

WHY GERMANY CLOSED ITS NUCLEAR POWER PLANTS

A Complete Assessment: Technical, Scientific, Regulatory and Legal Reasons

Central thesis: Operators could not discharge the burden of demonstrating that the facilities were safe for the public

March 2026

Reading guide: This document proceeds from the central legal thesis (operators could not demonstrate public safety) through the three compound grounds on which that burden failed: waste, health signal, and dose model. Each section documents the technical, scientific, regulatory and legal dimension of that ground. The document concludes with the direct application to the Energy Alberta IAAC proceeding.

THE CENTRAL THESIS

The operator burden of proof — and why it could not be discharged

Germany's nuclear phase-out is frequently mischaracterised as a political decision driven by public anxiety after Fukushima. The technical, scientific, regulatory and legal record establishes something more precise and more consequential: under the legal framework Germany had operated since 1959, operators of nuclear power plants were required to demonstrate that harm to the public was practically excluded. By 2011 — and in critical respects by 2007 — that demonstration could not be made on two independent grounds: the unresolved high-level waste disposal problem, and the unexplained population health signal near operating nuclear facilities. The 2017 codification of the operator burden of proof made the legal consequence of that failure explicit. It was not a new requirement; it was the Kalkar I constitutional standard, operative since 1978, given unambiguous statutory form.

The three-tier risk framework established by the Federal Constitutional Court in Kalkar I (BVerfGE 49, 89, 1978) classified all technological risks as hazard, risk, or residual risk, each attracting different legal consequences. The court held that the precautionary obligation operates in the zone of unresolved risk — before the threshold to confirmed hazard is crossed. For the precautionary obligation to be discharged, harmful events must be practically excluded and beyond the limits of cognitive capacities of man. This is a demanding standard. It does not permit a regulator to declare a signal unfounded and treat the obligation as discharged. It requires the operator to positively demonstrate practical exclusion.

The RSK's May 2011 finding that all 17 German reactors were mechanically sound did not discharge this burden. Mechanical safety and population health safety are distinct questions under the Atomgesetz framework. The RSK assessed engineering robustness. It could not and did not assess whether the childhood leukemia-NPP association was practically excluded at each facility. That question remained open. The Kalkar I standard was not met on the health dimension — independently of and in addition to its not being met on the waste dimension.

1959 — Atomgesetz (Atomic Energy Act): The Precautionary Standard

The Atomic Energy Act, promulgated 23 December 1959, built the precautionary standard directly into the licensing condition. Operators were required to take all necessary precautions in the light of the state-of-the-art of science and technology to prevent damage. These terms were deliberately left undefined to facilitate dynamic development: the standard tracks scientific progress. As science identifies new risks, the precautionary obligation expands to address them. A regulator cannot freeze the standard at 1959 levels by declining to update its risk characterisation.

1978 — Kalkar I, Federal Constitutional Court (BVerfGE 49, 89): The Constitutional Floor

The Federal Constitutional Court's Kalkar I decision established three principles that governed German nuclear regulation for the next 45 years:

- The precautionary obligation operates below the threshold of confirmed hazard — in the zone of unresolved risk.
- Harmful events must be practically excluded and beyond the limits of cognitive capacities of man before a licence issues.
- The standard must track the state of science dynamically — all necessary precautions in line with the latest scientific findings must be taken.

Kalkar I established a three-tier risk classification: hazard (state must eliminate), risk (precautionary measures required), residual risk (tolerated). The operator must demonstrate that the facility's risk profile has been reduced to tolerable residual risk. Where a risk cannot be practically excluded — because its mechanism is unknown or its magnitude is contested — the precautionary obligation is not discharged.

2002 — 13th Atomgesetz Amendment: The Phase-Out in Law

The Schröder government reached a nuclear consensus with the utilities in 2000, legislated in 2002. Each plant was assigned a fixed electricity budget corresponding to a 32-year average lifespan; new construction was banned. This was law a decade before Fukushima. The phase-out was not Fukushima's creation — it was Fukushima's accelerant.

