WHISTLING PAST THE NUCLEAR GRAVEYARD

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Since the first edition of *Atomic Accomplice* appeared more than a decade ago, the challenge of climate change is more visible, and the need to switch to low-carbon emitting energy is even more urgent. Citing the climate crisis, the nuclear industry is lobbying hard for public funding to increase nuclear energy capacity in Canada. Their strategy to revive the fortunes of their moribund industry? To develop and build what they call 'small modular reactors' (SMRs).

SMRs are an unproven and far more costly form of electricity production than renewables, generating new kinds of radioactive wastes, posing risks of severe accidents, and raising concerns about nuclear weapons proliferation. New reactor builds are notorious for cost overruns and significant delays, making it highly unlikely that SMRs can contribute to timely climate action.

SMRs will not solve any of the well-known problems with nuclear energy, including the devastating environmental impacts of uranium mining and the lack of a permanent solution to the industry's growing stockpile of highly radioactive nuclear waste. Yet Canadian governments and the nuclear regulator are going all-out to enable and fast-track their construction.

Meanwhile, Canada's nuclear industry is becoming ever more entangled with foreign corporations involved in the nuclear weapons business, providing training for a new generation of weapons scientists and perpetuating the permanent war economy.

Not all SMRs are small; a typical proposed installation is the size of a football field. The nuclear industry defines an SMR as a nuclear reactor that can generate 300 megawatts or less of electricity. In contrast, each of the 19 CANDU reactors currently operating in Canada can generate 500 megawatts or more.

By 'modular' the industry intends for SMRs to be built on a factory assembly line and shipped to sites for assembly, reducing construction costs. This assumes that their designs will be successful and that a large market for SMRs will materialize, but research suggests otherwise.

Of the more than 50 SMR designs in development globally, about a dozen nuclear companies, most from the US and UK, have submitted or are preparing to submit designs for a pre-licence review by the regulator, the Canadian Nuclear Safety Commission.

Aside from their smaller generating capacity, other differences between these SMR designs and the existing CANDU fleet include the nuclear fuel and cooling systems. CANDUs are fuelled by natural uranium mined in Canada and cooled by heavy water. In contrast, some SMR designs have liquid sodium metal or molten salt cooling systems.

Most SMR designs require enriched uranium fuel that will be fabricated outside Canada. Some designs propose to extract plutonium from high-level nuclear waste (used nuclear fuel) to make new fuel, raising concerns about weapons proliferation.

The SMR designs are different from each other, but if built they will all increase the amount of radioactive waste stored in Canada. Some will increase the amount of nuclear waste per unit of electricity generated, and some will create new radioactive waste streams with no known methods of storage or disposal.

The Canadian Nuclear Safety Commission has no experience with any of these reactor designs or wastes.

In 2017, the federal government gave the Canadian Nuclear Association (CNA) nearly one million dollars to map out a plan for expanding their industry. The following year, the CNA released 'A Canadian Roadmap for Small Modular Reactors,' an ambitious plan to vastly expand the country's nuclear

infrastructure by building SMRs throughout Canada, including in remote, often Indigenous, communities currently relying on diesel energy.

The plan's strategy: to convince Canadians that in the face of climate change, SMRs can help achieve a low carbon future.

The 'roadmap' urges federal and provincial governments and agencies to:

- provide financial support for SMR development;
- exempt SMRs from federal impact assessments;
- merge the new nuclear waste streams produced by SMRs into existing radioactive waste management plans;
- and shield SMR operators and suppliers from liability in the event of a nuclear accident, as are current CANDU reactors.

After the roadmap was released, the Ontario, New Brunswick Saskatchewan, and later, Alberta, governments signed a memorandum of understanding (MOU) to aggressively promote SMRs.

Among other commitments, these provinces pledged to 'work co-operatively to positively influence the federal government to provide a clear unambiguous statement that nuclear energy is a clean technology and is required as part of the climate change solution.'

Subsequently, the public electric utilities and governments in those provinces have been actively promoting SMRs and imploring the federal government to fully fund SMR development. Although the proponents and vendors are silent on SMR development costs, in 2022 the Saskatchewan government stated that a prototype would cost $5 billion to build.

Ottawa has responded in kind by bulking up the funding programs that could support the nuclear expansion. The department of Innovation, Science and Economic Development Canada (ISED) began flowing funds directly to SMR vendors in October 2020.

