Green Fleet Plan for TTC, Police, Fire & EMS

2008-2011

September 2008

For presentation to City of Toronto Executive Committee

Acknowledgements

Thank you to Christopher Morgan and Sean Severin of the Toronto Environment Office for providing emission-reduction estimates.

Reference

City of Toronto. 2008. Green Fleet Plan for TTC, Police, Fire & EMS. Toronto, Canada.

Contacts/Primary Contributors

Toronto Transit Commission:
Orest Kobylansky, General Superintendent Bus Maintenance
Tel: 416-393-3564

Bill Brown, Manager Vehicle Engineering Bus
Tel: 416-393-3162

Toronto Police Service:
Angelo Cristofaro, Director, Finance & Administration
Tel: 416-808-7877

Toronto Fire Services:
Terry Boyko, Deputy Fire Chief
Tel: 416-338-9052

Rob Anselmi, Division Chief, Mechanical
Tel: 416-394-6080

Toronto Emergency Medical Services:
Bruce K. Farr, Chief and General Manager
Tel: 416-397-9240

Toronto Fleet Services:
Sarah Gingrich, Business Development & Improvement Analyst
Tel: 416-392-4397

EXECUTIVE SUMMARY

The City of Toronto is committed to improving air quality and protecting the climate. As directed by City Council, the Toronto Transit Commission (TTC), Toronto Police Service (TPS), Toronto Fire Services (TFS) and Toronto Emergency Medical Services (EMS), with guidance from Toronto Fleet Services Division, have prepared this plan to conserve fuel and reduce emissions of greenhouse gases and smog-causing pollutants. This plan outlines the actions that each of the four organizations will take to green their vehicles, fuels and related activities. The plan will complement the City's Green Fleet Plan 2008-2011 for the City's core fleet of vehicles, those managed by Fleet Services Division and used by the City's Divisions.

In July 2007 Toronto City Council adopted the Climate Change, Clean Air and Sustainable Energy Action Plan. It directed the City's Agencies, Boards and Commissions (ABCs) with large fleets to prepare a "consolidated green fleet plan" for their fleets and include idle-reduction measures. This consolidated plan is presented here. For each of the four organizations, the plan includes the current vehicle inventory and existing green fleet activities. The heart of each organization's plan is a list of planned green fleet actions for 2008-2011. This is followed by estimates of the planned actions' financial implications and greenhouse gas emission-reductions.

Planned green fleet activities include:

TTC

- Continue service levels for existing ridership base of 460 million plus address growth and expansion
- Purchase 354 hybrid buses in 2008, 130 in 2009, 120 in 2010, and 40 in 2011
- Purchase 6 subway cars in 2009, 120 in 2010 and 108 in 2011
- Purchase 8 hybrid automobiles in 2008
- Reduce total amount of fuel through the 10% fuel saved by Hybrid City Buses
- Increased capacity on new electrically powered rail vehicles and through resignalling of Yonge-University-Spadina subway line allows improved reliability and ridership growth and provides ability to get more people out of their cars and onto transit, also facilitates expansion initiatives
- Emission reductions 2008-2011: 10,731 tonnes eCO_2 by using Hybrid City Buses in lieu of Conventional City Buses
- Cost impacts in 2008-2011: Cost premium for hybrid City Buses of $128.8 million; fuel savings of $16.6 million plus ongoing operating savings over 18-year life of these buses

Police

- Purchase 8 hybrid cars in 2008; and
- Identify and incorporate devices, equipment and practices that reduce fuel consumption, pollutant emissions and idling by vehicles.

- Emission reductions 2008-2011: 9,100 tonnes eCO_2
- Net cost 2008-2011: Savings of $8,600

Fire

- Provide on-line training where possible to reduce travel, travel during non peak hours, and use fuel-efficient vehicles for fire-prevention activities;
- Purchase 5 hybrid "light" SUV's in 2008, and 5 in 2011;
- Purchase 8 ultra-low emission cars in 2008, 8 in 2009, 8 in 2010, and 8 in 2011;
- Test smaller, fuel-efficient diesel vans to replace larger vans, 11 in total; and
- Work with Fleet Services Division to identify and pilot test promising green vehicles and work with industry to accelerate development and large-scale adoption.
- Since 2006 Toronto Fire has used nine hybrid SUVs to replace nine large sedans. This has saved 53.5 tonnes of eCO_2 and 1.9 tonnes of combined Criteria Air Contaminants (NO_X, SO_X, CO, VOC and PM_{10}) annually compared to continued use of large sedans.
- Emission reductions 2008-2011: 596 tonnes of eCO_2
- Net cost 2008-2011: $145,300

EMS

- Investigate the purchase of 4 hybrid sedans in 2008, 3 in 2009, 3 in 2010 and 3 in 2011;
- Investigate the purchase of 8 hybrid SUVs in 2009, 8 in 2010 and 8 in 2011;
- Identify and incorporate initiatives to reduce idling such as space heaters where operationally feasible;
- Work with the Province of Ontario, Toronto Fleet Services Division and industry to identify and pilot test hybrid, electric, hydrogen/fuel cell and fuel-conserving ambulances and equipment; and
- Utilize fuels from sustainable sources as they become available e.g. ethanol from cellulose.
- Emission reductions 2008-2011: 1,182 tonnes eCO_2
- Net cost 2008-2011: $266,100 including contribution to reserve ($226,200 before contribution to reserve)

The four organizations estimate that on the whole, this plan will reduce emissions of eCO_2 by more than 21,000 tonnes. Initiatives for which reductions could not be quantified will provide additional emission reductions.

TTC, Police, Fire and EMS estimate that on the whole the green fleet initiatives outlined in this plan will have a total estimated capital cost of approximately $129.4 million over 2008-2011 and an operating impact reflecting fuel cost savings of approximately $16.9 million during this period plus further savings in future years over the life of these assets.

It must be noted that the most significant cost is related to the TTC hybrid buses which have committed Federal and Provincial partnership funding.

As indicated in the existing Green Fleet Plan 2008-2011 for the City's core Divisions, the City will continue to pursue external funding opportunities to enable the City and its agencies, boards and commissions to enhance greening of their fleets. The City will also continue to actively encourage other orders of government to support policies and incentives that encourage the use of sustainable vehicles, fuels and practices.

This plan, including planned actions and financial implications, was developed and written by the TTC, Police, Fire and EMS. The Toronto Environment Office assisted the four organizations by providing emission-reduction estimates. Fleet Services acted as a resource and provided coordination. This plan will help the City to conserve fossil fuels, protect air quality and prevent emissions of greenhouse gases.

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INTRODUCTION

Toronto City Council adopted Toronto's Green Fleet Plan 2008-2011[1] in March 2008 to reduce fuel use and emissions of greenhouse gases and smog pollutants from vehicles used by the City's core Divisions. As described below, City Council also requested a consolidated green fleet plan for the Toronto Transit Commission (TTC), Toronto Police Service (TPS), Toronto Fire Services (TFS) and Toronto Emergency Medical Services (EMS), and it is presented here.

Toronto's Green Fleet Plan 2008-2011 is a comprehensive 38-point action plan that specifies the measures that Toronto will take to green the vehicles and fuels used by Toronto's core Divisions. It is "phase II" of the City's efforts to green its fleet, and it builds on "phase I", the Green Fleet Transition Plan 2004-2007. The Green Fleet Plan 2008-2011 addresses the vehicles and fuels that are managed by Toronto's Fleet Services Division and largely used by the City Divisions, e.g. Toronto Water, Transportation Services, Solid Waste, etc. However, the plan did not include some large fleets managed by other City Agencies, Boards and Commissions (ABCs). TTC, Police, Fire and EMS manage the four largest City fleets that were not included in the City's Green Fleet Plan 2008-2011.

To help improve air quality and reduce climate change, City Council asked that green fleet plans be developed for these additional, large ABC fleets. In July 2007 Toronto City Council adopted the Climate Change, Clean Air and Sustainable Energy Action Plan. In this report[2], Council directed the ABCs to prepare a "consolidated green fleet plan" for their vehicles and fuels and include idle-reduction measures.

A consolidated Green Fleet Plan for 2008-2011 is presented here for TTC, Police, Fire and EMS. It outlines the current and planned green fleet initiatives of TTC, Police, Fire and EMS. It lists each organization's planned green fleet actions and estimates the greenhouse gas emission reductions and financial implications of these actions. The planned actions in the Green Fleet Plan for TTC, Police, Fire and EMS were developed by the four organizations. Fleet Services Division acted as a resource and coordinator for the project, and Toronto Environment Office assisted the four groups in estimating emission reductions.

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[1] The City of Toronto's Green Fleet Plan 2008-2011 addresses the 4,700 vehicles and fuels used by the City's core Divisions. Implementation will be led by the Fleet Services Division. The plan is available at: http://www.toronto.ca/fleet/gfp_08_11.htm.