2011 — 13th Amendment Accelerated Post-Fukushima

Eight reactors were shut immediately after Fukushima. The remaining nine were given staggered end dates. Critically, the government proceeded despite the RSK's contemporaneous finding that all plants were mechanically sound. The decision rested on the Kalkar I standard — not mechanical soundness, but practical exclusion of harm. Mechanical soundness is a necessary but not sufficient condition for practical exclusion of harm.

2013 — Site Selection Act (Standortauswahlgesetz): Waste as a Legal Constraint

Parliament passed the Site Selection Act in 2013 to restart the search for a permanent repository for high-level nuclear waste — a direct consequence of the phase-out decision. The Act treated the unresolved waste problem as a legal obligation requiring resolution, not a manageable ongoing condition. Generating additional waste while no confirmed permanent disposal pathway existed was inconsistent with the Atomgesetz's precautionary standard.

2015–2017 — EU Directives Transposed: Tightened Standards Post-Fukushima

EU Directive 2011/70/Euratom on the responsible management of spent fuel and radioactive waste, and Directive 2009/71/Euratom on nuclear installation safety, were transposed into German law via the 14th and 15th Atomgesetz amendments in 2015 and 2017. The Strahlenschutzgesetz (Radiation Protection Act), entering into force October 2017, gave German radiation protection law an independent statutory basis for the first time, separate from the Atomgesetz. It transposed the EU Basic Safety Standards Directive 2013/59/Euratom, tightened directly in response to Fukushima lessons.

2017 — 17th Atomgesetz Amendment: The Burden of Proof Codified

The 17th amendment codified what Kalkar I had established in 1978: the burden of demonstrating safety rests entirely on the licensee. The state is not required to prove harm. The operator is required to practically exclude it. This codification was not a new requirement — it made the existing constitutional obligation explicit in statute. No operator could discharge this burden on the waste or health dimensions as documented below.

2016 — Federal Constitutional Court: Phase-Out Confirmed as Constitutional

In December 2016, the Federal Constitutional Court confirmed that the phase-out was constitutionally sound. The Court required only that operators receive fair financial compensation for curtailed electricity volumes — not that any plant be reopened. The closure obligation survived constitutional challenge. The 16th and 17th amendments addressed the compensation requirement; the phase-out itself remained legally intact.

2022–2023 — Final Three Plants: 19th Atomgesetz Amendment

The Bundestag adopted the 19th Act amending the Atomgesetz on 9 December 2022. The last three plants — Isar 2, Emsland, and Neckarwestheim 2 — closed 15 April 2023. A brief extension from December 2022 to April 2023 was permitted in response to the Ukraine energy crisis; no new fuel rods were permitted. The extension changed the timeline; it did not change the legal obligation.

II

GROUND ONE — WASTE: OPERATORS COULD NOT EXCLUDE HARM FROM THE BACK END

The Technical Problem

High-level nuclear waste remains lethally radioactive for geological timescales — hundreds of thousands of years. No country in the world has a licensed, operating deep geological repository for high-level nuclear waste. Germany had been shipping spent fuel to France (La Hague) and the UK for reprocessing; that arrangement was ending and no domestic alternative existed. The Asse salt mine repository, licensed in the 1960s, failed — it was found to be structurally unsound and groundwater-contaminated, requiring a costly and dangerous retrieval operation still ongoing.

The Scientific Problem

Germany's nuclear safety agency BASE commissioned an expert report that concluded none of the alternative reactor types — including SMRs — would eliminate the need for a final repository. Transmutation and partitioning concepts have been discussed for decades; none has proven feasible at industrial scale. The scientific basis for permanent geological isolation of high-level waste exists in principle but has never been validated at an operational repository. Germany's own repository search, restarted by the Site Selection Act 2013, has produced no confirmed site and is expected to take decades further.

