

Supporting Zero-Emissions Technology Innovation,
Research, Development, Demonstration & Integration
(RDD&I)

Pre Budget Submission
House of Commons Standing Committee on Finance
Government of Canada

by the
Canadian Urban Transit Research and Innovation
Consortium

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EXECUTIVE SUMMARY

The Canadian Urban Transit Research & Innovation Consortium (CUTRIC) [Consortium de recherche et d'innovation en transport urbain au Canada] is pleased to submit this pre-budget proposal, which focuses on a vision to position Canada as a global centre of transportation innovation.

CUTRIC has a framework in place to assist the Government of Canada's innovation efforts vis-à-vis zero-emissions technology development, design and manufacturing, as well as zero-emissions transportation system optimization. This framework will promote an entrepreneurial and creative society, building world-leading clusters through partnerships between industry and academia across Canada, while growing small to mid-sized enterprises and accelerating clean technology growth and adoption across the nation.

This submission introduces you to the important work CUTRIC is doing nationally to establish Canada as a world leader in zero-emissions transportation-related clean technology. It concludes with specific recommendations to support transportation innovation (including public transit, heavy-duty trucking and private passenger vehicle innovation) with the goal of growing a zero-emissions and integrated mobility manufacturing and development supply chain.

CUTRIC's Vision is to make Canada a global leader in zero-emissions and advanced transit and transportation technologies.

CUTRIC's Mission is to support research, development, demonstration and integration (RDD&I) projects through industry-academic collaborations that bring innovation, design, and manufacturing to Canada's transit and transportation networks.

CUTRIC's Objective is to support industry-academic collaborations in the development of next-generation technologies for Canadian transit and transportation systems. These advancements will help drive forward innovation in transportation across Canada, leading to job growth and economic development.

Through industry-academic partnerships, CUTRIC's work will lead to solutions to decrease fuel consumption, avoid wasted assets, and reduce redundancies in operations, saving taxpayers' money while supporting entrepreneurial opportunities.

INNOVATION

Bold thinking for zero-emissions technology and “smart” transportation

Incorporated in August 2014 to support industry-led research, development, demonstration and integration (RDD&I) projects across Canada, CUTRIC works to coordinate clustered growth across five pillars of innovation:

(1) **Zero-emissions propulsion technologies and system integration**, including battery electric propulsion technologies, hydrogen fuel cell and hydrogen combustion propulsion technologies, compressed and renewable natural gas (CNG/RNG) propulsion technologies, and advanced

low-emissions engine technologies that provide demonstrable greenhouse gas (GHG) emissions reductions.

(2) Light-weight materials and processing technologies for light-weight vehicles, including composite materials, polymers, advanced metals, and multi-material designs.

(3) Autonomous and connected vehicular and infrastructure technologies that support automation, autonomy and connectivity of vehicle systems on roads and rail, including sensors, signaling, and control systems.

(4) “Big Data” and data-driven analytics solutions that support fleet and network optimization for vehicles in mixed traffic, dedicated lanes, or specialized communities.

(5) Cybersecurity technology solutions to support vehicular and infrastructure securitization for electric vehicles, hydrogen fuel cell vehicles, natural gas vehicles, and autonomous vehicles given the susceptibility of these vehicle systems and their charging/fueling supplies to new forms of malicious attack.

These themes were identified by private sector transportation and automotive industry stakeholders as well as transit systems and researchers who engaged in a series of structured consultation sessions held across Canada in 2015 – the results of which have been published in a report to the Ministry of Innovation, Science and Economic Development (ISED), entitled *Automotive and Transportation Innovation Across Canada & Regional Transportation Needs and Capacities as Targeted Research, Development & Demonstration (RD&D) Projects*.

CUTRIC coordinates projects related to these themes across four provinces where transportation innovation clusters currently exist – namely, Ontario, Quebec, Manitoba and British Columbia. As a member-driven consortium, CUTRIC has integrated technology manufacturers, suppliers and adopters (e.g. transit systems) resulting in more than 50 project proposals involving cutting edge, zero-emissions transportation technologies.

