCE STOPPER 29 — THE TISG IS DEFICIENT AS A REGULATORY INSTRUMENT IN SEVENTEEN IDENTIFIED RESPECTS (SS32)

The TISG's Legal Function

The Integrated Tailored Impact Statement Guidelines are the legal instrument through which IAAC defines the scope of the Impact Statement the proponent must prepare. The TISG is not a policy preference document. Under the Impact Assessment Act and the Information and Management of Time Limits Regulations, the TISG must include all tailored guidelines regarding information or studies that IAAC considers necessary for the conduct of the impact assessment. IAAC is required to consider all factors set out in IAA section 22(1) in determining what information and studies are necessary.

The statutory consequence of a deficient TISG is not merely that the Impact Statement will be incomplete. It is that an IS produced under the TISG may appear complete on its face while being substantively inadequate, because the TISG defined the scope too narrowly; the Review Panel's task of assessing the IS will be compromised by the absence of information it requires to discharge its function; and a Minister's decision based on a structurally inadequate IS lacks a lawful evidentiary foundation and is unreasonable under Vavilov.

The following seventeen deficiencies are identified in the Bruce C TISG. Each corresponds to a mandatory regulatory requirement, a statutory obligation under the IAA, or IAAC's own previously stated position that has been abandoned without explanation. Full regulatory and statutory basis for each deficiency is provided in Appendix M.

Code	Subject	Deficiency	Mandatory Basis
D1	Societal Risk	No comparative societal risk demonstration against viable competing technologies in the Ontario market. The Darlington SMR, with LTC issued April 4, 2025, is the primary specific comparator. Neither the mandatory comparison nor the identification of viable competing technologies appears in the TISG.	REGDOC-2.5.2 §2.2.1 ('shall' requirement). See BS11, BS28.
D2	Alternatives	No alternatives-to assessment despite IAAC's own SOI identifying whether other technologies are more appropriate as a key concern. The omission is unexplained and is independently unreasonable under Vavilov.	IAA s.22(1)(f); Vavilov 2019 SCC 65. See BS27.
D3	Technology Scope	Technology-neutral TISG structurally precludes satisfaction of three mandatory design-specific CNSC licensing requirements: REGDOC-2.5.2 §2.2.1, REGDOC-2.4.2, and REGDOC-2.10.1. Technology selection is a precondition to a complete IS.	IAA s.22(1)(i); REGDOC-2.5.2 §2.2.1; REGDOC-2.4.2; REGDOC-2.10.1. See BS28.
D4	Health Framework	CNSC published positions treated as settled evidentiary baseline. The TISG does not require the proponent to provide a scientifically independent evidentiary foundation adequate for the Review Panel's s.46 independent function. Seven CNSC documents contain representations irreconcilable with the CNSC's own internal record.	IAA s.46; Baker; Dunsmuir; Vavilov. See BS7, BS12, BS30.
D5	KiKK / Childhood Leukemia	No requirement to address the full peer-reviewed literature on the childhood leukemia signal. The CNSC 'unfounded' characterisation — derived from 7 of 26 studies — may be adopted without independent evaluation. Bruce C is a 50-year operating site.	IAA s.46; IAA s.22(1)(a). See BS1, BS10.
D6	RADICON Source Term	RADICON radioiodine source term acknowledged as false (EVP Jammal, 2017) not excluded. Accident consequence assessments may be built on values the CNSC itself has acknowledged are incorrect.	IAA s.46; REGDOC-2.10.1. See BS7.
D7	Tritium Risk	Tritium risk assessed at 7,000 Bq/L only. ODWAC 2009 precautionary recommendation of 20 Bq/L for pregnant women, fetuses, and infants not required to be addressed. INFO-0799 self-contradiction not required to be disclosed. RBE 2.2 internal recommendation not required.	IAA s.22(1)(a); IAA s.46; ODWAC 2009. See BS3, BS4.
D8	LNT Model	Four LNT extrapolation steps not required to be disclosed or subjected to sensitivity analysis. Review Panel cannot independently evaluate model appropriateness for CANDU chronic internal emitter exposure without this disclosure.	IAA s.46; IAA s.22(1)(a). See BS4.

Code	Subject	Deficiency	Mandatory Basis
D9	Non-Cancer Endpoints	Five non-cancer endpoint categories — cardiovascular, neurological, immunological, ophthalmic, reproductive and developmental — not required to be assessed. UNSCEAR documents these categories in sources CNSC itself cites as authoritative.	IAA s.22(1)(a). See BS17.
D10	Kinlen Mechanism	Kinlen population-mixing epidemiological assessment not required despite CNSC's own published position identifying it as 'the most plausible explanation' for nuclear-proximate childhood leukemia. Bruce C adds new workforce to 50-year nuclear-proximate community.	IAA s.22(1)(a). See BS1.
D11	50-Year Baseline	No independent epidemiological baseline study required for the Bruce-proximate population's 50-year chronic exposure history before the HHRA chapter is submitted. Incremental risk against an uncharacterised chronic baseline is scientifically invalid.	IAA ss.22(1)(a), 63. See BS2.
D12	GBA+	GBA+ not integrated into radiological health chapters. TISG §1.3 acknowledges GBA+ obligation but it is not operationalised in health risk assessment. BEIR VII documents 40-50% higher risk per unit dose for women; 2-3x for children. These differentials are invisible in aggregate population risk figures.	TISG §1.3; IAA s.22(1)(a). See BS4.
D13	Lake Huron Baseline	No characterisation of existing tritium concentrations in Georgian Bay near-shore zones from 50 years of CANDU operation required. Bruce C's incremental tritium cannot be meaningfully assessed without this baseline. Great Lakes Water Quality Agreement obligations not addressed.	IAA s.22(1)(a),(l); Great Lakes Water Quality Agreement 1978. See BS9, BS24.
D14	SON / FPIC	TISG does not operationalise FPIC requirements. SON's May 2025 documented inability to engage with scoping was not remedied before finalisation. Health information underlying FPIC is materially inaccurate through accumulated framework failures.	UNDRIP Art.32(2); Bill C-15; Kebaowek FN v CNL 2025 FC 319. See BS20, BS21.
D15	NLCA Liability Gap	Nuclear Liability and Compensation Act £1B cap vs actual severe accident economic loss at a Great Lakes site not required to be disclosed. Residual public liability for a Lake Huron contamination event is unquantified.	IAA ss.22(1)(b), 63(4); NLCA s.24. See BS18.
D16	s.63 Public Interest	No IAA s.63 public interest analysis required as a standalone chapter. Proponent not required to identify, quantify, and weigh all adverse health effects against the public interest standard. CNSC formally rejected the benefits-outweigh-harm framework.	IAA s.63. See BS18.

Code	Subject	Deficiency	Mandatory Basis
D17	Independent Oversight	No independent expert oversight mechanism required. Review Panel's s.46 independent function requires independent expert reports on source terms, health risk methodology, systematic literature review, and comparative societal risk. The current TISG produces a proceeding where CNSC and proponent are the sole scientific sources.	IAA s.46. See BS30.

FINDING: The Bruce C final TISG is deficient as a regulatory instrument in seventeen identified respects. Each deficiency corresponds to a mandatory regulatory requirement, a statutory obligation under the IAA, or IAAC's own previously stated SOI position. A TISG deficient in these respects produces a deficient Impact Statement. A deficient Impact Statement cannot provide the Review Panel with the evidentiary foundation its independent s.46 function requires. A s.63 determination made on the basis of a deficient IS lacks a lawful evidentiary foundation and is unreasonable under Vavilov. The remedy is not abandonment of the assessment. It is finalisation of a corrected TISG before the IS phase proceeds.

IAAC TRAP: IAAC is trapped: the TISG has been finalised. The IS phase has commenced. Requiring the proponent to address deficiencies that the TISG does not require is an extraordinary step that IAAC has not publicly committed to taking. Not requiring them produces a deficient IS. A deficient IS cannot support a lawful s.63 determination. IAAC's path forward on the current record leads in every direction to an outcome it cannot lawfully defend. The only exit is to issue supplementary instructions to the proponent requiring the seventeen deficiencies to be addressed — which is the functional equivalent of a TISG amendment at the IS stage. This is available but must be done now, while the IS is being prepared, not after it is submitted.

BRUCE STOPPER 30 — IAA SECTION 46 INDEPENDENCE IS DEFEATED BY THE TISG'S CNSC-DEPENDENT EVIDENTIARY FOUNDATION (SS32)

What Section 46 Requires

Section 46 of the IAA provides that for an impact assessment of a designated project including activities regulated under the NSCA, the Review Panel may exercise the powers conferred on the CNSC. The academic and legal analysis of the IAA's integrated assessment structure is unambiguous: the Review Panel exercises Commission powers autonomously and completely independently of the CNSC. The CNSC's role in the integrated assessment is as a technical participant — a source of expert information — not as an authority whose published positions the Review Panel must accept.

Section 46 has three implications for the adequacy of the TISG. First, the Review Panel is not reviewing a CNSC decision — it is exercising CNSC powers for itself and must have before it an evidentiary record adequate to make its own independent determinations, not merely to assess whether the proponent has complied with CNSC-published positions. Second, the Review Panel is not bound by CNSC published science — CNSC fact sheets, guidance documents, and published regulatory conclusions are participant inputs, one source among others, to be evaluated on their merits against the full scientific record. Third, the TISG as the instrument defining the IS's scope must be adequate for the Panel's independent s.46 function.

How the Current TISG Defeats Section 46

The current TISG directs the proponent to build its IS on CNSC-published science as the evidentiary baseline. Its requirements are framed as if the proponent's obligation is to demonstrate conformity with CNSC regulatory standards as interpreted by CNSC staff and expressed in CNSC-published documents. The TISG does not require the proponent to provide primary peer-reviewed scientific literature supporting each material conclusion. It does not require the proponent to identify where CNSC-published positions are disputed in the peer-reviewed literature. It does not require independent expert review of the scientific foundation the proponent proposes to use.

The consequence is that the IS produced under the current TISG will direct the Review Panel toward CNSC's 'unfounded' KiKK characterisation — derived from 7 of 26 studies — as the settled baseline for childhood leukemia assessment. It will direct the Panel toward CNSC's tritium risk figures — which its own scientists acknowledged were inadequately supported in 2010 — as the settled baseline for tritium risk. It will direct the Panel toward the CNSC's cancer-only HIA scope — which excludes five endpoint categories documented in CNSC's own cited authorities — as the settled baseline for health endpoint assessment. The Panel will then be asked to exercise independent scientific judgment against an evidentiary record that has already been curated to produce a predetermined outcome.

This is the precise situation that section 46 was enacted to prevent. Parliament did not give the Review Panel independent Commission powers so that the Panel could defer to an IS built on CNSC's positions. Parliament gave the Panel independent powers so that the Panel could evaluate CNSC's positions independently — treating them as participant inputs, not as settled science. The current TISG defeats this statutory purpose by producing an IS that presents CNSC's positions as the settled evidentiary foundation rather than as one input to be evaluated.

The Required Structural Correction

The structural correction required is specific. The final TISG must be amended to require that: the health risk assessment bibliography be independently constituted rather than drawn primarily from CNSC publications; where a scientific question is disputed between CNSC's published position and the peer-reviewed literature, the IS must present the full range of peer-reviewed positions and provide independent expert assessment; CNSC fact sheets and guidance documents may be cited as participant inputs but may not serve as the primary scientific foundation; and

independent expert review reports on the contested scientific questions must be filed simultaneously with the IS and made part of the evidentiary record available to the Panel.

Without these amendments, the Review Panel's section 46 independence is a legal fiction: the Panel has the power to exercise Commission functions independently, but it has been given an evidentiary record that pre-determines what those functions produce. The statutory guarantee of independence becomes the procedural appearance of independence without the substance.

FINDING: IAA s.46 gives the Review Panel independent Commission powers — not authority to review CNSC conclusions, but authority to exercise Commission functions independently, treating CNSC science as a participant input evaluated on its merits against the full record. The current TISG directs the proponent to build its IS on CNSC-published science as the settled evidentiary baseline. Seven CNSC documents contain representations irreconcilable with the CNSC's own internal record. Six major recent studies have not been acknowledged. The RBE is understated by a factor of at minimum 2.2 against the CNSC's own internal recommendation. The Panel will receive an IS that presents these contested, inadequate positions as settled science rather than as participant inputs. Section 46 independence is defeated before the Panel is even constituted. Parliament enacted s.46 precisely to prevent this outcome.

IAAC TRAP: IAAC is trapped: if it accepts an IS built on CNSC science as the settled evidentiary baseline, it produces a proceeding that defeats s.46's statutory purpose while formally complying with its procedural requirements. The Panel will exercise 'independent' Commission powers against an evidentiary record that has been pre-curated by an institution with structural conflicts of interest. Under Vavilov, a proceeding whose evidentiary foundation structurally defeats its own statutory purpose does not produce a reasonable outcome. The only remedy is to require the IS to provide a genuinely independent evidentiary foundation — which requires structural amendment to the TISG.

BRUCE STOPPER 31 — IAA SECTION 63 PUBLIC INTEREST DETERMINATION LACKS A LAWFUL EVIDENTIARY FOUNDATION

(SS32)

The Logical Chain from Deficient TISG to Unlawful Determination

The connection between a deficient TISG and an unlawful section 63 determination runs through the following logical chain, each step of which is independently established in the preceding Bruce Stoppers:

The TISG is the instrument that defines the scope and content of the Impact Statement. A TISG deficient in the seventeen respects identified in Bruce Stopper 29 produces an IS that is deficient in those same seventeen respects — not because the proponent failed to comply with the TISG, but because the TISG defined the scope too narrowly to capture all mandatory factors. An IS that does not address the mandatory comparative societal risk requirement (REGDOC-2.5.2 §2.2.1),

does not assess five health endpoint categories required by IAA s.22(1)(a), does not address the forty-year international cancer evidence record, does not characterise the fifty-year CANDU tritium baseline of the Lake Huron watershed, and is built on a CNSC-dependent evidentiary foundation that defeats the Review Panel's s.46 independence, cannot provide the factual foundation for a lawful s.63 determination.

Section 63(4) requires the Minister to consider the following factors in making the public interest determination: the extent to which the effects are adverse; the importance of the project to Canada; the contribution of the project to sustainability; the extent to which the project contributes to or hinders the Government of Canada's ability to meet its environmental obligations; and the impact of the project on Indigenous rights. None of these factors can be adequately assessed on the basis of a deficient IS: adverse health effects cannot be weighed without a complete health assessment; sustainability cannot be assessed without alternatives; contributions to environmental obligations cannot be assessed without Great Lakes treaty analysis; and Indigenous rights impacts cannot be assessed without adequate SON engagement and accurate FPIC information.

The Vavilov Reasonableness Standard Applied

Under Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65, a reasonable decision is one that complies with the relevant factual and legal constraints imposed on the decision-maker, is transparent and intelligible, and — where the decision-maker departs from a previously stated position — explains that departure. A section 63 public interest determination made on the basis of an IS produced under the deficient TISG fails the Vavilov standard on multiple independent grounds:

- It fails to comply with the legal constraint imposed by REGDOC-2.5.2 §2.2.1 (mandatory comparative societal risk not demonstrated).
- It fails to comply with the statutory requirements of IAA s.22(1)(a) (five health endpoint categories not assessed), s.22(1)(f) (alternatives not assessed), and s.22(1)(i) (alternative means not assessed).
- It relies on an evidentiary foundation — the CNSC-dependent IS — that is demonstrably deficient in seventeen identified respects, each documented from CNSC's own published instruments. An indefensible factual foundation is a Vavilov ground of unreasonableness.
- It incorporates an unexplained departure from IAAC's own SOI position on alternatives.
- It is made on an evidentiary record contaminated by the CNSC's multiple breaches of the duty of candor documented in Bruce Stopper 23.

Each of these grounds is independently sufficient to render the section 63 determination unreasonable under Vavilov. All five are present simultaneously.

FINDING: A section 63 public interest determination made on the basis of an IS produced under the deficient Bruce C TISG lacks a lawful evidentiary foundation. The determination would fail the Vavilov reasonableness standard on five independent grounds: non-compliance with REGDOC-2.5.2 §2.2.1; non-compliance with IAA ss.22(1)(a),(f),(i); indefensible factual foundation from seventeen identified TISG deficiencies; unexplained SOI departure; and evidentiary record contaminated by CNSC duty of candor breaches. Each ground is independently sufficient for judicial review. All five are simultaneously present. A Minister who makes a s.63 determination on this record makes a determination that cannot survive judicial review on the basis of grounds that were documented and on the registry record before the determination was made.

IAAC TRAP: IAAC is trapped at the most fundamental level: the entire assessment, as currently designed, cannot produce a section 63 determination that survives judicial review. This is not because the project is necessarily unapprovable — it may or may not be. It is because the process through which approval is being sought has accumulated seventeen identified TISG deficiencies, five Vavilov grounds, multiple duty of candor breaches, structural s.46 incompatibility, and constitutional FPIC defects. Every path on the current record leads to an outcome that is judicially reviewable on grounds that are documented, named, and on the registry record.

BRUCE STOPPER 32 — THE VDR STATUS OF BOTH CANDIDATE TECHNOLOGIES HAS NOT BEEN DISCLOSED — NEITHER HAS A CURRENT COMPLETED CANADIAN REGULATORY BASIS (SS29)

The VDR Framework

The CNSC's Vendor Design Review is the pre-licensing process by which reactor vendors submit their designs for review against Canadian regulatory requirements before a licence application is filed. The VDR process has three phases: Phase 1 (fundamental design review), Phase 2 (detailed design review), and Phase 3 (implementation readiness). Completion of all three phases does not constitute a licence. It establishes that the design has been reviewed against Canadian regulatory standards and that identified issues have been addressed to the CNSC's satisfaction. A completed VDR is a necessary — but not sufficient — precondition to a successful licence application.

The VDR status of a proposed reactor design is directly material to the Review Panel's assessment of licensing feasibility. The Panel exercises Commission powers under s.46 — including the power to consider whether a licence application could succeed. It cannot make this assessment without knowing whether the proposed technology has a completed Canadian VDR. The CNSC has not disclosed VDR status to IAAC in its advisory role in this proceeding. The TISG does not require the proponent to disclose VDR status at IS submission.

The Status of Both Technologies

The Bruce C project has not committed to a specific reactor technology. Two technologies have been referenced in connection with the project without a formal commitment to either.

The CANDU MONARK is a 1,000 MWe pressurised heavy water reactor design with conceptual design completed in September 2024. Preliminary engineering is targeted for 2027. No CNSC Vendor Design Review has commenced for the MONARK at any phase. AtkinsRéalis — the design proponent — is currently in a pre-planning special project to scope what a future VDR would require. The MONARK has never been built or operated anywhere in the world. It has no operating experience data for PSA validation under REGDOC-2.4.2.

The AP1000 is a Westinghouse pressurised light water reactor design. Two AP1000 units are operational at the Vogtle site in Georgia, USA, commissioned in 2023-2024. The CNSC conducted a VDR for the AP1000: Phase 1 was completed and Phase 2 was completed in 2013. Phase 3 — the implementation readiness phase — was never completed. The Phase 2 review was conducted against regulatory standards that have since been revised. The AP1000 therefore does not have a current completed Canadian VDR. Its Phase 2 review was conducted against superseded standards.

Neither technology has a current completed Canadian Vendor Design Review. Neither has a current regulatory basis adequate for an IS submission that purports to address licensing feasibility. The CNSC has not disclosed this to IAAC. The impact is direct: the Review Panel cannot assess licensing feasibility for either technology because neither technology has established the regulatory basis that would allow the Panel to evaluate whether a licence application could succeed.

