

# **Toronto Green Sector Scan:**

## Electric Vehicles

City of Toronto – Economic Development and Culture  
[www.toronto.ca/invest-in-toronto/green](http://www.toronto.ca/invest-in-toronto/green)

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The scope of this sector scan focuses on companies located in Toronto that have a significant role in the advancement and production of electric vehicles (EV). The scan covers companies who: manufacture EVs (including those that provide battery electric vehicle (BEV), plug-in hybrid electric vehicles (PHEV), hybrid vehicles as well as low-speed vehicles (LSV), electric bicycles and electric scooters), organizations that develop essential EV infrastructure, and companies that develop and research individual EV components.

The scan also covers major academic institutional research projects, post-secondary institutional programs related to the electric vehicle automotive industry, private and public research/projects and key industry associations and publications.

## 1. Overview of the Sector

- The City of Toronto is incorporating EVs into its sustainable transportation plan and has been highly involved in research and promotion of the EV sector. The city has facilitated and participated in consultations with non-profit, academic and business partners and developed a report for City Council that highlights the economic and environmental impacts and opportunities of electric vehicles.
- The city has also convened the Electric Vehicle Working Group created to investigate various issues such as the impact on the electricity grid and ways to support EV-friendly policies.
- In Toronto, public and private partners are collaborating on a variety of research projects, pilot programs and post-secondary educational programs/projects that will provide essential knowledge and skills for the EV sector.
- The EV sector is just starting to develop. Almost every major automaker around the world is currently developing EV capabilities. Governments in Canada, the United States and around the world are developing batteries that are smaller and lighter, can be recharged more quickly and will store more power. Researchers are experimenting with lightweight materials and developing aerodynamic designs and to reduce vehicle weight and energy demand. Countries around the world are also investing in charging stations and infrastructure to support the adoption of electric cars.
- There is significant interest from a variety of stakeholders and many potential economic opportunities and advantages that may derive from:
  - Specialized knowledge, maintenance, automotive parts, research, and education with respect to electric vehicles
  - The facilitation of smart grids, electric vehicle infrastructure development and installation
  - Revenue source for electrical distribution utilities, transportation services and parking authorities
  - Leading the transition to a green economy and as a consultant for electric vehicle policy

## 2. Major Players

The following are the major players in EV development and manufacturing:

### Electric Vehicle Manufacturers/Research

- **Toyota Canada Inc.**  
**Address:** Head Office, 1 Toyota Place, Toronto Ontario M1H 1H9. Tel: 1-888-TOYOTA-8. Website: [www.toyota.ca](http://www.toyota.ca)  
Toyota Canada has its Canadian head office in Toronto. Its main electric mobility products include Hybrid cars and SUVs. There are several models under the Toyota and Lexus names including the Prius and Camry hybrids. The Government of Ontario, in partnership with the Government of

Canada, is supporting the production of the RAV4 EV through their investment in Toyota's recently announced Project Green Light. Project Green Light will see improved environmental standards at their Cambridge plant.

➤ **Unicell Limited**

**Address:** 50 Industrial Road, Toronto, Ontario M4G 1Y9. Tel: (416) 421-6845. Website: [www.unicell.com](http://www.unicell.com)

In partnership with ArvinMeritor, the world's largest truck suspension company, and Purolator Courier, Unicell developed and tested the Quicksider, a battery-operated electric delivery vehicle. Unicell designed the van and incorporated concepts of improved aerodynamics, low mass and a high-efficiency electric drive. During the 2010 Vancouver Olympic Games Purolator tracked the Quicksider's performance, including kilometres driven and greenhouse gas emissions saved. Unicell's major products are truck bodies for Ford and General Motors trucks.

➤ **Tesla Canada**

**Address:** 2 St. Thomas St., Toronto, Ontario M5S 2Z1. Tel: 416-969-8800. Website: [http://www.teslamotors.com/en\\_CA](http://www.teslamotors.com/en_CA)

Tesla Motors, Inc. is a Californian based company that designs, manufactures and sells electric cars and electric vehicle powertrain components. The Tesla Canada team is based in Toronto. It is the only automaker building and selling a zero-emission sports car, the Tesla Roadster.

