



## Canada's approach to reducing GHG emissions from motor vehicles

Paul Khanna  
Senior Advisor, Vehicle Fuel Efficiency  
Natural Resources Canada



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## History of GHG related automotive policy in Canada

- 1982 - Parliament passed the Motor Vehicle Fuel Consumption Standards Act
  - Industry committed to meet the standards voluntarily and the Act was never proclaimed
  - Fuel consumption is tracked, and voluntary targets are set, through the Company Average Fuel Consumption (CAFC) program
  - CAFC targets are based on U.S. CAFE standards
- 2000 – Action Plan 2000 calls for a significant reduction average fuel consumption to reduce GHG emissions
- 2002 – The Climate Change Plan calls for a 25% improvement in CAFC targets by 2010
- 2005 – NRCan leads negotiations resulting in a voluntary agreement - or Memorandum of Understanding (MOU) - with automakers that is expected to reduce GHG emissions from vehicles by 5.3 million tonnes per year by 2010



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## Details of the MOU

- The MOU between the Canadian Automotive Industry and the Government of Canada was signed in April 2005
- Greenhouse gases included under the MOU are:
  - direct and indirect emissions of carbon dioxide (CO<sub>2</sub>),
  - methane (CH<sub>4</sub>),
  - nitrous oxide (N<sub>2</sub>O)
  - hydrofluorocarbon (HFC) losses from vehicle air conditioning units
- The 19 automobile manufacturers signed onto the MOU agreed to collectively meet an emissions reduction target of 5.3 Mt in 2010, with interim targets of 2.4 Mt in 2007, 3.0 Mt in 2008 and 3.9 Mt in 2009 from a reference case
  - Reference case GHG emissions for 2010 are based on a previous forecast and include moderate reductions in fuel consumption and N<sub>2</sub>O reductions from the introduction of new air pollution standards



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## Tracking Progress under the MOU

### Inputs / factors

#### Updated in reference case and performance data

- Vehicle stock
- Average vehicle travel
- Car/truck mix
- Global warming potential
- Fuel CO<sub>2</sub> emissions factors

#### Updated in performance data only

- Lab-tested fuel consumption
- On road adjustment factor
- Emission factors for N<sub>2</sub>O, CH<sub>4</sub>, HFCs, and lube Oil

### Reference and Performance

#### Reference Case and performance Data

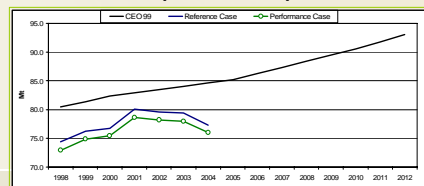
- Two separate spreadsheet sheets that track:
- Total fleet size,
  - Total VKT and
  - Total fuel used

### Outputs

#### Total GHGs emissions for reference case and performance data

- Difference between the reference case and performance data

### Sample Model Output



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## Monitoring the Agreement

- A government/industry committee has been established to track the auto industry's performance
  - Emission reductions will be monitored year-by-year against interim goals for 2007, 2008 and 2009
- The auto industry will likely focus on improved technology
  - List of technologies included in the MOU
  - Companies may optimize some high volume models for Canadian market or introduce models from other markets – this is already occurring
  - Companies may promote sales of technology options such as cylinder shut-off as they become available
- Fuel consumption should make up a significant part of the target; there may also be further nitrous oxide emission reductions
- HFC reductions are expected to be minor by 2010 – however, the auto industry is able to claim any progress



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## Emissions associated with MACs

### HFCs

- The main HFC, R-134a, is a powerful greenhouse gas with a warming potential 1,300 times greater than carbon dioxide
- Losses occur during servicing and repair, as well as running losses in vehicle operation,
- HFC emissions were not included in the reference case; however, the MOU allows for counting reductions in HFCs

### On-road fuel consumption effect

- MACs add to engine load, increasing vehicle fuel consumption
- In the tracking model, the difference between lab-tested and on-road fuel consumption is currently characterized as a constant
- This constant may be adjusted to reflect improvements in MACs, leading to credits for the auto industry



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## HFC Emissions

- The main issue is a lack of reliable and complete data
- Two recent studies, one from the California Air Resources Board (CARB) and the other from the European Commission (EC) provide differing estimates of average leakage rates from vehicles
  - 2004 CARB study - 85 gHFC-134a/year/vehicle
  - 2003 EC study - 52 gHFC-134a/year/vehicle
- Some evidence suggests that newer vehicles emit fewer HFC emissions than older ones, though we do not have a clear sense of average emissions by vintage



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## Factors for “in use” fuel consumption

- For consumer guides, both the U.S. and Canada use different adjustment factors on lab-tested data to convert it to information for consumers

MPG factors by country	City	Highway
U.S.	10%	22%
Canada	10%	15%

i.e., in Canada, tested highway value in U.S. mpg is multiplied by 0.85
- The GHG MOU tracking model currently uses a correction factor of 1.20 applied to fuel consumption based on historical trends
  - This is not conclusive, data from the fuel logs of drivers in the National Private Vehicle Survey (1994-1996) suggested factors of 1.23 for passenger cars and 1.25 for light duty trucks
- For the future, the EPA's proposed five cycle test provides direction



