



# Fuel Saving Opportunities Amongst Ski Resort Fleet

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Monitoring and Characterizing  
Driver Behaviour Among  
Ski Resort Fleet

September 21, 2010: Ontario Snow Resorts Association

## Funding Partners:



Natural Resources  
Canada

Ressources naturelles  
Canada

Canada



MITACS



YMCA



## Research Team:

**ONTARIO**  
**SNOW RESORTS ASSOCIATION**



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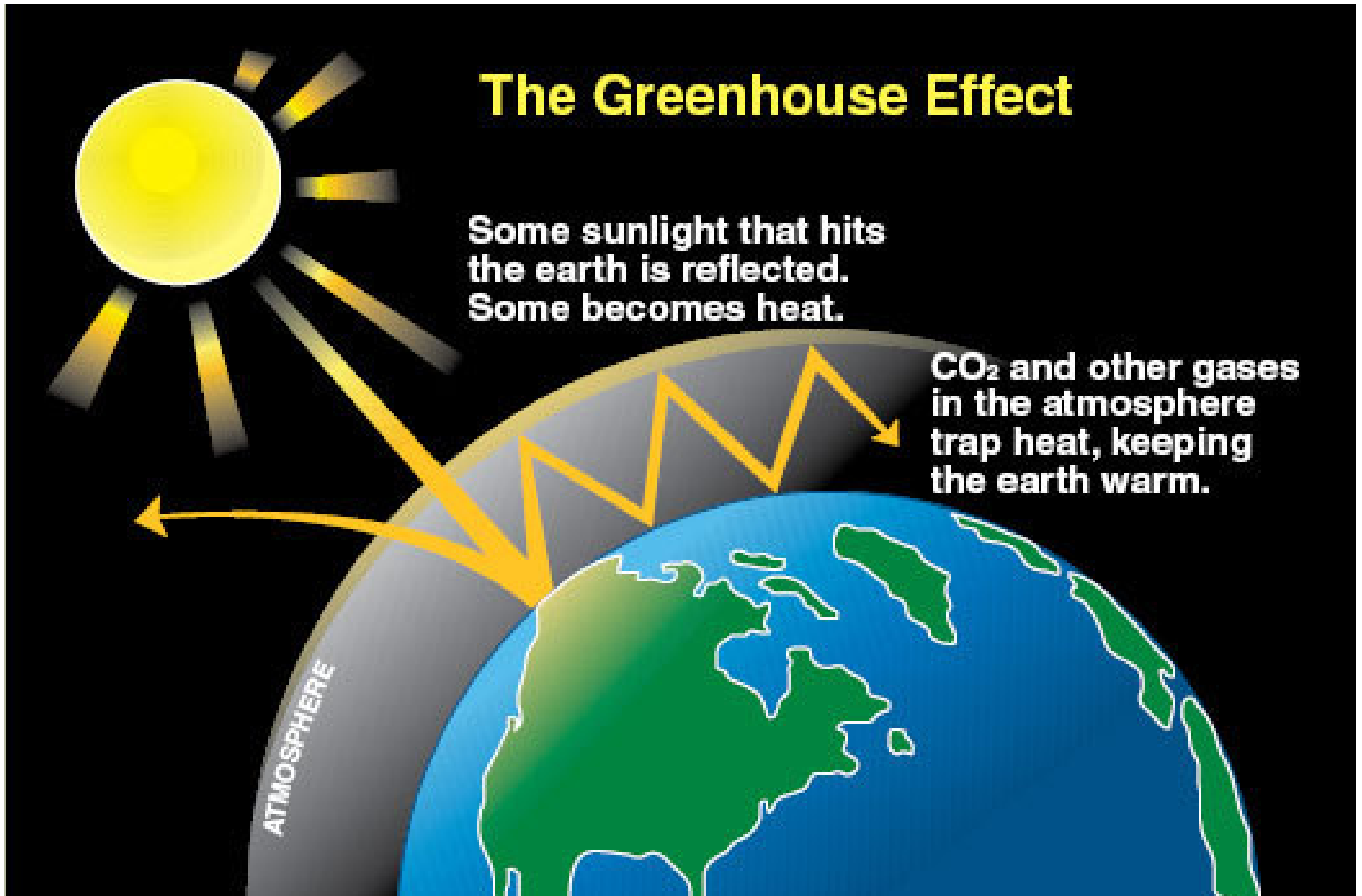
# Highly Vulnerable to Climate Change



# The Greenhouse Effect

Some sunlight that hits the earth is reflected. Some becomes heat.

CO<sub>2</sub> and other gases in the atmosphere trap heat, keeping the earth warm.