➤ **ZENN Motor Company Inc.**

**Address:** 85 Scarsdale, Toronto, Ontario M3B 2R2. Tel. 416-535-8395. Website: <http://www.zenncars.com/>

ZENN Motor Company (ZMC) Toronto, Canada, is dedicated to being a global leader in zero emission transportation solutions and technologies for markets around the world. Zenn makes and markets zero-emission vehicles including fully-electric low-speed vehicles (LSV). The ZENN, a low-speed vehicle, was manufactured from 2006-2010 but is no longer manufactured.

The company has now entered into a technology agreement with EESstor, Inc. to develop and manufacture a high-energy-density ceramic ultra capacitor called an Electrical Energy Storage Unit (EESU).

➤ **Toronto Electric**

**Address:** 9 Codeco Court, Toronto, Ontario M3A 1A1. Tel: (416) 386-0820. Website: <http://www.torontoelectric.com/index.html>

Toronto Electric is part of Project EVE (<http://www.projecteve.ca/index.html>) a major Canadian initiative that is promoting the production of electric vehicles and parts. It is comprised of a consortium of more than a dozen companies, including Toronto Electric and Archonix Corp. of Markham, and some technical schools that bring together Canadian skills and products for the purpose of producing and supporting key Canadian content in EVs.

The consortium intends to advance electric mobility technologies by working with fleet managers to manufacture, test, support and improve EV's and their components for the Canadian fleet and export environment. Other goals include reducing vehicle weight, improving safety, extending battery life, advancing charging technologies, environmental programs for EV life cycles, and designing for electric grids and data grids.

## Infrastructure

### ➤ **Better Place**

**Address:** Better Place Office, Centre for Green Cities, Suite 502, 550 Bayview Avenue, Toronto, Ontario M4W 3X8. Tel: (647)344-8096. Website: <http://www.betterplace.com/Ontario>

Better Place is an American company that promotes EV education and develops electric car charging infrastructure to cities around the world. Better Place developed an electric vehicle charging and demonstration project (Better Place Centre) at Evergreen Brick Works in Toronto. The project demonstrates smart charging via a network of EV charge spots and a demonstration centre featuring interactive displays to educate the public about the benefits of EVs and the Better Place model to enable mass-market adoption of electric cars.

### ➤ **Longhaul TSE (LTSE)**

**Address:** 28 Browning Ave, Toronto, Ontario M4K 1V7. Tel: (416) 346- 8837. Website: <http://www.longhaultse.com>

Longhaul TSE (LTSE) is a Canadian based Truck Stop Electrification company that designs installs, manages and sells electric parking infrastructure for the transport industry under the PowerStop brand. Trucks plug into the electrified parking spaces using a standard extension cord and each parking space provides enough power for all required services including fuel heaters, cab heaters, air conditioning, appliances and the engine block. The electrified parking spaces costs 60 per cent less than an idling diesel engine, reduces maintenance and operational costs, increases engine life, and cuts emissions. PowerStop electric spaces can be installed at any transportation terminal or parking area; yards, truck stops, rest areas, railways, seaports, warehouses and big box stores.

## EV Parts/Components

### ➤ **Electrocraft Systems**

**Address:** 23 Paperbirch Drive, Toronto, Ontario M3C 2E6. Tel: (416) 391-5958, Website: <http://www.evcraft.com>

Established in 1995 to provide products and services for the EV, solar, wind and power control sectors, Electrocraft has a sales office in Toronto and manufacturing plant in Richmond Hill, Ontario. Their mandate is to design and manufacture innovative chargers, controllers and instruments to help advance the electric transportation and sustainable energy fields. The main electric mobility products include: EV chargers, EV motor controllers, DC converters, EV gauges and engineering services.