CUTRIC also works to coordinate a fragmented set of provincial and federal funding programs aimed at funding parts of research, development, demonstration and integration (RDD&I) in Canada’s transit, transportation and mobility manufacturing sectors.

CUTRIC’s end goal is to produce an industrial renaissance in Canada in the areas of low- and zero-emissions, light-weight, digitally connected, highly efficient, user-friendly transportation systems across all modes of transit, including bus, rail, trolley, and on-road vehicles within the next five years. This work will help make all types of vehicles more efficient and less fossil fuel intensive, thereby supporting Canada’s shift to a low-carbon economy.

CUTRIC IN ONTARIO: THE BUSINESS GROWTH INITIATIVE

CUTRIC has been recognized as a trusted partner in promoting innovation, most notably at the provincial level in Ontario, as well as in British Columbia, Quebec and Manitoba. Early in 2016, the Ontario Ministry of Economic Development, Employment and Infrastructure committed \$10 million to CUTRIC through its Business Growth Initiative. Ontario will directly invest \$10 million over four years into CUTRIC projects that support zero-emissions, advanced transportation RDD&I – i.e. technology innovation.

CREATING PARTNERSHIPS TO FOSTER TECHNOLOGICAL INNOVATION

On June 28, 2016, CUTRIC partnered with the National Research Council of Canada (NRC) in Ottawa to host the first National CUTRIC Research & Innovation Forum dedicated to advancing transit and transportation solutions and technologies.

Dozens of private and public sector innovators delivered “ready to launch” innovation project proposals related to zero-emissions vehicles, lightweight materials, advanced transportation analytics, automated and connected vehicle systems, and cyber security solutions for vehicle communications.

Detailed evaluations are underway to earmark funding for those projects that are “ready to launch”. These projects require federal government support and co-investment to move forward. Every CUTRIC project integrates private sector funding of between 25% to 50% of total project costs, depending upon the technology readiness level (TRL) of the project. The other 75% to 50% of project costs are borne by provincial (i.e. MEDG’s \$10M investment in Ontario outlined above) and/or federal investment (i.e. as per the \$185M request below).

CLIMATE CHANGE INNOVATION

Canada’s transportation sector – both public and private– is in desperate need of innovation if the country intends to meet its Paris commitment to reduce emissions 30% below 2005 levels by 2030. Historically, manufacturers, suppliers, and transit systems have not been able to develop cutting edge innovation partnerships due to a lack of flexible and supportive funding at the federal and provincial levels.

Laudable federal efforts have been made in the past with the Automotive Partnership Canada (APC) grant, which launched several world-leading industry-academic collaborative projects related to electric vehicles (EVs), fuel cell vehicles (FCEVs), and light-weight vehicles from 2009-2015. That program has now ended, and nothing has replaced it.

In addition, there has never been a targeted federal innovation strategy for the combined “Transportation” or “Integrated Mobility” sector in Canada, including the full spectrum of mobility platforms, i.e. bus, rail, heavy-duty trucking and light-duty automotive technologies. The federal ASIP (Automotive Supplier Innovation Program) attempts to address this issue, but only in relation to automotive innovation.

There is an evident and challenging federal strategic gap vis-à-vis advanced, zero-emissions Big “T” Transportation innovation. CUTRIC has been established to address this gap and support GHG reductions through transportation innovation across mobility platforms.

In light of Canada’s Paris climate commitments, addressing this gap requires a targeted technology-focused research, development, demonstration and integration (RDD&I) fund that would support collaborative technology projects in heavy-duty bus and rail and light-duty automotive manufacturing. Such an initiative would build on the robust capacities and capabilities already developed across Canada by the now-defunct federal APC program and the nascent ASIP program. It would also help to grow hundreds of small to mid-sized enterprises (SMEs) that have invested private capital into technology-driven products and services for low- and zero-emissions, lightweight and connected vehicular and transportation systems for both private and public fleets (i.e. transit).

A NEW FEDERAL ROLE FOR TRANSPORTATION INNOVATION

CUTRIC encourages the Government of Canada to support the development of zero-emissions, light-weight, and connected transportation technologies through an innovation budget targeting industry-led collaborative research, development, demonstration and integration (RDD&I) projects.