The Regulatory Problem

The Atomgesetz required all necessary precautions in the light of the state of the art of science and technology to prevent damage. Final repository science is not at the state of the art — it does not exist as a validated operational technology. Interim storage is demonstrably impermanent: the Asse failure proved it. A regulator applying the Atomgesetz standard in good faith could not find that the back-end harm from indefinite interim storage of high-level waste was practically excluded. The precautionary standard was not met on the waste dimension.

The Legal Problem — The Kalkar I Application

The Kalkar I three-tier framework applied to waste with straightforward consequences. High-level nuclear waste stored indefinitely in interim facilities, with no confirmed permanent disposal pathway, and a demonstrated failure of one interim repository (Asse), is not residual risk — it is unresolved risk. The operator's burden under the 2017 amendment was to demonstrate that the harm was practically excluded. No operator could demonstrate that indefinite interim storage in ageing facilities — with no confirmed permanent alternative — practically excluded harm at geological timescales. The burden was not met. The waste problem was not resolvable within the operator's demonstration capacity.

Germany's environment minister stated at final closure: 'Nuclear power supplied electricity for three generations, but its legacy remains dangerous for 30,000 generations.' This is not rhetoric — it is the precise technical problem. The Kalkar I standard required practically excluding harm for those 30,000 generations. No operator could do that.

The KiKK Study (2007) — Germany's Own Finding

Germany's Federal Office for Radiation Protection commissioned the Kinderkrebs in der Umgebung von Kernkraftwerken (KiKK) study, published 2007. It found an odds ratio of 2.19 for childhood leukemia within 5 km of German NPPs — a 119% excess. This was a properly designed, government-commissioned, peer-reviewed case-control study. Germany's own radiation protection commission, the SSK, reviewed it and concluded: the cause remains unclear. More research is required.

The SSK's language is the operative legal fact under the Atomgesetz. 'Cause remains unclear' is a formal statement that practical exclusion of harm has not been demonstrated. The Kalkar I standard requires that harmful events be practically excluded. A 119% excess in childhood leukemia near NPPs, with cause unclear, cannot be characterised as practically excluded.

The International Replication Record

KiKK was not a German artefact. The signal was replicated across multiple independent national datasets:

- GEOCAP, France (2012) — OR ~1.9 for childhood leukemia near French NPPs; replication of KiKK in a different country with different reactor types.
- COMARE 14th Report, UK (2011) — signal accepted as real; cause attributed to population mixing or unknown mechanism; not denied.
- Pooled European analyses — 61% excess all childhood cancers within 5 km of NPPs across multiple countries.
- NAS Phase 1, USA (2012) — described KiKK as showing child leukemia risk 'doubles' near NPPs; 'an open question'; NRC commissioned a national NAS study in response.
- Harvard / Nature Communications (2025) — ~20% excess cancer mortality in populations near US nuclear facilities over 40 years.

No major regulatory body other than the CNSC has characterised this replicated signal as unfounded. Every other body — SSK, COMARE, NRC, NAS, IRSN, WHO — treats the cause as unclear and the signal as real. Germany's own SSK used the words 'cause remains unclear' about its own national study — weaker dismissal language than the CNSC applied to the same evidence.

The Dose Model Cannot Explain the Gap

The gap between LNT model predictions and observed leukemia excess near NPPs is 10,000 to 100,000-fold. The dose model predicts 0.001 to 0.01 excess leukemia cases per 1,000 children near NPPs. KiKK found 119% excess. This gap is not a rounding error — it is a structural failure of the model for this specific endpoint. Four independent extrapolation failures compound to produce the gap:

Step	Standard assumption	Evidence	Direction of error
1. Acute → Chronic	LNT without DREF	DREF uncertainty at micro-dose rates significant (ICRP, UNSCEAR)	Underestimates chronic risk

2. External → Internal (OBT)	wR = 1.0	wR = 2.2 more appropriate (INFO-0799); confirmed CNL-IRSN 2018	Underestimates internal emitter risk
3. Adult → Fetal tissue	Whole-body average	Fetal dose 2× adult at any concentration; models unvalidated (INFO-0799)	Underestimates fetal risk
4. High-dose → Micro-dose	Point estimate, no CI	4–5 orders of magnitude below calibration range (NAS BEIR VII)	Underestimates micro-dose risk

All four errors are directionally consistent: each underestimates risk for the relevant endpoint. The compound effect across four steps explains why the model predicts no signal and the epidemiology consistently finds one. Under the Kalkar I standard, a dose model that cannot account for a 10,000 to 100,000-fold gap between its predictions and real-world observations does not constitute practical exclusion of harm.