Their first big federal SMR grant was $20 million to Terrestrial Energy, an American company operating in Ontario, to help develop its design for a molten salt reactor marketed to heavy industry. Then, in March 2021, ISED gave Moltex Energy, a UK company operating in New Brunswick, $50.5 million to develop its design for a 300-megawatt molten salt reactor that includes controversial plutonium reprocessing technology.

A year later, Ottawa granted $27.2 million to the Canadian subsidiary in Ontario of the American giant Westinghouse to develop the eVinci micro reactor. Their design for a 5-megawatt SMR with a graphite core and heat pipes uses a new kind of uranium fuel, TRISO pellets. Two years prior, the US Department of Defence provided the funding to finalize the eVinci design prototype to allow the reactor to be mobilized in military containers for transport.

In October 2022 came an announcement that the Canada Infrastructure Bank would provide a $970 million low interest loan to the public utility Ontario Power Generation (OPG) for its SMR project. OPG has selected an American company operating in Ontario, GE Hitachi, to develop a prototype 300-megawatt boiling water reactor (BWRX-300) on the OPG Darlington nuclear station site. When federal natural resources minister Jonathan Wilkinson announced the loan, he declined to provide details on the interest rate or repayment terms.

Public opposition to SMRs in Canada has brought together groups across the country. A joint statement demanding that the federal government cease funding SMRs, calling them 'dirty dangerous distractions from tackling climate change,' has been signed by more than 120 environmental, civil society, Indigenous and faith-based groups.

In its submission for the 2023 federal budget, the Green Budget Coalition representing national environmental groups wrote:

'There is little evidence that SMRs are the breakthrough technology that will resurrect Canada's nuclear industry, which has been in a steady decline since 1996, nor feasibly enable Canada to meet its climate targets.'

Ground Zero: SMRs and Chalk River in Ontario

Canada's largest public nuclear complex, the Chalk River Laboratories in Ontario's upper Ottawa Valley, was ground zero for the Cold War nuclear arms race, serving as a training ground for scientists and engineers who went on to develop weapons programs in their respective countries. Chalk River is now positioning itself in a similar role 'to serve the world as a global hub for SMR research and technology.'

Canada's nuclear industry began producing plutonium for the US and UK weapons programs in the 1940s at Chalk River. In 1952 the Chalk River site became the flagship of Atomic Energy of Canada Limited (AECL), the highly secretive and virtually unregulated Crown corporation created by Liberal industry minister C.D. Howe.

AECL adapted the weapons-focused heavy water technology into the civilian-purposed CANDU reactors now operating in Canada and several other countries. AECL also led several largely unsuccessful small reactor ventures. These included the SLOWPOKE, fueled by weapons-grade enriched uranium, that operated at several Canadian universities (one still remains at the Royal Military College in Kingston, Ontario). Two small MAPLE reactors intended for medical isotope production proved impossible to operate safely and sit idle at the Chalk River site.

In 2011, AECL's CANDU reactor division was sold to SNC-Lavalin for $15 million, after taxpayers had invested roughly $20 billion in AECL's reactor ventures.

In 2015, Chalk River and other AECL research facilities were handed over to a consortium composed of SNC-Lavalin and US- and UK-based corporations with extensive involvement in the nuclear weapons industries. The Conservative government under Stephen Harper awarded the consortium, misleadingly called the Canadian National Energy Alliance (CNEA), a 10-year, multi-billion-dollar contract that transferred ownership of the former AECL subsidiary, Canadian Nuclear Laboratories (CNL), to CNEA. The contract details have never been made public, and it remains to be seen if it will be renewed in 2025.

The contract allows these private corporations to use federal nuclear research facilities to conduct their nuclear business activities. The CNEA board appoints CNL's revolving door of American senior managers who work for brief stints at Chalk River, drawing salaries averaging over $700,000 per year.

With their entwined interests in nuclear weapons and SMRs, consortium members are now promoting Chalk River as a testing ground for SMRs. Other partners include the provincial crown corporations Ontario Power Generation (OPG) and New Brunswick Power (NB Power), and the federal regulator, the Canadian Nuclear Safety Commission (CNSC).