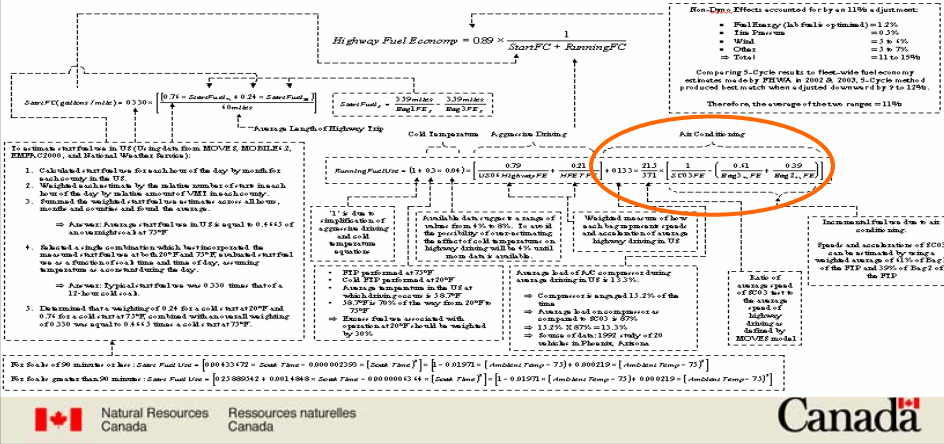
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# EPA's proposed 5 cycle test approach

- The EPA has proposed a 5-Cycle Test Method as a way to improve estimation of in-use fuel economy:
  - Data collected from current fuel economy tests is combined with data from current emissions tests in a series of weighted formulae



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# Effect of Air Conditioning Use

- The US SC03 Supplemental Federal Test Procedure was been introduced to represent the engine load and emissions associated with the use of air conditioning units in vehicles
- The driving cycle of the SC03 is unique among the driving cycles and, therefore, there is no cycle to directly compare it to account for the impact of air conditioning use on fuel economy
- Therefore, another weighted average is required to create comparable drive cycles:

$$\text{RunningFuelUse}_{DUE\ TO\ 100\% \ A/C\ USE} = \left[ \frac{1}{\text{SC03FE}} \right] - \left[ \frac{0.61}{\text{Bag}_{3.75}FE} + \frac{0.39}{\text{Bag}_{2.75}FE} \right]$$



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## Equating to real world conditions

- A study conducted in Phoenix, Arizona in 1992 on 20 vehicles produced the following results:
  - On average, the air conditioning compressor is engaged 15.2% of the time
  - On average, the air conditioning compressor operates a load that is 87% of that in the SC03 test
- The EPA is proposing that the incremental fuel use attributed to the use of air conditioning be weighted by  $15.2\% \times 87\% = 13.3\%$
- If Canada were to adopt this approach, we would likely want to “Canadianize” these factors, i.e., assign different weights to cold starts and air conditioning



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## Recent Regulatory Developments

- On October 19, Canada announced its intention to regulate motor vehicles under the new Clean Air Act.
- The Act will amend the Motor Vehicle Fuel Consumption Standards Act and enable new fuel consumption regulations for 2011
- While Canada’s form of regulation will likely remain consistent with the US approach, the Government intends to establish standards to reflect the Canadian market and the need for the nation to reduce GHG emissions
  - We expect new standards will build on progress made under the MOU



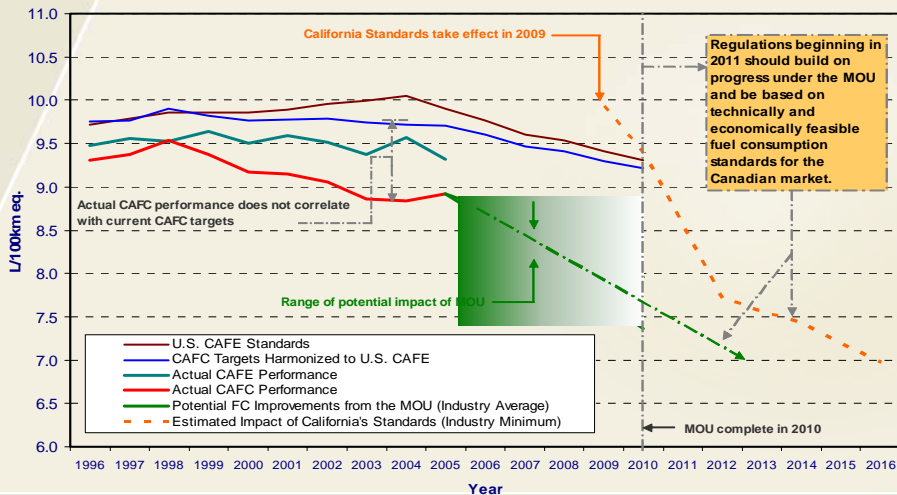
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## Context for 2011 Regulations

New Vehicle Fleet Fuel Efficiency measured in L/100km eq.



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## Impact of the MOU and regulations

- The Government wants to be able to account for actions that lead to actual, on-road reductions in GHG emissions, going beyond lab-tested fuel consumption
- The MOU to reduce GHG emissions has provided the impetus to establish a baseline for HFC emissions and to better define the effects of auxiliary vehicle systems on fuel consumption performance
- Under the planned 2011 fuel consumption regulations, there may be an opportunity to account for actions taken to reduce “in use” fuel consumption
- HFC emissions from vehicles may be limited or regulated through a different mechanism, such as the Canadian Environmental Protection Act



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Thank-you

Questions?

<http://oee.nrcan.gc.ca/transportation/ghg-memorandum/>

Paul Khanna, P.Eng.  
Senior Advisor, Vehicle Fuel Efficiency  
Natural Resources Canada  
18D5, 580 Booth Street,  
Ottawa, Ontario K1A 0E4  
Phone - (613) 943-9216  
pkhanna@nrcan.gc.ca



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