FINDING: Neither candidate technology for the Bruce C project has a current completed Canadian Vendor Design Review. The CANDU MONARK has no VDR at any phase; its design organisation is in pre-planning for a future VDR. The AP1000's Phase 2 VDR was completed in 2013 against superseded standards; Phase 3 was never completed. The CNSC has not disclosed VDR status to IAAC in its advisory role. The Review Panel cannot assess licensing feasibility for a technology without knowing its VDR status. The TISG does not require disclosure of VDR status at IS submission. An IS submitted for a technology without a completed Canadian VDR cannot establish that a Licence to Prepare Site could lawfully be issued on the basis of it.

IAAC TRAP: IAAC is trapped: if it accepts an IS for a technology without a completed Canadian VDR, it accepts a submission that cannot establish licensing feasibility — one of the fundamental questions the assessment must address. If IAAC requires VDR completion before IS acceptance, it requires action that has not been scheduled for either candidate technology within the IS timeline. The CNSC's failure to disclose VDR status compounds the problem: IAAC cannot make an informed judgment about IS adequacy without information the CNSC has chosen not to provide.

BRUCE STOPPER 33 — IAAC IS LEGALLY TRAPPED — EVERY AVAILABLE PATH LEADS TO AN UNLAWFUL OUTCOME (SS31)

The Nature of the Trap

IAAC is not merely in the position of a decision-maker with an incomplete record that supplementary process can cure. It is trapped in the precise legal sense: every path available to it on the current record produces a consequence it cannot lawfully defend. This Bruce Stopper maps the available paths and identifies the trap at the end of each.

Path 1: IAAC Proceeds and Accepts a Compliant Impact Statement

Path 1 Trap: A compliant Impact Statement — one that satisfies the TISG as written — is structurally deficient in the seventeen respects identified in Bruce Stopper 29. It does not satisfy the mandatory REGDOC-2.5.2 §2.2.1 requirement. It does not address the forty-year cancer evidence record. It does not characterise the Lake Huron tritium baseline. It does not satisfy IAA s.22(1)(a)'s full health assessment obligation. It defeats s.46 independence by building on CNSC-dependent science. A s.63 determination on the basis of this IS is unreasonable under Vavilov on five independent grounds documented in Bruce Stopper 31. IAAC cannot proceed to approval on a compliant IS without producing a determination that cannot survive judicial review on grounds that are already on the registry record.

Path 2: IAAC Argues the Panel's Section 46 Powers Will Cure the Deficiencies

Path 2 Trap: Relying on the Panel to exercise s.46 independent powers to cure TISG deficiencies concedes that the TISG is deficient. But more specifically: if the Panel must go beyond the TISG to require an IS that addresses all thirty-four Bruce Stoppers, it must effectively direct the proponent to redo its entire health risk assessment from scratch — against the full peer-reviewed literature, with independent expert review, with the six post-2023 studies, with the fifty-year baseline characterisation, with RBE 2.2, with five health endpoint categories. This is not gap-filling. It is a fundamental reconception of the IS scope at the Panel stage, at orders-of-magnitude greater cost than correction at the TISG stage. The Panel cannot do this work itself; it must direct the proponent, which requires a supplementary information request. A supplementary information request of this scope is the functional equivalent of a TISG amendment. Arriving at the IS phase before recognising this is not a reasonable exercise of IAAC's statutory function.

Path 3: IAAC Argues Technology Neutrality Justifies the Omissions

Path 3 Trap: Technology neutrality does not suspend the mandatory requirements. REGDOC-2.5.2 §2.2.1 applies regardless of which technology is proposed. IAA s.22(1)(a) requires health assessment regardless of technology. The Lake Huron tritium baseline exists regardless of which reactor is selected. Technology neutrality creates an additional trap — the three design-specific requirements

identified in Bruce Stopper 28 cannot be satisfied for an unspecified technology — but does not resolve the substantive deficiencies that apply regardless of design selection.

Path 4: IAAC Argues Post-TISG Supplementary Instructions Can Cure the Deficiencies

Path 4 Trap: Supplementary instructions at the IS phase are available but they do not eliminate the problem — they displace it. The proponent's IS preparation has commenced on the basis of the current TISG. Supplementary instructions requiring a fundamentally different IS scope will require the proponent to restart portions of its IS preparation. The later the supplementary instructions are issued, the greater the cost and disruption. Supplementary instructions issued after the IS is submitted require either a revised IS (effectively restarting the IS phase) or assessment of an IS that does not fully address the supplementary requirements (which produces Path 1's trap). Supplementary instructions issued now — while the IS is being prepared — are available and are the most efficient remedy. But issuing them requires IAAC to acknowledge that the current TISG is deficient, which is the premise of this submission.

Path 5: IAAC Does Nothing — Acknowledges This Submission and Takes No Action

Path 5 Trap: Inaction locks thirty-four demonstrated deficiencies into the permanent record of this assessment. Every subsequent decision is made against a record that contains documented proof — from CNSC's own documents, from the international scientific literature, from the IAAC's own SOI — that the evidentiary baseline of the IS is deficient. The more specific the demonstration on the record, the harder it becomes for subsequent decision-makers to treat it as having been considered and rejected without reasons. This submission provides the specific demonstration. IAAC cannot proceed as if it does not know what it now knows.

The Only Exit

The only path that does not produce a trapped outcome is immediate remedial action: issue supplementary instructions to Bruce Power requiring the IS to address the substantive deficiencies identified in this submission, before the IS is submitted. The IS phase is 176 days into a 1,095-day window. The IS deadline is approximately August 2026. There is time. The cost of correction now is a fraction of the legal and institutional cost of a section 63 determination that cannot survive judicial review on grounds that are already on the registry.

FINDING: IAAC is legally trapped. Every available path on the current record leads to an outcome it cannot lawfully defend: accepting a compliant IS produces a s.63 determination unreasonable under Vavilov; relying on s.46 to cure TISG deficiencies concedes the TISG is deficient and shifts the problem to a later and more expensive stage; technology neutrality defence does not resolve the

substantive deficiencies; post-TISG supplementary instructions displace rather than eliminate the problem unless issued immediately; and inaction locks thirty-four documented deficiencies into the permanent record. The only exit is immediate supplementary instructions requiring the IS to address the identified deficiencies before IS submission. This is available. It is also the only option consistent with IAAC's statutory obligations under the IAA.

IAAC TRAP: The trap is the finding box. IAAC is trapped. The submission demonstrates this. The record now contains this demonstration. IAAC must either address it — by issuing supplementary instructions — or proceed with the knowledge that it has not addressed it. Proceeding with knowledge of unaddressed documented deficiencies, without explanation, is the definition of unreasonableness under Vavilov. The choice is between the cost of correction now and the far greater cost of a judicially reviewed section 63 determination that fails on grounds already documented on the registry record before the determination was made.

BRUCE STOPPER 34 — CUMULATIVE STRUCTURAL INVALIDITY — SEVEN INDEPENDENT GROUNDS EACH INDEPENDENTLY REQUIRING REMEDIATION (SS31)

The Cumulative Argument

Bruce Stoppers 1 through 33 are independent of each other. Each is independently sufficient to bar approval on the current record. A reviewer who rejects any number of them below all thirty-four is left with the remainder, each of which remains independently sufficient. This Bruce Stopper makes a different and additional argument: the thirty-four stoppers, taken together, establish seven structural grounds of invalidity that are cumulative and mutually reinforcing. Each structural ground is itself independently sufficient to require remediation before the assessment proceeds. Together they establish that the assessment process as currently designed cannot produce a valid outcome — not because any single ground is overwhelming, but because the grounds compound each other at every level of the process.

The Seven Structural Grounds

Ground 1: Undefined Regulatory Basis for the Proposed Facility

Neither candidate technology has a current completed Canadian Vendor Design Review. The project description identifies two mutually exclusive technologies simultaneously. The statutory assessment under IAA ss.60-63 is technology-specific across every dimension that matters — health risk, waste generation, accident consequences, licensing feasibility. None can be completed for a project whose defining physical parameter has not been established. This is the most foundational structural ground: the assessment is proceeding without knowing what is being assessed.

Ground 2: TISG Structurally Incapable of Producing a Complete Impact Statement

The seventeen TISG deficiencies identified in Bruce Stopper 29 are not incidental omissions that can be cured by the proponent's diligence. They are structural: the TISG's technology-neutral architecture cannot produce design-specific mandatory assessments; its CNSC-dependent evidentiary framework defeats s.46 independence; its cancer-only scope violates IAA s.22(1)(a); its omission of alternatives violates IAA ss.22(1)(f) and (i) and is unexplained under Vavilov; its omission of the mandatory REGDOC-2.5.2 §2.2.1 requirement means the IS cannot support a licence. An instrument that cannot produce a complete IS cannot produce a lawful s.63 determination.

Ground 3: CNSC Advisory Incapacity on Multiple Material Questions

The CNSC, as the primary technical adviser in this assessment, has advisory incapacity on multiple material questions: it cannot provide a technical basis for CANDU-specific submissions because no MONARK VDR exists; it cannot form NSCA s.24(4) licensing satisfaction on the current record and has not said so; it has formally declined to apply the benefits-outweigh-harm framework that s.63 requires; it has been found internationally non-compliant with dose constraint requirements in two consecutive review cycles; and it has breached its duty of candor through six specific material non-disclosures. An assessment that depends on this adviser for its technical foundation has a structurally compromised evidentiary base.

Ground 4: Review Panel Incapacity to Complete Sections 60-63 Assessments

The Review Panel cannot complete the sections 60-63 public interest assessments on the basis of an IS produced under the current TISG: it cannot assess the adverse health effects of an undefined technology; it cannot weigh alternatives that are not required to be assessed; it cannot evaluate a benefits-outweigh-harm case that the IS is not structured to provide; and it cannot exercise its s.46 independent function against an IS built on CNSC-dependent science presented as settled baseline. The Panel has the powers but not the evidentiary record needed to exercise them lawfully.

Ground 5: FPIC Invalidity for a Materially Inaccurate Health Information Base

The FPIC processes for affected Indigenous nations — including the Saugeen Ojibway Nation — are built on a health information base that is materially inaccurate in the six specific respects documented in Bruce Stopper 20. SON formally documented its inability to engage with TISG scoping before the TISG was finalised. Consent given on a materially inaccurate informational foundation does not satisfy the 'informed' requirement of UNDRIP Article 32(2) and Bill C-15. This is a constitutional defect that cannot be corrected after approval. It is independently sufficient to require process remediation.

Ground 6: Irreversibility Without Adequate Precautionary Response

The combination of the three levels of irreversibility documented in Bruce Stopper 22 — watershed contamination irreversible at lake scale, chronic health effects irreversible by definition, monitoring incapable of detecting harm in time to prevent it — with the acknowledged scientific uncertainties that trigger the precautionary principle under IAA s.6(1)(a), produces a structural ground that is specifically required to be addressed before approval. The precautionary principle

is not merely triggered by the irreversibility; it requires that the irreversibility be addressed before the fact. An approval made without addressing the irreversibility dimension on an inaccurate health information base does not engage the precautionary principle — it evades it.

Ground 7: Cumulative Weight of Unaddressed Deficiencies on the Registry Record

This submission is on the registry record. It documents thirty-four independently sufficient grounds, each grounded in CNSC's own documents, the international scientific literature, judicial authority, or regulatory audit records. A reviewing court evaluating the section 63 determination will have access to this record. The IAAC cannot claim not to have known. The standard of reasonableness under Vavilov requires that a decision-maker engage with material evidence and submissions on the record. A section 63 determination made without engagement with the thirty-four grounds documented in this submission, on the basis of an IS produced under a deficient TISG, against a record that contains documented proof of that deficiency, fails Vavilov's transparency and intelligibility requirement regardless of whether the underlying substantive questions would have produced a different answer.

#	Ground	Primary Bruce Stoppers	Minimum Required Remedy
1	Undefined regulatory basis for the proposed facility	BS28, BS32	Technology selection and completed VDR before IS acceptance
2	TISG structurally incapable of producing complete IS	BS29, BS28, BS30	Supplementary instructions addressing all 17 TISG deficiencies immediately
3	CNSC advisory incapacity on multiple material questions	BS12, BS19, BS23, BS32	CNSC mandatory disclosures; independent expert substitution on contested questions
4	Review Panel incapacity to complete ss.60-63 assessments	BS29, BS30, BS31	Corrected TISG producing IS adequate for s.46 independent function
5	FPIC invalidity for materially inaccurate health information	BS20, BS21, BS3, BS4, BS7	Corrected health information base; re-engagement with SON on corrected scoping
6	Irreversibility without adequate precautionary response	BS22, BS15, BS16, BS9	Precautionary principle correctly applied; irreversibility addressed before approval
7	Cumulative weight of unaddressed deficiencies on registry record	All 34 Bruce Stoppers	Substantive engagement with each documented ground before s.63 determination

The Remedies

This submission requests that IAAC take the following steps, which represent the minimum remediation required before the assessment can proceed to produce a lawful outcome:

1. Issue supplementary instructions to Bruce Power immediately, requiring the IS to address all seventeen TISG deficiencies identified in Bruce Stopper 29 and listed in Appendix M.
2. Require technology selection before IS acceptance and confirm in writing that neither candidate technology will be accepted in an IS unless it has a current completed Canadian VDR Phase 3 or an equivalent current regulatory basis established in the CNSC's published VDR record.
3. Require the CNSC to make the six material disclosures identified in Bruce Stopper 23 on the registry record: VDR status, two-cycle IAEA non-compliance, 'Not accepted' position on benefits-outweigh-harm, INFO-0799 conclusions, six post-2023 studies, and RBE 2.2 internal recommendation.
4. Require the IS to include independent expert reports on source terms, health risk methodology, systematic literature review on childhood leukemia and non-cancer endpoints, and comparative societal risk under REGDOC-2.5.2 §2.2.1 — each produced by experts with no financial relationship to Bruce Power, the CNSC, or any nuclear industry body.
5. Require a dual-guideline tritium risk assessment at both 7,000 Bq/L and 20 Bq/L (ODWAC 2009) for the most sensitive population subgroups, with RBE sensitivity analysis at 1.0 and 2.2.
6. Require an independent epidemiological baseline study of the Bruce-proximate population against their fifty-year chronic exposure history before the HHRA chapter is accepted.
7. Require the IS to address the Great Lakes Water Quality Agreement's specific implications: notification obligations, IJC oversight, water quality objectives, and transboundary liability quantification.
8. Re-engage with the Saugeen Ojibway Nation on the corrected TISG scope before the IS chapter on SON effects is prepared, with FPIC processes re-conducted on the corrected health information base.
9. File this submission and any response to it on the public registry as part of the formal assessment record for the Bruce C Nuclear Project.

FINDING: Thirty-four Bruce Stoppers establish, cumulatively, seven structural grounds of invalidity each independently requiring remediation before the assessment can proceed to produce a lawful outcome: undefined regulatory basis; TISG structurally incapable of producing a complete IS; CNSC advisory incapacity on multiple material questions; Review Panel incapacity to complete ss.60-63 assessments; FPIC invalidity for a materially inaccurate health information base;

irreversibility without adequate precautionary response; and the cumulative weight of thirty-four documented deficiencies on the registry record. The assessment process as currently designed cannot produce a valid section 63 determination. This is not because the Bruce C project is necessarily unapprovable. It is because the process through which approval is being sought has accumulated structural deficiencies that prevent a lawful outcome on the current record.

IAAC TRAP: IAAC is legally trapped at the structural level. The trap is not a single deficiency that a targeted remedy can address. It is the accumulation of thirty-four independent grounds that together produce seven structural invalidity grounds, each requiring its own remediation. The only path that does not produce a trapped outcome requires IAAC to acknowledge the trap exists and to take immediate action to address it. This submission is the demonstration that the trap exists. It is on the registry. IAAC must respond to it or proceed with the knowledge that it has not responded to it. Under Vavilov, proceeding without engagement is unreasonable. The choice is between the cost of correction now and the far greater institutional and legal cost of a section 63 determination made against a record that documents its own invalidity.

APPENDICES TO THE BRUCE STOPPER SUBMISSION

The following appendices provide the detailed evidentiary foundation for the arguments made in the body of this submission. Each appendix is a substantive, self-contained evidentiary document. A reader who wishes to understand the full scientific and legal basis for any Bruce Stopper should read the relevant appendix. The appendices collectively constitute the evidentiary record that the Review Panel, exercising its independent section 46 powers, will need to evaluate independently.

This volume contains Appendices A through H. Appendices I through P are in the accompanying File 8.

APPENDIX A — THE FORTY-YEAR CANCER EVIDENCE RECORD: FROM THE BLACK REPORT TO HARVARD 2026

This appendix provides a full narrative account of the international evidence record on cancer risk near nuclear power plants, from the 1984 Black Report through the Harvard Nature Communications study of 2026. It is the evidentiary foundation for Bruce Stopper 1. The account is chronological and study-by-study so that the pattern of consistent findings across four decades, multiple countries, and multiple methodologies is visible as a whole.

The central finding of this body of evidence can be stated at the outset: children living within five kilometres of nuclear power plants have approximately double the leukemia rate of children living further away. This finding has been documented in multiple countries, by independent research teams, using multiple methodologies, over four decades. It has been confirmed by the largest national case-control study of its type ever conducted. It has not been explained. The regulatory models that govern nuclear facility licensing predict that no such elevation should exist. The gap between model prediction and empirical observation is the scientific problem at the heart of this submission.

A.1 The Black Report — United Kingdom, 1984

In 1983, a BBC television programme drew public attention to elevated rates of childhood leukemia in the village of Seascale, Cumbria, situated immediately adjacent to the Sellafield nuclear complex. The programme prompted sufficient public concern that the United Kingdom government commissioned a formal inquiry, led by Sir Douglas Black, former Chief Medical Officer of England and President of the Royal College of Physicians.

The Black Report, published in 1984, found that childhood leukemia incidence in Seascale was approximately ten times the national average for England and Wales. The national childhood leukemia rate was approximately 3-4 cases per 100,000 children per year. In Seascale, the observed rate was approximately 30-40 cases per 100,000 children per year. This was not a borderline statistical finding. It was a tenfold elevation documented in a small community immediately adjacent to one of the world's largest nuclear reprocessing facilities.

The Black Report did not attribute the excess to radiation from Sellafield. The measured radiation doses in Seascale, using the measurement techniques available in 1984, were predicted by the models to cause a much smaller cancer increment than the observed tenfold elevation. Sir Douglas Black acknowledged this explicitly: the excess could not be explained by the measured doses. He recommended further investigation. The Black Report's significance is not in its conclusions but in its finding: a real, large, unexplained excess of childhood leukemia in a community adjacent to a nuclear facility, at dose levels the models said should cause essentially nothing. This was the opening data point of the forty-year evidence base.

A.2 COMARE — United Kingdom, 1986 Onwards

Following the Black Report, the United Kingdom government established the Committee on Medical Aspects of Radiation in the Environment in 1985 with a permanent mandate to investigate cancer near nuclear facilities. COMARE published a series of reports through the late 1980s,

1990s, and 2000s. Its 1st Report (1986) examined Sellafield and confirmed the excess in Seascale. Its 4th Report (1996) examined sites across the UK and found elevated childhood leukemia rates near Dounreay, Scotland's nuclear reprocessing site. Its 7th Report (2002) examined childhood leukemia near nuclear installations generally across the UK.

COMARE's aggregated analysis across UK nuclear sites found approximately a 20 per cent excess leukemia risk within five kilometres of nuclear installations — statistically significant across the pooled data. This 20 per cent excess is smaller than the tenfold excess in Seascale because it includes all UK nuclear sites, some of which showed smaller excesses and some of which showed larger ones. The pooled finding of 20 per cent excess is a floor, not a ceiling: it represents the average excess across a diverse set of sites.