The CNSC seems to have difficulty remembering that it is a regulatory, not a promotional, agency. In 2011, Rumina Velshi, who until 2009 was OPG's lead for commercial activities and new nuclear projects, was appointed one of CNSC's 'independent' commissioners. In August 2012, the CNSC issued a 'site preparation licence' for OPG's Darlington site that included pre-approval for up to four new nuclear reactors of unspecified design.

The same year, the CNSC established the Vendor Design Review (VDR) process designed to pull the nuclear industry out of the doldrums with a shift to SMRs. A VDR gives SMR vendor-companies an opportunity to market their design as having passed a technical milestone. In fact, a VDR is merely

an optional process for SMR vendors to become familiar with CNSC licensing requirements before applying for a licence to construct. Exchanges between aspiring SMR vendors and the CNSC are private, with only superficial public disclosure.

Velshi became the CNSC president in 2018, the year that the CNSC successfully lobbied the Canadian government to exempt SMRs from the 2019 *Impact Assessment Act*. Two years later, she was appointed chairperson of the International Atomic Energy Agency (IAEA) Commission on Safety Standards where she has been working closely with her US counterparts to promote harmonized international safety standards for SMRs.

Velshi openly boasted that Canada will be the 'first Western country' to approve an 'on grid' SMR, namely GE-Hitachi's BWRX-300 at the Darlington nuclear site where she was formerly employed, and where site preparation for new nuclear reactors was pre-approved. OPG held a ground-breaking ceremony at Darlington in December 2022, even though the CNSC has not yet approved the reactor design.

An article in the *Bulletin of the Atomic Scientists* covering an SMR conference in the US in May 2022 has this observation about the CNSC president:

Rumina Velshi was adamant about the need for 'regulatory efficiency and regulatory readiness,' defining the CNSC's overall objectives as 'regulatory certainty, predictability, [and] efficiency.' This led some of Velshi's fellow countrymen to murmur—over drinks—that the safety authority should ensure the plants are safe, not that the industry stays afloat.

OPG is involved in another SMR project. In partnership with Seattle-based Ultra Safe Nuclear Corporation, in 2019 OPG applied for a CNSC license to build a 5-megawatt high-temperature gas-cooled reactor at Chalk River. At the time of writing, this 'Micro Modular Reactor' (MMR) project was two years behind schedule.

As with all nuclear reactors, the toxic waste produced by SMRs includes the reactors themselves. During operation, metal and concrete reactor components absorb neutrons from the splitting of uranium atoms and become radioactive. CNSC staff helped write a 2014 nuclear industry standard allowing shut-down SMRs that have become radioactive to be abandoned in place ('in-situ decommissioning').

The CNSC included this practice in their 2019 draft regulatory document on decommissioning. Later, peer reviewers from the International Atomic Energy Agency (IAEA) asked the CNSC to clarify that this is unacceptable, and Commissioner Sandor Demeter asked why facilities couldn't be designed 'so that in-

situ decommissioning is not the option.' But the final version still allows 'in situ decommissioning' of SMRs if their removal is not 'practicable' which would likely be the case if built in remote Indigenous communities.

While regulatory lenience will grease the SMR approval wheels, the real nuclear industry prize is the 'Advanced Nuclear Materials Research Centre' (ANMRC), the main component of a $1.2 billion federal grant to 'revitalize' the Chalk River nuclear laboratory site. Most of that funding was already spent by the time CNL held the ANMRC ground-breaking ceremony in September 2022, raising the spectre that future governments will be expected to spend even more money on the project.

The ANMRC's core focus is nuclear fuels, including research on reprocessing high-level nuclear waste to extract plutonium. If completed, the ANMRC will advance an industry goal of 'closing' the nuclear fuel cycle by using plutonium as the main reactor fuel.

In addition to raising nuclear weapons proliferation concerns, plutonium reprocessing in other countries has a history of huge costs, serious accidents and widespread environmental contamination. The CNSC dispensed with environmental assessment and licensing of the ANMRC, accepting CNL's argument that it will merely replace existing facilities.

CNL has also announced support for joint research at the Chalk River site with the two SMR vendors in New Brunswick, ARC and Moltex, whose designs involve using enriched uranium or plutonium as a fuel and building a plutonium reprocessing facility at the Point Lepreau nuclear site.

