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ecoTECHNOLOGY for Vehicles
an ecoACTION initiative

Canada

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Test drive the future with eTV



WELCOME TO eTV's *green* WHEELS

Welcome to the fall edition of *eTV's Green Wheels*, Transport Canada's ecoTECHNOLOGY for Vehicles (eTV) program's quarterly newsletter.

The past few months have been busy. The eTV team has forged interesting new partnerships and acquired a

number of vehicles for testing and evaluation. As we write, eTV is preparing for the upcoming auto show season and gearing up to send a number of vehicles to the Vancouver 2010 Olympic and Paralympic Winter Games.

You can find out more about these projects and some of the new technologies eTV is evaluating in this edition of *eTV's Green Wheels*.

Happy reading!

Going for Gold

As the world prepares for the coming 2010 Winter Games, eTV is hard at work on a number of related projects.

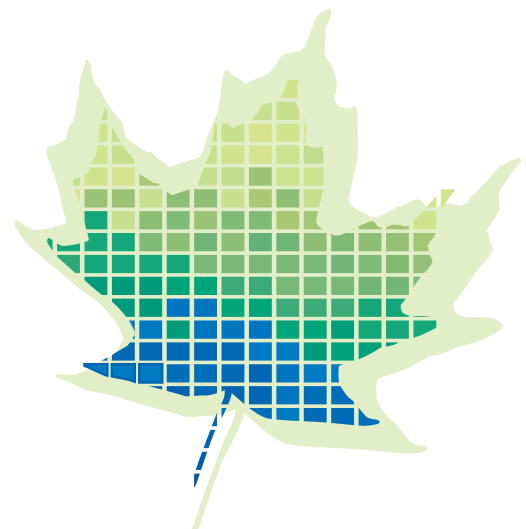
Transport Canada's safety and security inspectors will be busy travelling throughout British Columbia in the months leading up to the 2010 Winter Games. They are responsible for ensuring the safety and security of Canada's transportation system, which requires them to spend a great deal of time on the road. To help the department reduce its 2010 Winter Games-related environmental footprint, the eTV program will

lend the inspectors a number of advanced technology vehicles, including partial zero emission, hybrid, clean diesel and more.

eTV and Transport Canada are honoured that the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC) has awarded this unique environmental initiative with a Sustainability Star.

Interested in learning more about eTV's advanced vehicles?

Visit the eTV website to view the entire line-up of advanced technology vehicles that we are currently testing.



eTV in the Classroom

The eTV program has a long-standing partnership with the Canada Science and Technology Museum Corporation (CSTMC). We recently took this partnership one step further by agreeing to work with them to develop an Edukit and a Virtual Program around the theme of vehicles and the environment, both geared to high school students and teachers.

In case you were wondering, an Edukit is a huge suitcase delivered right to a teacher's door, filled with all the information, activity plans and materials he or she needs to present a first-class series of lessons on a given topic or series of topics.

A Virtual Program is a package of curriculum-linked teacher resources designed to encourage online learning. Each virtual program contains a variety of lesson plans, activity sheets and ideas for extension activities.

Both the Edukit and the Virtual Program on green vehicle technologies will be available for the 2010-2011 school year.



eTV and CSTMC staff posing for a photo to celebrate the official launch of the Edukit project

In the Garage with eTV

Over the past couple of months, eTV has been busy seeking out promising new vehicle technologies. Below you will find the most recent additions to the eTV program.

eTV acquired the smart fortwo mhd in July 2009, because of its unique power train. The "mhd" stands for micro-hybrid device, a unique starter-generator that replaces the smart's traditional starter and alternator.

This device can stop the engine at speeds below 8 km/h (about 5 mph). It automatically re-starts the engine when the driver releases the brakes. It is estimated that this device alone can help improve the vehicle's fuel efficiency by as much as 20 per cent in the city!



smart fortwo mhd: anti-idle technology

Over the coming months, eTV will test and report on this anti-idle technology. Of particular interest is how the system will perform in Canada's diverse climate and environment.

In August 2009, eTV acquired the 2010 Toyota Prius because it contains several technologies that are unique in Canada. For example, it is completely 'beltless' – the engine operates without any belts or pulleys, which reduces engine load and increases overall efficiency.