## Engine Idling Reduction Project

- Launched in 2008-2009
- 126,000+ drivers
- Up to **49% decrease** in CO<sub>2</sub>

## Monitoring and Characterizing Driver Behaviour Among Ski Resort Fleet

- Launched 2009-2010
- 3 Resorts; 22 vehicles



# Project Objectives

1. Acquire baseline data on driver behaviour
  - Multiple parameters
  - Range of vehicle duties
2. Reduce climate altering CO<sub>2</sub> emissions
  - Awareness
  - Eco-driver training
3. Identify best practices associated with the use of on-board vehicle monitoring devices

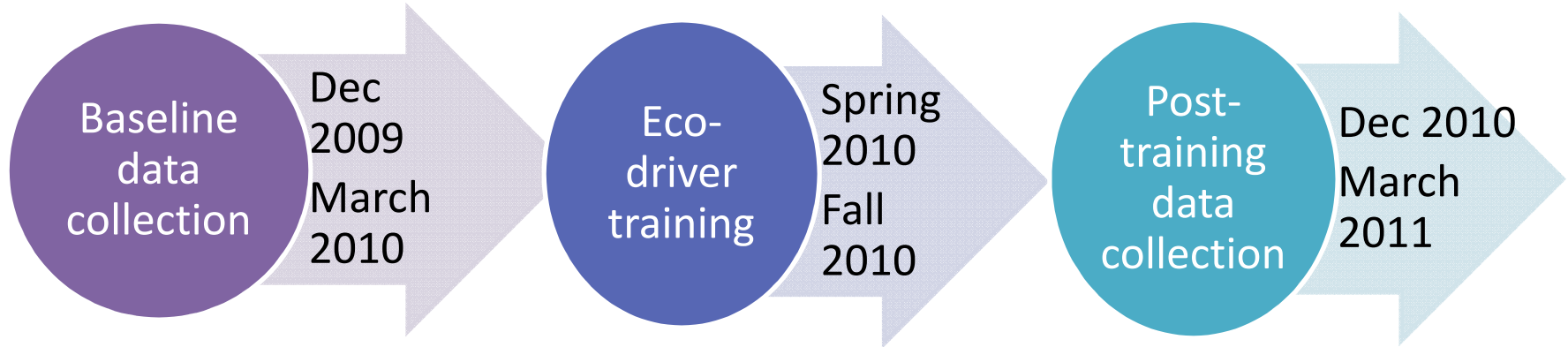


# Method

- On-board data loggers were programmed and installed into fleet OBD ports in Dec, 2009
  - Blue Mountain Resort (14)
  - Glen Eden (3)
  - Horseshoe Valley (5)
- Device reads and stores data from the vehicle's on-board computers, continuously recording driving and engine performance
- Removed and downloaded data bi-weekly



# Project Timeline



# Vehicle Monitoring Technology: CarChip®

- Easy install
- Unobtrusive
- Includes software package
- Records multiple parameters
  - Trip times
  - Trip distance
  - Average speed
  - Top trip speed
  - Trip time over 110km/hr
  - Hard accelerations and decelerations



# Ski Resort Fleet

- Light and medium duty vehicles
  - Ford F150/250; Toyota Tundra; GMC Sierra/Terrain
  - Safari Van; Dodge Caravan; Chevrolet Venture Van
  - Ford Senator (24 passenger); Ford E450 Bus; CTV Bus
  - Toyota Yaris; Honda Fit
- Fuel type: Gas ( 17); Diesel (5)
- Vehicle Tasks
  - Security; Delivery; Food & Beverage; IT; Shuttles; Grounds/Maintenance