Despite the ecological sensitivity of the site on the Bay of Fundy, in December 2022, Minister of Environment and Climate Change Steven Guilbeault, based on an analysis by the Impact Assessment Agency of Canada, determined that the ARC-100, the first SMR project to be considered under the 2019 *Impact Assessment Act*, 'does not warrant' impact assessment.

SMRs in New Brunswick, Saskatchewan and Alberta

NB Power, the provincial provider of electricity services in New Brunswick, is a Crown corporation with a big problem: its lone nuclear plant, the Point Lepreau Nuclear Generating Station, is a dud. The CANDU 6 reactor with a net generating capacity of 660 megawatts is the only operating nuclear power reactor outside Ontario and identical to Quebec's Gentilly 2, which was closed in 2012.

The Point Lepreau reactor has underperformed since beginning operation in 1983 and particularly since its relaunch in 2012 after a four-year refurbishment. Both the original build and

the refurbishment took years longer and cost over a billion dollars more than originally planned, together adding $3.6 billion to the utility's current $4.9 billion total debt. Point Lepreau's poor performance since its refurbishment is the main reason NB Power loses money almost every year.

Nevertheless, NB Power sees itself as a nuclear utility, and to keep its nuclear aspirations alive, has jumped on the SMR bandwagon. In 2018, the provincial government disbursed $5 million each to two SMR start-ups, UK-based Moltex Energy and US-based ARC Nuclear.

Both SMR projects are proposed for NB Power's Point Lepreau site on the Bay of Fundy, with NB Power the 'proponent' for licensing purposes, and the companies the 'vendors.' Neither of these companies has ever built a nuclear reactor.

With their $10 million in provincial funds, ARC and Moltex opened offices in Saint John, about 40 km from Point Lepreau. After settling into their new country, each promptly submitted multi-million-dollar proposals for more public funding.

In 2021, Premier Blaine Higgs gave a further $20 million to ARC. Shortly thereafter, Ottawa announced the $50.5 million grant to Moltex Energy.

The $80.5 million gifts of public funds to the two foreign companies aligns with the nuclear industry's 'SMR roadmap.' The plan is for Ontario to have the first SMR to market and for New Brunswick to develop two 'advanced' reactor designs that would take longer to realize: ARC 100-megawatt sodium-cooled 'fast' reactor, and the Moltex 300-megawatt molten salt reactor and plutonium reprocessing unit.

According to a foremost authority, these two reactor types are decades away from commercial operation. Yet the provincial government and NB Power both claim that the ARC-100 sodium-cooled reactor is proven technology that will be operating by 2030 and central to New Brunswick's climate action plans.

Sodium-cooled nuclear reactors have never been commercialized successfully. Liquid sodium metal reacts violently when exposed to air or water. Previous attempts over many decades have resulted in numerous fires or explosions, and in all cases the shut-down reactors have been very costly and difficult to decommission.

A molten salt reactor – the type proposed by Moltex – also has an unsuccessful history. Two molten salt reactors were built in the 1960s and operated for 100 hours, and less than four years, respectively, experiencing hundreds of unresolved technical

problems. Since then, there have been no further attempts to build molten salt reactors.

The Moltex plan to develop a commercial reprocessing unit is particularly ominous. Canada has had a de facto ban on reprocessing plutonium from high level nuclear waste since the 1970s because of nuclear weapons proliferation concerns.

The Moltex SMR design would extract plutonium from high level CANDU nuclear waste to fuel the molten salt reactor. Because the business model for the Moltex SMR includes modular production to make multiple units for *export*, this means that foreign buyers would gain the technology to extract plutonium that could be further processed and used for nuclear weapons.

A 2016 report from Canadian Nuclear Laboratories commissioned by the Ontario government found no business case for reprocessing high level CANDU nuclear waste, 'due to its low fissile content,' and associated costs and risks, including the increased proliferation risk.

Why is plutonium reprocessing a nuclear weapons proliferation risk? High-level nuclear waste is fiercely radioactive, offering a barrier to theft; a thief would be quickly exposed to lethal levels of radiation. Reprocessing this waste removes some of the radioactive elements so the plutonium can be used as new

fuel. It would be necessary to further process the material to produce plutonium for nuclear weapons, but this secondary process could be done in a relatively low-cost laboratory 'hot cell' rather than a multi-billion-dollar reprocessing plant.