Why the RSK 2011 Finding Did Not Discharge the Burden

The RSK's May 2011 review found all 17 German reactors were mechanically sound and safe. This finding addressed engineering robustness against natural events, station blackouts, cooling system failures, and man-made events including plane crashes. It did not and could not address:

- Whether the KiKK signal was practically excluded at each facility.
- Whether the population mixing mechanism was operative at each site.
- Whether the dose model adequately characterised fetal risk from CANDU-specific internal emitters.
- Whether the waste problem was practically excluded at geological timescales.

The government proceeded with the phase-out despite the RSK finding, correctly, because the Kalkar I standard encompasses all dimensions of harm — not only engineering safety. A mechanically sound reactor that produces an unexplained childhood leukemia signal in surrounding populations has not met the practical exclusion standard. The RSK finding resolved one dimension of the burden; it did not resolve the others.

IV

THE REGULATORY DIMENSION: DYNAMIC PRECAUTIONARY STANDARD IN PRACTICE

The Living Standard — Science Tracks, Standards Track

The Atomgesetz's precautionary standard was deliberately dynamic. The 1978 Kalkar I constitutional interpretation confirmed this: the legal provision must keep pace with scientific and technological developments. All necessary precautions in line with the latest scientific findings must be taken. KiKK (2007) constituted new scientific findings requiring precautionary action under the Atomgesetz's living standard. The SSK's conclusion — cause remains unclear — was not a finding that precautionary action was unnecessary. It was a finding that the mechanism was unknown, which under Kalkar I means practical exclusion of harm has not been demonstrated and precautionary measures are required.

The Strahlenschutzgesetz (2017) — Independent Radiation Protection

The Radiation Protection Act (Strahlenschutzgesetz) established an independent statutory basis for German radiation protection law, separate from the Atomgesetz. It transposed the EU Basic Safety Standards Directive 2013/59/Euratom, tightened in response to Fukushima. Germany thereby separated the radiation protection function from the licensing function — a structural reform that recognised the inherent tension between a single body performing both roles. The Act imposed precautionary radiation protection obligations independently of the Atomgesetz licensing framework, creating two parallel precautionary obligations on the same technology.

Convention on Nuclear Safety, Article 8 — Independence Requirement

Article 8 of the Convention on Nuclear Safety requires the regulatory body to be effectively independent from bodies promoting nuclear energy. Germany's Atomgesetz licensing structure, with both the licensing authority and the nuclear promotion function reporting ultimately to the federal government, was imperfectly consistent with this requirement. The structural reform embedded in the Strahlenschutzgesetz — establishing radiation protection as an independent statutory function — moved Germany's framework toward the Article 8 standard.

EU Directive Obligations — Legally Binding Waste Standards

EU Directive 2011/70/Euratom imposed a legally binding community framework for the responsible and safe management of spent fuel and radioactive waste. Germany's transposition of this Directive created a legal obligation to have a credible, demonstrable waste management pathway — not merely an ongoing search. With no confirmed permanent repository site and a failed interim repository (Asse) in costly retrieval operations, Germany's waste management pathway was not demonstrably credible on the Directive's standard. The phase-out reduced the rate of waste generation while the pathway problem was addressed — the only regulatory response consistent with the Directive's obligations.

