



A NATIONAL NEUTRON BEAM INFRASTRUCTURE PROGRAM

Canada's social, environmental and economic challenges require a complete twenty-first century scientific toolkit for research and innovation in materials.

Because everything is made of materials, innovation in materials underpins nearly all technology advances for national priorities, including:



CLEAN ENERGY PRODUCTION

Producing clean, reliable, and renewable energy and storing it for an efficient electricity grid.



TRANSITION TO NET-ZERO

Transforming manufacturing for clean and energy-efficient, light-weight planes, ships, and cars, including electric vehicles.



SAFETY AND SECURITY

Aiding nuclear non-proliferation, ensuring pipeline and rail safety, and determining fitness-for-service of naval ships.



HEALTH AND FOOD SUSTAINABILITY

Designing medical devices, and developing less-resource intensive, more sustainable plant-based foods.

Engineers and scientists apply many probes to advance knowledge and improve materials, and **neutron beams are versatile and irreplaceable tools for materials research**. They provide insights about materials that cannot be obtained by other scientific techniques. **Canadians have led in this field for over 70 years**, applying these tools to make major socio-economic impacts, such as those described at cins.ca/discover. One particular impact—**saving hundreds of millions of dollars** by reducing downtimes of Canada's fleet of nuclear power stations—has outweighed Canada's cumulative investments in neutron beam facilities to date.

While other nations are investing in multi-billion-dollar neutron sources, **Canada is just beginning to rebuild its neutron beam infrastructure** following the closure of Canada's primary neutron source in 2018. Without neutron beam infrastructure, **Canada's scientific toolkit is incomplete**, hindering our long-term ability to innovate to meet our social, environmental and economic challenges.



Neutron beams were vital to explain, and prevent downtime from, leaks at Canada's fleet of nuclear power reactors.



Neutron beams were critical to ensuring reliability of car engine parts manufactured with innovative methods.



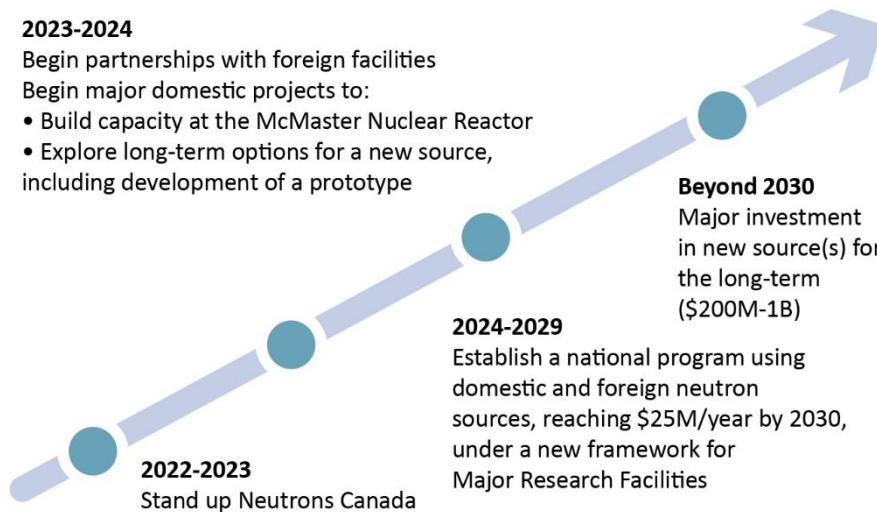
Neutron beams were critical to explain cracking issues in Canada's aging pipelines and develop industry standard practices to ensure reliability.



Neutron beams are being used at the University of Saskatchewan to advance global food security.

Canadian universities are leading the way to rebuild Canadian capacity for materials research with neutron beams through the development and implementation of the **national neutron strategy**, including their recent **creation of Neutrons Canada**, which has 15 member universities from coast to coast. They have also **secured federal and provincial investment** in a \$47M project that will (1) develop a neutron beam user laboratory at the McMaster Nuclear Reactor, and (2) establish short-term partnerships with two foreign neutron sources. They have proposed a further \$55M project led by the University of Windsor to develop a prototype neutron source and create further partnerships with foreign neutron sources.

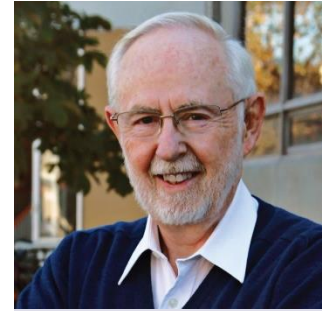
These projects are critical **seeds** for the strategy's envisioned **infrastructure program for research and development with neutron beams, which will reach \$25M/year by 2030.**



The neutron beam infrastructure program must be included in the new funding framework for Major Research Facilities, which is currently under consideration by Innovation, Science and Economic Development Canada.

Until such a funding framework emerges, **a direct government investment of \$95M over 2024 to 2029** would build on the above existing and proposed projects to **enable ramping up Canada's neutron beam infrastructure program and secure access to neutron beams for Canadian research.**

With a complete twenty-first century scientific toolkit, Canadians can accelerate the pace of innovation in advanced manufacturing, in clean and energy-efficient vehicles, in clean energy production, and in fighting diseases such as Alzheimer's and cancer. Canadians will also lay foundations for breakthroughs in new materials with greatly enhanced performance that will have a transformative influence on many technologies—and with such innovations come the promise of **enhanced quality of life for all Canadians.**



"World-class research and innovation require large, national-scale science facilities that are accessible and maintained at the state-of-the-art. Neutron beam facilities are critical tools for materials research and technology development in areas such as clean energy, clean transportation, health, and food security. The national neutron strategy proposes a single program for orderly stewardship of Canadian access to neutron beam facilities."

PROF. ART McDONALD
Nobel Laureate
in Physics (2015)
Queen's University

ABOUT NEUTRONS CANADA

Neutrons Canada is a not-for-profit corporation whose purpose is to govern, manage, and represent Canada's infrastructure program for research and development with neutron beams, including international partnerships that secure access to world-leading neutron laboratories, operation of Canada's domestic neutron beam facilities, and national initiatives for future neutron sources, thereby enabling Canadians to address major social and economic challenges.