A major 2022 report by the US National Academy of Sciences expert panel that reviewed the proposed Moltex reprocessing process reached consensus that it does not provide significant proliferation resistance.

It is obvious that exporting reactors that use plutonium as fuel, either in pure or slightly impure forms, can aid a country to obtain nuclear weapons. It would also call into question Canada's National Statement on Nuclear Energy, issued in Washington in October 2022, which proclaimed that Canada desires to play a leadership role in nuclear energy and promote its peaceful use around the world.

Nevertheless, research to support the Moltex plutonium reprocessing design is currently underway at Chalk River, and the New Brunswick government is bent on developing this product for export. It has bought the pitch that building and exporting SMRs will be an economic cash cow. The politicians' quest for endless economic growth, coupled with a historical attraction to big, shiny, new technologies, makes them gullible providers of hand-outs to speculative, and in this case dangerous, schemes.

Between 2020 and 2022, the provincial government:

- signed MOUs with Moltex and ARC to establish an 'advanced SMR vendor cluster' in New Brunswick;
- created a Centre of Excellence in Energy that promotes SMRs to students in public schools;
- supported the Atlantica Centre for Energy, an NGO that promotes SMRs to industry partners and the public;
- with funding from ACOA, the federal regional development agency, set up an office to help New Brunswick companies integrate into an SMR supply chain;
- hired a consultant in the Premier's Office to facilitate SMR development;
- and promised up to $550,000 in wage subsidies to an Ontario company to recruit nuclear engineers to relocate to New Brunswick. All of this is in expectation of setting up a factory production line for SMR exports from New Brunswick.

Of the two Prairie provinces that signed the SMR MOU, Saskatchewan is the more advanced. That province created an SMR secretariat, chose the GE Hitachi BWRX-300 light-water design as its preferred model, and identified two potential sites

to build it. A decision to proceed is scheduled for 2029, and the government has budgeted $140 million for the project until that date. The minister responsible for the provincial electric utility SaskPower said the cost to build it would be about $5 billion.

Over the border, Alberta signed an agreement in August 2022 with Terrestrial Energy, the American company in Ontario that had received Ottawa's first big SMR grant in 2020 to develop its molten salt reactor. Alberta's plan is to use SMRs to reduce the carbon emissions produced by tar sands extraction and processing. Clearly, using SMRs to extract more fossil fuels challenges the purported rationale that SMRs will help fight climate change.

SMRs = False Bravado, False Choice

This latest attempt by the nuclear industry and its backers to stage a nuclear renaissance will undoubtedly be its last. The 'next generation' of nuclear reactors – smaller, modular versions – is in a frenzied race with real green fossil-fuel replacements for private and public investment, as well as the hearts and minds of the public. The real green deal – solar, wind, storage and energy demand reduction – is already far out in front on the global stage. (See Chapter 2 Green Ascent)

Not so, however, in Canada. After several decades of languishing on the side lines, the nuclear cabal embedded in government departments, provincial utilities, federal regulatory bodies, and recently privatized nuclear research and development operations, has recaptured political imaginations in Ottawa and at least some provincial capitals. The climate crisis has offered a cover for their favoured technology – atom-splitting – which they are already draping in slick public relations campaigns.

The absence of climate-damaging CO2 emissions from nuclear generation has been seized upon by vested interests, acolytes, the media, and even some environmentalists to deceptively claim nuclear power as 'clean' energy – while carefully ignoring safety, radioactive waste, and serial cost overrun liabilities. A short time after setting up shop in New Brunswick, the two SMR vendors both changed their company names from ARC Nuclear to ARC Clean Technology and from Moltex Nuclear to Moltex Clean Energy (the corporate name, Moltex Energy Canada).

This isn't the first attempt at a climate-driven come-back for a moribund industry. Visions of a nuclear renaissance were floated briefly during the 2000s, but the industry simply could not shed the problems that had stalled most new nuclear plant orders since the late 1970s:

- long and complex licensing processes;
- routinely missing construction timelines and budgets by huge margins;
- spotty, unreliable operating performance and the need for large-scale thermal back-up plants to cover for outages;
- premature aging of reactor components requiring costly rebuilds;
- that ever-present boondoggle, a highly dangerous, permanent waste stream for which there is no final solution;
- and successive disasters (Three Mile Island, Chernobyl, Fukushima) that remind the public of the dangers inherent in every nuclear power plant.