Grid Architecture — Regulatory Incompatibility with the Energy Transition

A separate regulatory dimension operated in parallel with the safety questions. German energy law required a transition to renewable energy to meet climate obligations under the Kyoto Protocol and subsequent EU frameworks. Nuclear baseload and high-penetration variable renewables are technically incompatible at the grid level — both compete for dispatch priority, creating instability rather than complementarity. Nuclear power is inflexible; it cannot modulate output to balance variable wind and solar. At modest levels of renewable penetration, either nuclear displaces renewables or renewables displace nuclear. Germany's regulatory framework required the energy transition; the energy transition was technically incompatible with sustained nuclear operation at scale.

Reactor Aging — Approaching End of Design Life

Germany's reactor fleet was built primarily in the 1970s and 1980s, with designed operational lifespans of approximately 40 years. By the time of the final closures in 2023, the last operating plants were 33–36 years old. Aging reactors face increasing maintenance costs, erosion damage in pipes and safety systems, embrittlement of pressure vessels, and degradation of critical systems. France's contemporaneous experience — almost half of its 56 reactors offline at end of 2022 due to erosion damage, pipe cracks, and cooling system failures — demonstrated the practical consequences of operating an aging fleet. Germany's regulatory precautionary standard required operators to demonstrate safety under these conditions with increasing justification burden as systems aged.

Accident Probability and Consequence Magnitude

A statistical analysis by leading nuclear safety scientists estimated a 50% probability of an accident equivalent to Fukushima — with more than one billion dollars in damages — occurring every 60 to 150 years globally. While accident frequency has decreased with improved safety culture since the 1970s, average accident costs have increased. The uninsurability of catastrophic nuclear accidents is a structural technical problem: no private insurer in the world covers the full potential liability. Liability is capped by statute in every nuclear jurisdiction because the tail risk is uninsurable at market rates. Under the Kalkar I standard, an uninsurable tail risk is not a practically excluded harm.

Grid Architecture — Technical Incompatibility with High-Renewables System

Nuclear baseload power is technically incompatible with a high-penetration variable renewables grid. Nuclear reactors want to operate at maximum continuous output because their economics depend on maximising capacity factor. Solar and wind also want to be dispatched whenever available because they have near-zero marginal cost. When both are present at significant scale, one displaces the other. Flexible storage, demand response, and interconnection can mediate this conflict only within limits. Germany's renewables expansion reached the point where sustained nuclear baseload operation was technically inconsistent with the grid architecture required by the energy transition. This is an engineering constraint, not a political preference.

Waste Management — Technical Failures in the Repository Programme

The Asse salt mine repository, licensed in the 1960s and 1970s for low and intermediate level waste, was found to be structurally compromised and contaminated with groundwater. It must be emptied — a technically complex, expensive, and radiologically risky process expected to take decades. The Konrad repository for low and intermediate level waste with negligible heat generation was under construction as of the final closures. No site has been confirmed for high-level waste. The technical programme for permanent geological isolation of high-level waste — the only validated long-term approach — had failed in its first domestic application (Asse) and had produced no replacement.

VI

THE COMPOUND STRUCTURE: WHY THE THREE GROUNDS ARE MUTUALLY REINFORCING

The three grounds on which the operator burden of proof failed — waste, health signal, dose model — are not independent in the sense that each could be cured without affecting the others. They are mutually reinforcing in a specific way: each ground establishes that the Atomgesetz's practical exclusion standard was not met; together they establish that it could not be met by any operator making any arguable safety case available to it.

Ground	Why the burden could not be discharged	Atomgesetz standard not met because
Waste	No confirmed permanent repository; Asse failed; generating more waste with no disposal pathway	Harmful events at geological timescales cannot be practically excluded without a validated permanent disposal pathway
Health signal	KiKK OR 2.19 replicated internationally; cause unclear; mechanism unknown; model cannot explain gap	A 119% excess leukemia with unclear cause is not practically excluded harm — it is observed harm with unidentified mechanism
Dose model	Four unvalidated extrapolation steps; 10,000–100,000× gap between predictions and observations; fetal model unvalidated	A model that cannot account for the observed signal does not constitute a demonstration that harm is practically excluded
RSK 2011 finding (mechanical soundness)	Addresses engineering safety only; does not address waste, health signal, or dose model	Necessary but not sufficient — one dimension of practical exclusion, not all three