[2] Council's July 2007 decision on the Climate Change, Clean Air and Sustainable Energy Action Plan (report EX10.3) can be found at: http://www.toronto.ca/legdocs/mmis/2007/ex/reports/2007-06-25-ex10-cr.pdf
Recommendation 9f from this report says City Council will: "direct the Executive Fleet Steering Committee to develop by mid-2008 a consolidated Green Fleet Plan for the TTC, Emergency Medical Services, Toronto Fire, Toronto Police and other Agencies, Boards, and Commissions for fleets not included in the Phase I Green Fleet Transition Plan and include in that plan actions to eliminate unnecessary idling of City vehicles through the City's Anti-Idling Campaign".

This report provides greenhouse gas emission-reduction estimates as equivalent carbon dioxide (eCO_2). This is the sum of the greenhouse gases addressed by the Kyoto Protocol, expressed as the quantity of carbon dioxide (CO_2) that would have the same climate-altering potential. In addition to greenhouse gases, smog-causing pollutants are extremely important for air quality and health. Estimating emission reductions for the smog pollutants is complex and could not be included in this report. However, this plan will reduce emissions of both smog pollutants and eCO_2. Any initiative that reduces fuel consumption provides both climate protection and smog reduction benefits.

The Green Fleet Plan for TTC, Police, Fire and EMS will complement the City's Green Fleet Plan 2008-2011 for the core fleet. All four organizations presenting this report are committed to improving air quality and reducing climate change impacts and have developed this plan to achieve these goals.

CONSOLIDATED RESULTS

When taken together, TTC, Police, Fire and EMS estimate that their 2008-2011 plans will result in the following financial implications and emission reductions.

Total financial implications of the Green Fleet Plan for TTC, Police, Fire & EMS

TTC, Police, Fire and EMS estimate that on the whole the green fleet initiatives outlined in this plan will have a total estimated capital cost of approximately $129.4 million over 2008-2011 and an operating impact reflecting fuel cost savings of approximately $16.9 million during this period plus further savings in future years over the life of these assets. The capital cost is the "premium" paid to purchase green vehicles instead of conventional vehicles. It must be noted that the most significant cost is related to the TTC hybrid buses which have committed Federal and Provincial partnership funding.

Table A. Total cost of planned green fleet initiatives 2008-2011

	2008 ($ millions)	**2009 ($ millions)**	**2010 ($ millions)**	**2011 ($ millions)**	**Total ($ millions)**
TTC:					
Premium costs	70.800	26.000	24.000	8.000	128.800
Fuel savings	(1.601)	(3.596)	(5.290)	(6.148)	(16.635)
Police:					
Premium costs	0.024	0	0	0	0.024
Fuel savings	(0.003)	(0.009)	(0.010)	(0.011)	(0.033)
Police net costs	**0.021**	**(0.009)**	**(0.010)**	**(0.011)**	**(0.009)**
Fire:					
Premium costs	0.150	0.090	0	0.035	0.275
Fuel savings	(0.033)	(0.030)	(0.031)	(0.036)	(0.130)
Fire net costs	**0.117**	**0.060**	**(0.031)**	**(0.001)**	**0.145**
EMS:					
Premium costs	0.024	0.098	0.098	0.098	0.318
Fuel savings	(0.003)	(0.016)	(0.029)	(0.044)	(0.092)
EMS net costs	**0.024**	**0.094**	**0.082**	**0.066**	**0.266**
Total premium costs:	70.998	26.188	24.098	8.133	129.417
Total fuel savings:	(1.640)	(3.651)	(5.360)	(6.239)	(16.889)

(i) Premium cost is the difference paid to purchase green vehicles (e.g. hybrid vehicles) instead of less expensive conventional vehicles.
(ii) Net costs are premium costs paid for green fleet initiatives, less fuel savings. Numbers may not add exactly due to rounding.
(iii) Those initiatives for which costs could be estimated are included here.
(iv) TTC costs are for hybrid City buses only.
(v) "EMS net costs" also include contribution to EMS Vehicle Reserve. EMS net costs before contributions to reserve are ($000s) $21.2 in 2008, $81.9 in 2009, $69.3 in 2010, $53.8 in 2011 and $226.2 in total.
(vi) Operating savings attributable to these assets will also be realized in future years.

As indicated in the existing Green Fleet Plan 2008-2011 for the City's core Divisions, the City will continue to pursue external funding opportunities to enable the City and its agencies, boards and commissions to enhance greening of their fleets. The City will also continue to actively encourage other orders of government to support policies and incentives that encourage the use of sustainable vehicles, fuels and practices.

Total emission reductions from planned green fleet initiatives

The four organizations estimate that on the whole, this plan will reduce emissions of eCO_2 by more than 21,000 tonnes. Initiatives for which reductions could not be quantified will provide additional emission reductions.

Table B. Total forecast greenhouse gas emission reductions 2008 – 2011 (tonnes eCO_2)

	2008 (tonnes)	**2009 (tonnes)**	**2010 (tonnes)**	**2011 (tonnes)**	**Total (tonnes)**
TTC	1,731	2,374	3,165	3,461	10,731
Police	2,287	2,287	2,287	2,287	9,146
Fire	139	144	151	162	596
EMS	264	287	306	325	1,182
Total	**4,421**	**5,092**	**5,909**	**6,235**	**21,655**

(i) These emission reductions are underestimates. Initiatives for which emission reductions could not be estimated at this time have not been included.
(ii) TTC emission reductions are for hybrid City buses only.
(iii) Forecast emission-reductions for the Police are based on initiatives introduced in 2003-2007 as well as those in 2008-2011.

Conclusion

This plan aims to reduce emissions from the vehicles and fleet operations of TTC, Police, Fire and EMS. It includes a range of initiatives such as replacing conventional vehicles with hybrids and fuel-efficient vehicles and right-sizing the fleet. More importantly, it lays out a path ahead for the four organizations to explore the many opportunities that are now available. Green vehicles, equipment and practices are now available for light-duty,

heavy-duty and specialized applications on a commercial or experimental basis. This plan describes and refreshes the efforts by the TTC, Police, Fire and EMS to embrace these opportunities. This plan, along with Toronto's Green Fleet Plan 2008-2011 for the City's Divisions, will help Toronto achieve its air quality improvement and climate protection goals and remain a Canadian leader in greening the fleet.

Ride the Rocket.

THE BETTER WAY

TORONTO TRANSIT COMMISSION
GREEN FLEET PLAN 2008-2011

Introduction to the TTC

The Toronto Transit Commission is responsible for operating transit services for the City of Toronto. The TTC provides more than 450 million passenger rides each year. Each work day, an average of 1.5 million people ride the system which results in 1 million fewer trips by car. Fewer vehicles on the road equals lower greenhouse gas emissions.

The Toronto Transit Commission, through its Environmental Policy, has committed to reduce the environmental impacts from its facility and vehicle operations, and comply with all legal and applicable requirements.

In all aspects of its business, the TTC strives to provide the best alternative to car travel in the most environmentally responsible manner.

The Green Fleet Plan for TTC, Police, Fire and EMS outlines TTC's existing and planned green fleet initiatives for all areas of TTC's fleets. The plan is consistent with TTC's Environmental Policy and TTC's commitment to reduce the environmental impacts from its facility and vehicle operations. The plan is also consistent with TTC's Green Procurement Policy requiring that in addition to standard quality, performance and price considerations, the TTC will take into full consideration the environmental footprint of the products and services being purchased without sacrificing safety standards.

Current fleet vehicle inventory

Table 1. TTC buses (revenue vehicles with an internal combustion engine, Dec 31, 2007)

Type of Vehicle	Total Number of Vehicles	Number of Green Vehicles
City Buses (2-stroke diesel)	280	-
City Buses ("clean" diesel)	1163	-
City Buses (hybrid)	210	210
Wheel-Trans Buses (ELF)	140	-
Wheel-Trans Buses (Community)	6	-
Total	**1799**	**210**

ELF - Economical Low Floor

Table 2. TTC subway cars, SRT and streetcars (revenue vehicles without an internal combustion engine, as of Dec 31, 2007)

Type of Vehicle	Total Number of Vehicles	Number of Green Vehicles
Subway Cars	678	634
Scarborough RT (SRT)	28	28
Streetcars (active fleet)	248	248
Total	**954**	**910**

SRT – Scarborough Rapid Transit

Table 3. TTC non-revenue vehicles (support vehicles and rubber-tired shop equipment, as of Dec 31, 2007)

Type of Vehicle	Total Number of Vehicles	Number of Green Vehicles
Sedans	66	-
Light Trucks and Vans	188	-
Medium Duty Trucks	29	-
Heavy Duty Trucks	60	-
Trailers[3]	39	-
Construction and Rubber-Tired Shop Equipment[4]	355	8
Total	**737**	**8**

Non-revenue vehicles are those that do not have a fare box.

Existing green fleet initiatives

Fleet wide initiatives:

- Recommendations issued to vehicle operators to encourage a reduction in idle and engine warm-up time, as well as smooth use of engine power.
- Tire pressures monitored regularly to ensure tire rolling resistance is minimized to optimize fuel efficiency.
- B5, a blend of 95% Ultra Low Sulphur Diesel and 5% biofuel, has been used in all City Buses and Wheel-Trans Buses since September 2006.
- Re-cycle used petroleum products and purchase only re-refined engine oil and other re-refined petroleum products as appropriate.
- Promote frugal use of air conditioning in all Commission vehicles.