To get a foothold in a climate-constrained energy world, the nuclear industry needed to reboot. Enter this next generation of reactors. According to the marketing pitch, SMRs have shed the bugbears that have plagued the big reactors. Their backers claim that they are 'inherently safe, reliable, and low-cost.'

The low-cost factor is premised on a modular design which can be factory-produced like modular homes. This, of course, depends on there being robust new markets into which these plants would be sold, the evidence for which has yet to materialize.

It also depends on a design being approved that can be built on-time and on-budget, that will actually work reliably, and that can be commercialized. None of these conditions have yet been met for any SMR concept on the table in Canada.

The claims that SMRs are 'inherently safe,' produce minimal waste, or in some cases reduce existing stockpiles of nuclear waste are simply marketing fabrications. The public relations arms of these companies are in overdrive, churning out preposterous claims to reassure political and public audiences that there is a technological silver bullet to 'solve' the climate crisis, and further, that there is much money to be made by hosting SMR factories for the export market.

Meanwhile, the new world of cheap, renewable energy technologies is being created before our eyes. Why, then, has Canada thrown significant financial weight and regulatory lenience behind this SMR PR pitch? At this early stage in the high stakes game, the full picture of the interests involved is not yet clear. Yet four converging streams of vested interest seem to be at play.

First, Canada's self-image as a nuclear player has been burnished for 80 years, beginning with the Chalk River research facility's genesis in the Manhattan Project and its quest to build the first atomic bomb. By turning Chalk River's scientific talent and technology towards post-war civilian applications, including the heavy water CANDU reactor, Canada retained a cabal of

nuclear acolytes within federal departments and agencies, whose motivation would always be to maintain their positions, and who have been cheerleaders for any new nuclear propositions.

Second, the nuclear cabal is well-ensconced in the two provincial governments and electrical utilities with operating CANDU reactors, Ontario Power Generation and NB Power, both clearly seeing themselves as nuclear utilities and demonstrating little interest in renewables. With federal money flowing into the SMR sector, NB Power sees an opportunity to secure its nuclear identity into the future – without having to pay for it (it is shouldering a massive debt for its size, most of which is attributed to the Point Lepreau nuclear plant).

Third, Canada's nuclear program created a cabal of private engineering and supply chain companies that cashed in on the bonanza of contracts and sub-contracts associated with building CANDU megaprojects. The scandalous deal former Prime Minister Chretien signed with China for two CANDU reactors – with CANATOM and SNC-Lavalin both pressuring the Liberal government to make the deal – revealed just how politically embedded these interests are. (See Chapter 8 Down and Dirty With the Butcher of Beijing)

Fourth, the uranium mining industry and its backers have lots of reasons to cheerlead for new reactor projects, thus the interest of the Saskatchewan government in SMRs. Even though most SMR designs for Canada require unique fuel

mixes and assemblies to be made outside the country, much of the uranium used in the fuel will be mined in Saskatchewan. This shared interest in expanding uranium mining may be one of few points of agreement between Ottawa and Saskatoon in recent years.

There are several other strings to be pulled to unravel this SMR story, including the glaring connection between global SMR proliferation and nuclear weapons proliferation. Suffice to say, there is a political appetite in Canada for the Promethean promise of nuclear deliverance from the climate crisis, as well as the seduction of an economic bonanza, being stoked by a cynical calculus of nuclear interests seeking to exploit the global decarbonization imperative to ensure their own survival. Atoms for peace cannot be separated from atoms for war – and there's a piece of Canada in every American nuclear bomb.

This is a do or die moment for the nuclear industry. It has not been able to sustain itself on its own merits, and now, as in the past, it relies on mass infusions of public money to stay afloat. And money has been no object - it has continued to flow under both Liberal and Conservative federal governments, and from hapless electricity ratepayers. Nor has ethics been a barrier, as the connection with nuclear weapons proliferation attests.

The disadvantage now is time, a dimension in which deadly, complex nuclear technologies cannot compete against its challengers. Solar, wind, storage, and demand reduction have become the cheapest and fastest replacements for fossil-fueled electricity. The outstanding question is whether Canadians will allow their governments to keep nuclear in the race artificially, and thereby forego the early benefits of a rapid shift to efficiency and renewables – or continue to aid and abet Canada's reputation as a 'atomic accomplice.'