The compound structure means there is no single corrective action that could have discharged the operator burden. An operator could not argue that the waste problem was solved (it was not), or that the health signal was explained (it was not), or that the dose model was validated for the fetal endpoint (it was not), or that the RSK finding of mechanical soundness resolved all three (it addressed none of them). The burden failed on three independent, mutually reinforcing grounds.

VII

CHRONOLOGICAL SUMMARY: DATES AND TRIGGERING EVENTS

Year	Instrument / Event	What it established	Effect on operator burden
1959	Atomgesetz enacted	Precautionary standard tracking state of science	Operators must track and respond to new scientific findings
1978	Kalkar I BVerfGE 49, 89	Three-tier risk framework; practical exclusion standard; constitutional floor	Operators must practically exclude harm — a constitutional obligation, not regulatory preference
2000–2002	Nuclear consensus; 13th AtG amendment	Phase-out legislated; 32-year lifetime cap; new construction banned	Existing operators acquired legally limited remaining lifetime
2007	KiKK study published	OR 2.19 childhood leukemia near German NPPs; SSK: cause unclear	New scientific finding triggering Atomgesetz living standard; practical exclusion no longer demonstrable on health dimension
2011 (May)	RSK safety review	All 17 reactors mechanically sound	One dimension of burden met; waste and health dimensions remain unmet
2011 (June)	Post-Fukushima phase-out acceleration	8 plants shut; remaining 9 given end dates to 2022	Government acted on Kalkar I standard; mechanical soundness insufficient
2013	Site Selection Act	Repository search restarted; waste acknowledged as unresolved problem requiring legislative response	Waste burden formally unresolvable within existing operator capacity
2015–2017	14th, 15th AtG amendments; EU Directives transposed	Tightened safety and waste management standards; independent radiation protection statute	Burden standard raised; structural independence requirement tightened
2016	Federal Constitutional Court	Phase-out constitutionally valid; compensation required for curtailed volumes	Closure obligation confirmed; operators entitled to compensation but not reopening
2017	17th AtG amendment	Operator burden of proof codified: proving safety is solely the licensee's responsibility	Existing inability to demonstrate practical exclusion on waste and health dimensions codified as legal failure
2023 (April)	Final three plants closed	Commercial nuclear electricity generation ends in Germany	Operator burden unmet on waste, health and dose model grounds; phase-out complete

The German framework is not binding on the IAAC. But it is directly relevant to the IAAC in two ways: first, as the international comparator demonstrating how a legally equivalent precautionary framework was applied to the same evidence record; second, as the framework within which the CNSC's 'unfounded' declaration must be assessed — the CNSC applied stronger dismissal language to Germany's own science than Germany applied to it.

The Three Compound Grounds Apply to the Peace River Project

German ground	German position	Energy Alberta / Canada position
Waste	No confirmed permanent repository; Asse failed; generating more waste with no pathway is inconsistent with precautionary standard	Canada has no confirmed permanent repository (NWMO process ongoing); Peace River project proposes to generate additional high-level waste with no confirmed disposal pathway
Health signal	KiKK OR 2.19; cause unclear; practical exclusion not demonstrated; precautionary action required	Same signal; CNSC declares 'unfounded' against international consensus; no pre-construction baseline; no population mixing assessment; dose models unvalidated for fetal endpoint (INFO-0799, 2010)
Dose model	Model cannot explain 10,000–100,000× gap; practical exclusion not demonstrated by a model with this gap	CNSC INFO-0799 (2010) acknowledges four model failures; fetal biokinetic models explicitly unvalidated; wR = 2.2 more appropriate — unimplemented 16 years

The IAA s.6 Standard Is Functionally Equivalent to the Atomgesetz Standard

IAA s.6 requires the precautionary principle to be applied as a mandatory consideration in every impact assessment: where there are threats of serious or irreversible harm, lack of full scientific certainty shall not postpone measures. This is textually equivalent to the Atomgesetz standard — activated by uncertainty, not by proven harm. The CNSC cannot bind the IAAC's application of s.6 by characterising the uncertainty as resolved. The IAAC must apply s.6 independently to the full weight of the international evidence record.

