

A Canadian Perspective on Progress in Thorium R&D: Towards Sustainability

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Many of the world's nations believe that a greater use of nuclear energy will be required to achieve sustainable emissions-free energy production and energy use while economically meeting the requirements of security of supply and growing demand. Nuclear energy will continue to make a significant contribution to meet Canada's energy needs based on the sound foundation of existing CANDU technology, infrastructure and resources. In addition to meeting Canada's energy needs, Canada has the opportunity to work with others internationally in the nuclear energy field. To take advantage of the opportunities and to ensure that nuclear energy can contribute its full potential in Canada and internationally, heavy water reactor and related nuclear technologies must continue to evolve.

Currently heavy water reactors in Canada and internationally typically operate on a once-through nuclear fuel cycle using mainly natural uranium fuel. Future nuclear power program decisions will be increasingly based on strategic considerations involving the complete nuclear fuel cycle, including requirements related to supply assurances, resource utilization, proliferation resistance and radioactive waste disposal. Heavy water technology is uniquely suited to respond to future needs because of its inherent technical characteristics and associated fuel cycle flexibility.

Given its widespread abundance, thorium is expected to play a significant role as nations move towards implementation of advanced fuel cycles. Canadian Nuclear Laboratories (which evolved from Atomic Energy of Canada Limited) has been investigating thorium fuelled reactor concepts and developing thoria (thorium dioxide) fuel technology for more than 55 years, which complements international experience in the development of thorium-based fuel cycles. Although there is a strong foundation based on past experience, gaps exist in the science and technology required to implement the use of thorium-based fuels on an industrial scale.

Recent progress and some aspects of the necessary evolution of the technology are outlined in this paper.

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Dr. Speranzini was previously General Manager of CANDU Technology Development managing AECL's R&D program and has contributed technically over his career in the areas of reactor technology (e.g. chemistry and materials including feeders, chemical decontamination and SG chemical cleaning), isotope production and waste management.