

Electric Vehicles

PART OF CANADA'S CLIMATE CHANGE SOLUTION

As a northern nation, Canada will be affected more than the average for the planet. Already, we are seeing the northern polar ice pack diminishing year by year. Rainfall patterns are changing, which is having a drastic impact on agricultural production around the world, and here in Canada. Storm systems are becoming more intense, and causing more devastation, primarily through wind damage and flooding. Canadians can mitigate the impacts of climate change by reducing aggregate greenhouse gas (GHG) emissions.

“Climate change is the issue of our time, possibly of all time.”

Mayor David Miller of Toronto, and Chair of the C40 group of international cities, 2007

Canada's on-road transportation fleet, including personal cars and light trucks, are the major single contributor to greenhouse gas emissions. Taken together, the transportation sector and the fossil fuels industry that powers it produced 258 megatonnes (Mt) of CO₂ equivalent (CO₂e) greenhouse gases of the total 721 Mt (36%) in Canada in 2006.¹ The majority of that 258 Mt is associated with the current fleet of road vehicles burning gasoline and diesel fuel. The contribution from these sectors increased by over 30% between 1990 and 2006.

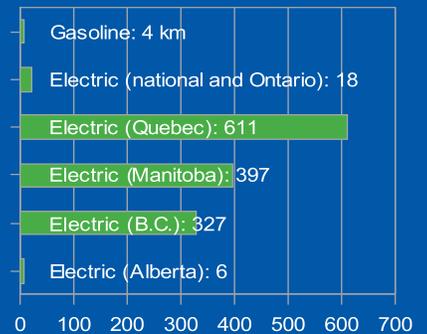
Traditional battery technologies have resulted in vehicles with range per charge limitations that were a barrier to consumer acceptance for general on-road use. Electric-hybrid drive vehicles are being developed which will be capable of typical commuter trips using only electricity and reserving the use of liquid fuels for longer trips. Similar vehicles are being produced for the transportation of goods and for public transportation. Some of these vehicles are available now and many more are expected in the very near future, saving consumers on their transportation fuel bills, and reducing GHG emissions.

“I believe strongly we have to get off oil. The electrification of the automobile is inevitable”.

Bob Lutz, General Motors Vice-President, quoted in Newsweek, December 31, 2007

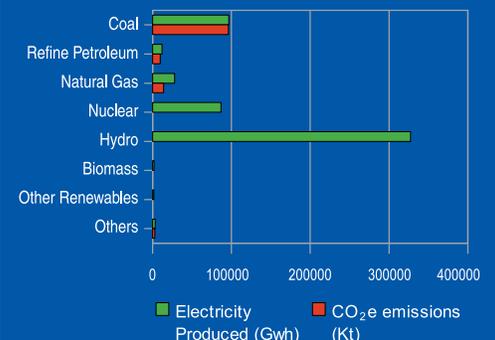
Gasoline and diesel fuel contain a lot of energy by volume (8.7 and 9.9 kWh per litre), but the internal combustion engines (Otto cycle and Diesel cycle) are much less efficient than electric motors. The internal combustion engines are often referred to as heat engines, as they produce more waste heat and noise than useful mechanical energy. Electric motors produce very little noise and relatively little waste heat. While electric motors frequently operate at over 80% efficiency, heat engines seldom achieve even 20% efficiency in real-world operating conditions. As a result, an electric car will travel at least four times as far on the same amount of energy as an equivalent car fuelled with gasoline.