2010 Toyota Prius: hybrid technology

The vehicle is also equipped with a solar roof, which powers a fan that ventilates the cabin during hot days. This reduces the initial load on the air conditioning system during vehicle start-up.

The Prius also uses exhaust heat recirculation. Heat from the engine's exhaust gas warms the engine coolant, which then heats the cabin and brings the engine to operating temperatures more quickly, helping to reduce fuel consumption and emissions at start-up.

The most recent addition to the eTV program is the 2010 Renault Mégane dCi 110. This vehicle is equipped with a small displacement, turbocharged high-efficiency diesel motor. Fuel is injected into the cylinders by a high-pressure common rail direct injection system. Using this and other fuel saving technologies, the Mégane can obtain an impressive city/highway fuel consumption of 4.6 L/100 km.

The Mégane also is equipped with special glow plugs that improve cold starting of the diesel engine, reducing fuel consumption and emissions at start-up. Over the coming months, eTV will evaluate the Mégane's emissions and fuel consumption to demonstrate these improved diesel technologies to Canadians.



2010 Renault Mégane:
clean diesel technology



Manual or automatic – no longer a simple choice

Manual or automatic transmission – the choice used to be simple. A manual transmission required the driver to change gears by depressing a clutch pedal and using a stick shift. Automatic transmissions did all the work for the driver, shifting gears as needed. But the distinction between manual and automatic is blurring somewhat. Manual and automatic transmissions now often share characteristics and operating features, with many types being neither automatic nor manual, but both.

As well, the array of transmissions is growing and being continually refined. For example, you have sliding gear, synchromesh, electronically shifted and sequential manual transmissions. Automatic transmissions can be dual-clutch, torque converter or continuously variable, to name just a few. To further complicate matters, transmissions are also classified by their number of speeds. Manual transmissions come with as many as 6 speeds and automatic transmissions can range from 4-speed units all the way up to 8 speeds. And each manufacturer has coined its own special name for its transmission system, such as S-tronic (Audi), Tiptronic (Porsche), Shiftronic (Hyundai), PowerShift (Ford) and Autotronic (Mercedes).

(Continued on page 4)

Making sense of hybrid, hybrid-electric and fully electric vehicles

Most Canadians know that manufacturers are developing electric vehicles. What you may not know, however, is that there are actually a number of ways that a vehicle can be 'electrified.' Some manufacturers have developed hybrid electric/gasoline engines, while others are working on plug-in hybrids or fuel-cell vehicles. But what is the difference between a hybrid and a plug-in hybrid, for example? To help you choose the one that is right for you, eTV has compiled the brief explanations that follow. Technical sheets for the vehicles and technologies on these examples can be found on the eTV website at www.tc.gc.ca/eTV

Micro-hybrid – a gasoline vehicle with idle start-stop capability, which turns the engine off while the vehicle is idling to save fuel and reduce emissions (e.g. smart fortwo mhd).

Hybrid – uses electric motor to assist the gas engine when extra power is needed, allowing for engine and usage optimization, improved fuel consumption and reduced emissions (e.g. 2010 Toyota Prius).




Plug-in hybrid (PHEV) – essentially the same as a hybrid, but features more electrical energy storage. This allows the vehicle to operate on electric-only power more often and for longer distances, significantly reducing emissions; can be recharged using any standard 110-V or 220-V outlet (e.g. A123 Hymotion conversion module).

Fully electric – does not have an internal combustion engine. It can be recharged using any standard 110-V or 220-V outlet as well as through regenerative braking; produces zero tailpipe emissions (e.g. Mitsubishi i MiEV).

Fuel cell – does not have an internal combustion engine. It generates electricity by combining hydrogen and oxygen through an electrochemical device known as a fuel cell. It usually uses regenerative braking and produces zero tailpipe emissions (e.g. Ford Focus FCEV).

Manual or automatic – no longer a simple choice (Continued from page 3)

To help make some sense of the evolving transmission picture, eTV examined the pros and cons of three commonly used transmission systems: the electronically shifted (or robotized) manual transmission, the dual-clutch transmission and the continuously variable transmission.