# Results

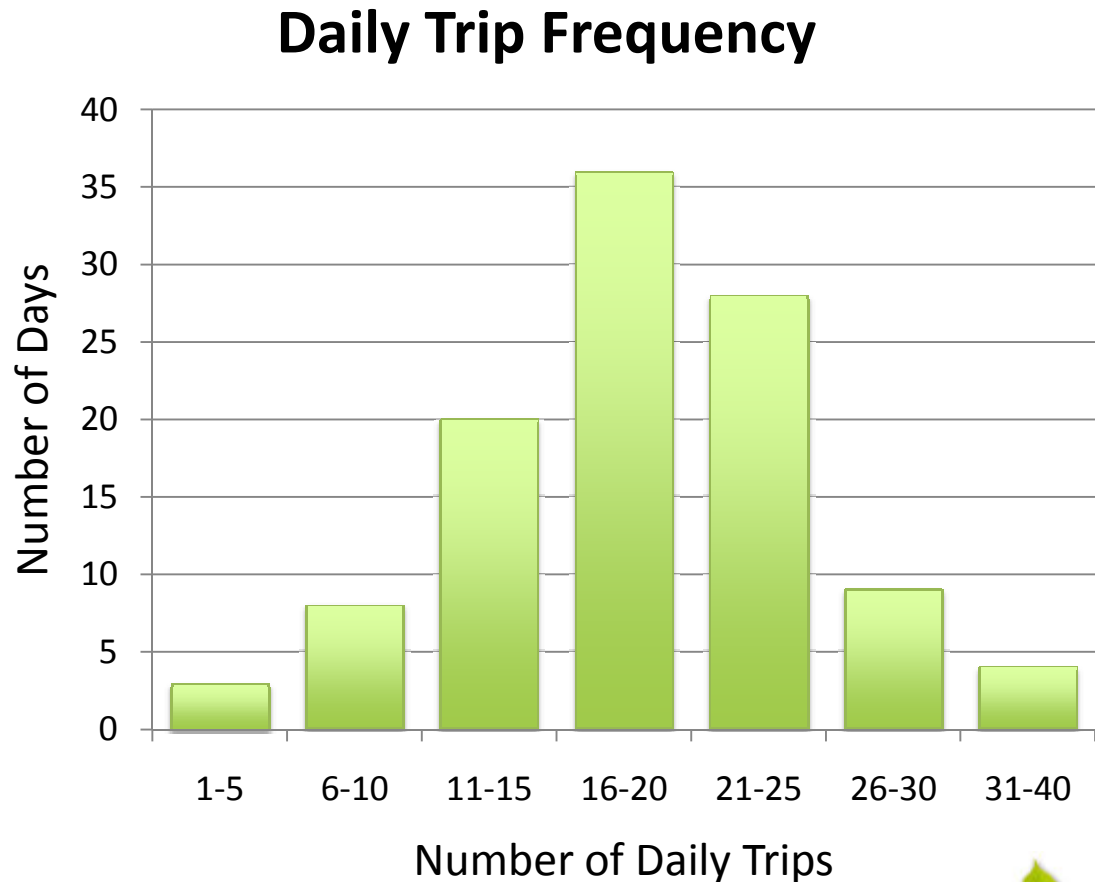
- Results package provided for all 22 participating vehicles
  - Trip & driving summary
  - Daily trip details
  - Fuel consumption
  - Environmental Performance
  - Comparative standing
  - Recommended behavioural changes



# Trip Summary: Example

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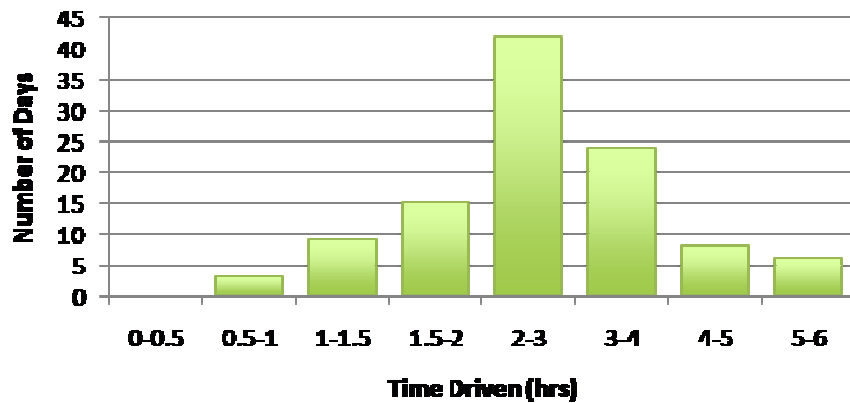
- Trip Definition
- Total Trips:  
2006
- Avg. # of Daily Trips:  
19
- Avg. Trip Time:  
10min



