



**Issue:** The Canadian nuclear industry has shown a pattern of seeking federal policy and financial support by promising cheaper and safer reactor designs. Despite significant federal support, the industry has consistently failed to innovate and deliver on these promises. Meanwhile, significant innovation in the renewable and clean-tech sectors is lowering greenhouse gas emissions and transforming energy markets internationally.

## Recommendations:

- In light of the magnitude of past government support, the federal government should not provide any additional financial or significant policy support toward the development of new reactors designs.
- The Department of Natural Resources Canada should review and refocus its resources on supporting innovation in the renewable and clean-tech industries.

## CANDU: A Technological Dead-End

Over the past sixty years, the Canadian nuclear industry has sought – and more often than not, acquired – significant federal financial and policy support based on the promise that new conceptual reactor designs will be cheaper, safer and of economic benefit for Canadians.

- The CANDU reactor design is at a technological dead-end. Despite billions in subsidies, the Canadian nuclear industry has been unable to successfully innovate, design, or sell any new reactor designs since the CANDU-6 was first developed in the early 1970s.
- Since the design of the CANDU-6, Atomic Energy of Canada Limited (AECL) has received federal funding for a long line of reactor designs that were never sold, including the Organic Cooled Reactor, the CANDU-Boiling Light Water Reactor, the Slowpoke Energy System, the CANDU-3, and the CANDU-9.
- Between 2002 and 2009, the federal government provided AECL with \$433.5 million in subsidies to support the development of the Advanced CANDU Reactor (ACR).<sup>i</sup> This support of the so-called “Next Generation CANDU” was given to the CANDU industry based on the promise that the Advanced CANDU would be 40% cheaper than the CANDU-6 design.<sup>ii</sup>
- AECL did not deliver on its promise of a lower cost ACR. In 2009, the Ontario government suspended its procurement of new reactors when the cost of building an ACR topped \$10,000 per kW, or \$26 billion for a 2,400 MW station.<sup>iii</sup> That is four times a 2005 cost estimate.
- In 2011, the newly formed CANDU Energy decided to abandon the marketing of its ACR design in favour of a repackaged version of its 1970s-era CANDU-6 reactor.
- The cost of building and operating a CANDU-6 is also expensive. New Brunswick Power has acknowledged that the Levelized Unit Energy Cost (LUEC) of operating a CANDU-6, including cost over-runs, at Point Lepreau was 13 cents a kWh between 1983 and 2006.<sup>iv</sup> Post life-extension, New Brunswick Power has estimated Point Lepreau’s LUEC to be 9.7 cents a kWh.<sup>v</sup> This estimate does not include the hundreds of millions of dollars in cost over-runs transferred to the federal government.
- Even the leadership of CANDU Energy seems to acknowledge privately that their reactors are too costly for Ontario: Kevin Wallace, the president of CANDU Energy, told his employees in 2012 that “It’s all about [dollars per megawatt] and we’re too expensive.”<sup>vi</sup>

## Recycled Promises: Small Modular Reactors

The Canadian nuclear industry is again seeking federal policy and financial support based on the promise that the yet to be designed Small Modular Reactors (SMRs) will be cheaper, safer and of economic benefit to Canadians.

- SMRs are still conceptual, with designs only 5 – 20% complete.<sup>vii</sup>
- SMRs will be expensive. A Hatch study commissioned by the Ontario government estimates that the cost of SMRs may range between 46 and 76 cents a kWh.<sup>viii</sup>
- Although the Hatch study found that SMRs could be competitive against diesel generation, it carried out no similar assessment against the declining cost of clean-tech energy options.
- The Hatch study observed that the limited market for SMRs is a barrier to development. Due to the limited market potential, the Hatch study recommended the government pick winning technologies, which will bring the most benefit to the province.<sup>ix</sup>
- The study found that a demonstration facility would be needed to prove the viability of prototype designs.<sup>x</sup>
- Chalk River Laboratories is being discussed as a demonstration site, which raises the possibility that federal taxpayers will be left with long-term liabilities.

## Updating Federal Focus: Clean-tech Innovation

Considering the Canadian nuclear industry's history of failing to innovate, the federal government should refocus its policy and financial support to the clean-tech sector.

- Energy markets are being transformed by innovation and the declining cost of renewables, energy storage, and other clean-tech energy technologies.
- Due to continued growth and declining costs, the International Energy Agency said 2015 marked a “turning point” for renewable energy.
- A 2016 survey found that energy experts anticipate a 24–30% reduction in wind energy costs by 2030 and a 35–41% reduction by 2050.<sup>xi</sup>

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<sup>i</sup> Briefing Note, “Atomic Energy of Canada Limited,” in response to an Access to Information Request for “A copy of the briefing book that was left at CTV’s studios,” September 25, 2009

<sup>ii</sup> Briefing Note, “ADVANCED CANDU REACTOR PROGRAM,” November 30, 2004, Natural Resources Canada, Acquired through Access to Information.

<sup>iii</sup> Hamilton, Tyler, “\$26B cost killed nuclear bid,” *Toronto Star*, July 14, 2009

<sup>iv</sup> New Brunswick Power written response to David Nicholson, Chairman of Public Utilities Board of New Brunswick, 2002.

<sup>v</sup> New Brunswick Power responding to New Clear Free Solutions, Interrogatory Response-02, December 1, 2016

<sup>vi</sup> Society of Professional Engineers and Associates, “Message to Members Regarding CANDU Energy (SNC-Lavalin) Final Offer,” August 24, 2012.

<sup>vii</sup> Canadian Nuclear Safety Commission, Presentation for Management Committee: Small Modular Reactor (SMR) Update – Readiness for Regulation, January 14, 2016. Acquired through Access to Information, A-2016-00010

<sup>viii</sup> Hatch Ltd., *Ontario Ministry of Energy SMR Deployment Feasibility Study*, June 2, 2016, pg. 11.

<sup>ix</sup> Ibid. Pg 82.

<sup>x</sup> Ibid. Pg 81.

<sup>xi</sup> R. Wiser, et al., “Expert elicitation survey on future wind energy costs,” *nature energy*, 12 September 2016, Article number: 16135.