Road Talk

Ontario's Transportation Technology Transfer Digest

Ministry of Transportation

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Ontario

Ontario's Emerging Vehicle Technologies and Trending Innovations

The Ministry of Transportation (MTO) is preparing the province's transportation system to adopt and integrate new transportation technologies in a way that is safe, sustainable and accessible.

The ministry is currently analyzing how to best support sustainable transportation options such as connected vehicles, automated vehicles and electric vehicles. MTO is also exploring other transportation technologies including advanced air mobility and micromobility.

What is a Connected Vehicle?

A Connected Vehicle (CV) uses advanced telecommunications technology to wirelessly connect drivers, vehicles, mobile devices, infrastructure and roadside devices, providing a range of traveller safety services that improve mobility and productivity.

In the future, telecommunications infrastructure could potentially work as a medium to wirelessly collect data from a connected vehicle and deliver it in real-time to travellers and road authorities. Travellers would be able to select personal preferences when sharing their data, including driving conditions, speed limits and road and traffic conditions.

What is an Automated Vehicle?

An Automated Vehicle (AV) can control all the functions of a vehicle, including steering, braking and accelerating, without direct driver input. Many jurisdictions use the Society of Automotive Engineers' (SAE) six levels of automation – zero to five – to describe the varying types of automation that may be found in a vehicle. Zero is no automation. Five is full automation, also known as autonomous.

Benefits of CVs and AVs

With proper preparation, CV and AVs may provide Ontario with a number of exciting benefits, such as:

- Better environmental sustainability with less or no emissions.
- Improving road safety by reducing driving errors and collisions.
- Making driving easier and more accessible.

Technology trends

Vehicles with advanced driver assistance systems that assist drivers with steering, breaking and/or speed control are already on our roads today. The automotive and technology sector continue to test increasingly more automated technologies and push for paths to deployment.

The move towards automation will not happen overnight. Conventional vehicles will continue to exist for many years, but sector experts predict vehicles will become more mixed in the next decade or two. Beyond 2040, CV and AVs will become increasingly prevalent, drivers will be more experienced with technology and greater benefits will be possible from that technology. Although timelines remain uncertain, studies estimate that 50 per cent of vehicles in Ontario will be fully automated by 2050.

To prepare Ontario for a smooth transition from conventional vehicles to CV and AVs, MTO is undertaking the following steps:

1. **Preparing for AV deployment:** This includes managing AV testing; supporting research and development; preparing highway infrastructure, long-term transportation planning as well as updating legislation and regulations; integrating technology with transit (e.g., Mobility-as-a-Service); modernizing insurance and privacy regimes; and supporting user education and awareness.
2. **Collaboration with other jurisdictions and stakeholders.** CV and AVs will impact more than just transportation. MTO is working with different ministries to address issues related to enforcement, insurance, accessibility, skills and workforce management. MTO is also engaging with the federal government, municipalities and other provinces to create a cohesive and shared approach to AVs.

The ministry's AV Pilot Program allows for the testing of AVs, including driverless vehicles, on public roads under certain conditions set by MTO.

To learn more about the AV pilot program's self-driving vehicle, click the link below:

Connected and automated vehicles | ontario.ca

What is an Electric Vehicle?

An Electric Vehicle (EV) is a vehicle with an electric powertrain that runs on battery power and plugs into an energy grid to recharge. There are three main types of EVs:

- **Battery electric vehicles (BEVs):** These vehicles run exclusively on electricity powered by an electric motor and battery. BEVs are fully electric cars that do not burn gasoline or diesel, nor do they create tailpipe emissions.
- **Plug-in hybrid electric vehicles (PHEVs):** These vehicles have small battery packs to run on electricity for limited driving distances (20-80 km) before switching to gas/electric hybrid mode for longer trips.
- **Hybrid Electric Vehicles (HEVs):** These vehicles use an electric motor to assist gas-powered engines. All energy for the battery is gained through regenerative braking. Unlike the PHEVs, HEVs cannot plug into the grid to recharge.

Benefits of EVs

There are numerous benefits to increasing EV uptake across the province, including reducing carbon emissions, promoting environmental sustainability and supporting job creation and retention through innovation and economic growth.

According to the Ontario Ministry of the Environment, Conservation and Parks, the majority of greenhouse gas emissions in Ontario come from the transportation industry (Figure 1). The adoption of EVs and electric CV/AVs can help reduce these emissions.