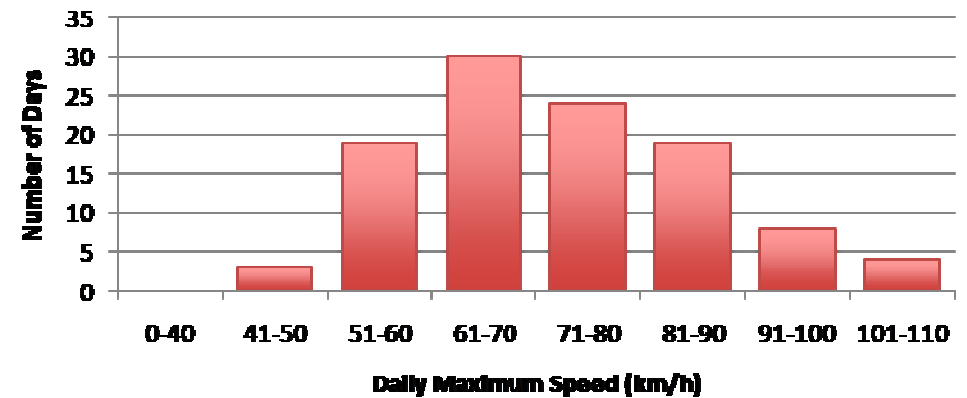
# Driving Summary: Example

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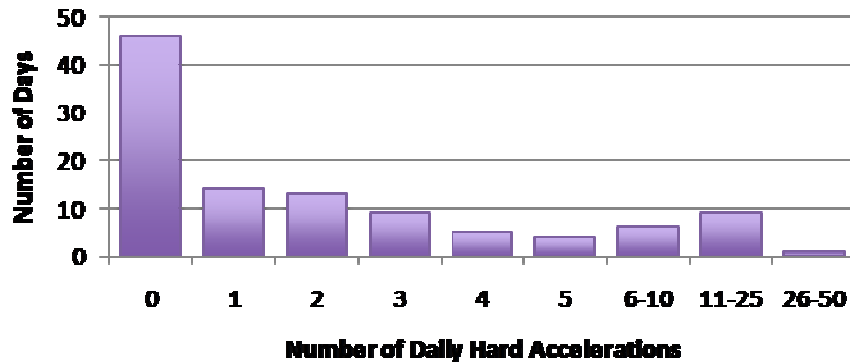
## Daily Driving Time



