

# INVESTING IN CANADA'S NEUTRON BEAM RESEARCH INFRASTRUCTURE

GENERATING NEW KNOWLEDGE AND HIGH-IMPACT INNOVATIONS

WORLD-LEADING CANADIAN NEUTRON BEAM RESEARCH IS ADDRESSING NATIONAL CHALLENGES



## CLEAN ENERGY

Producing clean, reliable, and renewable energy and storing it for electric vehicles (EVs) and a green electricity grid.



## NET-ZERO MANUFACTURING

Developing advanced manufacturing methods to reduce emissions, and transition to EV production.



## SAFETY AND SECURITY

Ensuring safety of airplanes, pipelines and our inventory of used nuclear fuel, and extending service life of naval ships.



## HEALTH AND FOOD SECURITY

Understanding health and disease, designing drugs and medical devices, and developing more sustainable foods.



## QUANTUM INNOVATION

Understanding and designing materials for quantum computers and other quantum technologies.

### Why does Canada need to invest now?

Since Canada closed its only neutron source at the Chalk River NRU reactor in 2018, other nations have been investing heavily in neutron sources. Canadian leadership is quickly eroding and its ability to undertake critically important research needs to be addressed before it is lost. The newly released *Canadian Neutron Long-Range Plan (LRP) for 2025 to 2035* articulates the research community's national vision for rebuilding Canadian capabilities and seizing emerging opportunities. Leading nations are willing to partner with Canada to access their neutron sources while we build up neutron beam capabilities within Canada.

**The top recommendation of the *Neutron LRP* is that the Government of Canada allocate \$95M over the 6-year period starting in 2025, and \$25M per year ongoing starting in 2031, to a national program for a neutron beam research and development infrastructure managed by Neutrons Canada. With a complete 21<sup>st</sup>-century scientific toolkit, Canadians can accelerate the pace of innovation and lay the foundations for scientific breakthroughs that will have a transformative influence on many technologies—and the promise of enhanced quality of life for all Canadians.**

### WHAT ARE NEUTRONS?

Neutrons are subatomic particles found inside the nucleus of every atom.

### WHAT ARE NEUTRON BEAMS?

Like beams of light used in a microscope, engineers and scientists apply neutron beams to probe materials to advance knowledge and improve materials.

*Research using major neutron beam facilities generates social, environmental and economic impacts worth at least triple the investment—and Canadians are leaders in realizing such impacts.*

## THE IMPACTS OF NEW KNOWLEDGE USING NEUTRON BEAMS



### ACCELERATED UPTAKE OF ELECTRIC VEHICLES (EVs)

The present value of economic benefits to Canada, cumulative to 2030, attributable to research using neutrons is estimated at \$1.6 billion, based on a conservative estimate that the research accelerated the development of EVs by just two years.

### COMPUTER HARD DRIVES

Canada has realized at least \$800 million in economic benefits attributable to neutrons from accelerated hard drive development.

### CLEAN ENERGY PRODUCTION

Canada's nuclear power stations avoided losses of hundreds of millions of dollars and prevented gigatons of carbon dioxide emissions.

### SUSTAINABLE FOOD

Daiya Foods, the top Canadian brand of plant-based cheese, launched new products in 2023 and 2024 resulting from a partnership with researchers who use neutron beams.

### PUBLIC SAFETY

Canadians enjoy safety from improved, evidence-based regulations for airplanes, pipelines, and railroads.

### WORKFORCE OF TOMORROW



Research using neutron beams profoundly impacts students' educational achievement and their pursuit of technology careers. A 2019 study found that 60% of Canadian undergrads

were inspired to earn graduate degrees, of which two-thirds earned a Ph.D.—rates far above Canadian norms. Over 80% of alumni went on to careers in sectors where high-tech skills and innovation are most needed, including manufacturing, scientific and engineering services, and academia

### STEWARDSHIP OF VITAL CAPABILITIES

"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 Canadian Neutron Long-Range Plan 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 US

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.