[3] Some trailers are equipped with an engine to permit special trailer movements or functions.
[4] Rubber-Tired Shop Equipment includes: forklifts, compressors, welders, sweepers, scrubbers, power washers, generators, skid steer loaders, electric trucks, scissor lifts, snow blowers, tractors, miscellaneous equipment. The eight green vehicles are electric utility carts used for carrying loads.

- Rationalize fleet size and vehicle types to suit applications with the intention of reducing the use of hydrocarbon fuels.
- Continue to track technological changes in vehicles and propulsion systems to take advantage of the best available technology to support the city in achieving its environmental goals.

Buses (City buses and Wheel-Trans buses):

TTC has taken major steps to procure new buses with the best available technology to address environmental concerns. Diesel hybrid buses in combination with ultra low sulphur fuel and bio-diesel allow for an expected reduction in fuel usage by 10% to 30%, compared to standard diesel buses, and a significant reduction in diesel particulate matter, unburned hydro-carbons, carbon monoxide and oxides of nitrogen. Diesel particulate traps, installed on buses purchased since 2006, reduce the emissions of diesel particulate matter by up to 99% as compared to older diesel engines not equipped with traps.

Table 4. TTC hybrid city bus purchases, to date and planned

Purchases	2007	2008	2009	2010	2011
40 Foot Diesel Hybrid City Bus	210	354	130 (on order)	120 (planned)	40 (planned)

The air conditioning set point temperature in all TTC buses has been increased by 1.1^{o}C (2^{o}F) to reduce air conditioning compressor operating periods, resulting in lower power demands on the diesel engines and reduced fuel consumption and exhaust emissions.

All buses are equipped with cycling clutches to operate the air conditioning compressors only when required.

The 210 Hybrid City Buses purchased in 2007 are estimated to have emitted 742 tonnes less green house gas emissions in 2007 when compared to similarly equipped Conventional City Buses.

Table 5. Summary of TTC greenhouse gas emissions 2005-2007 for fleet vehicles equipped with diesel powered internal combustion engines

Year	Fleet Type	Diesel Fuel Consumed (litres)	Kilometres Driven (km)	Average Rating (L/100km)	GHG Factor (grams/L)	Amount of Greenhouse Gases (CO_2) Emitted (tonnes)
2005	City Buses	61,550,442	99,594,944	61.8	2,587	159,231
	Wheel-Trans Buses	2,629,978	8,579,912	30.7	2,632	6,922
	Non-Revenue Support Vehicles	194,918	N/A	N/A	2,570	501
2006	City Buses	66,837,049	106,408,687	62.8	2,587	172,907
	Wheel-Trans Buses	2,739,480	9,418,533	29.1	2,632	7,210
	Non-Revenue Support Vehicles	158,509	N/A	N/A	2,570	407
2007	City Buses	72,557,094	110,684,880	65.6	2,587	187,705
	Wheel-Trans Buses	2,944,920	9,608,822	30.6	2,632	7,751
	Non-Revenue Support Vehicles	174,142	N/A	N/A	2,570	448

N/A - not available

The table shows City Buses have a steady increase in the quantity of diesel fuel consumed per hundred kilometres travelled. Older standard-floor non-hybrid City Buses have 39 to 40 seats, carry a crush-load of 80 passengers, and are equipped with diesel engines producing approximately 180 horsepower. Newer low-floor diesel-electric hybrid accessible City Buses have 38 seats (or 32 plus 2 wheelchair positions), carry a crush-load of 70 passengers, and are equipped with diesel engines producing approximately 260 horsepower. The newer low-floor diesel-electric hybrid accessible City Buses have additional equipment such as air-conditioning, additional lighting, global positioning systems (GPS) and dead-reckoning systems for automatic stop announcements, as well as ramps and kneeling features to assist elderly or disabled

passengers. Of the Commission's 1,653 City Buses, currently more than 450 are newer low-floor diesel-electric hybrid accessible City Buses with delivery continuing. Compared to similarly equipped conventional diesel buses, the newer low-floor diesel-electric hybrid accessible City Buses consume less fuel and produce lower emissions of greenhouse gases, smog pollutants and noise.

Electric passenger subway cars:

New subway train - the Toronto Rocket
The following features have been incorporated into the design for the new subway train in order to improve the environmental performance of the vehicle:

- Provision for Automatic Train Operation (ATO)

- an estimated 8-10% of energy can be saved if ATO is used in the future

- Improved Propulsion Controller

- performs same duties with four fewer traction motors per train resulting in a significant weight reduction for the vehicle

- Upgraded Propulsion System

- traction converter is approximately 50% lighter than traditional oil-cooled version and 55% more energy efficient

- Parallel Drive Gear

- higher efficiency than existing right-angle design

- Aluminium Heating, Ventilating and Air Conditioning (HVAC) Components

- design optimized without significant weight increase
- R407C refrigerant which is recognized as environmentally acceptable

- Design for Environment

- improved energy use
- improved noise and vibration characteristics
- decline the use of prohibited and restricted hazardous materials
- recycling plan for vehicle end-of-life
- requirement for an environmental report describing vehicle environmental aspects
- declaration of any hazardous materials used and processes required during use and at end-of-life

Electric passenger streetcars:

In the Low Floor Light Rail Vehicle (LFLRV) project, stringent requirements and an aggressive plan for a more environmentally friendly vehicle design have been included in the vehicle procurement specification. These include:

Vehicle Weight Reduction
An aggressive weight reduction plan includes changing the philosophy of a "tank-like" car body structure to a crash energy management design much like the evolution in the automobile industry. This will contribute to a safer vehicle for the operator and the passengers, while reducing energy consumption.

With the increase in capacity compared to existing vehicles, the LFLRVs will deliver a reduction in energy use per passenger at peak loads of approximately 20%.

Energy Recovery and Reduction Plan
An optimal energy recovery scheme will take full advantage of the frequent stop spacings in city operation. This is accomplished through advanced propulsion and braking control of an alternating current propulsion system to recover a higher amount of kinetic energy and convert it back to the power grid than in the already highly efficient direct current "chopper" control system.

It is intended that only two-thirds of the axles will be motored on Transit City vehicles. This will result in significant reduction in energy consumption while maintaining the performance typically required of a Right-Of-Way LRT operation in which station stops are farther apart than those on the existing streetcar network. Furthermore, consideration is being given to wayside energy storage for Transit City lines to improve use of regenerated energy.

Other measures to reduce energy consumption include Light-Emitting Diode (LED) exterior lighting, car body insulation, coated glazing, and properly sized HVAC equipment.

The environmental impact of the new LFLRV will be reduced by:

- Specifying air-conditioning refrigerant and materials meeting the Montreal Protocol on Substances that Deplete the Ozone Layer
- Requiring a thorough end-of-life recyclable material plan from the car builder
- Prohibiting the use of hazardous materials
- Requiring noise and vibration improvements

Non-revenue vehicles (support vehicles and rubber tired shop equipment):

Specifications for purchasing all new Non-Revenue Support Vehicles include the option to purchase any factory available "Green" propulsion instead of the specified standard engine.

Where possible, TTC purchases equipment with 4-stroke engines instead of 2-stroke engines.

Planned green fleet initiatives 2008-2011

TTC plans to purchase the following environmentally beneficial vehicles over 2008-2011:

Table 6. TTC buses - planned purchases

Type of Vehicle	2008	2009	2010	2011
City Buses (hybrid)	354	130 (on order)	120 (planned)	40 (planned)

TTC is committed to the purchase of diesel hybrid buses for the foreseeable future; at least until even better technology is proven in a transit application.

Table 7. TTC subway cars, SRT and streetcars - planned purchases

Type of Vehicle	2008	2009	2010	2011
Subway Cars	-	6	120	108
Scarborough RT (SRT)	-	-	-	9
Streetcars	-	-	1	3

Future purchases of subway cars, SRT and streetcars will utilize the most energy efficient technology available.

Table 8. TTC non-revenue vehicles - planned purchases (support vehicles and rubber-tired shop equipment)

Type of Vehicle	2008	2009	2010	2011
Sedans	8 test hybrids	TBD	TBD	TBD
Light Trucks and Vans	TBD	If available; 2 test hybrid crewcab pickups	TBD	TBD
Medium Duty Trucks	TBD	TBD	TBD	TBD
Heavy Duty Trucks	TBD	TBD	TBD	TBD
Construction and Rubber-Tired Shop Equipment	1 Regen - Air Street Sweeper	TBD	TBD	TBD

TBD - to be determined

The greening of Non-Revenue Support Vehicles is dependent upon evolving technology available from manufacturers to help make the fleet more fuel efficient and environmentally friendly. Eight gas-electric hybrid cars have been purchased and are currently being tested in hope of finding suitable applications within the Commission.

In addition to the actions listed below, wherever possible the Commission will implement the actions set out in the City's Green Fleet Plan 2008-2011 led by Fleet Services Division.