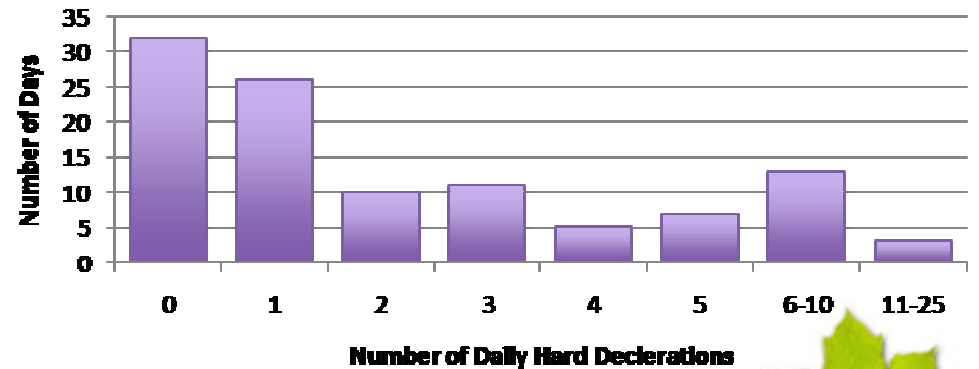
## Daily Maximum Speeds Reached



## Daily Hard Accelerations

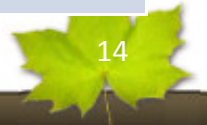


## Daily Hard Decelerations



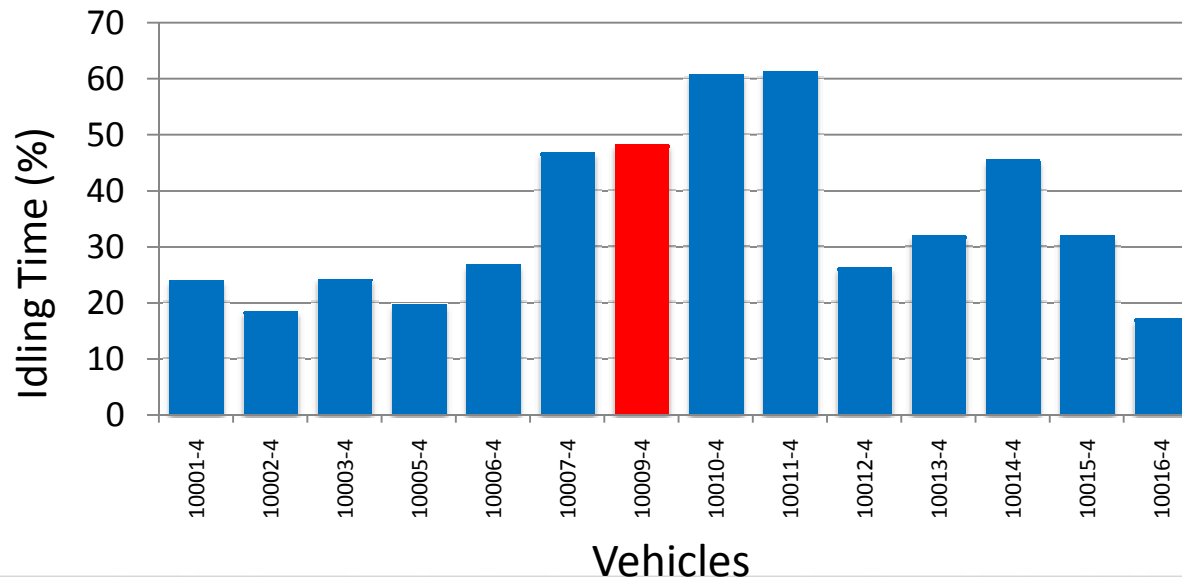
# Driving Summary con't: Example

Parameter	Daily Average	Seasonal Total
Drive Time (hh:mm)	02:45	295:30
Distance (km)	39	4203
Trip Distance (km)	2	-
Speed (km/h)	15	-
Max Speed (km/h)	-	107
Time over 110 km/h	0:00	0:00
# of Days with Speeds >110 km/h	-	0
Acceleration Count	3	318
Deceleration Count	3	277



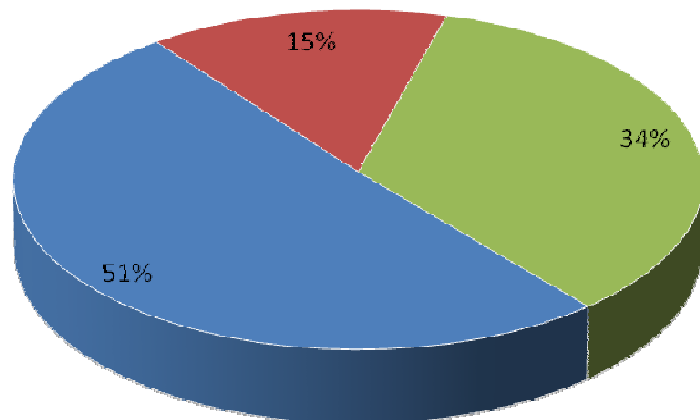
# Fuel Consumption & Environmental Performance: Example

Parameter	Daily Average	Seasonal Total
Idling (hh:mm)	01:21	145:33
Idling Time (%)	49	-
Idling Time (min/hr driven)	30	-
CO <sub>2</sub> Emissions from Idling (kg)	9	920
Fuel Consumed from Idling (L)	3.8	401.7
Estimated Fuel Cost from Idling	\$2.93	\$313.34



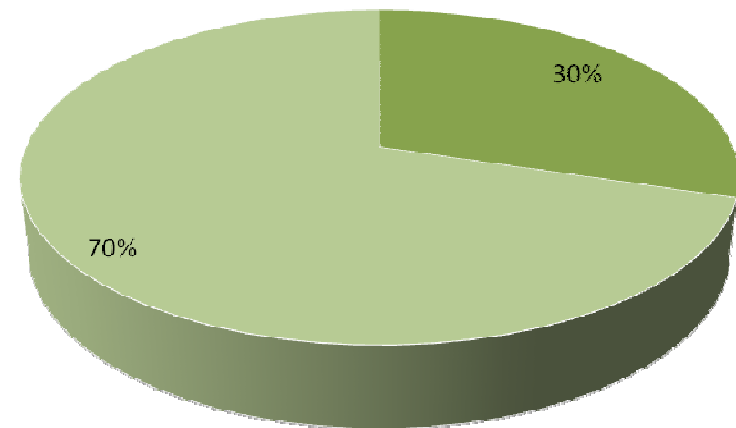
# Fuel Consumption & Environmental Performance con't: Example

