Canadian Urban Transit Research and Innovation Consortium (CUTRIC)

Consortium de recherche et d’innovation en transport urbain au Canada (CRITUC)

www.cutric-crituc.org

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CUTRIC Transit & Transportation Innovation R&D Areas
## CUTRIC Transportation Innovation RD&D Areas

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<tr>
<th>RD&amp;D Theme Areas</th>
<th>Sub-Theme</th>
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| Alternative (low- and zero-emissions) propulsion systems & fueling systems | Battery electric propulsion  
Fuel cell electric propulsion  
Compressed/Liquefied/Renewable Natural Gas propulsion |
| Light-weight materials                                     | Carbon fiber  
Polymers  
Light-weight metals  
Biofibers |
| Autonomous, connected vehicle communications technologies & Big Data system solutions | Sensors, signals, control systems  
Artificial intelligence for networked, ‘self-healing’ systems  
Consumer applications (real-time mobile communications) |
| Cyber- & critical systems security                         | Securitization of component parts, critical systems  
Vehicles-to-X (V2X) communications |
CUTRIC Transit and Corporate Founding Members

- BC Transit
- Brampton Transit
- Canada NRCC
- CUTA ACUT
- Durham Region Transit
- ENBRIDGE
- Oakville Transit
- OPTA
- Oxford County
- Plug'n Drive
- THALES
- Region of Waterloo
- City of Woodstock
- York Region Transit
- Viva
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<tr>
<th>No.</th>
<th>Presentation Title</th>
<th>Topic</th>
<th>Location</th>
<th>Presenters (Industry, Academia)</th>
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| 1   | Preform Development for Structural Automotive Application                          | Lightweight materials                                                 | Ontario      | Jim Staargaard, Plasan  
                |                                                                                       |              | Ian Swentek, Western University  
                |                                                                                       |              | • Steve Greydanus, Hexion  
                |                                                                                       |              | • Louis Kaptur, Dieffenbacher                                                           |
| 2   | Cyber Security for Connected and Autonomous Vehicles                                | Data analytics                                                        | Ontario      | Joe Cummins, Cybernetiq                                                                      |
| 3   | Driver Behaviour Modification for Heavy Diesel Vehicles                             | Connected and autonomous vehicles                                      | Ontario      | Nick Martyn, DriveLogik, a division of Deep Logic Solutions                                  |
| 4   | Wearable (Cab) Display                                                              | Connected and autonomous vehicles                                      | Ontario      | Walter Kinio, Thales  
                |                                                                                       |              | Illan Kramer, University of Toronto                                                     |
| 5   | Electric School Bus Integration Trial & Pilot Demonstration                         | Battery electric propulsion technologies                               | Ontario      | Cara Clairman, Plug’n Drive                                                                   |
| 6   | Low Life Cycle Cost Durable and Reliable Fuel Cells for Transit Bus Systems         | Hydrogen fuel cell electric propulsion                                 | British Columbia | Shanna Knights, Director of Research  
                |                                                                                       |              | Ballard Power Systems                                                                   |
| 7   | Evaluation of EU Class 8 HD LNG trucks with venting monitoring system in a Canadian context | Natural gas propulsion                                               | British Columbia | Gordon Exel, Westport Innovation                                                             |
| 8   | Pan-Ontario Electric Bus Demonstration Trial                                       | Battery electric propulsion technologies                               | Ontario      | Josipa Petrunic, CUTRIC  
                |                                                                                       |              | Scott Gillner, Brampton Transit  
                |                                                                                       |              | • Barry Cole, Oakville Transit                                                         |
CUTRIC TRL Range & Federal Funding Requirement ($185M/5 yrs)
INTRODUCTION

This electric bus demonstration project will

• Place 25 electric buses on Ontario roads over the next 2 years.
• Integrate at least 7 transit systems across 5 or more electrical distribution jurisdictions.
• Incorporate more than one electric bus manufacturer (Nova Bus, New Flyer, BYD, etc.).
• Integrate vehicles that require on-route charging as well as end-point charging.
• Predict and analyze the optimized usage of Ontario’s Smart-Grid technology vis-à-vis on-route and end-point charging requirements for electric bus systems.
• Establish standard practices for the electrification of transit buses across Ontario and create “best practices” for electrification across Canada.
RESEARCH QUERIES: Transit & LDC Systems

1. To what extent do transit systems in Ontario benefit from GHG reductions, cost reductions, and service improvements due to electrification?

2. What technical challenges need to be overcome in vehicle-to-grid communications to achieve mass (scaled) electrification of buses over the next 10 years? (Peak shaving, throttling, grid reliability, etc.)

3. To what extent can and should transit systems and LDCs (local distribution companies) use grid-scale energy storage devices at facilities to power electric buses with green, low-cost or free electricity?
OBJECTIVES & DELIVERABLES

1. **Deliverable**: A business case for transit systems, utilities and bus OEMs in Ontario based on the conversion of a significant portion of a given fleet or set of fleets to electric vehicles over the course of the next five years.

2. **Deliverable**: Identify technical requirements bus manufacturers and electric charging system designers and manufacturers must address in the future to optimize vehicle performance and charging technologies, which are currently offered to transit systems as “commercially ready”.

3. **Deliverable**: A business case study to bus manufacturers, utilities and transit operators that articulate the value of the batteries on-board as potential energy storage devices assuming a second life in a transit or non-transit application.
January 2019: Full government strategy development with targets established for the financial and technical enablement of all electric busing across Ontario by 2025.

December 2018: Full trial results, business case analyses, survey results of consumer preference.

December 2017: Midterm report of deliverables, metrics & business cases in development.

August 2017: Full 25 e-bus launch complete across all transit systems

January 2017: First on-road demonstration launch (selected transit system)

March-September 2016: 6 Technical Planning Sessions

October 2016: Full Financial Plan & Project Funding Bid Submission (Federal, Provincial, Municipal)
THANK YOU

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