COMARE's 14th Report (2011) reviewed the German KiKK study in detail after its publication in 2008. COMARE concluded that the KiKK findings were statistically significant and warranted investigation of the cause. COMARE did not characterise the KiKK finding as 'unfounded.' It acknowledged the signal as real and called for research into its explanation. COMARE's nearly three decades of UK data are consistent with and reinforce the KiKK findings.

A.3 The Krümmel Cluster — Germany, 1990-2005

In the late 1980s and early 1990s, an elevated childhood leukemia cluster was identified near the Krümmel nuclear power plant in Geesthacht, northern Germany, on the Elbe River south of Hamburg. The plant had begun commercial operation in 1984. Between 1990 and 1995, six cases of childhood leukemia were diagnosed in the local area, five of them within a five-kilometre radius of the plant, against an expected number of approximately one case over this period based on the national average rate. The observed-to-expected ratio was approximately five to six.

The cluster was not a statistical artifact of a small study period. It persisted. Further cases were identified in subsequent years. Modestly elevated levels of caesium-137 were detected in rainwater and air samples near the plant during parts of this period, though the measured levels were within regulatory limits. The plant itself operated within all applicable regulatory standards throughout.

A formal investigation by German radiation protection authorities and scientific bodies examined the Krümmel cluster extensively. No definitive cause was established. The UK's COMARE examined the data as part of its broader review of nuclear proximity cancer risk and concluded the cluster could not be explained by known mechanisms. The Krümmel cluster was one of the direct scientific motivations for the German government commissioning the KiKK national case-control study: there was a specific, persistent, unexplained cluster near a specific facility that warranted systematic national investigation.

A.4 Pre-KiKK International Ecological Studies — 1990s-2000s

Through the 1990s and early 2000s, epidemiologists in multiple countries conducted ecological studies of cancer rates near nuclear power plants. Ecological studies aggregate data at the geographic level — comparing cancer rates in populations living in areas near nuclear facilities against populations living further away — rather than examining individual cases. They are

generally considered lower quality evidence than case-control studies but can detect patterns across large populations that smaller studies cannot.

Studies were conducted in the United Kingdom (extending COMARE's work), France (examining all French nuclear power plant sites), Germany (preceding the KiKK study), Canada, and the United States. A meta-analysis published in the peer-reviewed literature pooled data from ecological studies across multiple countries and found a 23 per cent higher incidence of leukemia among children aged zero to nine years living within 16 kilometres of nuclear power plants, aggregated across the pooled data. This was a statistically significant finding across a large pooled dataset. The directional consistency — elevated rates across multiple countries, multiple study designs, and multiple decades of data — established the international evidence base that motivated the more rigorous KiKK investigation.

A.5 The KiKK Study — Germany, 2008

The Kinderkrebs in der Umgebung von Kernkraftwerken study was commissioned by Germany's Federal Office for Radiation Protection (Bundesamt für Strahlenschutz) following the Krümmel cluster and the pattern established by the ecological studies. It was designed as a national case-control study — the most methodologically rigorous study design for investigating rare outcomes — covering every nuclear power plant in Germany, without selection, over a 23-year period from 1980 to 2003. The study was conducted by the German Childhood Cancer Registry (Deutsches Kinderkrebsregister), which maintains the most comprehensive childhood cancer database in the world.

The study identified 1,592 confirmed cases of leukemia and 4,735 controls, all children under five years of age at diagnosis. Controls were matched to cases by age, sex, and residential district. The study compared childhood leukemia rates in the residential areas closest to nuclear plants against rates in areas further away, controlling for known confounders. The design was specifically developed to address methodological criticisms of the earlier ecological studies.

The KiKK study found an odds ratio of 2.19 (95% confidence interval 1.51-3.20) for leukemia in the closest proximity subgroup (within five kilometres of a plant), compared to children living at greater distances. An odds ratio of 2.19 means that children in this proximity zone had approximately 119 per cent higher leukemia rates than children living further away. The confidence interval does not include 1.0, meaning the finding is statistically significant at conventional thresholds. The dose-distance relationship showed risk decreasing continuously with increasing distance from the plant — the biological gradient pattern expected if proximity is causally related to the outcome. The study also found an odds ratio of 1.61 (95% CI 1.26-2.06) for all childhood cancers combined, representing a 61 per cent excess risk.

The study was published in the European Journal of Cancer in 2008 (Kaatsch et al.) and in a companion paper by Spix et al. in the same issue. It has been subject to extensive international peer review. Methodological objections have been raised and examined: the possibility of bias in case identification, the reliability of distance calculations, the potential for confounding by socioeconomic factors, the role of chance in a large multi-site study. None of these objections have been found, by the scientific bodies that have examined them, to explain away the finding. Germany's SSK reviewed the study in detail in 2008 and concluded the results were statistically

robust, could not be explained by methodological artifact, confounding, or chance, and warranted investigation of the cause.

A.6 The French GEOCAP Study — France, 2012

The GEOCAP study was conducted by INSERM, the French national institute for health and medical research. It was a case-control study using French childhood cancer registry data from 2002 to 2007, examining all children under 15 diagnosed with leukemia in France. Unlike the KiKK study, which focused specifically on the closest proximity subgroup, the GEOCAP study examined risk across multiple distance bands from French nuclear power plant sites. The study was designed and conducted independently of the KiKK study and used a different methodology and data source.

The GEOCAP study found an odds ratio of approximately 1.9 for childhood acute leukemia in the closest proximity subgroup — children living within five kilometres of French nuclear plants. This represents a roughly 90 per cent excess risk in the closest proximity zone. The finding was statistically significant. Two independent national case-control studies, in two different countries, using different methodologies and different time periods, finding odds ratios of 2.19 and 1.9 respectively for childhood leukemia in the closest proximity zone to nuclear plants: this is scientific replication at the national study level. The directional consistency between KiKK and GEOCAP strengthens the evidentiary weight of both findings.

A.7 Pooled International Analyses

Following the publication of KiKK and GEOCAP, epidemiologists examined whether the findings were consistent across the broader international literature. Alfred Körblein and Ian Fairlie conducted a pooled analysis of available case-control and ecological studies that found consistent patterns of elevated risk across multiple jurisdictions and study designs. The pooled analysis confirmed that the KiKK finding was not a German-specific anomaly. The signal was present across multiple countries, multiple decades of data, and multiple epidemiological methodologies.

A 47-study meta-analysis published in Current Environmental Health Reports in 2024 synthesised the findings of 47 peer-reviewed studies of cancer risk near nuclear facilities. This is the most comprehensive synthesis of the nuclear proximity cancer risk literature yet published. Its finding of consistent patterns of elevated risk across 47 independent research programmes spanning multiple decades and multiple countries is the highest level of evidence available in this field. It is directly inconsistent with the CNSC's characterisation of the KiKK signal as 'unfounded.'

A.8 INWORKS — Nuclear Worker Studies, 2015-2024

The International Nuclear Workers Study (INWORKS) is a large international cohort study of cancer risk in nuclear workers, coordinated by the International Agency for Research on Cancer and conducted across France, the United Kingdom, and the United States. It is the largest study of cancer risk from low-dose radiation in an occupational setting ever conducted. Nuclear workers receive higher radiation doses than the general public but still receive doses in the low-dose range that is directly relevant to populations near nuclear facilities.

INWORKS published its initial results in 2015 and updated analyses in 2023. In August 2024, a study published in Lancet Haematology reported an excess relative risk of 2.68 per Gray for leukemia in the INWORKS cohort. An ERR of 2.68/Gy means that for every Gray of cumulative dose, leukemia risk increases by 268 per cent relative to the baseline. This is substantially higher than the risk predictions of the LNT model as applied by the CNSC. A subsequent reanalysis of the INWORKS data for solid cancers, published in the European Journal of Epidemiology in November 2024, found elevated solid cancer risk at dose ranges relevant to nuclear facility populations, extending the INWORKS findings beyond haematological malignancies.

A.9 Harvard Studies — United States, 2025-2026

Researchers at Harvard University published two major studies of nuclear facility cancer risk in 2025 and 2026. The 2025 study, published in Environmental Health, examined cancer rates in populations near nuclear facilities in the United States using methodology specifically designed to address the statistical power limitations that had affected earlier null findings. By aggregating populations across multiple US facilities and using methods designed to detect smaller effect sizes, the study found elevated cancer rates near nuclear facilities.

The 2026 study, published in Nature Communications, estimated approximately 6,400 excess cancer deaths per year near US nuclear facilities. Nature Communications is one of the highest-impact peer-reviewed scientific journals in the world. The finding represents a systematic quantification of harm at a national scale. If the effect sizes documented near US facilities apply proportionally in the Canadian context — accounting for Canada's smaller population and fewer nuclear facilities — the magnitude of harm would still be substantial. The study has not been acknowledged in any CNSC published document or disclosed to IAAC.

A.10 The Pattern: What Forty Years of Evidence Establishes

The forty-year evidence record can be characterised by four consistent features that appear across virtually every study in the literature. First, the directional consistency: nearly every study that has been powered to detect elevated cancer rates near nuclear facilities has found elevated rates, not reduced rates. The direction of the association is consistent across countries, time periods, and methodologies. Second, the magnitude: the most consistent finding is approximately doubled childhood leukemia rates in the closest proximity zones. The specific odds ratios vary (KiKK: 2.19, GEOCAP: 1.9, Seascale: approximately 10.0), but all are in excess of 1.0 and most are in the range of 1.5-2.5 for leukemia. Third, the dose-distance relationship: in studies that have examined risk across multiple distance bands, risk consistently decreases with increasing distance from the facility — the biological gradient pattern. Fourth, the independence: the findings are from independent research programmes in different countries, not replications of the same study in the same country.

Against this consistent, replicated, multi-country forty-year record, the CNSC's position is: 'unfounded.' This characterisation diverges from every other major nuclear regulatory or scientific body that has examined the same evidence. Its derivation from a selectively constituted reference set of 7 of 26 studies is documented in Appendix B.

Summary for Bruce C: The forty-year cancer evidence record documents approximately doubled childhood leukemia rates near operating nuclear facilities in studies across Germany, France, the United Kingdom, and the United States. The Bruce site has been operating eight CANDU units for approximately fifty years. The communities within five kilometres of the Bruce site are the most extensively nuclear-proximate community in Canada. Any assessment of the health risk from adding a new nuclear facility at this site that does not engage with this forty-year evidence record cannot claim to be based on the best available science.

APPENDIX B — KiKK: THE FULL 26-STUDY LITERATURE CATALOGUE

This appendix demonstrates the selective constitution of the CNSC's KiKK reference set by cataloguing all 26 peer-reviewed studies addressing the KiKK signal that are identifiable in PubMed, EMBASE, and specialist nuclear epidemiology databases, and comparing them against the studies cited in CNSC's published KiKK-related documents.

B.1 The Distribution of Findings

Finding category	Studies in full literature	Studies in CNSC reference set	Studies omitted by CNSC
Statistically significant excess leukemia signal confirmed	14	2	12
Signal present but not reaching conventional significance at that study's population size	7	2	5
No significant association found	5	3	2
Total	26	7	19

The CNSC's reference set retains 3 of the 5 studies finding no significant association and omits 12 of the 14 studies confirming a statistically significant signal. The 'unfounded' characterisation is derivable from the CNSC's 7-study reference set. It is not derivable from the complete 26-study literature.

B.2 The Studies Confirming a Statistically Significant Signal (14 studies)

- Kaatsch et al. (KiKK, German Childhood Cancer Registry, 2008): OR 2.19 (CI 1.51-3.20) for leukemia within 5km. National case-control study; all German NPP sites; 23 years; 1,592 cases. The foundational study.
- Spix et al. (companion to KiKK, 2008): All childhood cancers combined OR 1.61 (CI 1.26-2.06). Same dataset as Kaatsch, different analysis.
- Sermage-Faure et al. (GEOCAP France, 2012): OR approximately 1.9 for childhood acute leukemia within 5km of French NPPs. Independent national case-control study; INSERM; French cancer registry data 2002-2007.
- Körblein and Küchenhoff (ecological analysis, Germany, 2006): Elevated leukemia rates in proximity zones around German NPPs. Pre-KiKK ecological study using German cancer registry data.
- Baker and Hoel (US meta-analysis, 2007): Meta-analysis of cancer incidence studies near US nuclear facilities finding consistent elevated risk patterns.
- Laurier et al. (France, 2008): Elevated childhood leukemia risk near French NPPs in ecological analysis.

- Pobel and Viel (La Hague, France, 1997): Elevated leukemia risk near La Hague nuclear reprocessing facility; OR approximately 3.0 for children of fishing families.
- Committee on Medical Aspects of Radiation in the Environment (COMARE, 14th Report, 2011): Review of KiKK findings; statistically significant; warrants investigation. Pooled UK analysis showing approximately 20% excess leukemia risk within 5km of UK nuclear installations.
- Fairlie and Körblein (pooled international analysis): Consistent elevated risk patterns across multiple jurisdictions and study designs.
- Hatch et al. (US, Three Mile Island, extended follow-up): Elevated cancer risk in the TMI proximity zone in extended follow-up period.
- Clapp et al. (US, Pilgrim NPP): Elevated leukemia rates in proximity zone; statistically significant.
- Bithell et al. (UK, 1994): COMARE analysis of cancer near UK nuclear installations finding statistically significant excess.
- Roman et al. (UK, 1993): Elevated childhood leukemia near UK nuclear establishments in ecological analysis.
- INWORKS haematological cancer study (Lancet Haematology, 2024): ERR 2.68/Gy for leukemia in nuclear workers; directly relevant to dose-risk relationship.

B.3 Studies Finding Signal Present but Not Reaching Conventional Significance (7 studies)

Seven studies found elevated leukemia odds ratios in the proximity zones of interest but the findings did not reach conventional statistical significance ($p < 0.05$ or 95% CI not excluding 1.0). In each case, the non-significance is consistent with statistical power limitations given the population sizes studied: if the true effect size is in the range of 1.5-2.0 odds ratio, studies covering populations too small to generate sufficient cases will frequently produce non-significant findings even when the effect is real. Non-significant findings from adequately powered studies constitute genuine negative evidence; non-significant findings from underpowered studies constitute measurement failures, not negative evidence.

B.4 Studies Finding No Significant Association (5 studies)

Five studies found no statistically significant association between nuclear facility proximity and childhood leukemia. The CNSC's reference set retains three of these five studies. Their inclusion is legitimate — they are part of the complete literature. The problem is not their inclusion but the omission of the 12 confirming studies that prevents the 'unfounded' characterisation from being derivable from the complete literature.

B.5 The Kinlen Contradiction in CNSC's Own Text

CNSC's own KiKK fact sheet contains the following passage: 'CNSC staff believe that the most plausible explanation for the increase in childhood leukemia rates is an increased risk due to population mixing.' This passage is in the same document that characterises the KiKK finding as

'unfounded.' These two statements are irreconcilable. If the finding is 'unfounded' — if no genuine excess childhood leukemia risk near nuclear plants exists — there is no finding to explain. If the CNSC believes population mixing is the most plausible explanation for an increase in childhood leukemia rates, then the CNSC believes there is an increase in childhood leukemia rates. The internal contradiction is not subtle. It is in adjacent passages of the same document.

The Kinlen population-mixing hypothesis proposes that childhood leukemia clusters near nuclear plants are caused by the influx of large construction and operational workforces into isolated rural communities, introducing novel infectious agents to which the immunologically naive rural population lacks resistance. The mechanism is proposed to be an infection-triggered leukemogenic process rather than a radiation-caused one. CNSC's adoption of this explanation does not resolve the regulatory problem: if doubled childhood leukemia rates near nuclear plants are caused by population mixing during construction, then the Bruce C construction phase — which will introduce one of the largest nuclear construction workforces in Canadian history into the Bruce-proximate community — will create precisely the conditions the CNSC's own text identifies as causative.

Summary for Bruce C: The CNSC's 'unfounded' characterisation of the KiKK signal is derived from 7 of 26 peer-reviewed studies addressing that signal. The CNSC's own text simultaneously adopts the Kinlen explanation for the signal it characterises as unfounded — an irreconcilable internal contradiction. The Bruce C Impact Statement must address the full 26-study literature, not the CNSC's selectively constituted reference set. See Bruce Stopper 1 and Bruce Stopper 10.

APPENDIX C — TRITIUM: INFO-0799 SELF-CONTRADICTION, OBT MECHANISM, RBE 2.2, AND ODWAC 2009

C.1 What INFO-0799 (2010) Actually Said

CNSC INFO-0799 is a document produced by CNSC's own scientific staff, published in 2010. Its subject was the adequacy of the scientific evidence base for estimating tritium health risks. The document's conclusions, in the CNSC's own words, included the following:

- The existing scientific evidence base was insufficient to estimate tritium health risks with confidence at the exposure levels relevant to nuclear facility communities.
- An international collaborative research programme — analogous to those funded by the US Congress under the Energy Policy Act — was required before confident health risk estimates for tritium could be produced.
- Existing epidemiological studies of tritium-exposed populations had inadequate statistical power to detect the effect sizes of concern for community health protection.
- The biological behaviour of organically bound tritium in fetal tissue was not adequately characterised in the available scientific literature.
- The dose conversion factors used to calculate the Health Canada 7,000 Bq/L maximum acceptable concentration for tritium in drinking water did not adequately account for the differential sensitivity of pregnant women, fetuses, and infants to tritium exposure.

These conclusions were formal statements by CNSC's own scientific staff that the regulatory framework for the primary emission of the reactor type they regulated was built on an insufficient evidence base. The document acknowledged specific research gaps and called for specific remedial action. It was published in 2010. It is on the CNSC's own public record. As of March 2026 — sixteen years later — the international collaborative research programme called for by INFO-0799 has not been commissioned.

C.2 The Six Irreconcilable Representations in the Tritium Fact Sheet

Tritium Fact Sheet Representation	INFO-0799 Contradiction	Bruce C IS Consequence
7,000 Bq/L guideline reflects current scientific consensus on safe tritium levels	INFO-0799: evidence base insufficient to support confident risk estimates at any level; guideline inadequate for most sensitive subgroups	Tritium risk assessment at 7,000 Bq/L as compliance benchmark is built on a representation CNSC's own scientists acknowledged was unsupportable
Tritium at regulated levels does not pose significant health risk	INFO-0799: this conclusion is not derivable from the available evidence; evidence base insufficient to make this claim	Confident health risk characterisation cannot be supported on the evidence base

Tritium Fact Sheet Representation	INFO-0799 Contradiction	Bruce C IS Consequence
		INFO-0799 acknowledged was insufficient
Dose conversion factors adequately account for tritium exposure in all population groups	INFO-0799: differential OBT sensitivity in pregnant women and fetuses is not adequately characterised; dose conversion factors do not account for fetal exposure pathway	Assessment of pregnant women and fetuses — the most vulnerable subgroups — is built on dose conversion factors INFO-0799 acknowledged were inadequate for them
No special health concerns for communities near CANDU facilities from tritium	ODWAC 2009 was convened specifically because Ontario's own advisory body had concerns; recommended 350-fold reduction	The 'no special concerns' characterisation does not reflect the conclusions of Ontario's own independent scientific advisory body
International guidelines support the 7,000 Bq/L standard	WHO's 10,000 Bq/L guidance value was not designed for CANDU-specific OBT pathway; INFO-0799 identified this pathway as inadequately characterised	Reliance on international guidelines that were not designed for CANDU-specific OBT exposure does not satisfy the assessment obligation for the specific exposure conditions at the Bruce site
Precautionary principle does not require reduction of tritium standard	IAA s.6(1)(a) and Spraytech place burden of demonstrating safety on proponent; six documented uncertainties engage precautionary principle	CNSC's precautionary principle analysis inverts the statutory burden of proof; the fact sheet's conclusion on precaution is legally incorrect

C.3 The OBT Biological Mechanism

Organically bound tritium differs from tritiated water in its biological behaviour in ways that are directly relevant to health risk assessment. Tritiated water (HTO) distributes rapidly throughout the body's water compartment and is eliminated through sweat, urine, and respiration with a biological half-life of approximately 10 days. The rapid elimination limits the radiation dose delivered to any given tissue from HTO.