EV Charging Basics

Types of Chargers

Level 1 (L1): L1 chargers work through typical residential 120V AC outlets and can take from 40 to over 50 hours to charge a BEV to 80 per cent from empty and five to six hours for a PHEV.

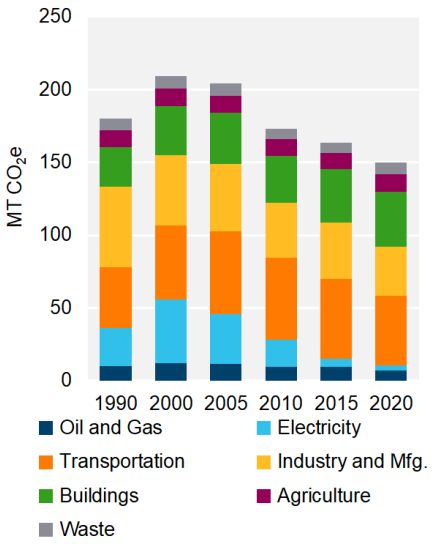

Figure 1: *Ontario's Greenhouse Gas Emissions by sector (Canada Energy Regulator, Provincial and Territorial Energy Profiles – Ontario)*

Level 2 (L2): L2 chargers are common in homes, workplaces and public EV charging stations. With similar energy demands as a clothes dryer or stove, L2s can be installed in homes and commercial facilities by a licenced electrician. They charge through 240V in residential applications or 208V in commercial applications. L2 chargers can charge a BEV to 80 per cent from empty in four to 10 hours and a PHEV in 1-2 hours (Figure 2).

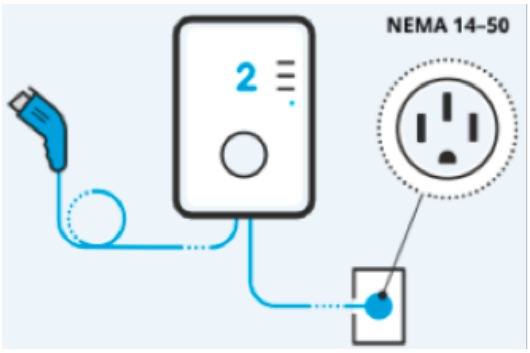

Figure 2: *Level 2 Charging Outlet*

Level 3 (L3): L3 chargers also known as Direct Current (DC) chargers, provide the fastest charging (400 Volts/100 Amp+). L3 stations charge a battery from empty to 80 per cent in 20 minutes to an hour (Figure 3). Most PHEVs that are currently on the market do not work with fast chargers.

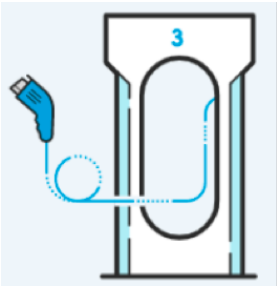

Figure 3: *Level 3 Charging Outlet*

Supporting EV Uptake in Ontario

Ontario is taking a number of steps to make it easier to own an EV and feel confident driving EVs in communities and across the province. Through the EV ChargeON program, the province is investing $91 million to support the installation of public EV chargers outside of large urban areas, including at community hubs, highway rest stops, carpool parking lots and Ontario parks. EV ChargeON will aim to reduce range anxiety in EV drivers by targeting underserved areas and filling existing gaps in the public charging network while making chargers more affordable and accessible across the province.

Ontario's public charging network currently consists of approximately 9,675 L2 and L3 charging ports at approximately 3,560 stations.[1] Ivy Charging Network is installing over 80 new L3 fast chargers across all 23 ONroute locations along the busiest highways. In addition, Ontario has 32 L2 charging stations in eight

1 Data from Natural Resources Canada Alternative Fuels Locator. Accessed 17 April 2024.

commuter carpool lots and over 100 chargers at government buildings managed by Infrastructure Ontario.

"Supporting the building of new charging stations is crucial to the province's plan to position itself as a global leader in the EV industry," said Katie De Palma, Director of the Transportation Policy Branch in the Integrated Policy and Planning Division. "The efforts we make today will make it easier for Ontarians to transition to EVs in the years ahead."