The TTC will implement the following actions over 2008-2011:

Action: Request that Council note and endorse the current environmental benefits of public transit, noting that the 2,500 revenue vehicles servicing 460 million passengers in the GTA and traveling over 198 million miles in 2007 result in significant existing environmental benefits over the alternative potential impacts of car trips and the environmental impact of these trip decisions;

Action: Purchase portable powered equipment with four-stroke engines instead of two-stroke engines wherever possible;

Action: Purchase a regenerative-air street sweeper to reduce air-borne dust during street sweeping operations in stations;

Action: Incorporate regenerative braking into all subway trains by 2010;

Action: Contain fleet size and purchase fuel-efficient, right-sized non-revenue service vehicles as a standard practice, if they are commercially available and meet operational needs, specifically:

a) Use vehicles as efficiently as possible;
b) Purchase the right size of vehicle for the job, using small vehicles where they meet operational needs; and
c) Purchase the most fuel-efficient vehicle, or lowest-emitting vehicle, that is commercially available, financially viable and meets operational needs;

Action: Identify and incorporate devices, equipment and practices that reduce fuel consumption, pollutant emissions and idling by vehicles, such as LED lights, batteries, inverters or other equipment that reduces the need to idle a vehicle for long periods in order to operate lights and other necessary tools and equipment;

Action: Include in all vehicle procurement specifications green vehicle attributes, such as fuel efficiency and low emissions;

Action: Use clean sources of energy for vehicles; and

Action: Maintain and expand its existing transit service with the goal of removing passengers from private vehicles and onto the public transit system.

Financial implications of planned green fleet initiatives

Fleet wide initiatives:

Hybrid vehicles will reduce fuel consumption compared to conventional vehicles. Given their higher purchase price hybrid electric vehicles are expected to result in minimal, if any, savings in overall cost of ownership for both non-revenue support vehicles and city buses.

Buses (City buses and Wheel-Trans buses):

Throughout the transit industry, it is generally accepted that fuel savings alone will not payback the $ 200k / bus hybrid premium within the 18-year life of a bus.

Table 9a. TTC capital financial implications of purchasing Hybrid City Buses in lieu of Conventional City Buses

City Buses (Wheel Trans buses not included)	**2008**	**2009**	**2010**	**2011**	**Total**
Quantity of Hybrid Buses Purchased	354	130 (on order)	120 (planned)	40 (planned)	644
Hybrid premium cost versus purchasing conventional buses (premium approx $ 200k/bus)	$ 70,800 thousand	$ 26,000 thousand	$ 24,000 thousand	$ 8,000 thousand	$ 128,800 thousand
Cumulative total Hybrid premium cost	$ 70,800 thousand	$ 96,800 thousand	$ 120,800 thousand	$ 128,800 thousand	$ 128,800 thousand

(i) Costs and quantities do not include 210 Hybrid Buses purchased in 2007.

Table 9b. TTC operating financial implications of Hybrid City Buses

City Buses (Wheel Trans buses not included)	**2008**	**2009**	**2010**	**2011**	**Total**
Total Fleet Size	1681	1709	1804	1864	
Total Quantity of Hybrids	564	694	814	854	
Estimated Diesel Fuel Cost	$0.8852 /L (actual)	$1.45 /L	$1.60 /L	$1.70 /L	
Estimated Annual-Total Diesel Fuel Cost (conventional and hybrid buses combined)	$67,810 thousand	$110,102 thousand	$120,169 thousand	$127,153 thousand	$425,234 thousand
Estimated Annual-Total Fuel Savings directly attributable to total quantity of hybrid buses (10% fuel savings - based on most current TTC test results)	$1,601 thousand savings	$3,596 thousand savings	$5,290 thousand savings	$6,148 thousand savings	$16,635 thousand savings

(i) Total Quantity of Hybrids includes hybrid buses purchased in 2007.
(ii) Estimated Annual-Total Fuel Savings includes fuel saved by hybrid buses purchased in each previous year including 210 purchased 2007 but exclude future year savings over the remainder of the 18-year life of the buses.
(iii) Mileage, fuel consumption, and emissions not adjusted for ridership growth.

Electric passenger streetcars:

The replacement of the current Streetcar fleet with lighter more energy efficient vehicles, beginning in 2010, is expected to reduce the cost of operation. The actual savings cannot be determined until operating experience is gained with the vehicles.

Non-revenue support vehicles:

TTC estimates the current cost premium for purchasing a hybrid Non-Revenue Support Vehicle is on average approximately $4,000 to $7,000, before government rebates.

Fuel savings will likely not recover the cost of the hybrid premium by end of vehicle life.

Emission reductions from planned green fleet initiatives

Table 10. TTC estimated greenhouse gas emission reductions from green buses

City Buses (Wheel Trans buses not included)	**2008**	**2009**	**2010**	**2011**	**Total**
Total Fleet Size	1681	1709	1804	1864	
Total Quantity of Hybrids	564	694	814	854	
Estimated Total Mileage Travelled (million kms)	111.0	111.0	111.0	111.0	
Estimated Total Fuel Consumption (million litres)	76.6	75.9	75.1	74.8	
Estimated eCO_2 emissions (tonnes)	180,867	172,701	162,651	158,882	675,101
Estimated eCO_2 emission reductions (tonnes)	**1,731**	**2,374**	**3,165**	**3,461**	**10,731**

(i) Mileage, fuel consumption, and emissions not adjusted for ridership growth.
(ii) Non-Revenue Support Vehicles not shown in above table as figures will be much, much less than figures in table.

Compared to similarly equipped conventional diesel buses, the newer low-floor diesel-electric hybrid accessible City Buses are estimated to produce:

- 37% less greenhouse gas (GHG) emissions
- 30-50% less harmful particulates
- 30-50% less Nitrogen Oxides (NO_X) emissions
- 40 tons less Carbon Dioxide (CO_2) per bus each year
- Lower noise level (3-5 reduction in decibel level)
- 10-30% less fuel consumption depending on route assignments

Monitoring and reporting

Buses (City buses and Wheel-Trans buses):

TTC is in process to undertake a study to establish TTC's baseline measures and key environmental priorities in order to meet Toronto City Council's established targets for greenhouse gas emissions and smog causing pollutants. The baseline will establish, where feasible, the amount of diesel fuel, gasoline, natural gas and electricity consumed by the TTC in 1990, 2004 and 2006. Once these amounts have been identified, the study will recommend goals, measurement systems and next steps with the aim of reducing greenhouse gas emissions and smog causing pollutants without a reduction in transit service. In addition, once the baselines and goals have been established, a reporting process will be proposed.

Fuel consumption and mileage figures should be available for City Buses on an annual basis. Estimates of green house gas emissions will be calculated from the quantity and mix of conventional versus hybrid City Buses.

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Gary Webster
Chief General Manager,
Toronto Transit Commission

TORONTO POLICE SERVICE
GREEN FLEET PLAN 2008-2011

Introduction to the Toronto Police Service

The Toronto Police Service (TPS) has a permanent authorized strength of 5,510 Sworn Officers and 2001 Civilian Members. The Service's fleet inventory consists of 1,620 vehicles, and the majority of these operate on three shifts, 365 days a year. The vehicles, other than boats, are serviced and repaired at three garage locations. The three garages have been strategically located (and consolidated from seven previously) to allow reduced travel time for Officers when attending these sites.

Current fleet vehicle inventory

Table 11. TPS vehicle summary (as of March 19, 2008)

Type of vehicle	Number of vehicles
Marked	495
Marked Mini Vans/4WD	28
Marked Parking Enforcement	94
Motorcycles	92
Other Marked	98
Plain	747
Plain Parking Enforcement	7
Trailers	36
Boats	23
Total	**1,620**
Bicycles	247

Existing green fleet initiatives

The Service has piloted and implemented various green initiatives over the past twenty years. These include:

- Propane vehicle conversions;
- Natural gas vehicles, purchased for evaluation purposes;

- Right sizing: down sizing (i.e. full size to mid size, mid size to compact); gasoline to diesel; and limiting fleet size through pooling and bicycles;
- Conversion from two stroke gas to four stroke gas engines for boats;
- Purchase to date of 158 (E85-capable) vehicles; and
- Introduction of bicycles to current level (247 bicycles).

In May 2007, the Service implemented a pilot project (which is still in progress) in the Parking Enforcement unit. This initiative involves the comparison of fuel-efficient and hybrid cars to the current base model vehicle used in Parking Enforcement. The evaluation of the pilot project is being reported to the Toronto Police Services Board at its August 2008 meeting.

Environmental initiatives undertaken by the TPS with respect to its 22 fuelling sites include:

- Tank replacement program every 20 years;
- Steel tanks upgraded to fibreglass;
- Annual tank pressure testing (all sites);
- Hose and sump checks twice annually (all sites); and
- Install and implement spill containment measures at all fuelling sites.