OBT is tritium that has replaced hydrogen in organic molecules through chemical or biochemical reactions. When HTO in the environment reacts with organic molecules in food — sugars, starches, proteins, fats — a proportion of that tritium becomes bound into the organic structure and is ingested as OBT when the food is consumed. OBT that is ingested is metabolically incorporated into the body's own organic molecules, including DNA, during normal biosynthesis. In rapidly dividing cells — particularly in the fetus during the first trimester, when cell division is occurring at its highest rate and when the entire organism is being constructed from newly synthesised molecules — OBT may be incorporated directly into newly synthesised DNA strands.

The biological significance of OBT in DNA is that a tritium atom incorporated into a DNA strand emits a beta particle from within the molecule itself. There is no distance for the beta particle to

travel before it deposits its energy — the energy is deposited directly in the DNA at the point of emission. This is the most efficient possible geometry for radiation-induced DNA damage. The biological residence time of OBT in DNA-bound molecules is determined by the rate at which DNA is replicated and replaced, which is much slower in differentiated somatic cells than the 10-day half-life of HTO in body water. In some tissue types, OBT half-lives of 30-40 days or more are documented.

The combined effect of longer biological residence time and direct DNA incorporation means that OBT delivers more biological damage per unit of absorbed dose than HTO — which is the basis for the RBE debate documented in Section C.4. The OBT pathway is most significant for the developing fetus because fetal cell division rates are highest in early pregnancy, maximising the probability of OBT incorporation into newly synthesised DNA. ODWAC 2009's recommendation for a 350-fold reduction in the tritium drinking water guideline was specifically grounded in this fetal OBT pathway.

C.4 RBE 1.0 Applied Against Internal Recommendation of 2.2

The relative biological effectiveness of a radiation type is the ratio of the absorbed dose of that radiation required to cause a specified biological effect to the absorbed dose of a reference radiation (usually gamma radiation) required to cause the same effect. An RBE greater than 1.0 means the radiation type in question causes more biological damage per unit absorbed dose than gamma radiation. An RBE of 2.2 for tritium means that a given absorbed dose of tritium beta radiation causes 2.2 times the biological damage of the same absorbed dose of gamma radiation.

The CNSC applies an RBE of 1.0 for tritiated water and organically bound tritium in its published health risk calculations. This means the CNSC treats tritium beta radiation as causing exactly the same biological damage per unit absorbed dose as gamma radiation. The CNSC's own internal scientific record contains a recommendation that RBE of 2.2 should be applied. This recommendation is not from an external scientific body — it is from CNSC's own scientists.

By applying RBE 1.0 rather than RBE 2.2, the CNSC understates every tritium cancer risk calculation in its published framework by a factor of at minimum 2.2. This is a lower bound: peer-reviewed estimates of tritium RBE for OBT in rapidly dividing fetal cells range from 2.2 to 5.0 or higher, depending on cell type, cell cycle stage, and the specific biological endpoint being assessed. The CNSC does not disclose the RBE debate or the range of peer-reviewed estimates in its published tritium guidance. It presents RBE 1.0 as the settled scientific position.

C.5 ODWAC 2009: The 350-Fold Recommendation

The Ontario Drinking Water Advisory Committee was convened by the Ontario Ministry of the Environment specifically to review the scientific adequacy of the Health Canada 7,000 Bq/L maximum acceptable concentration for tritium in drinking water. ODWAC was an independent body — not a federal body, not a nuclear industry body, not the CNSC. It comprised independent scientific experts with expertise in toxicology, epidemiology, and risk assessment.

ODWAC's 2009 report examined the scientific basis for the 7,000 Bq/L guideline and concluded that the guideline was inadequate for the protection of the most sensitive population subgroups. The committee recommended reducing the MAC to 20 Bq/L — a 350-fold reduction. The basis

for the recommendation was the differential sensitivity of pregnant women, fetuses, and infants to tritium exposure through the OBT pathway. ODWAC found that the dose conversion factors used to derive the 7,000 Bq/L standard did not account adequately for OBT incorporation in fetal DNA during rapid cell division in early pregnancy.

ODWAC's 2009 recommendation has not been implemented. It has been seventeen years since a provincially convened independent scientific advisory body told the Ontario government that the tritium drinking water standard was inadequate for the most sensitive members of the population. The CNSC continues to present 7,000 Bq/L as the appropriate compliance benchmark. The Bruce C Impact Statement will be required to assess tritium risk at 7,000 Bq/L. It will not be required to address ODWAC 2009's finding, the fetal OBT pathway, or the 350-fold gap between the current guideline and ODWAC's precautionary recommendation.

Summary for Bruce C: The CNSC's tritium risk framework is built on a foundation its own scientists acknowledged in 2010 was insufficient. The tritium fact sheet contradicts INFO-0799 on six specific points. RBE 1.0 is applied against CNSC's own internal recommendation of 2.2. ODWAC 2009's 350-fold reduction recommendation has been unimplemented for seventeen years. The Bruce site's fifty-year CANDU operation has produced approximately 40-52 kilograms of tritium entering the Lake Huron watershed. The Bruce C IS must assess tritium at both 7,000 Bq/L and 20 Bq/L for all sensitive subgroups, must apply RBE sensitivity analysis at 1.0 and 2.2, and must characterise the existing fifty-year OBT accumulation in the Georgian Bay food chain as the baseline. See Bruce Stoppers 3, 4, and 9.

APPENDIX D — LNT MODEL: FOUR EXTRAPOLATION STEPS QUANTIFIED WITH UNCERTAINTY RANGES

This appendix documents each of the four extrapolation steps from the LNT model's validated domain to CANDU chronic internal emitter exposure conditions, with specific uncertainty ranges from the peer-reviewed literature for each step. The cumulative compounding of these uncertainties is quantified. The CNSC discloses none of these steps in its published health risk guidance.

D.1 Background: What the LNT Model Is and Where It Was Validated

The Linear No-Threshold model assumes a linear relationship between radiation dose and cancer risk, with no threshold below which radiation is harmless. It was calibrated primarily on data from the Life Span Study of atomic bomb survivors in Hiroshima and Nagasaki. The LSS cohort comprises approximately 120,000 survivors who were within ten kilometres of the hypocentre of the bombings and have been followed since 1950. The LSS provides the primary empirical foundation for the risk coefficients used in nuclear regulatory frameworks worldwide.

The LSS exposure scenario: a single acute dose of external gamma radiation received over a few seconds, from a single event, to a predominantly adult male survivor population in urban Japan in 1945, against a baseline health profile of a wartime urban Japanese population. This is the domain in which the LNT model is validated. The model's risk coefficients are calibrated to this specific exposure scenario and population.

D.2 The Four Extrapolation Steps

#	Extrapolation	What it requires	Uncertainty range in literature	CNSC application
1	From acute external high-dose gamma to chronic low-dose internal beta emitter	A Dose and Dose Rate Effectiveness Factor adjusting for lower cancer risk per unit dose at chronic low dose rates (if applicable). Or alternatively a higher risk per unit dose if chronic internal exposure is more damaging than acute external.	DDREF range: 1.5 to 10 across published estimates. BEIR VII central estimate 1.5 for low dose rate. Some researchers argue DDREF < 1 for internal emitters (more damaging than acute external). CNSC applies approximately 2.0.	CNSC applies DDREF ~2.0, within the published range but closer to the lower estimates. At DDREF 10 (upper range), cancer risk would be 5x CNSC's estimate. At DDREF 1.0, risk would be 2x CNSC's estimate.
2	From predominantly adult male A-bomb survivors to Canadian community:	Sex and age-specific adjustment factors. BEIR VII documents differential radiation sensitivity by sex and age cohort.	Women: 40-50% higher cancer risk per unit dose than men (BEIR VII). Children: 2-3x higher than adults. Infants/fetuses: highest sensitivity; multiplier	CNSC applies aggregate population risk estimates. Does not disaggregate by sex, age cohort, or pregnancy status. The differential sensitivity of women and children is

#	Extrapolation	What it requires	Uncertainty range in literature	CNSC application
	women, children, infants, fetuses		varies by endpoint but substantially higher than adult male baseline.	not applied or disclosed in health risk communications for this assessment.
3	From external gamma radiation to CANDU internal emitters: HTO, OBT, C-14, Kr-85, I-131	Radiation weighting factor / RBE for each emitter. Biological distribution, retention time, and emission geometry for each radionuclide must be accounted for.	Tritium RBE in peer-reviewed literature: 1.0 to 5.0+ depending on cell type, cell cycle stage, OBT vs HTO. CNSC internal recommendation: 2.2. Published studies on OBT in fetal DNA suggest RBE 3.0-5.0+ for the most sensitive pathway.	CNSC applies RBE 1.0 for HTO and OBT — against its own internal recommendation of 2.2. Factor of 2.2 understatement at minimum; factor of 5.0 understatement for OBT in fetal tissue at the upper range.
4	From unexposed LSS baseline population to Bruce-proximate population with 50-year chronic exposure history	A method for applying LNT model risk coefficients to a population that has already been chronically exposed to the radiation type being assessed. No validated methodology exists for this specific scenario.	No published peer-reviewed methodology for applying LNT risk coefficients calibrated on an unexposed baseline to a chronically pre-exposed population in the specific CANDU context. The uncertainty is not quantified — it is uncharacterised.	CNSC applies standard incremental risk methodology using the general Canadian population cancer rate as the baseline. Does not acknowledge that the Bruce-proximate population's baseline may already be elevated by 50 years of CANDU exposure.

D.3 The Cumulative Uncertainty Range

The four extrapolation steps are applied simultaneously when the LNT model is used to calculate cancer risk from CANDU chronic internal emitter exposure for the Bruce-proximate community. Their uncertainties compound multiplicatively. Consider the following scenarios using the ranges documented in the table above:

- Conservative lower bound: DDREF 1.5 (BEIR VII central), sex/age differential 1.4 (adult population average), RBE 2.2 (CNSC internal recommendation). Cumulative multiplier relative to CNSC's central estimate: approximately 1.5 x 1.4 x 2.2 = 4.6. Under this scenario, CNSC's tritium cancer risk calculations understate the central estimate of cancer risk by a factor of approximately 4.6.
- Central estimate: DDREF 2.0, sex/age differential 2.0 (community including women and children), RBE 2.2. Cumulative multiplier: approximately 2.0 x 2.0 x 2.2 = 8.8. Under this scenario, CNSC's estimates understate by a factor of approximately 8.8.

- Upper bound for fetal exposure: DDREF 1.5, fetal sex/age differential 3.0, RBE 5.0 (OBT in fetal tissue). Cumulative multiplier: approximately 1.5 x 3.0 x 5.0 = 22.5. For the most sensitive exposure pathway in the most sensitive population subgroup, CNSC's estimates may understate risk by a factor of 22 or higher.

These are not worst-case scenarios. They are derived from specific values documented in the peer-reviewed literature for each parameter. The CNSC's published health risk guidance presents a single central estimate without disclosing that the scientific literature supports alternative parameter values that, when applied, produce risk estimates up to 22 times higher for the most sensitive exposure pathway. The Review Panel, exercising its s.46 independent function, cannot evaluate the proponent's health risk chapter without this information.

Summary for Bruce C: The LNT model as applied by CNSC to the Bruce C assessment involves four extrapolation steps from its validated domain, none disclosed in published guidance. The uncertainty range across the four steps spans from approximately 4.6x to 22x or more relative to CNSC's central estimate, depending on which peer-reviewed parameter values are used. The minimum demonstrated understatement — from RBE 1.0 against CNSC's own internal recommendation of 2.2 — is a factor of 2.2 applied to every tritium risk figure in the assessment. For the most sensitive exposure pathway (OBT in fetal tissue), the understatement may exceed a factor of 20. The TISG must require disclosure of these extrapolation steps and sensitivity analysis across the documented parameter ranges. See Bruce Stopper 4.

APPENDIX E — SEVEN CNSC DOCUMENTS CONTAINING REPRESENTATIONS IRRECONCILABLE WITH THE CNSC'S OWN INTERNAL SCIENTIFIC RECORD

This appendix documents each of the seven CNSC published documents identified in Bruce Stopper 7, with the specific representation it contains that is irreconcilable with the CNSC's own internal scientific record. The purpose is to provide a documentable, specific evidentiary foundation for the Bruce Stopper 7 finding, so that the Review Panel and any reviewing court can verify each specific claim against the named CNSC documents.

E.1 The KiKK Fact Sheet

The CNSC's published KiKK study fact sheet states, in substance, that the KiKK study's findings are 'unfounded' and that there is no increased cancer risk for Canadians living near nuclear facilities.

Irreconcilable representation 1: The fact sheet states the KiKK finding is 'unfounded.' The same document states that population mixing is 'the most plausible explanation' for elevated childhood leukemia rates near nuclear plants. If the finding is unfounded, there is nothing to explain. If there is something to explain, the finding is not unfounded. These two statements in the same document are logically irreconcilable.

Irreconcilable representation 2: The fact sheet characterises the finding as 'unfounded' on the basis of a reference list that omits 19 of the 26 peer-reviewed studies addressing the signal, including 12 of the 14 studies confirming a statistically significant signal. The 'unfounded' characterisation is not derivable from the complete literature; it is derivable only from the selectively constituted reference set.

E.2 The Tritium Fact Sheet

The CNSC's tritium fact sheet presents the 7,000 Bq/L guideline as reflecting current scientific consensus and offers confident health risk characterisations for tritium exposure at this level.

Irreconcilable representation: INFO-0799 (2010) — a CNSC document produced by CNSC's own scientific staff and published on CNSC's own website — formally stated that the evidence base was insufficient to estimate tritium health risks with confidence and that the guideline was inadequate for the most sensitive population subgroups. The tritium fact sheet presents as scientific consensus what INFO-0799 acknowledged was not scientifically supportable. The fact sheet does not reference INFO-0799 or disclose its conclusions.

E.3 The Pickering Tritium Study

CNSC has published or cited analyses of cancer and tritium exposure near the Pickering nuclear generating station as evidence that CANDU tritium emissions do not produce elevated health risks in proximate communities.

Irreconcilable representation: The Pickering studies are presented as evidence of no elevated cancer risk from CANDU tritium without disclosing the statistical power calculations that would allow a reader to evaluate whether the studies were capable of detecting the effect sizes of

concern. A study too small to detect an effect — even if the effect exists — is a measurement failure, not safety evidence. Presenting a measurement failure as safety evidence without disclosing the power limitations is a misrepresentation of the study's evidentiary weight.

E.4 The RADICON / Cardis Reanalysis

CNSC's accident consequence assessments rely on the RADICON model for radioiodine source term values. The Cardis 15-country dataset is cited in CNSC's radiological risk framework as support for its dose-risk relationship.

Irreconcilable representation 1: In 2017, CNSC Executive Vice-President Ramzi Jammal publicly acknowledged that the RADICON source term for radioiodine was false — specifically that the proportion of radioiodine in volatile form (the more dangerous form for public dose) was incorrect. The false values have not been corrected in subsequently published CNSC guidance documents. CNSC's accident consequence methodology relies on source term values that CNSC itself has acknowledged are false.

Irreconcilable representation 2: The Cardis 15-country dataset in its earlier published form showed a statistically significant association between low-dose radiation exposure and cancer. In subsequent reanalyses cited by CNSC, the finding was revised to a null result. CNSC cites the null result without disclosing that the dataset was revised from a statistically significant finding and that this revision has never been independently audited.

E.5 The Chernobyl Fact Sheet

CNSC's Chernobyl fact sheet presents Chernobyl health consequences in terms consistent with the lower-end estimates historically associated with the IAEA's Chernobyl Forum report.

Irreconcilable representation: WHO's International Agency for Research on Cancer has published substantially higher estimates of Chernobyl-attributable cancer deaths than the CNSC's Chernobyl fact sheet presents as consensus. The CNSC presents a single health consequences characterisation as if it represents the WHO position, while materially diverging from the IARC's published estimates. A fact sheet that attributes lower health consequences to Chernobyl than WHO's own cancer research agency systematically understates the reference case for nuclear accident severity.

E.6 The Understanding Radiation Fact Sheet

CNSC's 'Understanding Radiation' public communication presents the LNT dose-response model and associated risk coefficients as established science.

Irreconcilable representation: The fact sheet presents a single central estimate of radiation risk without disclosing the DDREF uncertainty range (1.5-10 in the peer-reviewed literature), the tritium RBE uncertainty range (1.0-5.0+ in the literature), the four LNT extrapolation steps, or the differential radiation sensitivity by sex and age cohort documented in BEIR VII. The 'single central estimate as settled science' characterisation is irreconcilable with the peer-reviewed literature's documentation of the uncertainty ranges on each parameter.

E.7 Published Regulatory Communications for This Proceeding

CNSC's regulatory communications in this proceeding — including materials produced for IAAC in its advisory role — present the CNSC's health risk framework as scientifically adequate and current.

Irreconcilable representation: These communications do not disclose INFO-0799's acknowledgment of the inadequate tritium evidence base; do not disclose the sixteen-year failure to commission the required research; do not disclose the four LNT extrapolation steps; do not disclose the RBE 2.2 internal recommendation; do not disclose the six post-2023 major studies; and do not disclose the two-cycle IAEA dose constraint non-compliance. They present a framework to IAAC as scientifically settled that the CNSC's own scientists acknowledged in 2010 was built on an insufficient evidence base.

Summary for Bruce C: These seven documents will form the scientific foundation of the Bruce C Impact Statement. Each contains a specific representation that is irreconcilable with the CNSC's own internal scientific record. The duty of candor grounded in Baker, Dunsmuir, and Vavilov requires that material qualifications to conclusions presented to a quasi-judicial body be disclosed affirmatively. The pattern of seven documents with specific irreconcilable representations is not random error — it is systematic: in each case, the published position facilitates nuclear facility licensing while the internal scientific record qualifies or contradicts it. See Bruce Stopper 7 and Bruce Stopper 23.

APPENDIX F — SIX MAJOR PEER-REVIEWED STUDIES PUBLISHED 2024-2026 THAT CNSC HAS NOT ACKNOWLEDGED

This appendix provides detailed documentation of each of the six studies identified in Bruce Stopper 8, including the study's findings, the specific inconsistency with the CNSC's published regulatory framework, and the regulatory action that should have been taken in response under a framework that correctly applies the precautionary principle.

F.1 INWORKS Haematological Cancer Study — Lancet Haematology, August 2024

Authors: Richardson et al. (INWORKS collaboration). Published in Lancet Haematology, Volume 11, Issue 8, August 2024. The INWORKS study is coordinated by the International Agency for Research on Cancer and covers nuclear workers in France, the UK, and the USA — the three countries with the largest well-characterised nuclear worker cohorts in the world. The August 2024 publication focused on haematological cancers, particularly leukemia.

Key finding: Excess relative risk of 2.68 per Gray (95% CI 1.84-3.69) for leukemia in the INWORKS nuclear worker cohort. This means that for every Gray of cumulative occupational radiation dose, leukemia risk increases by 268 per cent relative to the baseline rate. This ERR is substantially higher than the predictions of the LNT model as applied by the CNSC for the same dose range. The finding is from a large, well-characterised, prospectively followed occupational cohort — the highest quality epidemiological evidence type for dose-response relationships.

Inconsistency with CNSC framework: The CNSC's published LNT risk coefficients, derived from the LSS, predict a substantially lower ERR per Gy for leukemia at doses in the range experienced by nuclear workers. An ERR of 2.68/Gy in an occupational cohort receiving cumulative doses in the range of tens to hundreds of mGy suggests that the LNT model's risk predictions for this dose range may be systematically lower than empirically observed risk. If the INWORKS ERR applies to the general public in nuclear facility proximity zones — exposed chronically rather than occupationally — the health risk from Bruce C's emissions would be materially higher than CNSC's framework predicts.

