

# Green Fleet Strategy

Driving Peel toward reduced fleet emissions



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# Readers Note

The Green Fleet Strategy has been developed using information from a large technical review and report that was completed in 2017. The technical review supported the recommended approach, work plan, and 15 preliminary recommended Strategy actions. The technical document is available by request to anyone who is interested in learning more about the background review.

# Executive Summary

The Region of Peel is one of the fastest growing municipalities in Ontario, with a population of over 1.4 million people and is comprised of the City of Mississauga, the City of Brampton and the Town of Caledon.

The Region has recently launched its revised Strategic Plan (2015-2035), which consists of three Areas of Focus for Peel's 20 year Strategic Objectives and four year Term of Council Priorities (TOCP). One of the current TOCPs is to 'Adapt To and Mitigate the Effects of Climate Change'.

The Region's Corporate Greenhouse Gas (GHG) inventory consists of three primary streams. Of the overall Fleet emissions of 23% (which is inclusive of all Regional business areas and employee mileage), only 13% is applicable to the fleet focused on for this Strategy which excludes Peel Police.

This Green Fleet Strategy has been developed with initiative options and their quantified potential impact on fleet GHG emission reduction, forecasted to 2050 based on currently available technologies and best estimates related to emerging technologies and fuels. This Strategy is intended to provide a strategic roadmap to guide the Region with actions in its efforts to reduce fleet emissions and forms part of the overall action plan for reducing Peel's corporate GHG emission profile which will be included in the Climate Change Master Plan currently in development and expected to be complete by the end of 2018.

Peel's fleet across the corporation (excluding Peel Police) is comprised of approximately 700 vehicles including light-duty, medium-duty, and heavy-duty and an additional 465 pieces of equipment. In 2016, the fleet related emissions accounted for 10,181 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) of the overall corporate GHG emission profile of approximately 77,000 tCO<sub>2</sub>e.

Peel's historical fleet related GHG emissions have steadily risen with enhancements to Regional services and greater demands for fleet vehicles to deliver on the operational expectations across the organization. Prior to undertaking the Strategy, various emission reduction opportunities (such as the use of hybrid vehicles) in the fleet have been successful in an emission avoidance of 1,570 tCO<sub>2</sub>e or a cumulative percentage of 13% since 2010. This emission avoidance while positive is not significant enough to align to the corporate reduction target and based on projections will not be successful in overcoming fleet demands in the future.

To address the reality of the fleet GHG emission forecast, a more aggressive approach needs to be taken to align to the corporate target and position the Region for future emission reduction success. In 2017, baseline research and analysis, stakeholder engagement and consultant supported review of available options was undertaken. There were several potential scenarios developed of fleet composition options over time that were compared to a business as usual (BAU) scenario if no initiatives were implemented by Peel.

Of these scenarios, there is one that was determined as a balanced approach to fleet greening based on current estimates and forecasts and available fuels and vehicle technologies. This scenario focuses on the introduction of battery electric vehicles (BEV's), flex-fuel capable vehicles that can use high

ethanol fuel (E85) and biodiesel (B20) in the short-term (2018-2022) Strategy implementation phase. In the medium-term (2023-2027) implementation phase the fleet composition is recommended to continue to transition to high ethanol fuel (E85) in light and medium-duty flex-fuel capable vehicles and to begin to introduce compressed natural gas (CNG) in the medium-duty diesel fleet, battery electric vehicles (BEV's) in the TransHelp fleet and biodiesel (B20) in diesel powered equipment. Long-term (2028-2050) forecasts are challenging to confirm at this time but are anticipated to have the ability to have a high focus on BEV's across many of the light-duty and medium-duty vehicles and renewable natural gas (RNG) in the medium and heavy-duty diesel fleet and diesel powered equipment.

For the preliminary implementation of the Green Fleet Strategy and positioning the Region to achieve the long-term GHG emission reduction targets there are 15 identified actions across five categories that address research and baseline data analysis, consultant review and internal fleet stakeholder engagement.

## 1. Dedicated Resource for the Green Fleet Strategy Implementation

In order to facilitate ongoing development of work plans for the Green Fleet Strategy and their implementation, a dedicated resource is a recommended approach to implement the required actions of the Strategy. This resource would be the centralized coordinator of all Green Fleet Strategy activities, research and pilot studies and responsible to align stakeholder groups across the organization toward achieving the Strategy objectives and targets.

Action 1 Obtain a dedicated resource for continued work plan development and implementation of the Green Fleet Strategy.