Initiatives that the Police Service has already put in place have resulted in the following emission reductions:

Table 12. TPS emission reductions from existing green fleet activities

	eCO_2 emission reduction (tonnes)
Emission reductions 1990-2007:	34,721
Emission reductions 2002-2007:	8,126

Planned green fleet initiatives 2008-2011

The Toronto Police Service is committed to evaluating new initiatives and technology towards implementing a green fleet. The evaluation must take into consideration the Service's operational requirements as well as any legal obligations.

The City of Toronto Green Fleet Plan 2008-2011 was adopted by Council in March 2008. The plan sets out 38 specific actions that the City, led by the Fleet Services Division, will take to green the vehicles and fuels used by City Divisions. Actions that apply to the Police Service's fleet have been adapted and included below.

The Toronto Police Service will implement the following actions over 2008-2011:

Action: In 2008 use eight hybrid vehicles to replace existing unmarked vehicles and evaluate them in a similar manner to the parking enforcement pilot;

Action: Contain fleet size and purchase fuel-efficient, right-sized vehicles as a standard practice, if they are commercially available and meet operational needs, specifically:

a) Contain the size of the fleet by reducing the number of vehicles required and kilometres travelled, use vehicles more efficiently and delete underused vehicles from the fleet or move them to other operations;
b) Purchase the right size of vehicle for the job, using small vehicles where they meet operational needs; and
c) Purchase the most fuel-efficient vehicle, or lowest-emitting vehicle, that is commercially available and meets operational needs;

Action: Identify and incorporate devices, equipment and practices (as long as these do not impact operational or legislated requirements) that reduce fuel consumption, pollutant emissions and idling by vehicles, such as procure LED lights, batteries, inverters, space heaters or other equipment that reduces the need to idle a vehicle for long periods in order to operate lights and other necessary tools and equipment;

Action: Replace the oldest vehicles with cleaner, modern technology by accelerating the replacement of overdue vehicles;

Action: Include in all vehicle procurement specifications green vehicle attributes, such as fuel efficiency and low emissions, and provide an appropriate weighting for these attributes when selecting a product;

Action: Share information with Greater Toronto Area municipal and Police fleet managers through the Police Cooperative Purchasing Committee;

Action: Use clean sources of energy for vehicles, including biofuels from sustainable feedstocks as they become available, for example ethanol produced from cellulose;

Action: Continue the long-standing practice of incorporating bicycles into the Toronto Police Service's fleet;

Action: Investigate and implement ways to reduce the number of work-related vehicle trips taken by staff, such as increasing the use of conference calls and scanners to share information between work sites;

Action: Promote the organization's green vehicles and fuel efficiency efforts at public events;

Action: Investigate the feasibility and benefit of adopting additional green practices at maintenance facilities; and

Action: Investigate the practices used by local, Canadian and international municipal green fleet leaders and incorporate successful practices into the organization's fleet operations where feasible.

Financial implications of planned green fleet initiatives

Table 13. TPS financial implications of planned green fleet initiatives

	2008	2009	2010	2011	Total
Hybrid sedan purchase cost premium	$24,000	0	0	0	$24,000
Hybrid sedan cumulative fuel savings	$3,024	$9,072	$9,744	$10,752	$32,592
Total net cost	**$20,976**	**-$9,072**	**-$9,744**	**-$10,752**	**-$8,592**

(i) Assume gasoline prices of $1.35/L in 2008-09, $1.45/L in 2010 and $1.60/L in 2011.
(ii) Assume $3,000 premium on hybrid over conventional model.
(iii) Net costs are hybrid purchase premium after rebates, less fuel cost savings.
(iv) Hybrid vehicle residual values and maintenance costs, relative to conventional vehicles, are not included here.

Emission reductions from planned green fleet initiatives

Over 2008-2011 the Police Service anticipates reducing eCO_2 emissions by approximately 9,100 tonnes. The majority of these reductions result from switching to more fuel-efficient vehicles and incorporating bicycles.

Table 14. TPS total annual forecast greenhouse gas emission reductions from planned initiatives 2008-2011

	2008 (tonnes)	2009 (tonnes)	2010 (tonnes)	2011 (tonnes)	Total (tonnes)
Total	2,287	2,287	2,287	2,287	**9,146**

(i) Forecast emission reductions for the Police are based on initiatives introduced starting in 2003 as well as those in 2008-2011 (2002 baseline).
(ii) Total forecast emission reductions 2008-2011 would be 15,809 tonnes eCO_2 based on initiatives introduced starting in 1992 as well as those in 2008-2011(1990 baseline).

Monitoring and reporting

Updates on implementation of the Police Service's green fleet plan will be reported to the Police Services Board as required.

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William Blair, O.O.M
Chief of Police
Toronto Police Service

TORONTO FIRE SERVICES
GREEN FLEET PLAN 2008-2011

Introduction to Toronto Fire Services

Toronto Fire Services is comprised of 3,144 personnel who are employed in four sections: Operations, Fire Prevention and Public Education, Mechanical and Training, and Staff Services and Communications. It is the largest fire service in Canada and the fifth largest in North America. Fire Services is a pro-active leader in fire prevention, protection and emergency services to meet the diverse needs of the community. The mission statement is to protect life, property and the environment from the effects of fires, illness, accidents, natural disasters and other hazards.

Current fleet vehicle inventory

Table 15. Toronto Fire vehicle fleet summary

Type of vehicle	Number of vehicles
Aerial Ladders	39
Pumper Trucks	85
Rescue Trucks	28
Heavy Squads	7
Air/Light Trucks	5
Single Purpose Trucks (Haz-Mat, High-Rise, Tanker, De-con)	15
Vans	44
Sedans / Light SUV's / Mini-Vans	45
Small Cars	91
Fire Boats	2
Total	**361**

Existing green fleet initiatives

TFS Pumper trucks are designed small in comparison to most municipal apparatus. The shorter wheelbase is required to negotiate urban streets, but more importantly, it allows the use of smaller format engines and transmissions, which in turn allow the use of

smaller axles and wheels. This results in a more fuel-efficient truck that creates less waste in the form of replacement fluids, tires, and maintenance requirements. An automatic lubrication system is installed on all apparatus to extend the life of expensive parts, create less waste, and actually use less grease.

An auxiliary oil filtration system has been installed on all apparatus to extend the service life of engine oil, generating less waste oil and fewer waste filters.

TFS have pioneered the use of hybrid-electric vehicles for emergency response purposes. Changing from conventional "Police pursuit" vehicles to hybrid SUVs has meant a significant increase in fuel mileage and a large reduction in carbon dioxide emissions. To date, TFS has purchased nine hybrid vehicles.

These nine hybrid SUVs replaced nine large sedans used by fire officers to respond to emergency calls throughout the City in 2006. This has reduced the use of fuel and reduced emissions. These nine vehicles saved approximately $14,738 in gas costs annually compared to continued use of the large sedans. They also reduce emissions by 53.5 tonnes of eCO_2 and 1.9 tonnes of combined Criteria Air Contaminants (NO_X, SO_X, CO, VOC and PM_{10}) annually compared to continued use of the nine large sedans.

A number of local departments have followed our lead in converting to this vehicle. Two additional benefits to the hybrid system are; the fact they get better mileage in **city** driving than on highway, and the "all wheel drive" nature of the system removes the annual requirement to install snow tires. All future Senior Officer vehicles and Fire Prevention Officer cars will be purchased as hybrids or ultra-low emission vehicles.

Replacement schedules for certain fluids are now dictated by regular oil analysis, not simply by date or time-span. Aerial ladder hydraulic oil and automatic transmission oils are tested annually to define the requirement for replacement.

The TFS main garage facility purchased a unit designed to crush oil filters to remove almost all of the residual oil in the filter. The remaining steel disc is sent for recycling.

An engine coolant recovery unit has been used for years so coolant can be re-used instead of simply replacing old coolant with new. This unit saves hundreds of gallons of coolant from being disposed of, and saves the cost of new coolant.

TFS Mechanical Division utilizes up to four road service Technicians on a daily basis to allow heavy apparatus and their crews to remain in-service, and in their running area, conserving fuel and pollutants.

TFS have drafted an "idle policy" for the front line apparatus (Appendix 1). Emergency operations dictate that it's not always possible to shut the truck off at a scene because of the use of the water pump that could freeze during cold weather and destroy equipment. However there are many instances where it can be done to realize fuel and emission savings.

Planned green fleet initiatives 2008-2011

Toronto Fire Services is committed to greening its fleet operations over the next four years and has planned a number of initiatives for its fleet vehicles.

A more active approach by the Training Division is being developed to reduce the distance staff driving large apparatus are asked to travel to various training events. More training sessions are provided on-line to avoid the need for crews to travel to training centres.

A service bay extension currently being built at Toryork maintenance garage will realize a number of green initiatives;

- Solar panels will be used to generate some of the power required;
- Windows in the face of the building will provide ambient light;
- Mobile truck lifts will continue to be used in lieu of in-ground hoists to eliminate the potential for in-ground hydraulic oil leaks;
- High speed roll-doors will be used to contain building heat; and
- A rainwater collection system is being investigated to provide a source for truck power-washing water and a location to dump fire truck water tanks to save wasting hundreds of litres of water during the repair process.