**Driving Time vs. Idling Time  
(Total Operating Time: 295.5 hours)**



- Driving Time
- Idling Time During 1st Trip of Day
- Remaining Idling Time

**Percent Daily Idling Time**



- Idling time during 1st trip of day
- Remaining daily idling time

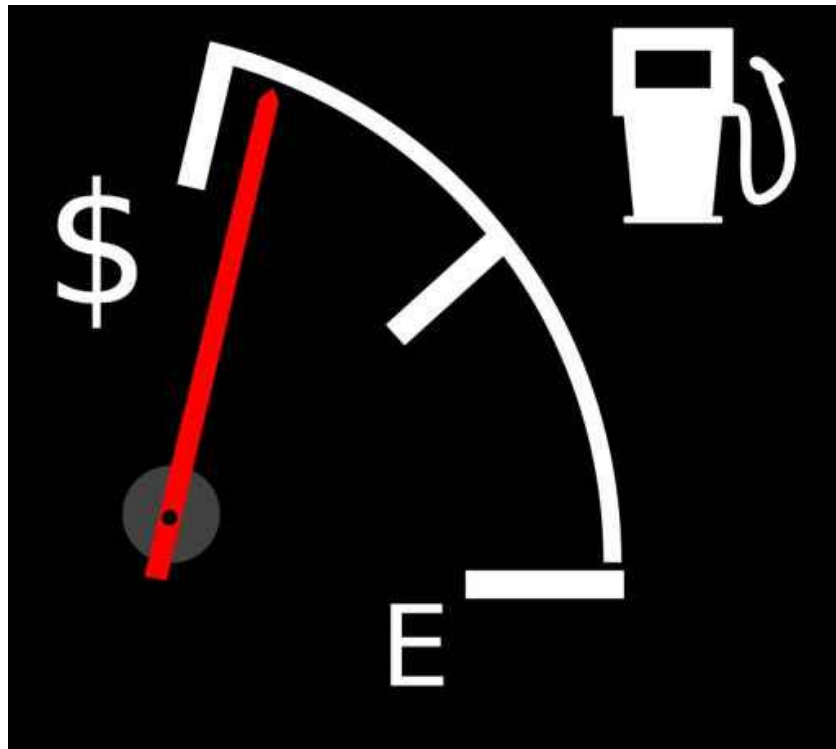


# All Three Resorts: Seasonal Totals

	Drive Time (hrs)	Distance (km)	Idling Time (hrs)	CO <sub>2</sub> emissions from Idling (kg)	Fuel Consumed by Idling (L)	Fuel Cost from Idling (\$CAD)
BMR	3464	70108	1239	8823	3613	2818.39
Glen Eden	266	4263	115	850	371	290.60
Horseshoe	765	31615	197	1541	673	524.99
<b>Total</b>	<b>4,495</b>	<b>105,986</b>	<b>1,550</b>	<b>11,104</b>	<b>4,610</b>	<b>\$3595.64</b>



# What can fleets do? Lots!



1. **Efficient driving**
  - 35% difference
2. **Fuel-efficient vehicles**
3. **Less driving**



# Go Idle Free: 1<sup>st</sup> Trip of the Day

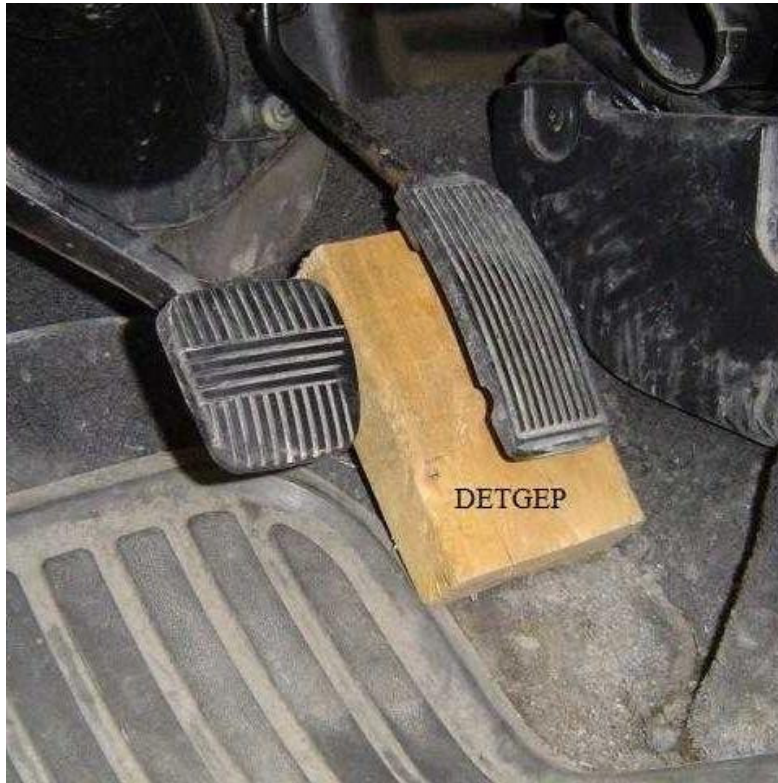


TEN SECONDS of  
idling uses more  
fuel than restarting.

The best way to  
warm up a vehicle  
is to drive it.