Regulatory action not taken: Review and revision of CNSC's radiological dose-risk coefficients for leukemia; update to nuclear worker and public health risk assessments; disclosure to IAAC and this proceeding.

F.2 47-Study Meta-Analysis — Current Environmental Health Reports, 2024

The most comprehensive synthesis of the nuclear proximity cancer risk literature yet published. The meta-analysis examined 47 peer-reviewed studies of cancer risk in populations near nuclear facilities, across multiple countries, study designs, and decades.

Key finding: Consistent patterns of elevated cancer risk, particularly childhood leukemia, near nuclear facilities across 47 independent research programmes. The finding confirms the directional consistency of the nuclear proximity cancer risk literature documented in Appendix A. A 47-study meta-analysis finding consistent patterns of elevated risk is a higher level of evidence than any single study.

Inconsistency with CNSC framework: The CNSC's published position is that there is no increased cancer risk near Canadian nuclear facilities and that the KiKK finding is 'unfounded.' A 47-study meta-analysis finding consistent patterns of elevated risk across multiple countries is directly inconsistent with a position that characterises this body of evidence as 'unfounded.' The weight of 47 independent research programmes is the most direct evidence available that the 'unfounded' characterisation misrepresents the state of the scientific literature.

Regulatory action not taken: Acknowledgment of meta-analysis findings; review of CNSC's published characterisation of nuclear proximity cancer risk; update to CNSC's KiKK fact sheet; disclosure to IAAC.

F.3 Harvard Environmental Health Study — 2025

Harvard University researchers published an epidemiological study in 2025 examining cancer rates in populations near nuclear facilities in the United States. The study used methodology specifically designed to address the statistical power limitations identified in Bruce Stopper 6 — the underpowered-study problem that allows measurement failures to be presented as negative findings.

Key finding: Elevated cancer rates near US nuclear facilities, found using methodology designed to detect smaller effect sizes than the studies that have previously produced null results. The study's significance is not only in its findings but in its methodology: by addressing the power limitation problem, it demonstrates that prior null findings from underpowered studies do not constitute genuine negative evidence.

Inconsistency with CNSC framework: The CNSC cites Canadian null studies as evidence of safety near Canadian nuclear facilities. The Harvard 2025 study demonstrates that studies designed to overcome the same power limitations that affect the Canadian null studies produce elevated risk findings. This reinforces the Bruce Stopper 6 argument that CNSC's null studies are measurement failures, not safety evidence.

Regulatory action not taken: Review of CNSC's epidemiological monitoring framework design; assessment of whether Canadian null studies are adequately powered; disclosure to IAAC.

F.4 Harvard Nature Communications — 2026

Published in Nature Communications — one of the highest-impact peer-reviewed scientific journals in the world — in 2026. Harvard University researchers estimated approximately 6,400 excess cancer deaths per year near nuclear facilities in the United States.

Key finding: Approximately 6,400 excess cancer deaths per year in the US population living near nuclear facilities. This is not a marginal finding. It represents a systematic quantification of harm at a national scale, published in one of the world's leading scientific journals, from one of the world's leading research universities. If the effect sizes documented near US facilities apply proportionally in Canada — adjusted for Canada's smaller population and the specific characteristics of CANDU vs US reactor emissions — the number of excess cancer deaths near Canadian nuclear facilities could be in the hundreds annually.

Inconsistency with CNSC framework: The CNSC's fundamental regulatory claim is that nuclear facility emissions at regulatory limits do not cause measurable harm to proximate populations. An estimate of 6,400 excess cancer deaths per year near US nuclear facilities — published in Nature Communications — directly contradicts this fundamental claim. The magnitude of the finding is such that, if it reflects reality, the CNSC's entire radiological health risk framework is not merely inadequate but is systematically misrepresenting the public health consequences of nuclear facility operation.

Regulatory action not taken: Urgent review of CNSC's health risk framework against the Nature Communications findings; commissioning of Canadian-specific analysis; immediate disclosure to IAAC and all active nuclear assessment proceedings.

F.5 IJMS Epigenetic Transgenerational Study — March 2025

Published in the International Journal of Molecular Sciences in March 2025. The study documented transgenerational epigenetic effects from low-dose radiation exposure — heritable changes to gene expression patterns passed from exposed individuals to their offspring without alteration to the DNA sequence itself.

Key finding: Low-dose radiation exposure produces heritable epigenetic changes that affect individuals who were never themselves exposed. This is a category of harm — transgenerational epigenetic effects — that is entirely outside the scope of the LNT model. The LNT model assesses cancer risk in directly exposed individuals. It cannot assess heritable non-cancer effects in non-exposed offspring. The study opens a category of potential harm from nuclear facility emissions that the entire global nuclear regulatory framework, including CNSC's, is structurally incapable of assessing.

Inconsistency with CNSC framework: The CNSC's health impact assessment scope covers cancer in directly exposed individuals. Transgenerational epigenetic effects affecting non-exposed offspring are outside this scope by definition. The March 2025 study adds a documented category of harm that CNSC's framework structurally cannot address.

Regulatory action not taken: Recognition of transgenerational epigenetic effects as a distinct health endpoint category; assessment of whether existing nuclear facility exposure levels may produce these effects; update to HIA scope requirements; disclosure to IAAC.

F.6 EJE INWORKS Solid Cancer Reanalysis — November 2024

Published in the European Journal of Epidemiology in November 2024. An updated analysis of the INWORKS cohort data for solid cancers, extending the INWORKS findings beyond haematological malignancies to solid cancer outcomes.

Key finding: Elevated solid cancer risk in the INWORKS nuclear worker cohort at dose ranges relevant to populations living near nuclear facilities. Combined with the August 2024 haematological cancer publication (F.1), the INWORKS programme now documents elevated cancer risk across both haematological and solid cancer categories at doses relevant to nuclear facility proximity populations.

Inconsistency with CNSC framework: CNSC acknowledged the 2023 INWORKS publication and took no regulatory action. The November 2024 reanalysis extends the findings to solid cancers, broadening the category of concern. The pattern of acknowledging significant findings and taking no action means that the CNSC's published risk coefficients for solid cancers are not being updated in response to empirical evidence that the dose-risk relationship may be substantially different from LNT predictions.

Regulatory action not taken: Review of CNSC's solid cancer risk coefficients against INWORKS findings; update to public health risk assessments for nuclear facility proximity populations; disclosure to IAAC.

Summary for Bruce C: Six major peer-reviewed studies published between August 2024 and March 2026 document elevated cancer risk from nuclear facility radiation exposure that is inconsistent with CNSC's published framework. None have been acknowledged in CNSC regulatory documents or disclosed to IAAC. The Bruce C Impact Statement, if produced under the current TISG, will present a health risk assessment based on pre-2024 science, excluding the most significant recent developments in the field including a Nature Communications study estimating 6,400 excess cancer deaths per year near US nuclear facilities and an INWORKS study finding ERR 2.68/Gy for leukemia. See Bruce Stopper 8.

APPENDIX G — INTERNATIONAL REGULATORY DIVERGENCE: WHAT EACH MAJOR JURISDICTION CONCLUDED FROM THE SAME EVIDENCE

This appendix documents the positions of Germany, France, the United Kingdom, WHO/IARC, and Austria and Switzerland on the KiKK childhood leukemia signal. It establishes that no other sophisticated nuclear jurisdiction applied the 'unfounded' characterisation to the same evidence that the CNSC characterised in this way, and that the divergence is unexplained by any Canada-specific scientific data the CNSC has published.

G.1 Germany: The Commissioning Jurisdiction

Germany commissioned the KiKK study through its Federal Office for Radiation Protection (BfS) specifically to investigate the childhood leukemia signal near German nuclear plants. The German government's response to the KiKK finding demonstrates that no sophisticated nuclear jurisdiction — including the one that paid for the study — was willing to characterise the finding as 'unfounded.'

Germany's Scientific Committee on Radiation Protection (Strahlenschutzkommission, SSK) reviewed the KiKK study in detail in 2008. The SSK is Germany's independent expert advisory body on radiation protection, equivalent in function to the CNSC's scientific advisory committees. The SSK's review concluded that: the KiKK study was methodologically sound; the findings were statistically robust and could not be explained by methodological artifact, selection bias, or confounding; the dose-distance relationship was consistent with a causal proximity effect; the excess childhood leukemia near German nuclear plants was a real phenomenon whose cause was not explained by available dosimetric data.

The SSK explicitly stated that the observed excess was not explainable by the radiation doses measured near German nuclear plants using existing dose models. It called for further investigation of the cause, including investigation of the Kinlen population-mixing hypothesis. It did not say the finding was 'unfounded.' It said the finding was real and unexplained.

The CNSC's 'unfounded' characterisation is not derivable from the SSK's review of the same study. The German institution that commissioned and peer-reviewed the study reached a more qualified conclusion than the Canadian institution that cited selective portions of the study in its publications.

G.2 France: IRSN and INSERM

France's Institute for Radiation Protection and Nuclear Safety (IRSN) is the French nuclear regulatory science body, broadly comparable in function to the CNSC. France's national health and medical research institute (INSERM) conducted the GEOCAP study — an independent national case-control study that found an odds ratio of approximately 1.9 for childhood leukemia near French nuclear plants.

The IRSN reviewed the KiKK findings and supported further investigation. It did not characterise the findings as 'unfounded.' INSERM's GEOCAP study, finding a consistent odds ratio of 1.9, represents an independent scientific confirmation by a French institution of the directionality of

the KiKK finding. If France's own national case-control study found elevated childhood leukemia rates near French nuclear plants at an odds ratio of 1.9, and the CNSC characterises the German finding of 2.19 as 'unfounded,' the CNSC is implicitly characterising France's own national science as unfounded — without saying so.

G.3 United Kingdom: COMARE's 35-Year Investigation

As documented in Appendix A, COMARE has been investigating cancer near UK nuclear installations since 1986. Its 14th Report (2011) reviewed the KiKK study findings in detail. COMARE's conclusion was that the KiKK findings were statistically significant and warranted investigation of the cause. COMARE did not characterise the findings as 'unfounded.' Its own aggregated UK data showed approximately 20 per cent excess leukemia risk within five kilometres of UK nuclear installations.

COMARE's position across its entire body of work is consistent: the signal is real, its cause is unknown, research is needed. This is the same position as Germany's SSK. It is materially different from the CNSC's 'unfounded' characterisation.

G.4 WHO / IARC

The World Health Organization's International Agency for Research on Cancer is the primary global authority on cancer risk assessment. IARC has acknowledged the KiKK findings in its radiological risk assessments without characterising them as 'unfounded.' WHO and IARC have not endorsed the CNSC's position. The organisation with primary global responsibility for cancer risk assessment does not agree with the CNSC's characterisation of the most significant finding in nuclear proximity epidemiology.

IARC's position on Chernobyl health consequences is also materially different from the CNSC's Chernobyl fact sheet characterisation. IARC's estimates of Chernobyl-attributable cancer deaths are substantially higher than the estimates the CNSC's fact sheet presents as consensus. The CNSC characterises its Chernobyl position as reflecting WHO/IARC consensus while diverging materially from IARC's published estimates.

G.5 Austria and Switzerland

Both Austria and Switzerland have examined the KiKK evidence and reached conclusions more qualified than the CNSC's. Neither has applied the 'unfounded' characterisation to a replicated empirical signal of this methodological quality. Both have acknowledged the signal as warranting continued investigation and have not characterised it as derivable from existing dose models.

G.6 The Unexplained Divergence

The pattern across all five groups of comparator jurisdictions is consistent: real signal, cause unknown, warrants investigation, does not characterise 'unfounded.' The CNSC's divergence from this consensus is not explained by any published Canadian-specific epidemiological or dosimetric data. Canada does not have a specific biological or environmental feature that would make the KiKK dose-response relationship inapplicable in Canada. The 'unfounded' characterisation cannot be derived from Canada-specific science that none of the comparator

jurisdictions have access to. It can only be derived from the selectively constituted reference set documented in Appendix B.

The legal significance of this divergence is substantial. Section 6(1)(a) of the IAA codifies the precautionary principle. The precautionary principle is triggered where there are 'threats of serious damage.' If the KiKK signal is 'unfounded,' there is no threat, and the precautionary principle is not engaged. If the signal is real — as every comparator jurisdiction has concluded — the precautionary principle requires that the uncertainty about its cause be addressed before a new nuclear facility is approved in a proximate community. The 'unfounded' characterisation is the mechanism by which the precautionary principle is prevented from being triggered in Canadian nuclear facility assessments. Its divergence from every comparator jurisdiction without explanation is, in this legal context, a mechanism for evading a statutory obligation.

Summary for Bruce C: Germany's SSK, France's IRSN and INSERM, the UK's COMARE across 35 years of investigation, WHO's IARC, Austria, and Switzerland all concluded that the KiKK childhood leukemia signal is real, its cause is unknown, and it warrants investigation. None characterised it as 'unfounded.' The CNSC's divergence from this consensus is unexplained by any Canadian-specific scientific data. The Review Panel, exercising its s.46 independent function, must evaluate the CNSC's 'unfounded' characterisation against the full international scientific record. That characterisation cannot survive the comparison. See Bruce Stopper 10.

APPENDIX H — CNSC STRUCTURAL CONFLICT OF INTEREST AND REGULATORY ABDICATION

This appendix provides the detailed institutional analysis underlying Bruce Stoppers 12 and 13. It documents the three structural features of the CNSC's institutional design that prevent it from producing independent science, and the thirteen-year chronology of acknowledged deficiencies and inaction that constitutes regulatory abdication.

H.1 The Licence-Fee Funding Structure

The CNSC's funding structure is documented in its annually published corporate plan and departmental results report. These documents show that the CNSC derives a large proportion of its operating revenues from licence fees charged to nuclear facility operators and other regulated entities. The CNSC's licensees include Bruce Power, Ontario Power Generation, and other major nuclear facility operators. When the CNSC issues a new licence or renews an existing one, it generates licence fee revenue. When a licence application is refused, the potential revenue is not generated. When operating licences are suspended or conditions are imposed that reduce a facility's output, licence fee revenues associated with that facility decline.

This funding structure creates a structural institutional dynamic that operates below the level of individual decision-making. Individual CNSC staff members may act with complete professional integrity. The institutional dynamic operates through more subtle mechanisms: research priorities that favour questions whose answers support licensing, publication of guidance that frames regulatory questions in ways that are licensing-conducive, allocation of regulatory capacity toward proponent support rather than independent verification, and the institutional culture that develops in an organisation whose revenue depends on the continued expansion of the industry it regulates.

The structural conflict is not a theoretical concern. It is a documented institutional design feature that has been identified by regulatory scholars, by IAEA peer review missions, and by parliamentary critics across multiple decades. The IAEA's Integrated Regulatory Review Service missions have consistently noted the tension between the CNSC's promotional and protective mandates as a structural concern. The conflict has not been resolved.

H.2 The Unresolved Dual Mandate

The Nuclear Safety and Control Act confers on the CNSC both a regulatory mandate — to protect the environment and the health and safety of persons from the risks of nuclear energy — and a promotional mandate — to promote the development and peaceful use of nuclear energy in Canada. These two mandates are in structural tension with each other whenever evidence of health risk from nuclear energy emerges.

A regulator committed to protecting health must follow the evidence wherever it leads, even if it leads to conclusions that impede the development of nuclear energy. A regulator committed to promoting nuclear energy has an institutional interest in not finding that nuclear energy poses health risks that would impede its promotion. The dual mandate creates an institutional design in which both obligations exist simultaneously, and in which the resolution of conflicts between them

is left to the institution's own judgment — a judgment that is also influenced by the institution's licence-fee revenue dependency on the industry whose promotion it is mandated to support.

The dual mandate has been in the NSCA since the CNSC's creation in 2000. It was in the predecessor Atomic Energy Control Act from 1946. It has been unresolved for 34 years of CNSC existence and for 80 years of Canadian nuclear regulatory history. The promotional mandate has never been repealed or quarantined. The CNSC continues, in 2026, to hold both a mandate to protect health and a mandate to promote nuclear energy.

H.3 The NRU Parliamentary Override: Documented Loss of Operational Independence

In November 2007, the CNSC ordered the shutdown of the National Research Universal reactor at Chalk River, Ontario. The NRU reactor was, at that time, one of the primary global sources of molybdenum-99, the parent isotope of technetium-99m, the most widely used medical diagnostic radioisotope in the world. CNSC ordered the shutdown because of safety concerns related to the reactor's connection to backup power systems required under post-9/11 security upgrades.

The shutdown created a global shortage of medical isotopes within days, affecting diagnostic imaging capacity in hospitals across Canada, the United States, and internationally. The shortage generated significant public concern and political pressure. The federal government faced demands to restore isotope supply. The CNSC had not certified that the safety upgrades required for restart had been completed.

On December 11, 2007, Parliament passed the Nuclear Safety and Control Act Amendment (Bill C-38). The amendment directed the CNSC to allow the NRU reactor to restart and to operate for a defined period — on terms the CNSC itself had not approved as satisfying its safety requirements. Parliament, through legislation, overrode the CNSC's safety determination and ordered the reactor to operate.

In January 2008, Linda Keen, the President and Chief Executive Officer of the CNSC, was removed from her position by the federal government. She had publicly defended the CNSC's shutdown order and had characterised the NRU situation as a safety issue, not a policy issue. Her removal, following the parliamentary override of the CNSC's safety determination, was widely interpreted as a consequence of her defence of the CNSC's independence.

The NRU incident is not an abstract illustration of structural vulnerability. It is a documented, on-the-record demonstration, with named participants, specific legislation, and a specific date, that the CNSC's operational independence from government nuclear policy can be and has been overridden by direct parliamentary action when nuclear operation is politically important. Any analysis of the weight to be placed on CNSC's technical submissions in a proceeding assessing a major nuclear project must account for this demonstrated limitation on CNSC's independence.

H.4 The Thirteen-Year Regulatory Abdication Chronology

The following chronology documents what was known, when it was known, what authority existed to require action, and what action was not taken:

- 2008: KiKK study published. Germany's SSK reviews and finds statistically robust, unexplained childhood leukemia signal near German NPPs. COMARE acknowledges signal as real and warranting investigation. CNSC characterises it as 'unfounded' in published fact sheet without explanation of divergence from SSK and COMARE.
- 2009: Ontario Drinking Water Advisory Committee, convened by Ontario Ministry of Environment, recommends 350-fold reduction in tritium drinking water guideline from 7,000 Bq/L to 20 Bq/L. Recommendation based on inadequate protection of pregnant women, fetuses, and infants through OBT pathway. CNSC does not implement recommendation. Does not publish response to ODWAC 2009 acknowledging or engaging with the scientific basis for the 350-fold recommendation.
- 2010: CNSC INFO-0799 published. CNSC's own scientists formally acknowledge: evidence base insufficient to estimate tritium health risks with confidence; international collaborative research programme required; existing studies inadequate statistical power; OBT in fetal tissue inadequately characterised; dose conversion factors inadequate for most sensitive subgroups. NSCA s.9(b) authority exists to commission required research. Annual budget exceeds $350 million. No research commissioned.
- 2012: GEOCAP study (France) published. Independent national replication of KiKK finding at OR 1.9 for childhood leukemia near French NPPs. CNSC does not update its KiKK fact sheet, does not acknowledge GEOCAP, does not revise its 'unfounded' characterisation.
- 2017: CNSC Executive Vice-President Ramzi Jammal publicly acknowledges RADICON radioiodine source term is false. No correction issued for published CNSC guidance documents that incorporate the acknowledged false values. Documents remain in circulation with false values.
- 2019: IAEA IRRS mission to Canada finds CNSC non-compliant with IAEA GSR Part 3 Requirement 29 (dose constraints). Issues Recommendation R2. CNSC develops implementation plan deferring dose constraints to construction licence stage — the reverse of what R2 requires.
- 2023: INWORKS cohort study (earlier phase) published with elevated cancer risk findings in nuclear workers. CNSC acknowledges findings. Takes no regulatory action.
- 2024: IAEA IRRS follow-up mission to Canada finds Recommendation R2 still open. CNSC non-compliant with same requirement in second consecutive international review. Same deferred implementation plan in place.
- 2024-2026: Six major peer-reviewed studies published (documented in Appendix F). CNSC does not acknowledge any of them in regulatory documents or disclose them to active nuclear assessment proceedings.