Electronically shifted manual transmission	Dual-clutch transmission	Continuously variable transmission
<p>How does it work? A manual transmission modified with a module to support the automatic operation of the clutch and gearshift. The driver can choose to operate manually or to turn those duties over to the onboard computer and electro-hydraulic systems.</p>	<p>How does it work? Sometimes called “semi-automatic”, this system uses two clutches but does not have a clutch pedal. Each clutch operates independently. One clutch controls the odd gears (1, 3, 5, and reverse) while the other controls the even gears (2, 4, 6). Gears can be changed without interrupting the power flow from the engine to the wheels.</p>	<p>How does it work? This transmission uses a high-strength metal chain and a system with two pulleys – a driving input pulley that gets power from the engine and a driven output pulley that provides power to the differential. As the two pulleys change their pitch radius relative to one another, they create an infinite number of gear ratios.</p>
		
<p>Pros Operates like a manual, with the added convenience of an automatic, faster changes and reduced CO₂ emissions and fuel consumption.</p>	<p>Pros Offers more dynamic, smoother acceleration by eliminating shift shock (jerkiness). Reduces fuel consumption and CO₂ emissions.</p>	<p>Pros Lighter and less complex than dual clutch transmission, avoiding heavy mechanically meshed gears. By having an infinite number of gears and by better matching vehicle operational demands with engine output, fuel consumption can be improved and CO₂ emissions reduced.</p>
<p>Cons Can sometimes feel jerky and unrefined.</p>	<p>Cons It is as complex and heavy as a traditional automatic transmission. While currently a more expensive option, the cost will likely decrease as it becomes more popular.</p>	<p>Cons Power must still be used to create hydraulic pressure to adjust the pulley cones, making it unable to cope with more powerful engines.</p>

eTV and Nissan partner to showcase fuel-cell technology

If you visit the 2010 Canadian International Auto Show (Toronto, February 12-21) or the Globe 2010 Conference (Vancouver, March 24-26), be sure to check out the Nissan Fuel-Cell cut-away that will be on display in eTV's booth.