# Reduce Hard Accelerations and Decelerations

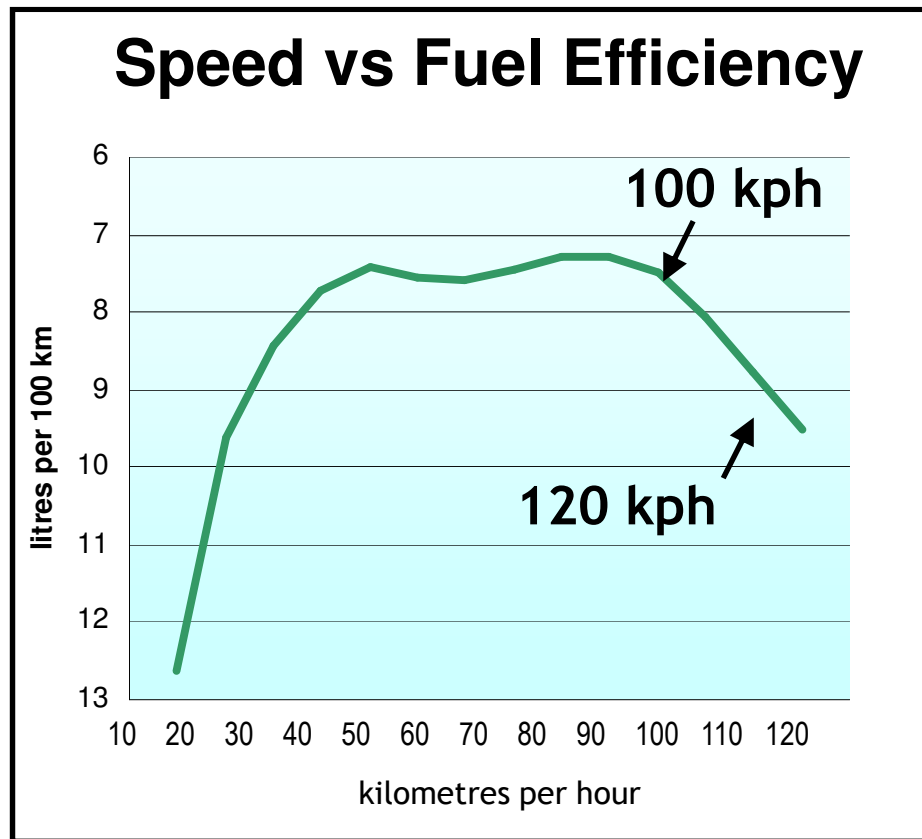


- European study suggests a heavy foot = 37% more fuel and only saves 2.5 min/hr

**Tip: Drive as if there's an egg under your foot.**



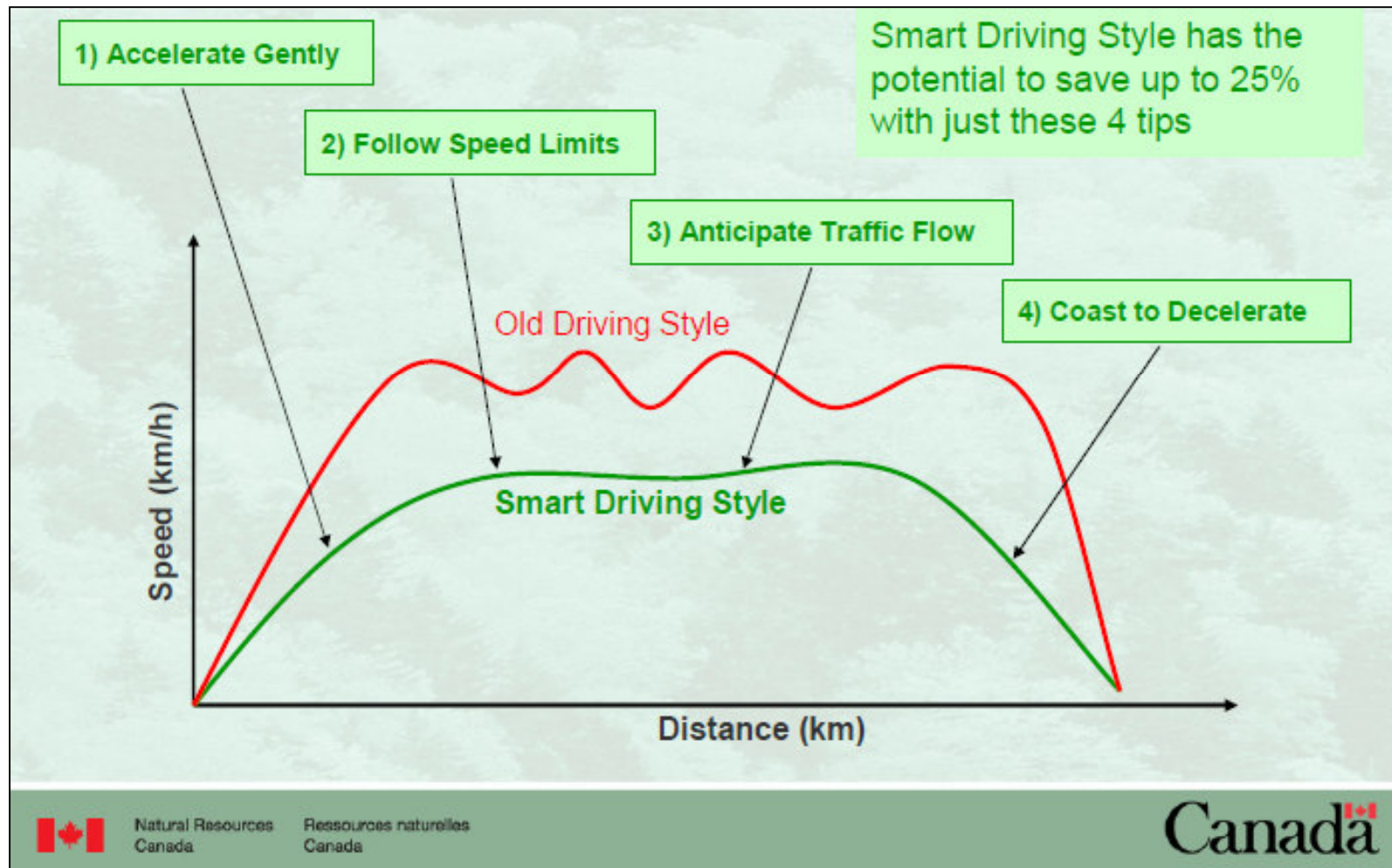
# Slow down and Save!