Adoption through Innovation

CUTRIC encourages the Government of Canada to recognize

- Many “green” technologies which support zero-emissions transit and transportation networks are not yet optimized. They require RDD&I to scale up so that Canadian manufacturers and innovators can capitalize successfully on the growth of a new low-carbon economy.
- Pricing carbon (whether nationally or sub-nationally) will help to spur innovation throughout the supply chain from manufacturers through to end-stage users and adopters.
- Innovation investments in zero-emissions transportation systems must recognize the need for “smart” infrastructure and fueling systems development, e.g. high-powered overhead charging systems for e-buses, optimally located hydrogen electrolysis plants with connected piping and fuel storage systems for fuel cell vehicles, and renewable natural gas production in bio-digesters with connected piping and fuel storage systems for advanced CNG vehicles. These fueling systems need to be designed, optimized, installed, tested and integrated into communities through “smart” infrastructure spending that links technology innovation to infrastructure innovation.

Innovation Support for “Made in Canada” Solutions

CUTRIC encourages the Government of Canada to recognize Canadian manufacturers and suppliers need support to compete globally in the zero-emissions, lightweight and data-driven transportation sectors.

Canadian companies can succeed and they can lead in these domains, but they need robust, stable and long-term innovation funding that provides support for collaborative innovation projects to design and optimize “Made in Canada” transportation solutions.

1. CUTRIC requests the Government of Canada become an active investor in RDD&I projects integrating industry and academic collaborators to produce advanced transportation technologies arising from early-stage research through to late-stage demonstration and integration trials.
2. As demonstrated in the full business case CUTRIC will be submitting to ISED, Transport Canada and NRCan this year, CUTRIC requests a minimum investment of at least **\$185M over four years starting in 2017** to ensure Canadian companies can compete effectively and robustly in these spaces over the next half decade. This funding will enable Tier 1 manufacturers, Tier 2 and Tier 3 suppliers, SMEs, start-ups and public sector adopters (i.e. transit systems) to regain their foothold with relation to advanced technology development and adoption.

3. CUTRIC requests this federal funding investment be made not via a government program, but via an independent, not-for-profit innovation consortium – such as the federally-supported Consortium for Research and Innovation in Aerospace in Québec (CRIAQ) in the aerospace sector – which can nimbly, quickly and effectively disburse project financing to stakeholder organizations. CUTRIC constitutes such a nimble, third-party consortium of national stakeholders and should be viewed as a partner in this effort.

Example: Pan-Ontario Electric Bus Demonstration & Integration Project

CUTRIC’s Pan-Ontario Electric Bus Demonstration & Integration Trial is already proving that innovation through consortium partnerships can effectively advance zero-emissions transportation projects. This project integrates New Flyer Industries, Nova Bus, ABB Group and Siemens along with six Ontario transit agencies and six Ontario utilities. Its goal is to design, manufacture, integrate, assess, and optimize up to 27 electric buses on Ontario roads starting in 2017. This project will generate a globally leading “plug and play” system for newly standardized overhead charging stations. This ~\$40M project over 2.5 years is a “ready to launch” initiative that will produce the innovation deliverables needed to move electric buses towards full commercialization across Canada, making it a global leader in “plug and play” en route charging for e-buses.

CONCLUSION

CUTRIC’s request for federal transportation innovation funding will serve the interests of Canadian vehicle manufacturers, suppliers, and transit systems.

CUTRIC is aligned with Canada’s Innovation Agenda and the Vancouver Declaration process, which seek to conjointly reduce GHGs while driving forward job growth and creating greener, cleaner and more mobile communities.

In supporting these initiatives with flexible and sustainable **transportation innovation funding**, Canada can become a world-class testing ground for mobility advancements serving the needs of a zero-carbon economy. It will show leadership on the world stage by harnessing innovative research brought to life in real-world applications.

About CUTRIC

CUTRIC is an industry-led innovation consortium dedicated to fostering research, development, demonstration and integration (RDD&I) projects focused on zero-emissions, lightweight and autonomous/connected vehicular systems, as well as Big Data solutions for transit and transportation optimization. CUTRIC develops projects in Ontario, Quebec, Manitoba and British Columbia.

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