## LSV/EV Bicycles/Scooters etc.

### ➤ **ElectroWheels (Rogue Electrics)**

**Address:** 100 Bridgeland Avenue, Unit A, Toronto, Ontario M6A 1Z4. Tel: (877) 962-4459. Website: [www.electro-wheels.com](http://www.electro-wheels.com)

ElectroWheels' core business is to manufacture affordable, quality PEVs (personal electric vehicles) for personal and commercial use. The main electric mobility products offered include: Low speed electric scooters, bicycles and chairs, electric ATVs and golf carts.

### ➤ **Daymak Canada**

**Address:** 130 Oakdale Rd., Toronto, Ontario M3N 1V9. Tel: (416) 749-2324. Website: <http://www.daymak.com/pages/about.php>

Founded in 2001, Daymak Inc. is a designer, developer and manufacturer of power-assist electric bicycles based in Toronto. The company is a consumer-oriented and environmentally-friendly transportation provider. They also offer a variety of electric scooters, ATV's and Dirt Bikes.

### 3. Labour Force

The following are the NAICS that apply to the sector:

- **2211 Electric Power Generation, Transmission and Distribution**
- **336 Transportation Equipment Manufacturing**
  - 3361 Motor Vehicle Manufacturing
  - 3362 Motor Vehicle Body and Trailer Manufacturing
  - 3363 Motor Vehicle Parts Manufacturing
- **441 Motor Vehicle and Parts Dealers**
  - 4411 Automobile Dealers
  - 4412 Other Motor Vehicle Dealers
  - 4413 Automotive Parts, Accessories, and Tire Stores
- **811 Repair and Maintenance**
  - 8111 Automotive Repair and Maintenance
  - 8112 Electronic and Precision Equipment Repair and Maintenance

The following are the general occupational areas for EV:

- Engineers (including design, electrical, mechanical, industrial and technicians)
- Industrial production managers
- Machine setters
- Operators
- Assemblers
- Electricians
- Machinists
- Sales representative
- Service manager
- Automotive service technician/mechanic

### Educational Attainment

There are a number of automotive related certifications including:

- Certified Automotive Service Technician
- Auto Body Repairer
- Automotive Electronic Accessory Technician
- Transmission Technician

These positions require a valid Certificate of Qualification in Ontario or require the worker to be registered as an apprentice. To write provincial qualification exams, applicants must prove they have experience in the trade. Examples of proof include things like: completion of an apprenticeship contract, documentation showing that training time meets at least minimum industry standards, or proof of relevant experience as a skilled worker. More information can be found here -

<http://www.tcu.gov.on.ca/eng/employmentontario/training/certification.html>

- **Centennial College** - P.O. Box 631, Station A Toronto, Ontario M1K 5E9
  - In collaboration with the Canadian Automotive Repair and Service Council (CARS), Centennial College offers a training course on hybrid vehicle technology.  
<http://db2.centennialcollege.ca/ce/coursedetail.php?CourseCode=CESD-937>

- **The Automotive Training Centre (Ontario) Ltd.** - 152 Norseman Street, Toronto, Ontario, 8Z 2R4 Canada
  - This college offers the following automotive career training programs: Automotive Technology, Fixed Operations Specialist (Automotive), Auto Sales & Leasing, Business Manager, Auto Parts, Ozone Depletion and CFC Certification - <http://www.autotrainingcentre.com/auto-mechanic-schools-toronto/>
- **The Canadian Automotive & Trucking Institute (CATI)** (in Mississauga)
  - A premier career trainer in automotive and transportation operations. CATI Mississauga provides students with the skills and knowledge you need to launch a fulfilling career in the automotive industry - <http://www.cati.ca/mississauga.php>

#### 4. Innovation and Research

The following provides an overview of some of the interesting research taking place in Toronto.