Distance traveled by a midsize car per kg of CO₂e²



For each gasoline car that is replaced by an electric car in Canada, GHG emissions will be reduced by over a tonne-and-a-half annually.³

Electricity Generated in Canada in 2005 by source and showing associated GHG emissions



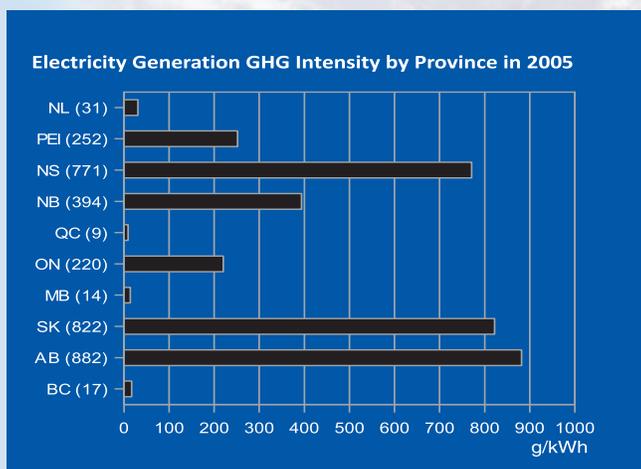
Ontario, the province with the largest road vehicle fleet, is phasing out its use of coal-fired electrical generation, which will further increase the benefit of switching to electric drive and away from gasoline and diesel fuel. Even in Ontario in 2005, use of electric vehicles represented a 73% reduction in GHG emissions over gasoline vehicles. In reality, the benefit will be even larger as the majority of electric vehicle charging will be done at off-peak times, when very little electricity is generated from coal.

The benefit is most pronounced in Quebec, where GHG emissions are reduced by fully 99%! Even in Alberta, there is a GHG emissions reduction benefit from switching to an electric vehicle of roughly 35%.

Where electricity is produced from fossil fuels at centralized plants, there is the potential for carbon capture, which is not feasible with cars and trucks burning gasoline and diesel fuel.

Almost 60% of Canada's electricity is produced from hydro power. 75% comes from sources with zero net GHGs in operation. Less than 20% comes from coal. This is a far different picture than in the U.S. where 50% of electricity is produced from coal and only 7% comes from hydro. As a result, a shift away from fossil fuels to electric drive will have a far greater GHG reduction benefit in Canada than in the U.S.

Replacing even a portion of these vehicles powered by fossil fuels with vehicles based on zero-emissions electric-drive vehicles will make a positive contribution to reducing Canada's total GHG emissions. The net benefit will depend on the mix of energy sources used to produce the electricity. Today, that varies by region. The graph below illustrates GHG intensity by province for electrical generation in 2005. (These figures are taken from the Canadian government's National Greenhouse Gas Inventory Report, 1990-2005. Figures have been rounded to the nearest whole number.)



For Canada as a whole, the weighted figure is 220 grams per of CO₂e per kWh; the same as Ontario. As Canada moves toward cleaner sources of electricity in the future, the benefits of shifting to electric drive will improve accordingly.

Electric Mobility Canada – Mobilité Electrique 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.

Our Mission

To establish electric mobility, in all its forms, as the primary solution to Canada's growing transportation energy issues and to assist its members in the fulfillment of their mandates.

Our Vision

A Canadian society that accepts electric mobility, in all its forms, as the first choice for the transport of persons and goods. This is being achieved through collaboration efforts between government at all levels and the private sector supported by an informed public faced with increasing energy costs and concerned about the impacts of burning fossil fuels on the environment and quality of life.



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Footnotes:

- Environment Canada 2006 Greenhouse Gas Inventory www.ec.gc.ca/pdb/ghg/inventory_report/2006/tab_eng.cfm
- Distance for regular midsize gasoline car (10 l / 100 km), producing 2.54 kg CO₂e per litre, e.g. Chevrolet Malibu or Toyota Camry – combined city and highway driving.
Distance for a midsize electric car (18 kWh / 100 km, e.g., the Nissan Altra electric, varying g CO₂e per kWh based on Government of Canada figures for GHG emissions intensity per kWh by province and nationally in 2005). www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/ta9_1_eng.cfm
- Assumes gasoline fuel economy of 10 l/100 km and GHG intensity of 2.54 kg/litre vs. 18 kWh/100 km and GHG intensity of 220 g/kWh (2005 Canadian national average), 15,000 km traveled per year, results in 3,810 kg CO₂e for the gasoline vs. 594 kg CO₂e for the electricity consumed, for a difference of 3,216 kg per vehicle.