Fire Services plans to purchase the following numbers of ultra-low emission cars and hybrid SUVs over the next four years.

Table 16. Toronto Fire number of planned green vehicle purchases 2008-2011

	2008	**2009**	**2010**	**2011**	**Total**
Ultra-low emission cars	8	8	8	8	32
Hybrid Light SUV	5	0	0	5	10
Total	**13**	**8**	**8**	**13**	**42**

Table 17. Toronto Fire number of planned right-sized and fuel-efficient vehicle purchases 2008-2011

	2008	**2009**	**2010**	**2011**	**Total**
Smaller Sized Pumper Trucks	6	6	TBD	TBD	12
HAZ MAT Truck	0	1	0	0	1
District Chief Vans	1	3	0	5	9
Van for light delivery	1	0	0	0	1
Command Vehicle	1	0	0	0	1
Total	**9**	**10**	**0**	**5**	**24**

All future trucks purchased will have engines that conform to the stricter 2007 emission standards. The benefits are a significant reduction in nitrogen oxides (NO_X) output, and

virtually no particulate discharge. The systems use ultra-low sulphur diesel, with a diesel particulate filter (DPF) in lieu of a conventional muffler to clean the exhaust discharge.

Toronto Fire Services will design and purchase apparatus that are sized to the purpose of the job, and conform to all standards and regulations governing their use. Toronto Fire Services has tested fire trucks that are used in Europe. The European models do not have the hose capacity, on-board water capacity or pumping capacity of North American vehicles and, after extensive testing and adjustments, were found not to be compatible with the protective equipment used by North American fire-fighters.

The size of European vehicles is not much smaller than those in use in Toronto. The width of European vehicles ranges from 92.5 to 98 inches - the width of vehicles in use in Toronto is very similar. In addition, as aerial trucks have been upgraded over the years, the Toronto Fire Service has purchased vehicles that are 10 feet shorter than those in use in 1991 reducing the length of aerial trucks from 52 down to 42 feet. Finally, Fire Services has also researched and purchased vehicles that improved the turning radius of vehicles by more than 25 per cent. Fire Services will continue to seek fuel-efficient, appropriately sized apparatus.

Some of Toronto Fire's planned initiatives are new, and some follow from the City of Toronto Green Fleet Plan 2008-2011, which was adopted by City Council in March 2008. The Green Fleet Plan 2008-2011 sets out 38 actions to green the vehicles and fuels used by City Divisions, led by the Fleet Services Division. Actions from that plan that apply to Toronto Fire's fleet are included below.

Toronto Fire Services will implement the following actions over 2008-2011:

Action: Purchase all future Senior Officer vehicles and Fire Prevention Officer cars as hybrids or ultra low emission vehicles;

Action: Test an eco-friendly auto parts washing machine that uses a warm water-based formula charged with enzymes;

Action: Contain fleet size and purchase fuel-efficient, right-sized vehicles as a standard practice, if they are commercially available and meet operational needs, specifically:

a) Use fleet vehicles strategically, travel fewer kilometres per course for training, increase efficiency in the use of vehicles and delete underused vehicles from the fleet or move them to other operations;
b) Purchase the right size of vehicle for the job, using small vehicles where they meet operational needs; and
c) Purchase the most fuel-efficient vehicle, or lowest-emitting vehicle, that is commercially available and meets operational needs, e.g. more fuel efficient vans for District Chiefs;

Action: Replace the following numbers of vehicles with green vehicles, giving priority to the cleanest technologies: At a minimum, replace 13 vehicles in 2008, 8

vehicles in 2009, 8 vehicles in 2010 and 13 vehicles in 2011;

Action: Work with Fleet Services Division to identify and pilot test promising green vehicles and work with industry to accelerate development and large-scale adoption in Canada by:

a) Actively seeking, pilot testing and incorporating green vehicles into the fleet;
b) Continuing to review the merits and applicability of natural-gas and other alternative-fuel vehicles;

Action: Identify and incorporate devices, equipment and practices that reduce fuel consumption, pollutant emissions and idling by vehicles, such as:

a) Procure LED lights, batteries, inverters, space heaters or other equipment that reduces the need to idle a vehicle for long periods in order to operate lights and other necessary tools and equipment;
b) Investigate the potential to use auxiliary heating systems to protect the fire truck pump and tank from freezing when the main engine is shut down;

Action: Replace the oldest vehicles with cleaner, modern technology by accelerating the replacement of overdue vehicles;

Action: Include in all vehicle procurement specifications green vehicle attributes, such as fuel efficiency and low emissions, and provide an appropriate weighting for these attributes when selecting a product;

Action: Design and purchase fire trucks and other apparatus that are sized to the purpose of the job, and conform to all standards and regulations governing their use;

Action: Use clean sources of energy for vehicles, including biofuels from sustainable feedstocks as they become available, for example ethanol produced from cellulose;

Action: Encourage other municipal and private fleets to green their vehicles by promoting and sharing Toronto's green fleet experience on the organization's website and through government/industry associations and groups;

Action: Promote and enforce the City of Toronto Idle-Free Policy and 10-second idling rule for staff and the Toronto Fire Services Standard Operating Policy for idling emergency vehicles;

Action: Explore the feasibility of making green pool vehicles available to staff who require their vehicle for work;

Action: Investigate and implement ways to reduce the number of work-related vehicle trips taken by staff, such as increasing the use of conference calls and scanners to share information between work sites;

Action: Encourage staff to make sustainable transportation choices on their commute and at home, including by providing information on green vehicles and commuting alternatives to staff;

Action: Promote the organization's green vehicles and fuel efficiency efforts at public events;

Action: Investigate the feasibility and benefit of adopting additional green practices at maintenance facilities;

Action: Investigate the practices used by local, Canadian and international municipal green fleet leaders and incorporate successful practices into the organization's fleet operations where feasible; and

Action: Provide annual updates on progress achieved in meeting the commitments and targets of this Green Fleet Plan for Toronto Fire Services to Community Development and Recreation Committee.

Financial implications of planned green fleet initiatives

Table 18. Toronto Fire financial implications of planned green fleet initiatives

Initiative	2008	2009	2010	2011	Total
Light Fleet:					
Ultra-low emission car purchases, 8 annually	0	0	0	0	0
Ultra-low emission car cumulative fuel savings (i)	($2,524)	($3,010)	($3,712)	($4,096)	($13,342)
Ultra-low emission car net cost	**($2,524)**	**($3,010)**	**($3,712)**	**($4,096)**	**($13,342)**
Hybrid Light SUV, 5 purchases 2008 & 2011 (ii)	$35,000	0	0	$35,000	$70,000
Hybrid Light SUV purchase, 9 in 2006 (iv)	0	0	0	0	0
Hybrid Light SUV cumulative fuel savings (i)	($18,121)	($14,738)	($14,738)	($17,498)	($65,095)
Hybrid Light SUV net cost	**$16,879**	**($14,738)**	**($14,738)**	**$17,502**	**$4,905**
Total net cost for Light Fleet changes (iii)	**$14,355**	**($17,748)**	**($18,450)**	**$13,406**	**($8,437)**
Heavy Fleet:					
Pumper Trucks purchase	$90,000	$90,000	TBD	TBD	$180,000
HAZ MAT Truck purchase	$15,000	0	0	0	$15,000
District Chief Vans purchase (v)	TBD	TBD	TBD	TBD	0
Van for light delivery purchase (v)	0	0	TBD	TBD	0
Command Vehicle purchase	$10,000	0	0	0	$10,000
Heavy Fleet Training related fuel savings (vi)	($12,040)	($12,040)	($12,930)	($14,270)	($51,280)
Total net cost for Heavy Fleet changes	**$102,960**	**$77,960**	**($12,930)**	**($14,270)**	**$153,720**
Total net cost for Light & Heavy fleet changes	**$117,315**	**$60,212**	**($31,380)**	**($864)**	**$145,283**

(i) Assume gasoline prices of $1.35/L in 2008-09, $1.45/L in 2010 and $1.60/L in 2011.
(ii) Assume $7,000 premium on hybrid light SUV over business-as-usual. Ultra-low emission cars do not have the premium cost of a hybrid vehicle and will not involve a price premium.
(iii) All costs are net based on the incremental cost of purchasing hybrid vehicles, less fuel cost savings, taking available rebates into account.
(iv) Only the fuel savings are listed for vehicles purchased in 2006.
(v) TFS are investigating the use of more fuel-efficient vans in lieu of larger diesel vans for use as District Chief vehicles and light delivery vehicles .
(vi) Fuel savings only relate to a reduction in kilometres travelled for training; fuel efficiency savings are not yet included for the heavy fleet. Engine manufacturers are forced to meet tougher emission standards for 2010 model engines. The method to meet these standards and the cost implications are still in development.

Emission reductions from planned green fleet initiatives

In 2007 Toronto Fire Services reduced trucks traveling to training sessions during rush hour as a result of 24-hour shift. There are sixteen heavy trucks per day, 365 days per year that are now not traveling to training events during rush hour traffic. This saves rush-hour idling and slow driving time of 15 minutes to training and 15 minutes back from training. These savings will be found in 2008 and are estimated at 9,000 km less heavy truck travel per year, or a reduction of 10 tonnes of eCO_2.