- **Ryerson University: Centre for Urban Energy (CUE)**
  - **Plug-in Hybrid Electric Vehicle Charging Station Project** for Urban Energy Systems (UES) is helping to develop a novel charging station configuration employing common DC bus for PHEV with funding from Hydro One Networks Inc.  
[http://www.cue.ryerson.ca/cue/research/electric\\_pluginhybrid.html](http://www.cue.ryerson.ca/cue/research/electric_pluginhybrid.html)
  - **Electrical Impact on Transformer Station (TS) Components Due to Electric Vehicles** – this project will assess and quantify the electrical impact on TS components based on low, moderate and high penetration levels of EVs under different charging scenarios as well as for power export (vehicle to grid) conditions.
- **University of Toronto : Department of Civil Engineering – (Matthew Roorda)** - Assessment of the Ministry of Transportation of Ontario's Green Commercial Vehicle Program (GCVP).
  - This project will emphasize the analysis of impacts of hybrid technologies promoted through the Ministry of Transportation of Ontario's Green Commercial Vehicle Program (GCVP)  
[http://www.autopropane.ca/GCVP\\_FUNDING\\_GUIDE.pdf](http://www.autopropane.ca/GCVP_FUNDING_GUIDE.pdf)
  - The proposed research addresses the issue of greenhouse gas emissions and community exposure to air pollutants emitted by trucks. The research builds an integrated tool that models traffic at the individual vehicle level, estimates individual truck emissions, estimates dispersion of pollutants to neighbouring communities under different weather conditions, and estimates the exposed population at times of peak emissions. The methodologies developed could be applied to assess a variety of other policies/programs aimed at reducing the impacts of vehicle emissions in the City of Toronto and in other jurisdictions.
- **University of Toronto - Department of Civil Engineering- (Leon Raykin, Heather L. MacLean, Matthew Roorda)** - Estimating impacts of regional driving patterns on energy use and petroleum consumption of plug-in hybrid electric vehicles.
  - The study examines how driving patterns (including both driving distance and driving conditions) and the electricity generation supply interact to impact the well-to-wheel (WTW) energy use and greenhouse gas emissions of PHEV. The implications of these interactions on the WTW performance of a PHEV relative to that of a (non-plug-in) HEV and internal combustion engine vehicle (ICEV) are examined. The study results have implications for environmentally beneficial PHEV adoption and usage patterns.

Beyond this research there are a number of supports that have been developed at the provincial and municipal level, including:

- **Province of Ontario - LSV** – the Transportation Statute Law Amendment Act, 2005, enabled MTO to pilot test new technologies on Ontario roads. In September 2006, Ontario launched a five-year pilot project evaluating the use of LSVs in provincial and municipal parks, conservation areas and on public roads with speed limits of 50 km/hr. or less.
- **Province of Ontario** - electric bicycles and electric motor scooters are permitted on Ontario roads and highways where conventional bicycles are used - <http://www.mto.gov.on.ca/english/dandv/vehicle/emerging/index.shtml#electric>
- **Province of Ontario - Public recharging facilities** – access to public recharging facilities at GO stations and other Ontario government parking lots is being developed - <http://www.mto.gov.on.ca/english/dandv/vehicle/electric/ev-benefits.shtml>
- **Province of Ontario – Magna Partnership** - in partnership with Magna International Inc., the Government of Ontario is contributing \$48 million to help fund 19 research and development projects over the next six years. The projects include developing concept electric cars, parts for hybrid vehicles, metallic components, alternative energy and ways to improve fuel efficiency.
- **Municipal - City of Toronto EV Working Group** - this working group is developing a report for City Council outlining recommendations on how the city can better understand the economic and environmental impacts and opportunities of electric vehicles in Toronto.
- **Toronto Atmospheric Fund** – the Toronto Atmospheric Fund has a number of initiatives to support the adoption of EV in Toronto, including:
  - **PHEV Pilot Project** - from 2007 to 2009, TAF managed an on-street pilot test involving ten standard hybrid vehicles that enabled plug-in charging. Each organization tested one vehicle for at least 12-months. Data collection and analysis was handled by engineering students from the University of Toronto.
  - **Hybrid Taxi Pilot Project** - in June 2007, TAF helped Co-op Cabs put 10 Toyota Camry Hybrids and one Toyota Prius on the road to test their suitability for the punishing job of being a Toronto taxi. A year's worth of on-road monitoring show that hybrids can reduce greenhouse gas emissions, saving their owners money by cutting fuel costs by 24 to 37% and providing protection from rising fuel prices.
  - **Green Vehicle Evaluation and Selection Tool (GVEST)** – in September 2010, TAF and the City of Toronto Fleet Services released an evaluation tool for low-emission vehicles. GVEST is an Excel-based tool that compares green vehicle technologies based on emissions of greenhouse gases and smog-causing pollutants, and approximate lifetime cost - <http://www.fleetchallenge.ca/content/gvest>
  - **Project Get Ready** – in April 2009, the Toronto Atmospheric Fund joined Project Get Ready, which is led by the Rocky Mountain Institute, a non-profit environmental organization. The initiative is aimed at preparing cities for the introduction of PHEVs and EVs. Collaboration with a wide array of partners and technical advisors to help cities prepare for plug-in infrastructure - <http://projectgetready.com/>
  - **EV300 Initiative** - Toronto Atmospheric Fund (TAF) initiative to encourage commercial vehicle fleets in the Greater Toronto Area to work collaboratively to purchase, drive, charge, evaluate