- 2026 (current): The health risk framework entering the Bruce C assessment is substantively the same framework the CNSC's own scientists said was inadequate in 2010. Sixteen years have elapsed. The research has not been commissioned. The tritium guideline has not been updated. The KiKK characterisation has not been revised. The RADICON values have not been corrected. The IAEA dose constraint non-compliance has not been resolved.

This chronology describes regulatory abdication: not regulatory lag, not resource constraints, not scientific uncertainty that required resolution before action could be taken. It describes a specific institutional choice to maintain an acknowledged inadequate framework while presenting it to affected communities, to IAAC, and to this proceeding as scientifically adequate.

H.5 Why Parliament Created Section 46

Section 46 of the IAA does not exist by accident. Parliament made a specific choice to give the Review Panel independent Commission powers rather than simply asking the CNSC to assess the health and environmental implications of major nuclear projects. The institutional features documented in this appendix — licence-fee funding, dual mandate, NRU parliamentary override, and thirteen-year regulatory abdication — are the structural reasons for that choice. Parliament recognised that the CNSC, as an institution with financial dependencies on the nuclear industry and a promotional mandate alongside its protective one, is not positioned to produce the independent scientific assessment that the public interest determination under section 63 requires.

A TISG that directs the proponent toward CNSC published science as its evidentiary baseline defeats the purpose for which section 46 was enacted. It pre-determines the evidentiary foundation of the Panel's independent assessment in favour of an institution that Parliament specifically chose not to trust with the final determination. The current TISG is structurally incompatible with the purpose of section 46 as understood against the institutional background that motivated its enactment.

Summary for Bruce C: The CNSC has three documented structural features that prevent it from producing independent science for this assessment: licence-fee funding from the industry it regulates; an unresolved dual promotional/protective mandate; and a documented history of parliamentary override of its operational independence. The thirteen-year chronology of acknowledged deficiencies and no action is not regulatory lag — it is regulatory abdication: a deliberate choice to maintain an acknowledged inadequate framework. Parliament created section 46 specifically in response to these features. A TISG that directs the proponent toward CNSC-published science as the evidentiary baseline defeats section 46's statutory purpose. See Bruce Stoppers 12 and 13.

APPENDIX I — REGDOC-2.5.2 §2.2.1 IN THE ONTARIO ELECTRICITY MARKET: VIABLE COMPETING TECHNOLOGIES AND THE MANDATORY COMPARISON

This appendix establishes the viable competing technologies for generating electricity in Ontario that must be addressed in the mandatory REGDOC-2.5.2 §2.2.1 comparative societal risk assessment for the Bruce C project. It documents each technology's current status, its relevance as a comparator, and the specific parameters that must be compared. It provides the evidentiary foundation for Bruce Stoppers 11 and 27.

I.1 The Mandatory Requirement

CNSC REGDOC-2.5.2, Design of Reactor Facilities, Version 2.1, §2.2.1 states: 'Societal risks to life and health from reactor facility operation shall be comparable to or less than the risks of generating electricity by viable competing technologies, and shall not significantly add to other societal risks.' The word 'shall' is confirmed mandatory by REGDOC-3.5.3. The requirement has three components: (1) identification of viable competing technologies in the relevant jurisdiction; (2) quantitative societal risk calculation for those comparators using consistent methodology; (3) demonstration that the proposed facility's societal risk is comparable to or less than the comparators. None of these three components appear in the Bruce C TISG.

The relevant jurisdiction for the Bruce C assessment is Ontario's electricity market, as managed by the Independent Electricity System Operator. The need the Bruce C project proposes to address is Ontario's projected electricity load growth through the 2040s. The viable competing technologies are those that are technically and economically feasible for meeting that need in Ontario.

I.2 The Darlington SMR (BWRX-300) — The Primary Nuclear Comparator

On April 4, 2025, the Canadian Nuclear Safety Commission issued a Licence to Construct to Ontario Power Generation for the Darlington BWRX-300 small modular reactor at the Darlington New Nuclear site in Clarington, Ontario. This is the most significant specific comparator for the REGDOC-2.5.2 §2.2.1 assessment for the following reasons:

- Canadian jurisdiction: The Darlington SMR is licensed by the CNSC, in Ontario, regulated under the same NSCA as Bruce C. It is not a foreign comparator requiring methodological translation.
- PSA on public record: The PSA and design basis for the BWRX-300 were evaluated at the public CNSC Commission hearing in January 2025 that preceded the LTC decision. The Commission member documents from that hearing are on the public CNSC record.
- Vogtle operating data: Two BWRX-300-lineage units (Vogtle 3 and 4, AP1000 design) have been operational in Georgia, USA, since 2023-2024. Operational experience data for the design family is available for PSA validation under REGDOC-2.4.2.
- Meeting the same need: The Darlington SMR is proposed specifically to meet Ontario electricity demand growth — the same need that Bruce C proposes to address. It is the most directly comparable alternative.

If Bruce C's proposed technology produces higher societal risk than the Darlington SMR on any material metric — core damage frequency, small release frequency, large release frequency, individual fatality risk, routine health risk — REGDOC-2.5.2 §2.2.1 is not satisfied and a licence cannot be issued. This comparison is not optional. It is mandatory. The TISG does not require it.

I.3 Bruce A and B Refurbishment and Power Uprate

Bruce Power is currently completing the Bruce A and B life extension programme, refurbishing existing units for continued operation through the 2060s. A concurrent CNSC written hearing scheduled for July 2026 will consider Bruce Power's application to increase the licensed power output of existing units above current capacity. If approved, the power uprate will provide additional licensed generating capacity from existing facilities without a new impact assessment process.

The Bruce C assessment must address whether Ontario's load growth need can be met by the combination of the Bruce A and B refurbishment, the proposed power uprate, and other existing capacity — before a new greenfield facility with its associated radiological hazard, waste generation, and capital cost is required. This is the 'need for' analysis that IAA s.22(1)(i) requires and that the Bruce C TISG does not address.

I.4 Renewable Generation Plus Storage

The IESO's 2024 Annual Planning Outlook identifies significant renewable generation capacity in the interconnection queue for Ontario. Grid-scale battery energy storage projects have received IESO Need Identification Document approval in 2024-2025. The combination of renewable generation and long-duration storage — including vanadium redox flow battery systems capable of 8-12 hour discharge at full power — constitutes a viable competing technology portfolio for Ontario's electricity load growth.

The societal risk profile of renewable plus storage differs categorically from nuclear: no radiological hazard, no Emergency Planning Zone, no long-lived radioactive waste requiring deep geological disposal, no Nuclear Liability and Compensation Act liability cap, no transboundary treaty notification obligations for Lake Huron. The REGDOC-2.5.2 §2.2.1 comparison must address these categorical differences, not merely compare capacity factors and capital costs.

I.5 Natural Gas with Carbon Capture and Storage

Ontario has existing natural gas generation infrastructure and grid connections. Natural gas combined cycle plants with post-combustion carbon capture and storage are commercially deployed at analogous facilities (Boundary Dam, Saskatchewan; Quest CCS, Alberta). CCS is explicitly identified in Ontario's emissions reduction planning as a technology pathway for dispatchable electricity generation.

Flex gas with CCS provides firm, dispatchable capacity with no radiological hazard and no EPZ. Its societal risk profile on conventional safety metrics — process safety, CO2 release risk from CCS failure, air quality from NOx and particulates — is categorically different from nuclear. The lifecycle carbon intensity of flex gas with CCS is sensitive to upstream methane leakage and CCS

capture rates; the REGDOC-2.5.2 assessment must use Ontario-specific data, not global averages.

I.6 The Required Comparison Methodology

Parameter	Bruce C (proposed)	Darlington SMR	Renewable + Storage	Flex Gas with CCS
Core damage frequency	Design-specific; must be calculated for selected technology; no MONARK or AP1000 VDR Phase 3 baseline	BWRX-300 PSA in LTC public record	Not applicable; no fission hazard	Not applicable
Large release frequency	Design-specific; must be calculated for selected technology	Available from LTC record	Not applicable	CCS failure release frequency required
Individual fatality risk at site boundary	Design-specific; EPZ sizing required	Available from LTC record	Minimal; no EPZ required	Process safety risk at plant boundary
Routine health risk: primary emission	Tritium (CANDU: 100-130 g/unit/yr) or much lower (LWR)	Tritium (BWRX-300: light water; tritium production ~1-3 g/unit/yr)	No radioactive emissions	NOx, SO2, particulates at AEO regulatory limits
Long-lived radioactive waste	Used fuel + ILW; DGR pathway legally challenged	Used fuel; DGR same pathway concern	No radioactive waste	No radioactive waste; CO2 stored in geological formation
Liability cap and residual public liability	$1B NLCA cap; residual public liability for Lake Huron contamination	$1B NLCA cap; site boundary on Lake Ontario	Commercial insurance; no statutory cap	Commercial insurance; no statutory cap; no government backstop required
Lifecycle CO2e (gCO2e/kWh)	~12 (nuclear, IPCC median); higher if CANDU uranium mining included	~12 (nuclear, IPCC median); Vogtle data available	~10-30 (wind+solar+storage)	~40-200 (CCS-dependent; Ontario-specific methane leakage required)

Summary for Bruce C: REGDOC-2.5.2 §2.2.1 imposes a mandatory 'shall' requirement. The Darlington SMR (LTC April 4, 2025) is the primary specific Ontario nuclear comparator with PSA on the public CNSC record. Bruce C must demonstrate that its selected technology's societal risk is comparable to or less than the Darlington SMR on each metric in the table above. The TISG does not require this. Without this demonstration, a Licence to Prepare Site cannot lawfully be issued. This is a mandatory legal requirement, not a policy preference. See Bruce Stopper 11.

APPENDIX J — LAKE HURON CUMULATIVE TRITIUM PATHWAY: QUANTIFICATION AND GREAT LAKES TREATY OBLIGATIONS

J.1 The Quantification Basis

CNSC's Independent Environmental Monitoring Programme for the Bruce A and B nuclear generating stations publishes annual data on tritium production and releases at the Bruce site. This data is publicly available on CNSC's website and constitutes the primary source for the quantification in this appendix. The following estimates are derived from CNSC's own published IEMP data and CNSC's own published data on CANDU reactor tritium production rates.

CANDU pressurised heavy water reactors produce tritium through neutron activation of deuterium in the heavy water moderator and coolant. The production rate is approximately 100-130 grams of tritium per unit per year. This rate is confirmed in CNSC's IEMP reports and in the peer-reviewed literature on CANDU reactor tritium production. The Bruce site has operated eight CANDU units across Bruce A (4 units) and Bruce B (4 units). Bruce A units began commercial operation in 1977-1979; Bruce B units in 1984-1987. For estimation purposes, using a conservative average of approximately 50 years of operation at an average of eight units: at 100-130 grams per unit per year, total cumulative production is approximately 40,000 to 52,000 grams — 40 to 52 kilograms of tritium.

A fraction of this production is captured by the Bruce Tritium Removal Facility, which recovers tritium from the heavy water moderator and sells it commercially. The BTRF removes a portion but not all of the tritium generated. The remaining fraction is released to the environment through two CNSC-licensed pathways: atmospheric releases as tritiated water vapour (HTO) and liquid releases to Lake Huron through cooling water discharge. Both pathways are permitted under CNSC licensing conditions and documented in annual IEMP reports.

J.2 Georgian Bay Near-Shore Dynamics

Georgian Bay is a semi-enclosed inlet of Lake Huron with a surface area of approximately 15,000 square kilometres. It is separated from the main body of Lake Huron by the Bruce Peninsula and Manitoulin Island, with restricted water exchange through the passage at Tobermory (the main channel) and through the North Channel. The restricted geometry means that water entering Georgian Bay from the Bruce site's discharge does not instantly mix with the bulk volume of Lake Huron (approximately 3,540 cubic kilometres). Georgian Bay has its own hydrodynamic circulation driven by thermal stratification, seasonal density gradients, and wind-driven circulation patterns.

The practical consequence for the Bruce C assessment is that tritium discharged at the Bruce site enters a semi-enclosed water body with restricted exchange dynamics, not an effectively infinite open lake. Near-shore tritium concentrations in Georgian Bay adjacent to the Bruce site's discharge point will be higher than bulk Lake Huron concentrations for a period determined by Georgian Bay's flushing time — estimated at several years for complete exchange. Communities drawing drinking water from Georgian Bay near-shore intakes experience a higher tritium exposure than bulk Lake Huron dilution calculations would suggest.

The TISG does not require the proponent to: characterise existing tritium concentrations in Georgian Bay near-shore zones using existing IEMP data; model the near-shore tritium plume dynamics for routine and accident release scenarios; identify all drinking water intakes in the Georgian Bay affected zone and their distances from the Bruce site discharge; assess OBT accumulation in Georgian Bay fish species and other aquatic organisms consumed by local communities; or characterise the incremental contribution of Bruce C to the existing near-shore tritium loading. Each of these assessments is necessary to evaluate Bruce C's incremental impact on a watershed that has received fifty years of CANDU tritium loading.

J.3 OBT in the Georgian Bay Food Chain

Tritium released to the atmosphere as HTO undergoes atomic exchange with hydrogen in all biological tissue — crops, livestock, fish, and humans — in the surrounding region. This exchange produces OBT at concentrations proportional to the ambient HTO concentration in the environment. OBT has a biological residence time in organic molecules approximately 20-50 times longer than HTO's 10-day biological half-life in body water. In long-lived fish species in Georgian Bay — lake trout, walleye, whitefish — OBT may accumulate over lifetimes spanning decades, producing tissue OBT concentrations that reflect the integrated ambient HTO exposure over the fish's life rather than the instantaneous HTO concentration at the time of sampling.

Indigenous and non-Indigenous communities surrounding Georgian Bay consume fish from the Bay as part of their regular diet. High fish consumers — including Indigenous communities with traditional fishing practices — face a higher OBT exposure pathway than the general population. This exposure pathway is not adequately captured by comparing the HTO concentration in Georgian Bay water to the 7,000 Bq/L drinking water guideline. The relevant comparison for high fish consumers requires OBT concentration data in the fish they consume, combined with an OBT dose assessment that accounts for the higher biological residence time of OBT compared to HTO.

J.4 The Great Lakes Water Quality Agreement

The Great Lakes Water Quality Agreement, concluded between Canada and the United States in 1978 and amended most recently in 2012, is a binding international treaty governing the Great Lakes Basin ecosystem. Its legal status in Canadian law is that of an international treaty obligation binding on the federal executive and on federal regulatory and assessment bodies acting on Canada's behalf.

Article VI of the Agreement establishes specific water quality objectives applicable to both countries across the Great Lakes Basin, including Lake Huron and Georgian Bay. The objectives cover a range of chemical and physical parameters. The Agreement does not establish specific radioactivity objectives by name, but its overarching requirement to restore and maintain the chemical, physical, and biological integrity of the Basin ecosystem applies to all substances that affect that integrity — including radiologically active substances.

Article IX establishes the International Joint Commission as the coordinating oversight body. The IJC has investigative authority to examine questions of water quality in the Great Lakes Basin when referred by either government. Its recommendations are directed to both the Canadian and

US governments. The IJC's finding on a matter involving Bruce C's impacts on Lake Huron would constitute an international public record of Canada's regulatory performance.

The notification obligations under Article VI are triggered when either country has reason to believe that the other's waters are being polluted by activities in one country. A severe accident at Bruce C that resulted in a significant radiological release to Lake Huron would be such an event. The release would trigger Canada's notification obligations to the United States. US EPA would be entitled to request information and potentially to refer the matter to the IJC for investigation. The affected US population — approximately 20-25 million people in Michigan, Ohio, Indiana, Pennsylvania, and New York drawing drinking water from the Great Lakes system — would have an international procedural mechanism available to them that does not exist for domestic Canadian regulatory proceedings.

The TISG does not require the proponent to: identify Canada's specific obligations under the Great Lakes Water Quality Agreement for the Bruce C site; quantify the transboundary liability from a severe accident contaminating Lake Huron; assess the IJC's potential role in post-accident governance; or address the notification triggers applicable to the Bruce C site's routine and accident emissions.

J.5 Why This Is the Most Acute Tritium Assessment in Canada

The Bruce C tritium assessment is more complex and more consequential than any other current Canadian nuclear assessment for four compounding reasons. First, the CANDU design's inherent high tritium production makes tritium the dominant radiological emission pathway regardless of which CANDU variant is proposed. Second, fifty years of CANDU operation has created an existing baseline tritium loading in Georgian Bay that has never been comprehensively characterised and that will be added to by Bruce C's emissions. Third, the Lake Huron watershed provides drinking water to approximately forty million people in two countries under a binding bilateral treaty with active international enforcement. Fourth, ODWAC 2009's specific finding that the 7,000 Bq/L guideline is inadequate for the most sensitive population — pregnant women and fetuses — was developed specifically in response to concerns about Ontario's CANDU-heavy nuclear fleet and applies most directly to the Bruce site as the largest CANDU cluster in the world.

Summary for Bruce C: The Bruce site has produced approximately 40-52 kilograms of tritium over fifty years, entering Georgian Bay through licensed atmospheric and liquid discharge pathways documented in CNSC's own IEMP data. Near-shore Georgian Bay concentrations are higher than bulk Lake Huron dilution calculations suggest. OBT accumulates in Georgian Bay fish species consumed by local communities including high fish consumers. The Great Lakes Water Quality Agreement creates binding notification obligations and IJC oversight authority for releases affecting Lake Huron. The TISG does not require any of the baseline characterisation, plume modelling, or treaty obligation assessment that this pathway demands. See Bruce Stopper 9.

APPENDIX K — TECHNOLOGY-NEUTRAL TISG: THREE MANDATORY REQUIREMENTS THAT CANNOT BE SATISFIED FOR AN UNSPECIFIED TECHNOLOGY

K.1 The Three Mandatory Requirements

Three mandatory CNSC licensing requirements are design-specific and cannot be satisfied for an unspecified technology. The Bruce C TISG is technology-neutral. The structural incompatibility is not remediable by the proponent's diligence — it is a consequence of the TISG's architecture. This appendix documents each requirement and explains why it is design-specific.

K.2 REGDOC-2.5.2 §2.2.1: Comparative Societal Risk

As documented in Appendix I, the mandatory comparative societal risk demonstration requires calculation of the proposed reactor facility's core damage frequency, small release frequency, large release frequency, individual fatality risk, and societal fatality risk profile. These quantities are calculated through a Probabilistic Safety Assessment that is specific to the reactor design. A PSA for a CANDU MONARK produces different numerical outputs than a PSA for an AP1000. The PSA outputs drive the comparative societal risk demonstration. A technology-neutral IS cannot provide a PSA for an unspecified technology and therefore cannot satisfy REGDOC-2.5.2 §2.2.1.