The Ontario government is further supporting stakeholders and partners in their build-out of EV infrastructure by releasing data through the Ontario Data Catalogue, which tracks the growth in BEVs and PHEVs registered throughout the province by postal codes. The current dataset includes EV registration data through 2022 and the second quarter (April to June) of 2024. The dataset is updated on a quarterly basis and is available here.

Air and Micromobility Technologies

In addition to road vehicles, MTO is also exploring the potential environmental, economic and mobility impacts of using Advanced Air Mobility (AAM) technologies in the transportation network. AAM is an emerging sector of air transportation that uses new types of aircraft technologies to improve services for people. Drones and electric powered vertical take-off and landing (eVTOL) aircrafts are examples of advanced air mobility technologies. AAM technology-equipped aerial vehicles may be ideal in areas with limited access to other modes of transportation, including northern, rural and remote communities.

AAM technologies can be powered by electric batteries and reduce emissions from the aviation sector. They can also create new economic opportunities in Ontario including jobs and business in aviation.

Benefits of AAM Technologies

- **Operations** - AAM technologies are used by the public and private sector to enhance the efficiency of their operations. Some AAM operations include monitoring wildlife, inspecting bridges for structural issues and search and rescue missions.
- **Goods Movement** - Lighter-weight and urgent packages, like medical supplies, can bypass congested highways and reach remote communities with the support of AAM. In the future, common goods (e.g., groceries, packages) could be delivered by remotely piloted aircraft systems, also known as drones, in urban environments.
- **Passenger Transport** - AAM aircrafts – which may require less infrastructure, operations and maintenance than traditional modes of air transportation – could increase access to, from and throughout regions, including urban and remote areas.

The federal government, through Transport Canada, is responsible for the legislation and regulation of drone and other AAM technologies. MTO is taking a phased approach to support the deployment of AAM once it becomes more readily available.

Current MTO AAM Activities

At present, MTO uses AAM technology for remotely piloted aircraft or drones to:

- Survey and take aerial images (e.g., mapping

the highway corridor, surveying pits and quarries).
- Conduct structural investigation of infrastructure (e.g., bridges).
- Carry out low-level mapping.

Drones are used across the Ontario Public Service. As part of its work, MTO documents how other ministries are using such technologies in their operations.

Potential Future MTO AAM Activities

There are opportunities for MTO to explore AAM technology as a tool for:

- Traffic management
- Traffic data collection
- Air quality testing

Government drone operations are continually expanding and new uses are being explored, while generally avoiding high aviation safety risk scenarios such as flying over moving traffic.

Higher use of AMM technology in drones could be a cost-savings measure for the long term (e.g., for preliminary inspections of infrastructure, traffic control).

Micromobility

Along with exploring air mobility initiatives, MTO is working to support the safe use of micromobility on Ontario's roads and to recognize its connections with existing MTO projects.

Micromobility transportation devices are small, low-speed, human or electric-powered devices such as bicycles and e-scooters. Ontario currently has five micromobility pilot programs under the *Highway Traffic Act* (HTA). Two of the most popular pilot programs are the Electric Kick-Scooters Pilot Project and the Cargo Power-Assisted Bicycles Pilot Project.

Under the pilot programs, municipalities can allow electric kick-scooters (also known as e-scooters) and cargo power-assisted bicycles (cargo e-bikes) to operate on their roads. Municipalities can choose where and how these devices can operate in their jurisdictions.

The province also allows the operation of e-bikes under the HTA. Riders must follow certain rules and meet requirements to keep themselves and others safe, for instance:

- Be 16 or older
- Wear an approved bicycle or motorcycle helmet
- Keep e-bikes in good working order
- Follow the same rules of the road as other cyclists

E-bikes were piloted in Ontario and demonstrate a success story of the province's pilot-program approach to emerging transportation technologies.

Through innovative pilot programs, Ontario is working to ensure new vehicle types can be used safely on our roads.

Benefits of Micromobility

- Smaller devices can use alternative routes like bike lanes and multi-use paths (where permitted by municipalities)
- Human or electric-powered
- Reduces traffic on main roads
- Less wear and tear on infrastructure
- Supports better connections with transit stations

MTO has always worked to maintain its position as a leader in the transportation industry. By continuing to research and explore new and emerging transportation technologies, the ministry seeks to improve mobility and the quality of life for the people of Ontario.

For more information, please contact:
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