and promote at least 300 plug-in electric vehicles by 2012 helping to prepare the region for full-scale electric mobility - <http://www.fleetwise.ca/>

➤ **Pollution Probe**

- **Electric Mobility Master Plan for the City of Toronto** – in October 2010, Pollution Probe released a report that identifies the main elements that would comprise an effective Electric Mobility Master Plan. The report was supported by a review of existing and developing technology, modeling analysis of potential emission reductions, and consultations with experts. The projects scope included grid-vehicle interface technologies and protocols to identify means of incorporating electric vehicle use into the urban environment. The final report is listed below under “Key Publications”.

➤ **Toronto Hydro**

- **The Toronto Hydro Smart Experience** - Toronto Hydro and Smart Canada (a division of Mercedes-Benz Canada) in collaboration with Pollution Probe have been working together on a comprehensive pilot program that will deploy 15 new “SMART fortwo” electric drive vehicles in Toronto. The goal of the Toronto Hydro Smart Experience is to study driving patterns, charging habits and the impact on the electricity grid. The knowledge gained through this program will help inform the development of technology, infrastructure, and public policy with respect to electric vehicle use - <http://www.smartexperience.ca/index.aspx>
- **Electrical Charging infrastructure** - Working alongside public, private and government partners to pilot the installation of EV charging infrastructure throughout the City.

- **Plug’n Drive Ontario**, a partnership between Ontario-based electricity companies, auto manufacturers, government agencies and universities has been formed to prepare the province for potential uptake of EVs with the Ontario market. This coalition is sponsored by Ontario Centres of Excellence - <http://www.plugndriveontario.com/>

## 5. Key Industry Associations

- **Electric Mobility Canada** – Electric Mobility Canada is a national membership-based not-for-profit organization dedicated exclusively to the promotion of electric mobility as a readily available and important solution to Canada’s emerging energy and environmental issues. EMC is now Canada’s dominant clean transportation industry association - <http://www.emc-mec.ca/>
- **The Electric Vehicle Society of Canada (E.V.S.C.)** - The E.V.S.C. provides a forum for to discuss and promote personal experiences in building or converting a variety of vehicles to Electric Propulsion. Members examine electric cars, electric bicycles, e-scooters, electric boats, electric aircraft, and other modes of electric transportation - <http://www.evsociety.ca/>
- **The Ontario Motor Vehicle Industry Council** – is responsible for administering Ontario’s Motor Vehicle Dealers Act (MVDA) to maintain a fair, safe and informed marketplace in Ontario by protecting the rights of consumers, enhancing industry professionalism and ensuring fair, honest and open competition for registered motor vehicle dealers - <http://www.omvic.on.ca/>
- **Canadian Vehicle Manufacturer Association (CVMA)** - industry association representing Canada’s largest manufacturers of light and heavy duty motor vehicles. Their main electric mobility initiative is the Auto Green Plan, a strategy for greater use of hybrid and electric vehicles to reduce air pollution in Canada.