K.3 REGDOC-2.4.2: Probabilistic Safety Assessment Validation

CNSC REGDOC-2.4.2 requires a PSA validated against operating experience data for the proposed reactor facility. 'Validated against operating experience data' means that the failure rate assumptions in the PSA are calibrated to actual failure data from operating units of the same design. For a CANDU-lineage design, the relevant operating experience data is from operating CANDU units worldwide. For the AP1000, the relevant data is from the Vogtle 3 and 4 units operational since 2023-2024. For the CANDU MONARK specifically, no operating data exists anywhere in the world — the MONARK has never been built or operated. A PSA for the MONARK cannot be validated against operating experience data for the MONARK; it must rely on analogy from other CANDU designs, with explicit disclosure of the analogical assumptions and their uncertainty implications.

A technology-neutral IS cannot provide a PSA validated against operating experience data for an unspecified technology. Until technology is selected, it is impossible to identify what operating experience data is relevant and whether validated PSA data exists for the selected design.

K.4 REGDOC-2.10.1: Emergency Planning Zone Sizing

CNSC REGDOC-2.10.1 Version 2 requires that the Emergency Planning Zone be sized for the specific facility. The EPZ size is calculated from the facility's radioactive source term under design basis and beyond design basis accident scenarios. The source term is design-specific in several critical respects:

- Tritium source term: CANDU reactors produce approximately 100-130 grams of tritium per unit per year; AP1000 produces approximately 1-3 grams per unit per year. This two-

to-three order of magnitude difference dominates the tritium component of the accident source term and the routine release assessment.

- Positive void coefficient: CANDU reactors exhibit a positive coolant void coefficient under certain conditions, meaning a loss-of-coolant event can produce a transient power increase before shutdown systems engage. The AP1000 uses passive safety systems with a negative moderator temperature coefficient. The worst-case accident sequences — and therefore the source terms used to size the EPZ — differ fundamentally between designs.
- Heavy water inventory: CANDU reactors contain a large heavy water inventory that can itself be a source of tritium release under severe accident conditions. AP1000 uses light water; no heavy water tritium release pathway.

An EPZ sized for CANDU accident sequences is not valid for AP1000 accident sequences. An EPZ sized for AP1000 accident sequences is not valid for CANDU. A technology-neutral IS cannot provide an EPZ sized for the specific facility because the facility's design has not been specified.

Parameter	CANDU (e.g. MONARK)	Light Water (e.g. AP1000)	Technology-neutral IS consequence
Annual tritium production per unit	~100-130 g/yr	~1-3 g/yr	2-3 orders of magnitude difference; source term, EPZ, Lake Huron pathway all design-specific
Positive void coefficient	Present; worst-case sequences include LOCA + delayed shutdown	Not present; passive safety; negative moderator temp coefficient	EPZ sizing methodology differs; cannot be assessed without design selection
PSA validation basis	MONARK: none (no units built); analogy from other CANDU required	Vogtle 3 and 4 operating since 2023-2024; empirical data available	Cannot satisfy REGDOC-2.4.2 validation requirement without design selection
Heavy water tritium inventory	Large H2O inventory is itself a severe accident tritium source	No heavy water; no this pathway	CANDU-specific EPZ scenario does not exist for LWR; LWR EPZ not valid for CANDU
CNSC VDR status	MONARK: no VDR at any phase	AP1000: Phase 2 (2013, superseded standards); Phase 3 never completed	Neither technology has a current completed Canadian regulatory basis

K.5 The Only Remedy

Technology selection before IS acceptance is the only remedy for this structural deficiency. Once the proponent selects a specific technology, all three mandatory requirements become satisfiable in principle. The proponent can commission a PSA for the selected design; can provide or reference validation data from operating units of the selected design; can size the EPZ for the selected design's accident sequences; and can provide the comparative societal risk demonstration using the selected design's PSA outputs.

Technology selection should also be accompanied by disclosure of the selected technology's current VDR status. If neither the MONARK nor the AP1000 has a completed current Canadian VDR, the IS cannot establish that a Licence to Prepare Site could lawfully be issued on the basis of it — because the CNSC cannot form the licensing satisfaction under NSCA s.24(4) without a completed VDR establishing that the design has been reviewed against current Canadian regulatory standards.

Summary for Bruce C: The Bruce C TISG is technology-neutral. REGDOC-2.5.2 §2.2.1, REGDOC-2.4.2, and REGDOC-2.10.1 each require design-specific data. The CANDU MONARK and AP1000 differ by 2-3 orders of magnitude in tritium production, have fundamentally different safety system designs, require different EPZ sizing methodologies, and neither has a current completed Canadian VDR. Technology selection is a precondition to a complete and legally adequate Impact Statement. The current TISG does not require it. See Bruce Stopper 28.

APPENDIX L — SAUGEEN OJIBWAY NATION ENGAGEMENT RECORD AND FPIC LEGAL ANALYSIS

L.1 SON's Territory and Treaty Rights

The Saugeen Ojibway Nation is a collective of two First Nations — Saugeen First Nation and Chippewas of Nawash Unceded First Nation — whose traditional territory encompasses the Bruce Peninsula, the eastern shore of Lake Huron, and Georgian Bay. SON holds Treaty rights under Treaty 72, concluded in 1854, which covers a territory that includes the Bruce Power site, the Lake Huron and Georgian Bay shoreline, and extensive surrounding lands. SON's Treaty rights include fishing rights in Lake Huron and Georgian Bay, water rights in the Treaty territory, and land use rights throughout the traditional territory.

The Bruce C project, if approved and constructed, will operate within SON's Treaty territory for sixty to one hundred years including decommissioning. It will add approximately 3,200-4,000 MWe of generating capacity and associated CANDU tritium production to a site that has been within SON's Treaty territory for the entire fifty-year operating history of Bruce A and B. SON is not a peripheral stakeholder in this assessment. It is the primary rights-holder in the territory where the assessment's subject matter is located.

L.2 The May 2025 Registry Letter

In May 2025, the Saugeen Ojibway Nation submitted a formal letter to IAAC that was filed on the public registry of the Bruce C assessment. In that letter, SON stated that it was unable to provide adequate comments on the draft TISG due to the inadequacy of the engagement process at that stage of the assessment. The specific concerns SON raised included: insufficient time and resources to meaningfully review the complex TISG document; inadequate information about the assessment process and timeline; and the absence of a meaningful consultation process that would allow SON to shape the scope of the assessment rather than merely comment on a pre-drafted scope document.

This letter is on the public registry. It is a documented, on-registry statement by the primary rights-holder that the TISG scoping process was inadequate for SON to participate meaningfully. It was filed before the TISG was finalised. The TISG was finalised on August 19, 2025 — approximately three months after the May 2025 letter. No substantive IAAC response that specifically addresses SON's expressed concerns and explains how adequate engagement was achieved before TISG finalisation appears on the registry record for the period between May and August 2025.

L.3 Why Scoping-Stage Engagement Cannot Be Remedied Post-Scoping

The scoping stage of an impact assessment — the stage at which the TISG is developed and finalised — is the stage at which the scope of the assessment is defined: what questions the proponent must answer, what studies it must conduct, what evidence it must provide. The TISG defines this scope. Once the TISG is finalised, the scope is set. The proponent prepares its Impact Statement to answer the questions the TISG requires it to answer.

If a rights-holder is unable to engage adequately at the scoping stage, it loses the opportunity to influence what questions are asked. It may subsequently engage at the IS review stage,

commenting on the proponent's answers. But it cannot at that stage add questions that the TISG did not require to be asked. The proponent is not required to answer questions outside the TISG's scope. The Panel may have supplementary information request authority, but using it to add entire new assessment chapters is a fundamentally different and more expensive process than ensuring the TISG is adequate in the first place.

SON's inability to engage with TISG scoping means that the scope of what the proponent must study about effects on SON territory and Treaty rights was defined without adequate SON input. The questions the IS will answer on SON's interests were shaped primarily by IAAC and the proponent, not by SON. Post-TISG consultation at the IS review stage allows SON to comment on the adequacy of the answers to those pre-defined questions but not to change the questions themselves.

L.4 Kebaowek First Nation v. Canadian Nuclear Laboratories (2025 FC 319)

In Kebaowek First Nation v. Canadian Nuclear Laboratories, 2025 FC 319, the Federal Court addressed the adequacy of Crown consultation with an Indigenous nation in the context of a Canadian nuclear regulatory proceeding. The Court established several principles directly applicable to the Bruce C assessment.

First, the duty to consult is not satisfied by the availability of a public comment process that applies equally to all participants. Indigenous nations with Treaty rights affected by a regulatory decision have a right to meaningful consultation that accounts for their specific rights and interests — not merely the opportunity to file public submissions alongside other stakeholders.

Second, free, prior, and informed consent under UNDRIP requires that the consent be actually informed — that the information provided as the basis for the consent process be accurate and complete. Consent given on the basis of materially inaccurate information does not satisfy the 'informed' requirement.

Third, the FPIC process must be actively pursued at the relevant decision stage — the stage at which the decision that affects Indigenous rights is being made. For the TISG, the relevant stage is the scoping stage. A TISG finalised over the primary rights-holder's documented inability to engage at the scoping stage has a procedural defect at the stage where the relevant decision — definition of the assessment scope — was made.

L.5 The Health Information Base for SON's FPIC

As documented in Bruce Stopper 20, the health information provided as the foundation for SON's consent processes is built on the CNSC's radiological health risk framework. That framework, as documented throughout this submission, characterises the KiKK childhood leukemia signal as 'unfounded' on a selectively constituted reference set; applies tritium risk at a guideline ODWAC 2009 found inadequate for the most sensitive subgroups; applies RBE of 1.0 against the CNSC's own internal recommendation of 2.2; excludes five health endpoint categories documented in sources the CNSC itself cites; and does not disclose six major recent studies including the Harvard Nature Communications (2026) study.

SON's traditional diet includes fish from Georgian Bay and Lake Huron. SON community members include pregnant women, infants, and children. SON's territory will receive the incremental tritium emissions from Bruce C for the operational life of the facility. The health information provided as the basis for SON's consent to this project understates tritium risk by at minimum a factor of 2.2 (from RBE 1.0 vs 2.2 alone), excludes the OBT food chain pathway most relevant to traditional fish consumers, and excludes ODWAC 2009's specific finding of inadequate protection for the most vulnerable subgroup. Consent given on this health information base is not informed consent under UNDRIP Article 32(2) and Bill C-15.

Summary for Bruce C: SON's May 2025 letter documenting its inability to engage adequately with TISG scoping is on the registry. The TISG was finalised over this documented inability. Post-TISG engagement cannot cure a scoping-stage defect. The health information underlying SON's FPIC processes is materially inaccurate in the specific respects documented in this submission. Kebaowek 2025 FC 319 establishes that FPIC must be actively pursued at the relevant decision stage with accurate information. Both the procedural defect (scoping stage engagement inadequacy) and the substantive defect (materially inaccurate health information base) are independently sufficient grounds for FPIC invalidity. See Bruce Stoppers 20 and 21.

APPENDIX M — THE SEVENTEEN BRUCE C TISG DEFICIENCIES: FULL REGULATORY AND STATUTORY BASIS

This appendix provides the complete regulatory and statutory basis for each of the seventeen TISG deficiencies identified in Bruce Stopper 29. For each deficiency, the specific TISG section affected, the deficiency, the mandatory basis, and the required amendment are stated.

Code	Subject	Deficiency (full statement)	Mandatory Basis	Required Amendment
D1	Societal Risk	No comparative societal risk demonstration against viable competing technologies. Neither the identification of viable competing technologies in the Ontario market, the quantitative risk calculation for those comparators, nor the demonstration that the proposed facility's societal risk is comparable to or less than those comparators appears in the TISG. The Darlington SMR (LTC April 4, 2025) is the primary specific comparator.	REGDOC-2.5.2 §2.2.1 ('shall' = mandatory, confirmed by REGDOC-3.5.3)	TISG must require a mandatory quantitative comparative societal risk assessment against viable Ontario competing technologies, including Darlington SMR as primary nuclear comparator, using REGDOC-2.4.2 PSA methodology with independent peer review.
D2	Alternatives	No alternatives-to-project assessment despite IAAC's own SOI identifying whether other technologies are more appropriate for Ontario as a key concern. The omission is unexplained and independently unreasonable under Vavilov. No explanation for departing from the SOI position appears in the TISG finalisation documents.	IAA s.22(1)(f); Vavilov 2019 SCC 65 (unexplained departure from own stated position)	TISG must require assessment of technically and economically feasible alternatives to the project under IAA s.22(1)(f), including Darlington SMR, renewable-plus-storage, and gas-with-CCS in the Ontario grid context.
D3	Technology Scope	Technology-neutral TISG structurally precludes satisfaction of three mandatory design-specific CNSC licensing requirements. A technology-neutral IS cannot provide a validated PSA, an EPZ sized for the specific facility, or a comparative societal risk demonstration for an unspecified technology.	IAA s.22(1)(i); REGDOC-2.5.2 §2.2.1; REGDOC-2.4.2; REGDOC-2.10.1	TISG must require technology selection before IS acceptance. Proponent must confirm in writing at IS submission which technology is proposed and demonstrate all TISG requirements address that specific technology.

Code	Subject	Deficiency (full statement)	Mandatory Basis	Required Amendment
D4	Health Framework	CNSC published positions treated as settled evidentiary baseline. The TISG does not require the proponent to provide a scientifically independent evidentiary foundation adequate for the Panel's s.46 independent function. Seven CNSC documents contain representations irreconcilable with the CNSC's own internal record.	IAA s.46; Baker v Canada [1999] 2 SCR 817; Vavilov	TISG must require IS health risk assessment bibliography be independently constituted; disputed questions identified and independently reviewed; CNSC documents cited as participant inputs only, not settled baselines.
D5	KiKK / Childhood Leukemia	KiKK/childhood leukemia assessment not required to address full peer-reviewed literature. CNSC 'unfounded' characterisation (derived from 7 of 26 studies) may be adopted without independent evaluation. Bruce C is a 50-year nuclear-proximate community.	IAA s.46; IAA s.22(1)(a)	TISG must require IS to address all 26 peer-reviewed studies on the KiKK signal and obtain independent expert assessment of the literature.
D6	RADICON Source Term	RADICON radioiodine source term (acknowledged false by EVP Jammal, 2017) not excluded. Accident consequence assessments may be built on source term values CNSC has acknowledged are incorrect.	IAA s.46; REGDOC-2.10.1	TISG must exclude RADICON as source term basis; proponent must disclose and independently validate any proposed source term values before IS acceptance.
D7	Tritium Risk	Tritium risk assessed at 7,000 Bq/L only. ODWAC 2009 recommendation of 20 Bq/L not required. INFO-0799 self-contradiction not required to be disclosed. RBE 2.2 internal recommendation not required. Fifty-year Lake Huron baseline not required.	IAA s.22(1)(a); IAA s.46; ODWAC 2009	TISG must require dual-guideline tritium assessment at 7,000 Bq/L and 20 Bq/L for all sensitive subgroups; RBE sensitivity analysis at 1.0 and 2.2; Lake Huron baseline characterisation.
D8	LNT Model	Four LNT extrapolation steps not required to be disclosed or subjected to sensitivity analysis. Review Panel cannot independently evaluate model appropriateness without this information.	IAA s.46; IAA s.22(1)(a)	TISG must require disclosure of all four extrapolation steps and sensitivity analysis across DDREF range (1.5-10), sex/age differentials, and RBE range (1.0-5.0+).
D9	Non-Cancer Endpoints	Five non-cancer endpoint categories absent:	IAA s.22(1)(a)	TISG must require quantitative assessment

Code	Subject	Deficiency (full statement)	Mandatory Basis	Required Amendment
		cardiovascular, neurological, immunological, ophthalmic, reproductive/developmental. UNSCEAR documents these in sources CNSC itself cites.		of all five non-cancer endpoint categories using current UNSCEAR and BEIR VII literature.
D10	Kinlen Mechanism	Kinlen population-mixing assessment not required despite CNSC's own text identifying it as 'most plausible explanation.' Bruce C adds large workforce to 50-year nuclear-proximate community.	IAA s.22(1)(a)	TISG must require independent epidemiological assessment of whether Bruce C construction creates Kinlen conditions in the Bruce-proximate community.
D11	50-Year Baseline	No epidemiological baseline study required for Bruce-proximate population against their 50-year chronic exposure history. Incremental risk against uncharacterised chronic baseline is scientifically invalid.	IAA ss.22(1)(a), 63	TISG must require independent epidemiological baseline study of Bruce-proximate population against 50-year exposure history before HHRA chapter acceptance.
D12	GBA+	GBA+ obligation at TISG §1.3 not operationalised in radiological health chapters. BEIR VII documents 40-50% higher risk per unit dose for women; 2-3x for children. These differentials invisible in aggregate risk figures.	TISG §1.3; IAA s.22(1)(a)	TISG must require all material radiological risk estimates disaggregated by sex, age cohort, and pregnancy status, including differential tritium sensitivity.
D13	Lake Huron Baseline	No characterisation of existing Georgian Bay near-shore tritium concentrations from 50 years of CANDU operation. Bruce C's incremental contribution cannot be assessed without this baseline. Great Lakes Agreement obligations not addressed.	IAA s.22(1)(a),(l); Great Lakes Water Quality Agreement 1978	TISG must require Georgian Bay near-shore tritium baseline characterisation; OBT accumulation in local food chain; plume modelling; Great Lakes Agreement obligation assessment.
D14	SON / FPIC	TISG does not operationalise FPIC requirements. SON May 2025 documented inability to engage not remedied before finalisation. Health information underlying FPIC materially inaccurate.	UNDRIP Art.32(2); Bill C-15; Kebaowek FN v CNL 2025 FC 319	SON must be re-engaged on corrected TISG scope; FPIC processes re-conducted on corrected health information base before IS submission.
D15	NLCA Cap	NLCA $1B cap vs actual severe accident economic	IAA ss.22(1)(b), 63(4); NLCA s.24	TISG must require worst-case economic

Code	Subject	Deficiency (full statement)	Mandatory Basis	Required Amendment
		loss at a Great Lakes site not required. Residual public liability for Lake Huron contamination unquantified.		loss estimate for a Bruce C severe accident, explicit disclosure of gap between that estimate and the $1B NLCA cap, and identification of residual public liability.
D16	s.63 Public Interest	No IAA s.63 standalone public interest analysis required. CNSC formally rejected benefits-outweigh-harm framework (CARN v BWXT 2022 FC 849 ¶¶47-53; IAEA IRRS Suggestion S9 'Not accepted'). This has not been disclosed.	IAA s.63	TISG must require standalone s.63 public interest chapter identifying all adverse health effects, quantifying each, and presenting explicit benefits-versus-harm analysis structured for s.63(4) weighing.
D17	Independent Oversight	No independent expert oversight mechanism required. Review Panel's s.46 function requires independent expert reports on: source terms; health risk methodology; systematic literature review on childhood leukemia and non-cancer endpoints; comparative societal risk.	IAA s.46	TISG must require independent expert reports on each of the four areas above, from experts with no financial relationship to Bruce Power, CNSC, or any nuclear industry body, filed simultaneously with IS.

APPENDIX N — PRECAUTIONARY PRINCIPLE: LEGAL ANALYSIS AND APPLICATION TO BRUCE C

N.1 The Statutory Text

Section 6(1)(a) of the Impact Assessment Act provides that the Agency and other decision-makers must take into account 'the precautionary principle, according to which where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation.' This provision is not aspirational. It is a statutory direction to decision-makers in this proceeding.

N.2 The Supreme Court of Canada in Spraytech

In 114957 Canada Ltée (Spraytech, Société d'arrosage) v Hudson (Town), [2001] 2 SCR 241, the Supreme Court of Canada confirmed that the precautionary principle is an operative legal principle in Canadian environmental law. Justice L'Heureux-Dubé, writing for the majority, noted that the precautionary principle has been 'codified in several international instruments' and has been incorporated into Canadian domestic law through various statutory mechanisms. The Court applied the precautionary principle as a justification for a municipality's exercise of regulatory power to restrict pesticide use, finding that the principle supported precautionary regulation even in the absence of proof of harm.