In addition, the implementation of mandatory training in a 24-hour shift reduces heavy trucks from having to drive to training at the Fire Academy. Small vehicles are now used to travel to training sessions. Heavy truck trips are reduced by five trucks per day, five days per week for 52 weeks, with one hour commuting per truck. We are saving per course on distance from each fire hall to the Fire Academy on Eastern Ave. The average distance for traveling from 82 fire stations is 13.5 km to Eastern Avenue. It is estimated that we have reduced heavy truck travel time by 17,700 km per year with this initiative, or 19 tonnes of eCO_2. However future savings will be impacted by planned mandatory training courses.

The following chart provides an outline of the reduction in pollution emissions:

Table 19. Toronto Fire greenhouse gas emission reductions from planned green fleet initiatives for 2008 to 2011 (tonnes eCO_2)

	2008 (tonnes)	**2009 (tonnes)**	**2010 (tonnes)**	**2011 (tonnes)**	**Total (tonnes)**
Ultra-low emission cars & Hybrid Light SUV	11.3	17.1	23.7	34.8	87.0
Hybrid Light SUV's purchased in 2006 (i)	53.5	53.5	53.5	53.5	214.0
Reduced heavy truck travel to training sessions	29.1	29.1	29.1	29.1	116.4
10% Ethanol in Gasoline	44.7	44.7	44.7	44.7	178.8
Total reductions (tonnes eCO_2)	**138.6**	**144.4**	**151**	**162.1**	**596.16**

(i) Reductions of 1.9 tonnes of combined Criteria Air Contaminants (NO_X, SO_X, CO, VOC and PM_{10}) also result annually.

Monitoring and reporting

Updates on implementation of Toronto Fire's green fleet plan will be reported annually to Community Development and Recreation Committee.

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William Stewart
Fire Chief,
Toronto Fire Services

EMERGENCY MEDICAL SERVICES
GREEN FLEET PLAN 2008-2011

Introduction to Emergency Medical Services

Toronto EMS provides emergency medical response for the City of Toronto: a service district encompassing 650 square kilometres with a daytime population of 3.5 million people. This makes Toronto EMS the largest municipal paramedic ambulance service in Canada, and one of the most comprehensive pre-hospital emergency care systems in the world.

Current fleet vehicle inventory

Table 20. EMS current fleet vehicle inventory (as of June 2008)

Type	Purpose	Number
Ambulances	Transport	146
Antique Ambulances	Display vehicles	3
Bicycles	Emergency Response	15
Buses	Multi-Patient Transport	4
Carts/Utility	Special Event Response	9
Pick-ups Trucks	Snow Removal/Operational Support	9
Sedans	Administrative/Operational Support	18
SUVs	Emergency Response	56
Trailers	Operational Support	4
Trucks	Operational Support/Logistics	8
Vans	Operational Support	11
Total		**283**

Existing green fleet initiatives

Over the last few years, EMS has been converting its fleet of diesel ambulances to gasoline. This initiative is leading the industry as other services are following the developments in Toronto very closely. As a result of using gasoline ambulances, the particulate emissions associated with diesel fuel have been eliminated. There have been fuel cost savings as well since diesel prices have been averaging 9 cents/litre more than

gasoline through the first half of 2008 according to the Ontario Ministry of Energy and Infrastructure. In 2007 and 2006, the price of diesel and gasoline was more comparable.

In addition, EMS has been dispensing ethanol-enriched gasoline (E10 is a 10% ethanol to gas mixture) at headquarters since 2006. The Provincial requirement for ethanol in gasoline was introduced in 2007 at E5.

The EMS Paramedic Bike program responds to 500 calls per year, eliminating emissions from emergency response vehicles.

Last, EMS is participating in educational opportunities such as the Green Fleet Expo (GFX) to inform other services about the use of biofuels.

Planned green fleet initiatives 2008-2011

As the largest EMS service in Canada, Toronto is uniquely positioned to provide leadership to other EMS fleets. In 2008, Toronto will complete its replacement of diesel, transport ambulances with gasoline vehicles running on ethanol-enriched gas at which point the entire ambulance fleet will be using gasoline.

Looking forward, Toronto EMS will investigate the suitability of introducing hybrid sedans in 2008 and hybrid SUVs for its fleet starting in 2009. In addition, staff will investigate other opportunities to green the fleet as new products are introduced to the marketplace such as hybrid/hydrogen ambulances.

Over the next six years, Toronto EMS will be pursuing the following green fleet acquisitions and supporting the work of Fleet Services Division on greening the City's fleets.

Table 21. EMS green fleet acquisitions (planned, pending investigation and funding approval)

Initiative	2008	2009	2010	2011	2012	2013	Total
Hybrid Sedan	4	3	3	3	3	3	19
Hybrid SUV	0	8	8	8	8	8	40
Hybrid Ambulance	0	TBD	TBD	TBD	TBD	TBD	TBD
Hydrogen Ambulance	0	TBD	TBD	TBD	TBD	TBD	TBD
Ethanol Gasoline	YES	YES	YES	YES	YES	YES	N/A

Source: EMS Service Plan 2009

The City of Toronto's corporate Green Fleet Plan for the next four years was unanimously approved by City Council in March 2008. The Plan includes 38

recommendations encompassing vehicles, fuels, sustainable choices and maintenance and management practices. Most of the actions are unique to Toronto's core fleet but some have direct applicability for EMS. These actions have been adapted to suit EMS's fleet, and are included below.

Toronto EMS plans to implement the following actions between 2008 - 2011:

Action: Work with the Province of Ontario, Toronto Fleet Services Division and industry in an effort to identify and pilot test hybrid (electric and hydraulic), full electric, hydrogen/fuel cell and fuel-conserving ambulances and equipment as they become available provided they meet operational needs and regulation;

Action: In 2008, complete the replacement of diesel, transport ambulances with gasoline vehicles running on ethanol-enriched gas;

Action: Purchase fuel-efficient, right-sized vehicles as a standard practice, if they are commercially available and meet operational needs and regulation as outlined in the Ontario Provincial Land Ambulance and Emergency Response Vehicle Standard Version 4.0, specifically:

a) Reduce the number of kilometres travelled where possible, use vehicles more efficiently and rotate underused vehicles through the fleet;
b) Purchase the right size of vehicle for the job, using small vehicles where they meet operational needs and applicable regulation; and
c) Purchase the most fuel-efficient vehicle, or lowest-emitting vehicle, that is commercially available and meets operational needs and applicable regulation;

Action: Attempt to replace (where appropriate vehicles are available) the following numbers of vehicles with green vehicles, giving priority to the cleanest technologies: Planned vehicle replacements are as follows provided they meet operational needs and applicable regulations: 4 vehicles in 2008, 11 vehicles in 2009, 11 vehicles in 2010 and 11 vehicles in 2011;

Action: Work with Fleet Services Division to identify and pilot test promising green vehicles and work with industry and government to accelerate development and large-scale adoption in Canada by:

a) Actively seeking, pilot testing and incorporating green vehicles into the fleet provided they meet operational needs and applicable regulations;
b) Continuing to review the merits and applicability of alternative-fuel vehicles such as but not limited to natural gas;

Action: Identify and incorporate devices, equipment and practices that reduce fuel consumption, pollutant emissions and idling by vehicles, such as procure LED lights, batteries, inverters, space heaters or other equipment that reduces the need to idle a vehicle for long periods in order to operate lights and other necessary tools and equipment provided they meet regulation and can be certified;

Action: Include in all vehicle procurement specifications green vehicle attributes, such as fuel efficiency and low emissions, and provide an appropriate weighting for these attributes when selecting a product, provided they meet regulation and can be certified for use in emergency vehicles;

Action: Use clean sources of energy for vehicles, including biofuels from sustainable feedstocks as they become available, for example ethanol produced from cellulose;

Action: Encourage other municipal and private fleets to green their vehicles by promoting and sharing Toronto's green fleet experience on the organization's website and through government/industry associations and groups;

Action: Support the City's cycling initiative by incorporating the use of paramedics on bicycles where operationally feasible;

Action: Promote the City's Idle-Free Policy and 10-second idling rule for staff (noting exceptions from the policy such as emergency vehicles);

Action: Explore the feasibility of making green pool vehicles available to staff who require their vehicle for work;

Action: Investigate and implement ways to reduce the number of work-related vehicle trips taken by staff, such as using transit and increasing the use of conference calls and scanners to share information between work sites;

Action: Encourage staff to make sustainable transportation choices on their commute and at home, including by providing information on green vehicles and commuting alternatives to staff;

Action: Promote the organization's green vehicles and fuel efficiency efforts at public events;

Action: Investigate the feasibility and benefit of adopting additional green practices at maintenance facilities such as recycling;

Action: Investigate the practices used by local, Canadian and international municipal green fleet leaders and incorporate successful practices into the organization's fleet operations where feasible; and

Action: Provide annual updates on progress in implementing the Green Fleet Plan for EMS to the Community Development and Recreation Committee.