- **Electric Mobility Canada Conference (Exhibition Place - Toronto September 26-29, 2011)** - With over 60 speakers from Canada, USA, Europe and Asia, the program offered learning opportunities covering technical, business and policy discussions for electric mobility. The conference was attended by representatives from auto manufacturers, EV industry executives from OEM's, utilities, environmental technology, service companies, government policy makers from Canada and the US. - (<http://www.emc-mec.ca/ev2011ve/en/home.html>)
- **The Green Fleet Expo (GFX)** - This annual event is hosted by the City of Toronto, City of Hamilton and other partners. At the GFX fleet managers have the chance to test drive green vehicles and learn about new and emerging technologies - <http://www.toronto.ca/fleet/expo.htm>

## 6. Incentives

There are a number of incentives available for EV adoption, including:

- **Provincial Government Incentives:**
  - **Electric Vehicle Incentive Program** - to complement the Ontario's Government's goal of having five per cent of all cars in the province in 2020 run on electricity, effective July 1, 2010, Ontario persons, businesses, municipalities, non-government organizations and non-profit groups will be eligible for an incentive ranging from \$5,000 to \$8,500 towards the purchase or lease of a new plug-in hybrid electric or battery electric vehicle - <http://www.mto.gov.on.ca/english/dandv/vehicle/electric/electric-vehicles.shtml>
  - **Green License Plates** - purchasers of EVs can also benefit from green license plates, which give drivers access to the province's high occupancy vehicle (HOV) lanes, even with only one person in the vehicle - <http://www.mto.gov.on.ca/english/dandv/vehicle/electric/ev-green-plates.shtml>
  - **Recharge Facilities** - **there is \$80 million fund** for development of recharging facilities, as Infrastructure Ontario encourages public and private sector partners to come forward with proposals to build, test and expand the availability of recharging facilities.

## 7. Key Publications

- **Toronto Atmospheric Fund** - the objective of this project is to compare the on-road performance of Toyota Camry Hybrid vehicles against conventional vehicles over the period of one year to determine the business case and air emission reductions associated with hybrid cab use - <http://www.toronto.ca/taf/pdf/hybrid-taxi-oct09.pdf>
- **Toronto Atmospheric Fund** - on-street pilot test of PHEV technology - <http://www.toronto.ca/taf/pdf/fleetwise-phev-july2009.pdf>
- **Pollution Probe** - substantial review of the status of electric vehicle technology, as it pertains to the movement of people and goods throughout the Toronto region - <http://www.pollutionprobe.org/PDFs/EMMP.pdf>
- **Waterloo Institute for Sustainable Energy** - comprehensive multi-disciplinary study for the Ontario Centres of Excellence - Energy to foster adoption and large-scale Implementation of Plug-In

Electric Vehicles in Ontario -

<http://plugndriveontario.ca/pdf/Waterloo%20PHEV%20Report%20June%202010%20FINAL.pdf>

- **Electric Mobility Canada** - released in 2009, the roadmap is an industry led, federal government coordinated document, focused on the development and adoption of EVs in Canada and is positioned as the starting point of a new transport regime in which vehicles on Canadian roads are increasingly powered by electric traction. A strategic vision for highway-capable battery-electric, plug-in and other hybrid-electric vehicles - [http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/fichier/81890/ElectricVehicleTechnologyRoadmap\\_e.pdf](http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/fichier/81890/ElectricVehicleTechnologyRoadmap_e.pdf)
  
- Pollution Probe – an educational brochure highlighting the latest in hybrid-electric and electric vehicle technology - [http://www.pollutionprobe.org/pdfs/Driving\\_Electric.pdf](http://www.pollutionprobe.org/pdfs/Driving_Electric.pdf)