The Spraytech analysis establishes two components of the precautionary principle that are directly relevant to the Bruce C assessment. First, it allocates the burden of proof: the burden of demonstrating the absence of significant adverse effects rests on the party proposing the activity, not on the party challenging it. In the Bruce C context, the burden rests on Bruce Power to demonstrate that the project will not cause significant adverse health effects — not on IAAC, SON, or members of the public to prove that it will. Second, it specifies the threshold: scientific uncertainty about potential harm is not a justification for inaction when there are threats of serious or irreversible damage. The documented scientific uncertainties about radiological health risk near nuclear facilities are precisely the type of uncertainty that triggers the precautionary principle obligation.

N.3 How the CNSC Inverts the Precautionary Principle

The CNSC's operational application of the precautionary principle in nuclear assessments inverts both components identified in Spraytech. On burden allocation, the CNSC treats the absence of demonstrated harm in Canadian null studies as evidence of safety, placing the effective burden on affected communities to demonstrate that harm exists. As documented in Bruce Stopper 6, the Canadian null studies are underpowered and therefore cannot produce genuine negative evidence — they produce measurement failures. Presenting measurement failures as evidence of safety while placing the burden on communities to prove harm is a double inversion: the evidentiary mechanism (underpowered null study) and the burden allocation (harm must be proven by the community) both operate in the same direction, systematically favouring non-findings.

On threshold specification, the 'unfounded' characterisation of the KiKK signal serves as the mechanism by which the precautionary principle trigger is prevented from being reached. If the signal is 'unfounded,' there are no 'threats of serious damage,' and the precautionary principle does not apply. As documented in Bruce Stoppers 1, 7, and 10, the 'unfounded' characterisation is derived from a selectively constituted reference set and diverges from every comparator jurisdiction's assessment of the same evidence. The mechanism by which the precautionary principle is disabled in CNSC-advised nuclear assessments is this unexplained characterisation of a replicated empirical signal.

N.4 The Six Uncertainties That Independently Trigger the Precautionary Principle

The precautionary principle is engaged when there are 'threats of serious or irreversible damage' combined with 'lack of full scientific certainty.' Six scientific uncertainties in the Bruce C assessment independently satisfy both conditions:

- The cause of the forty-year internationally replicated childhood leukemia signal near nuclear plants is scientifically uncertain. The signal is real (acknowledged by SSK, COMARE, IRSN, IARC); its cause is unknown. Scientific uncertainty about the cause of an observed health harm, where the harm includes doubled childhood leukemia rates, is a threat of serious damage under conditions of scientific uncertainty. IAA s.6(1)(a) requires that this uncertainty not be used as a reason for postponing precautionary measures.
- The health risk from tritium at doses below 7,000 Bq/L is scientifically uncertain. INFO-0799 (2010) acknowledged that the evidence base was insufficient to estimate tritium health risks with confidence. ODWAC 2009 found the existing standard inadequate for the most sensitive subgroups. These are concurrent acknowledgments by CNSC's own scientists and by an independent provincial advisory body that the evidence base for safe tritium exposure limits is insufficient. Scientific uncertainty about the health risk from the primary emission of the proposed facility, at the level of the applicable guideline, is a threat of serious damage under conditions of scientific uncertainty.
- The appropriate RBE for tritium is scientifically uncertain across a range from 1.0 to 5.0+ in the peer-reviewed literature. CNSC applies 1.0 against its own internal recommendation of 2.2. If the true RBE is at the upper end of the literature range, every tritium cancer risk estimate in this assessment is understated by a factor of 5 or more. Uncertainty about the correct biological effectiveness factor for the primary emission is a threat of serious damage under conditions of scientific uncertainty.
- The health effects of chronic low-dose radiation exposure beyond cancer are scientifically uncertain and inadequately characterised in the CNSC's assessment scope. Six endpoint categories are excluded despite being documented in the CNSC's own cited authorities. Uncertainty about the full range of health effects of the primary emission pathway is a threat of serious damage under conditions of scientific uncertainty.
- Transgenerational epigenetic effects from low-dose radiation, documented in the March 2025 IJMS study, represent a category of harm that is scientifically uncertain in its

magnitude and that is irreversible by definition — harm passed to non-exposed offspring cannot be undone. Irreversible harm under conditions of scientific uncertainty is the paradigm case for precautionary principle application.

- The health effects of the existing fifty-year CANDU tritium loading of the Lake Huron watershed are scientifically uncertain because no comprehensive baseline characterisation exists. Adding incremental tritium loading to an uncharacterised existing baseline where the population is receiving an unknown dose from fifty years of prior operation is a threat of serious damage under conditions of scientific uncertainty.

Each of these six uncertainties independently satisfies the statutory trigger for the precautionary principle under s.6(1)(a). All six are simultaneously present in the Bruce C assessment. The CNSC's framework engages none of them.

Summary for Bruce C: IAA s.6(1)(a) codifies the precautionary principle as a statutory direction in this proceeding. Spraytech confirms it places the burden of demonstrating safety on the proponent. Six independent scientific uncertainties in this assessment trigger the precautionary principle obligation: the childhood leukemia signal, tritium health risk below 7,000 Bq/L, tritium RBE, non-cancer endpoints, transgenerational effects, and the existing Lake Huron baseline. The CNSC's 'unfounded' characterisation of the childhood leukemia signal and its cancer-only HIA scope are the primary mechanisms by which the precautionary principle is prevented from being triggered. The Review Panel's s.46 independent function requires it to evaluate these mechanisms against the full evidence record. See Bruce Stopper 15.

APPENDIX O — MONITORING FRAMEWORK STATISTICAL POWER ANALYSIS

O.1 What Statistical Power Means in Epidemiological Monitoring

Statistical power is the probability that a study — or a monitoring programme — will detect a true effect of a specified size if that effect exists. A monitoring programme with 80 per cent power to detect a doubling of childhood leukemia rates has an 80 per cent probability of detecting that doubling if it truly exists; it has a 20 per cent probability of missing the doubling and reporting no significant effect even though the effect is present. A monitoring programme with 10 per cent power to detect the same doubling will miss it nine times out of ten.

Statistical power depends on three factors: the size of the effect being sought, the size of the population being monitored, and the statistical significance threshold applied. For detecting a doubling of childhood leukemia rates in a defined proximity zone around a nuclear facility: the effect size is fixed by the epidemiological hypothesis (OR approximately 2.0, from KiKK and GEOCAP); the threshold is conventionally fixed at $p < 0.05$ (two-tailed); and the power therefore depends primarily on the size of the population being monitored — specifically, on how many childhood leukemia cases can be expected in the proximity zone over the monitoring period.

O.2 The Calculations for the Bruce Site

Childhood acute leukemia has an incidence of approximately 4 cases per 100,000 children aged 0-14 per year in Canada. Within the five-kilometre proximity zone around the Bruce site, the child population is approximately 1,000-2,000 based on the population sizes of the communities in that zone (primarily areas of the Municipality of Kincardine and surrounding rural areas). At 4/100,000 per year, the expected number of childhood leukemia cases in this five-kilometre zone is approximately 0.04-0.08 per year — effectively less than one case every ten to twenty years.

To detect a doubling of this rate with 80 per cent statistical power using a Poisson probability model, a monitoring programme would need to observe approximately 15-20 expected cases in the comparison group. At the background rate applicable to the Bruce five-kilometre proximity zone, accumulating 15-20 expected cases would require approximately 150-500 years of monitoring, depending on the exact population size. This exceeds the operational life of the proposed facility by a factor of 2-8.

Even if the monitoring zone is extended to 25 kilometres — the distance within which COMARE documented approximately 20 per cent excess leukemia risk across UK nuclear sites — the population within 25 kilometres of the Bruce site increases but remains substantially below the threshold required for a powered prospective study of childhood leukemia incidence. The Bruce site is in a rural, low-density region of southern Ontario. The population within 25 kilometres is much smaller than the populations within 25 kilometres of Darlington or Pickering, which are in the Greater Toronto Area.

O.3 What This Means for Monitoring as a Regulatory Condition

The statistical power analysis above establishes that a monitoring programme based on the population within any reasonable proximity zone around the Bruce site will not be capable of

detecting a doubling of childhood leukemia rates within any regulatory timeframe. The monitoring programme will produce a series of annual reports over the operational life of the facility — sixty years or more — finding no statistically significant elevation. These reports will look like evidence of safety. They will be measurement failures.

The monitoring programme currently in place for Bruce A and B — the CNSC's Independent Environmental Monitoring Programme — measures radionuclide concentrations in environmental samples and compares them to regulatory limits. It does not include epidemiological monitoring of cancer incidence in the Bruce-proximate community with specified statistical power to detect the effect sizes documented in the international literature. The proposed monitoring framework for Bruce C will not include this either, unless the TISG specifically requires it — which it does not.

O.4 The Alternative: Pooled Multi-Site Monitoring

A statistically adequate monitoring programme for childhood leukemia risk near the Bruce site would require pooling data across multiple Canadian nuclear facility proximity zones — Bruce, Darlington, Pickering, Point Lepreau — to accumulate enough cases for adequate statistical power. A pooled national surveillance programme for childhood cancer near nuclear facilities in Canada, with specified minimum power requirements and pre-specified analysis protocols, would provide genuine monitoring capability that no single-site programme can provide. The CNSC does not operate such a programme. The TISG does not require one.

Without pooled multi-site monitoring with specified statistical power, any monitoring condition attached to the Bruce C approval is documentation of the appearance of oversight rather than genuine monitoring capability. The distinction between a powered monitoring programme and an underpowered one is the distinction between a genuine safeguard and false assurance.

Summary for Bruce C: The population within any practical proximity zone around the Bruce site is insufficient to support a statistically powered prospective monitoring programme for childhood leukemia at the effect sizes documented in the international literature. Annual monitoring reports finding no statistically significant elevation will be produced throughout the facility's operational life — not because no elevation exists, but because the monitoring programme was never capable of detecting one. A monitoring condition attached to Bruce C approval provides false assurance rather than genuine protection. A genuine monitoring programme would require pooled multi-site national surveillance with specified statistical power. See Bruce Stopper 16.

APPENDIX P — IRREVERSIBILITY: WHY MONITORING CONDITIONS CANNOT CURE POST-APPROVAL HARM AT THE BRUCE SITE SCALE

P.1 The Three Levels of Irreversibility

Bruce Stopper 22 identifies three simultaneous levels of irreversibility in the Bruce C assessment. This appendix develops each level in detail and explains why their combination makes a monitoring condition an inadequate response to radiological health risk uncertainty at this specific site.

P.2 Level 1: Watershed Contamination Is Irreversible at Lake Scale

Lake Huron has a surface area of approximately 59,596 square kilometres, a volume of approximately 3,540 cubic kilometres, and a mean depth of approximately 59 metres. The flushing time of Lake Huron — the time required for the lake's water volume to be replaced by inflow — is approximately 22 years. Georgian Bay, as a semi-enclosed inlet, has a longer effective mixing time with the main lake body.

A severe accident at the Bruce C site that resulted in a significant radiological release to Lake Huron would introduce radionuclides — including tritium, iodine-131, caesium-137, strontium-90, and others depending on the accident sequence — into a water body from which approximately 40 million people in two countries draw drinking water. The practical consequences would depend on the magnitude and nature of the release, but at the Chernobyl or Fukushima scale of release, the contamination would be effectively irreversible within any human planning timeframe.

Fukushima contaminated approximately 24,000 square kilometres of land. The decontamination effort has cost hundreds of billions of dollars over more than a decade. Significant areas remain under access restrictions more than fifteen years after the accident. Contamination of a comparable scale in Lake Huron would affect a water body 2.5 times larger than Fukushima's contaminated land area, containing a 3,540-cubic-kilometre water mass that cannot be physically removed or chemically treated. The economic cost and the public health consequence of Lake Huron contamination at a severe accident scale would exceed Fukushima's by any measure. It would be irreversible in the practical meaning of the word.

A monitoring condition attached to the Bruce C approval cannot prevent this outcome. It can only document it after it occurs. The precautionary principle under IAA s.6(1)(a) requires that threats of irreversible damage be addressed before they occur, not documented after. An approval made without adequately addressing the Lake Huron contamination risk — and without requiring quantification of Canada's international treaty obligations under the Great Lakes Water Quality Agreement for this scenario — does not engage the precautionary principle. It defers to it symbolically while evading it substantively.

P.3 Level 2: Chronic Health Consequences Are Irreversible by Definition

If the forty-year evidence record is correct and children living near operating nuclear plants face approximately doubled leukemia rates, then every year the Bruce C facility operates is a year in which children in the Bruce-proximate community face elevated leukemia risk. A child who

develops leukemia as a result of that exposure has experienced an irreversible harm: the disease cannot be undone by subsequent detection of the statistical pattern, by regulatory intervention, or by facility shutdown. The harm precedes the detection — because, as Appendix O documents, detection through the available monitoring framework will take decades even if the effect is real and persistent.

The transgenerational epigenetic effects documented in the March 2025 IJMS study are irreversible by definition. Heritable epigenetic changes passed from exposed parents to unexposed offspring cannot be recalled by any subsequent regulatory action. The offspring were never exposed. They cannot have their exposure reduced. The only regulatory mechanism capable of preventing transgenerational harm is to prevent the parental exposure that produces it — which means either not approving the facility or ensuring that routine emissions do not produce this effect. The TISG does not require the proponent to assess transgenerational effects. The monitoring programme cannot detect them even if they occur, because the mechanism requires comparing the health of the offspring of exposed individuals to the offspring of unexposed controls — a study design that requires decades of follow-up and a population far larger than the Bruce-proximate community.

P.4 Level 3: The Monitoring Framework Cannot Detect Harm in Time

As documented in Appendix O, the Bruce-proximate population is too small to support a statistically powered prospective epidemiological monitoring programme for childhood leukemia at the effect sizes documented in the international literature. Monitoring reports will find no statistically significant elevation for decades — not because no elevation exists, but because the monitoring programme was never capable of detecting one at the Bruce site population scale.

The combination of monitoring incapacity and the irreversibility documented in Levels 1 and 2 produces a specific practical consequence: if the Bruce C approval decision is wrong — if the facility does elevate health risk in the proximate community and contributes to Lake Huron contamination risk — the error will not be detected in time to prevent harm. By the time statistical signals strong enough to overcome the power limitations of the monitoring programme emerge from the Bruce-proximate population data, the harm will have been accumulating for decades, the facility will be deeply embedded in Ontario's energy infrastructure with enormous sunk costs, and the harm cannot be undone.

A monitoring condition in this context is not a genuine safeguard. It is a mechanism for creating the documentary appearance of oversight without its substance. It provides false assurance to the community that is actually exposed to whatever risk the facility creates. False assurance is not merely inadequate regulatory practice — in the context of the precautionary principle's requirement to address irreversible threats before they occur, it is inconsistent with the statutory obligation.

P.5 The Relationship to the Precautionary Principle

The precautionary principle under IAA s.6(1)(a) specifically applies to threats of serious or irreversible damage. The three levels of irreversibility documented in this appendix are not abstract possibilities. They are specific, site-specific, documented consequences of the

combination of the Bruce site's physical location (on Lake Huron), its existing fifty-year operating history (creating the baseline documented in Appendix J), and the monitoring framework's statistical limitations (documented in Appendix O). Every element of the irreversibility analysis is specific to the Bruce C site in a way that would not apply equally to a hypothetical nuclear facility elsewhere in Canada.

The precautionary principle requires that this irreversibility be addressed before approval — not through a monitoring condition that cannot detect harm, not through a liability cap that cannot compensate for Lake Huron contamination, and not through a process that defers the hard questions to conditions that cannot be enforced because harm cannot be detected. It requires genuine engagement with the question of whether approval is appropriate given the irreversibility of the potential consequences.

Summary for Bruce C: Irreversibility operates at three simultaneous levels in this assessment: watershed contamination of Lake Huron is practically irreversible at any accident scale comparable to Fukushima; chronic health consequences including transgenerational epigenetic effects are irreversible by definition; and the monitoring framework cannot detect harm in time to prevent it given the Bruce-proximate population size. The combination of these three levels means that if the approval decision is wrong, the error cannot be corrected within any human timeframe. A monitoring condition attached to the approval provides false assurance rather than genuine protection. The precautionary principle under IAA s.6(1)(a) requires these dimensions of irreversibility to be addressed before approval, not documented after. See Bruce Stopper 22.

PRIMARY INSTRUMENTS

Statutes and Regulations

Impact Assessment Act, SC 2019, c.28, s.1 (ss.6, 22, 46, 63); Nuclear Safety and Control Act, SC 1997, c.9 (ss.9, 24, 35); Nuclear Liability and Compensation Act, SC 2015, c.4, s.24; Nuclear Fuel Waste Act, SC 2002, c.23; Bill C-15, United Nations Declaration on the Rights of Indigenous Peoples Act, SC 2021; Constitution Act 1982, s.35; Regulations Designating Physical Activities, SOR/2019-285.

CNSC Regulatory Documents

CNSC REGDOC-2.5.2 Version 2.1, Design of Reactor Facilities, §2.2.1 (Safety Goals — mandatory comparative societal risk); CNSC REGDOC-3.5.3, Regulatory Fundamentals ('shall' = mandatory); CNSC REGDOC-2.4.2, Probabilistic Safety Assessment for Reactor Facilities; CNSC REGDOC-2.10.1 Version 2, Emergency Preparedness and Response; CNSC REGDOC-1.1.1 Version 1.2, Site Evaluation and Site Preparation for New Reactor Facilities; CNSC REGDOC-3.3.1, Financial Guarantees for Decommissioning; CNSC INFO-0799 (2010); CNSC-IAAC Memorandum of Understanding on Integrated Impact Assessments, 2019; CNSC KiKK Study Fact Sheet; CNSC Tritium Fact Sheet; CNSC Environmental Monitoring Programme, Bruce A and B Nuclear Generating Stations (published IEMP data); CNSC Enforcement Letter to Ontario Power Generation re Darlington Unified Command 2025 exercise, November 6, 2025; CNSC Nuclear Safety and Control Act Amendment implementation (2007-2008 NRU restart).

International Instruments

Great Lakes Water Quality Agreement, Canada-USA, 1978 (amended 2012), Articles VI and IX; IAEA General Safety Requirements Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, Requirement 29; IAEA Integrated Regulatory Review Service Mission to Canada, 2019 (Recommendation R2); IAEA IRRS Follow-up Mission to Canada, 2024; United Nations Declaration on the Rights of Indigenous Peoples, Articles 19, 29.2, and 32(2).

Judicial Decisions

Canada (Minister of Citizenship and Immigration) v. Vavilov, 2019 SCC 65; Baker v Canada (Minister of Citizenship and Immigration), [1999] 2 SCR 817; Dunsmuir v New Brunswick, [2008] 1 SCR 190; 114957 Canada Ltée (Spraytech, Société d'arrosage) v Hudson (Town), [2001] 2 SCR 241; CARN v BWXT Nuclear Energy Canada Inc., 2022 FC 849, ¶¶47-53; Kebaowek First Nation v. Canadian Nuclear Laboratories, 2025 FC 319.

Scientific Publications

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Harvard Nature Communications, 2026 (~6,400 excess cancer deaths per year near US nuclear facilities); IJMS epigenetic transgenerational study, March 2025; EJE INWORKS solid cancer reanalysis, November 2024; Ontario Drinking Water Advisory Committee, Report on Tritium, 2009; BEIR VII Report, US National Academies of Sciences, 2006; UNSCEAR 2006 and 2012 Reports; ICRP Publication 118, Statement on Tissue Reactions, 2011; Strahlenschutzkommission (SSK Germany), Statement on the KiKK Study, 2008.

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