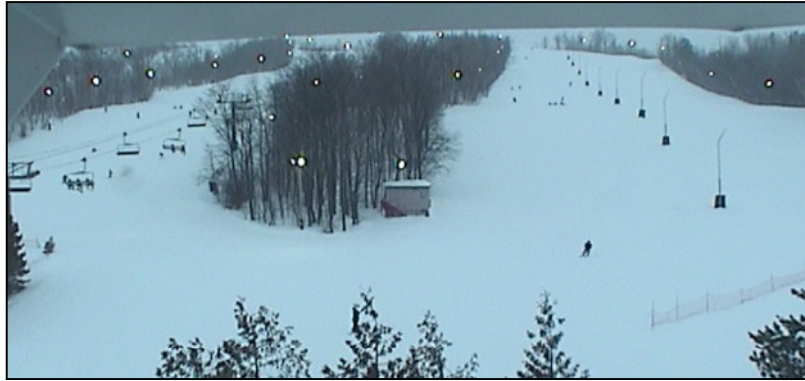
**Fuel efficiency drops 10% for every 10 kph above 90.**

**Going 120 instead of 100 is like paying 20% extra at the pump.**

# Smart Driving Style



# Use the right vehicle for the job.



**Use the 4x4 for trips up the hill.**









**Not for trips to Tims.**



# How far can you get?

Kilometres traveled on 40 litres

S T A R T	Honda Fit: 625	
	Ski-Doo Legend Touring V-800: 425	
	Toyota Tacoma 2.7l: 417	
	Dodge Caravan: 365	
	GMC Sierra 5.3l: 328	
	Chevrolet Express: 274	

# Maintain and save.



**Tune ups: 15%**

**Air filters: 10%**

**Oil: 1-2%**

**Tire pressure: 4%**



# Other fuel efficiency factors.



- ✗ roof racks: 5%
- ✗ extra weight: 2%
- ✗ off season tires
- ✓ block heaters: 10%
- ✓ cruise control



# Moving Forward

- Customizing eco-driver training for ski resort fleets
  - Fleet drivers: focus on driving techniques, trip planning, 'right sizing'
  - Fleet managers: driving techniques, maintenance, purchasing/vehicle replacement
  - Snow resort executives: the above, plus the business case for smart driving



# Next Research Phase:

- Roll out eco-driver training
  - (Sept – Dec 2010)
- Reinstall CarChips<sup>®</sup> into same fleet vehicles
  - (Dec 2010 – March 2011)
- Compare with baseline data to assess the effectiveness of training on driver behaviour
- Aim: reduction in idling, fuel consumption and CO<sub>2</sub> emissions



# Thank You!

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# Applicability: Making a Difference

- First insight into the quantity of fuel consumed and greenhouse gases emitted due to idling fleet vehicles.
  - Report to OSRA
- Inform the effective use of vehicle monitoring technology to aid operational efficiency, safety and environmental performance.
- Through eco-driver training, identify potential fuel savings and emissions reductions