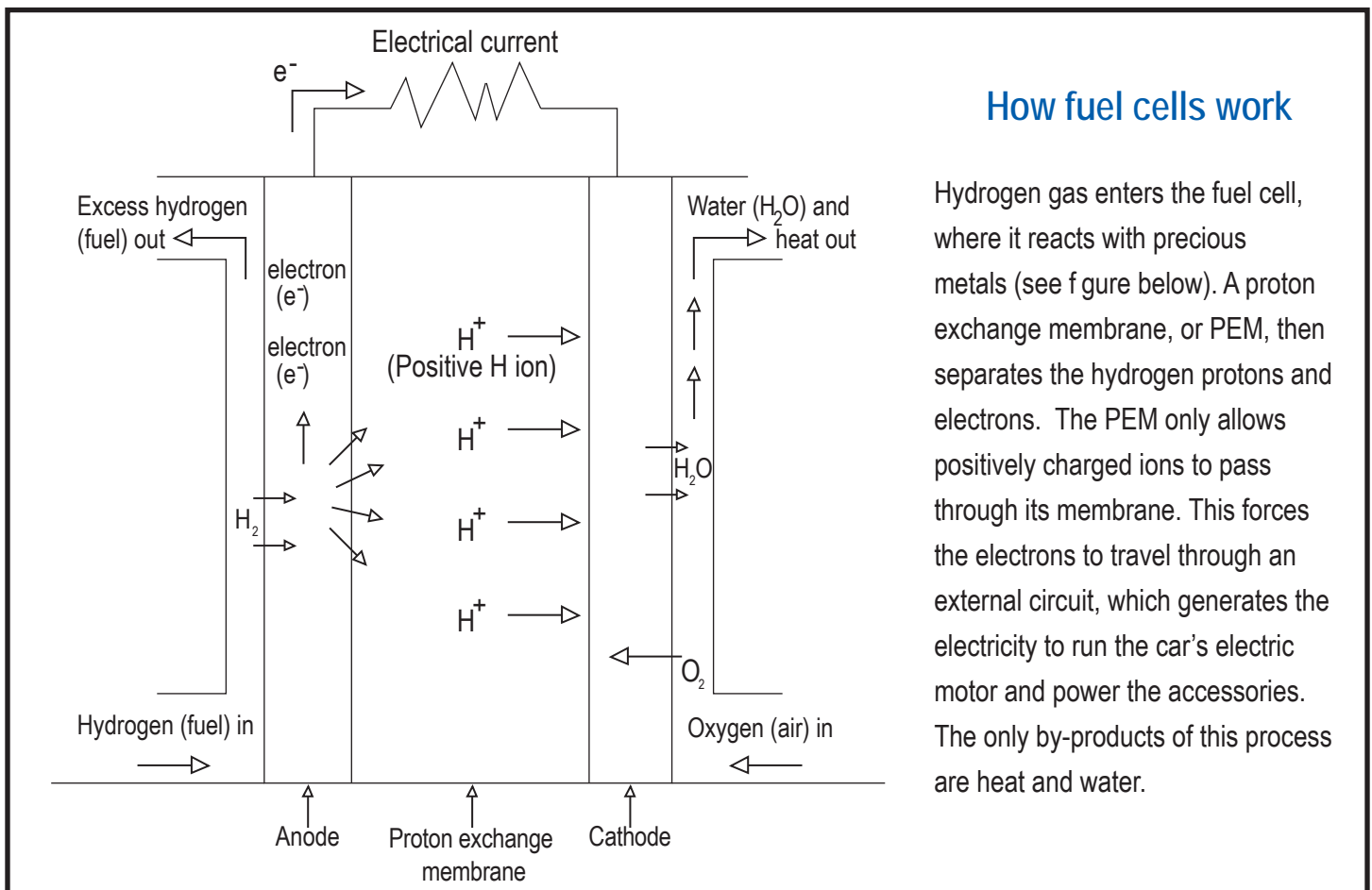
The cut-away is an exact replica of Nissan's X-Trail FCV. It has been specially designed to allow you to see the internal workings of a vehicle powered by fuel cells, including the electric motor, batteries, fuel-cell stack and hydrogen storage tanks. It is truly a unique display and one worth seeing!



Nissan X-Trail FCV Prototype vehicle, 2005 model

Nissan X-Trail FCV demonstrates the viability of fuel-cell technology and the progress towards having enjoyable and practical vehicles on the road. A 90-kW electric motor enables a 0-100 km/h acceleration time of 14.5 seconds and a maximum speed of 150 km/h. Motor power is supplied by Nissan-developed fuel-cell stack and lithium-ion laminate-type battery. X-Trail FCV has a cruising range of up to 500 km using compressed hydrogen gas, and can carry five passengers. North American-based Nissan X-Trail FCVs have already logged nearly 500,000 kilometres in ongoing public-road tests, with one vehicle exceeding 160,000 kilometres.

The eTV program is interested in fuel-cell technology because it may obtain near-zero greenhouse gas (GHG) emissions, provides an alternative to fossil fuels and has the potential to provide a clean means of transportation for Canadians.



Parting thoughts

Canadians everywhere can do their part to help ensure a clean, healthy environment. It starts with making choices – like choosing a greener vehicle. But with the number of new cars and trucks on the market today, how do you choose the one that is right for you? The ecoTECHNOLOGY for Vehicles (eTV) program is dedicated to providing Canadians with the information they need to make these informed choices.

Over the next few months, eTV will attend a number of events. Look at the Upcoming Events calendar on the eTV website www.tc.gc.ca/eTV to see if there

is an upcoming outreach event in your area. Check the eTV website over the coming months to learn more about the technologies that eTV plans to evaluate. As well, early in the New Year, eTV's website will be getting a new look – same kind of in-depth information about new and emerging vehicle technologies, but presented in a more engaging way.

We hope that you share our excitement about these promising new green technologies and will visit our website to read more about how eTV is *test driving the future!*

If you have any questions, comments, or know of an event eTV should attend to showcase advanced technologies, please send an e-mail to eTV@tc.gc.ca.

Until next time,

The ecoTECHNOLOGY for Vehicles Team