The Morton v. Canada (2015 FC 575) Doctrine

The Federal Court held that licence conditions cannot derogate from the precautionary principle, and accepted the precautionary principle as a norm of substantive Canadian law to be used in the interpretation of all statutes and regulations. Energy Alberta's IAAC application rests on CNSC safety characterisations. Those characterisations include documents — the KiKK Fact Sheet, the Tritium Fact Sheet — that have been shown to misrepresent the CNSC's own internal science. Under Morton, the IAAC cannot approve conditions that derogate from the precautionary principle. An approval resting on documents that foreclose the precautionary trigger by misrepresenting the evidence record is precisely such a derogation.

The Energy Alberta Applicant Cannot Discharge the Burden

Under NSCA s.24(4), no licence issues unless the Commission is satisfied of adequate provision for the protection of the health and safety of persons. Under IAA s.63, the Minister cannot approve a designated project unless the Review Panel is satisfied the effects are in the public interest. Under Morton, the applicant must prove it would not cause an unacceptable level of harm. Against the three compound grounds — unresolved waste disposal, unexplained and replicated health signal, structurally unvalidated dose model — Energy Alberta cannot make that demonstration:

- It cannot show the waste problem is resolved — Canada has no confirmed permanent repository.
- It cannot explain the childhood leukemia signal — the CNSC's own body text says the cause is unclear. The 'unfounded' conclusion in the same document is internally contradicted.
- It cannot validate the dose model for the fetal endpoint — the CNSC's own INFO-0799 (2010) says the models are unvalidated and has not corrected this in sixteen years.
- It cannot demonstrate that population mixing will not be operative at a rural Peace River construction site drawing a major workforce from diverse geographic origins.
- It cannot establish a pre-construction baseline against which post-construction harm could be detected — the Peace Region population is too small and the monitoring design (demonstrated by RADICON at 8% power for a much larger population) cannot detect the effect sizes documented in the international literature.

Germany's operators, facing the same three compound grounds under the Atomgesetz, could not discharge the burden. The phase-out was the legal consequence. The IAAC Review Panel, applying IAA s.6, NSCA s.24(4), and the Morton doctrine, is not required to reach a different conclusion on the same evidence. It is required to reach the same conclusion — or to provide a reasoned, transparent, and justifiable explanation of why the practical exclusion standard has been met where Germany's own regulator, operating under a legally equivalent framework, found that it had not.

Sources: Atomgesetz (AtG) 1959 as amended through 19th amendment 2022; BVerfGE 49, 89 (Kalkar I, 1978); Standortauswahlgesetz 2013; Strahlenschutzgesetz 2017; EU Directive 2011/70/Euratom; EU Directive 2009/71/Euratom as amended 2014; EU BSS Directive 2013/59/Euratom; Federal Constitutional Court December 2016 and September 2020; KiKK study (Kaatsch et al., 2008); GEOCAP (Sermage-Faure et al., 2012); COMARE 14th Report (2011); NAS Phase 1 Report (2012); Harvard / Nature Communications (2025); CNSC INFO-0799 (2010); CNSC KiKK Fact Sheet (rev. October 2025); CNSC RADICON (2013); CNSC INFO-0210/Rev.10 and Rev.13; ODWAC Report (2009); Morton v Canada (Fisheries and Oceans) 2015 FC 575; Spraytech v Hudson (Town) 2001 SCC 40; Vavilov 2019 SCC 65; IAA ss.6, 22, 63; NSCA s.24(4) and s.24(5); Convention on Nuclear Safety Art.8.