Financial implications of planned green fleet initiatives

As part of the Service Plan exercise in June 2008, EMS proposed the vehicle acquisitions in Table 21 in order to support the priorities of City Council related to climate change. Table 22 below summarizes the estimated cost of the hybrid vehicle purchases factoring in anticipated fuel cost savings, rebates and contributions to reserve.

Table 22. EMS financial implication of planned green fleet initiatives

	2008 ($000s)	**2009** ($000s)	**2010** ($000s)	**2011** ($000s)	**Total** ($000s)
Hybrid Sedans *(# of vehicles for replacement)*	*(4)* $24.0	*(3)* $18.0	*(3)* $18.0	*(3)* $18.0	*(13)* $78.0
Hybrid SUVs *(# of vehicles for replacement)*		*(8)* $80.0	*(8)* $80.0	*(8)* $80.0	*(24)* $240.0
Fuel Savings (Sedans & SUVs)	($2.8)	($16.1)	($28.7)	($44.2)	($91.8)
Sub-total	**$21.2**	**$81.9**	**$69.3**	**$53.8**	**$226.2**
Additional Costs:					
Contribution to EMS Vehicle Reserve *(Cost to replace vehicles in approximately 8 years)*	$3.0	$12.3	$12.3	$12.3	$39.9
TOTAL COST (Gross)	**$24.2**	**$94.2**	**$81.6**	**$66.1**	**$266.1**

(i) Incremental cost over regular vehicles: Hybrid Sedan $6,000; Hybrid SUVs $10,000, net of rebates of $2,000 Provincial and $2,000 Federal in 2008, $2,000 Provincial-only in 2009, 2010 and 2011 unknown.
(ii) Gasoline prices estimated at $1.35/L in 2008-09, $1.45/L in 2010 and $1.60/L in 2011.

Emission reductions from planned green fleet initiatives

Starting in 2008, EMS will investigate the replacement of four large, conventional sedans with smaller hybrid-electric sedans. A 2008 model hybrid sedan can emit 2,448 fewer kilograms of eCO_2 than the 2008 conventional sedan and uses 1,020 litres less gasoline to travel 20,000 kms. At $1.35/litre, each hybrid is estimated to save $688 in fuel costs for half a year in 2008.

Starting in 2009, EMS will investigate the replacement of eight conventional SUVs with hybrid SUVs provided they meet operational needs and applicable regulation. A 2008 model hybrid SUV emits 1,440 fewer kilograms of eCO_2 than the regular 2008 SUV and

uses 600 litres less gasoline to travel 20,000 kms. At $1.35/litre, each hybrid SUV is estimated to save $810 in fuel costs in 2009.

By switching to hybrid sedans and SUVs, EMS could reduce eCO_2 by 147 tonnes between 2008 and 2011. In addition to introducing cleaner vehicles in 2008, EMS plans to use ethanol-enriched gasoline throughout the fleet. Based on 1.8 million litres of projected E5 gasoline use in 2008, the annual eCO_2 emissions reduced from fuel switching from diesel will result in an estimated 259 tonnes of eCO_2 reduction or 7% over the business-as-usual scenario.

Table 23. EMS greenhouse gas emission reductions from each planned green fleet initiative 2008 - 2011

Vehicle	$eC0_2$ reduction 2008 – 2011 (tonnes)
Hybrid sedans	78
Hybrid SUVs	69
Fuel switching from diesel to E5 gasoline	1,034
Total	**1,182**

Source: Based on Office of Energy Efficiency Fuel Consumption Guide for vehicles
Source: Toronto Environment Office for diesel and gasoline emission factors

Table 24. EMS total forecast greenhouse gas emission reductions from planned initiatives 2008-2011 (tonnes eCO_2)

	2008 (tonnes)	2009 (tonnes)	2010 (tonnes)	2011 (tonnes)	Total (tonnes)
Sedans	4.9	17.1	24.5	31.8	78.3
SUVs	0.0	11.5	23.0	34.6	69.1
Fuel	259	259	259	259	1,034
Total	**264**	**287**	**306**	**325**	**1,182**

Monitoring and reporting

Toronto EMS will provide annual updates on the progress of greening the fleet to the Community Development & Recreation Committee. Where possible, EMS will do so with Fleet Services Division in a coordinated way.

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Bruce K. Farr
Chief & General Manager,
Emergency Medical Services

TORONTO **Fire Services**

Standard Operating Policy

From:	Fire Chief	**File as:**	**A-IDLE**
Effective Date:	2008 September 01	**Rescinds:**	2004 October 27
Subject:	**Idling Apparatus, Vehicles and Water Craft**		
Attachments:	None		
Related SOG/P:	A-PARK — *Parked or Unattended Apparatus/Vehicles* P-SHOP — *Shopping*		

Purpose: To provide all Toronto Fire Services personnel a policy relating to TFS apparatus, vehicles and water craft left idling.

Responsibility: Drivers are responsible for understanding and adhering to the idling policy.

Company Officers are responsible for ensuring Drivers/Operators follow the by-law outlined in this policy.

Platoon and Division Chiefs are responsible for answering questions related to the specifics of fire operations during smog alerts and ensuring personnel follow this policy.

Policy:

0.0 Overview

0.01 This policy is intended to reduce unnecessary idling of TFS vehicles, to reduce the amount of carbon dioxide and smog pollutants released into the atmosphere.

1.0 Definitions

Idling: *Parking a vehicle and keeping it running while it is not operational or performing a job function.*

10 second rule: *If stopped for more than 10 seconds a vehicle shall be turned off. Ten seconds of idling uses the same amount of fuel as stopping and starting a vehicle.*

Warm-up time: *The time needed for a vehicle to be at an operational temperature.*

Carbon dioxide: *Carbon dioxide (CO_2) is a "greenhouse gas" which is causing global climate change. Vehicle emissions are the largest source of greenhouse gases in Toronto.*

Smog pollutants: *Vehicles emit a mixture of pollutants that contribute to smog formation, poor air quality and health problems such as asthma symptoms and breathing problems.*

It is recognized that this guideline may not address all circumstances. Conditions may exist that shall require reasonable discretion on the part of the Officer In Charge. Decisions should always take into consideration the safety of the public and Toronto Fire Services personnel.

2.0 Stationary Vehicle

2.1 Toronto Fire Services uses the 10 second rule for vehicle idling.

2.2 Drivers and Company Officers shall do the following:

(a) Abide by the 10 second rule;

- if stopped for more than 10 seconds in a non-operational setting, turn the vehicle off.

(b) Follow these warm-up times for vehicles when not required for emergency response:

(i) Heavy duty Fire apparatus:

- Above 0°C: 3 to 5 minutes
- Below 0°C: 3 to 5 minutes

(ii) Light duty vehicles (cars, vans, light trucks, etc.):

	Gasoline Engines	**Diesel Engines**
Above 0°C	10 seconds	10 to 30 seconds
Below 0°C	10 to 30 seconds	30 to 60 seconds

2.3 TFS vehicles shall not be left idling while the vehicle is stationary for any significant period of time.

> *No person shall cause or permit a vehicle or boat to idle for more than three (3) minutes in a sixty-minute period.*[1]

2.4 Although there are some exemptions for emergency vehicles, in accordance with the City's idling by-law, TFS vehicles shall be shut down when stationary and not in traffic for more than three (3) minutes. The exemptions are the following:

> *...does not apply to:*
> *(a) Police, fire or ambulance vehicles or boats while engaged in operational activities, including training activities, except where idling is substantially for the convenience of the operator of the vehicle or boat.*
> *(b) Vehicles and boats assisting in an emergency activity.*[2]

2.5 TFS vehicles are not to remain idling for extended periods of time unless inclement weather is a factor. Additional exemptions in the City by-law include the following:

> *Vehicles or boats when the ambient temperature inside a vehicle...is:*
> *(a) More than twenty-seven degrees Celsius (27°C.); or*
> *(b) Less than five degrees Celsius (5°C.).*[3]

[1] City of Toronto, By-law No. 673-1998-2.(1).
[2] City of Toronto, By-law No. 673-1998-2.(2).
[3] City of Toronto, By-law No. 673-1998-2.(2)(m)(a)-(b).

2.6 Stationary apparatus shall have batteries turned to the ON position when radio and/or clearance/marker lights are required.

2.7 TFS vehicles within the City are to be in compliance with this by-law.

2.8 Company Officers shall ensure this policy is followed by personnel.

2.9 Platoon Chiefs and District Chiefs shall do the following:

(a) Ensure their staff are aware of the policy
(b) Educate and inform drivers when they are spotted idling in non-operational situations
(c) Post information relating to the *Idle-Free* policy in all TFS workplaces.

2.10 Platoon and Division Chiefs are responsible for answering questions related to the specifics of fire operations during smog alerts and ensuring personnel follow policy.

3.0 Emergency Incident

3.1 TFS vehicles shall be idling at any time that emergency lights are required for the incident.