## 2. Fleet Monitoring and Data Analysis

An important aspect of understanding Peel's fleet and opportunities for efficiencies is the ability to gather and monitor relevant statistics to its operation. In 2016, an Automatic Vehicle Location (AVL) initiative was undertaken by the Operations Support Division to begin to gather and assess vehicle data. This type of vehicle technology can offer great insight into the fleet and offer opportunities to focus efforts in the areas where environmental and cost saving benefits can be achieved. Similar systems are used in the Peel Paramedic and TransHelp fleets. Recent vehicle data collected indicates that there is an opportunity to reduce unnecessary idling in fleet vehicles to save GHG emissions and fuel costs.

In addition to AVL data, a significant number of kilometers are driven by Regional employees for business purposes using their own personal vehicles which are reimbursed by the Region. These reimbursed kilometers are captured as part of Peel's corporate emission reporting and are contributing over 600 tCO<sub>2</sub>e annually to emissions related to Peel's operations. There may be an opportunity to reduce these emissions through an enhanced Regional vehicle pool of fuel efficient vehicles and through corporate initiatives such as Workplace Modernization.

Action 2 Evaluate available AVL and other fleet data to refine the types of vehicles and conditions that lead to excessive idling in Peel's fleet. This will allow us to identify vehicle utilization trends and efficiency opportunities in the fleet related to the number of vehicles and route optimization opportunities to reduce fuel consumption in vehicles used in various Regional operations.

- Action 3      Use excessive idling statistics to identify internal policy refinements and technological tactics to reduce idling in the fleet.
  
- Action 4      Gather and refine the data on the number of kilometers driven related to Peel’s employee personal vehicle business travel. Identify opportunities to reduce these kilometers through an enhanced Regional vehicle pool of high fuel efficient vehicles or other relevant tactics.

### 3. Alternate and Renewable Lower-Carbon Fuel Research and Transitioning

Within the current fleet, there are opportunities to pilot and evaluate lower-carbon fuel alternatives that can provide GHG emission reduction in the near-future. In the medium-term (2023-2027) and long-term (2028-2050) alternate fuels will form an important component of achieving the Strategy GHG emission reduction targets. These emerging fuels and vehicle technology will continue to be evaluated for their feasibility and large-scale applications in the fleet and currently includes the following options for further research:

#### Short-Term (2018-2022)

- Ethanol (E85) blends of fuel
- Biodiesel (B20) blends of fuel

#### Medium-Term (2023-2027) to Long-Term (2028-2050)

- Ethanol (E85) blends of fuel
- Biodiesel (B20) blends of fuel
- Compressed Natural Gas (CNG)
- Renewable Natural Gas (RNG)

- Action 5      Evaluate and introduce pilot studies of alternate lower-carbon fuels for select vehicles in the fleet. This may include the trial of higher blend ethanol fuel and biodiesel blends based on seasonality considerations for select fleet vehicles across light, medium, and heavy-duty vehicle classes.
  
- Action 6      Evaluate larger-scale lower-carbon fuel transitions in Peel’s fleet based on the results of the alternate fuel pilot studies. Where appropriate, present recommendations to Regional Council for consideration and budget approval.
  
- Action 7      Continue to evaluate medium-term (2023-2027) and long-term (2028-2050) fuel options and evolving vehicle technology for Peel’s fleet that aligns to Peel’s medium and long-term GHG emission targets.

## 4. Procurement Practices, Green Vehicle Specifications and Vehicle Selection Hierarchy

Through the baseline work of the Green Fleet Strategy it was identified that there are opportunities to better align the GHG emission reduction goals with Peel's internal procurement practices. Currently there are limited formal internal processes related to vehicle replacements and acquisitions for the fleet which can be a barrier when looking to influence meaningful GHG emission reduction.

Through research and stakeholder engagement, a vehicle selection hierarchy can be developed for all vehicle classes that ensure future fleet vehicles meet the basic operational requirements for the work while achieving GHG emission reduction benefits.

The development of more formal internal approaches processes to vehicle selection to use with the vehicle selection hierarchy can also support improvement in the green vehicle specifications included in the Region's procurement practices and documents.

Action 8 Through collaboration with fleet stakeholders, develop and launch vehicle selection criteria hierarchies for all vehicle classes across Peel's fleet. Refine and formalize internal vehicle request processes to have an increased focus on environmental objectives that increase vehicle selection dialogue and align to the goals of the Green Fleet Strategy and corporate GHG emission targets.

Action 9 Through collaboration with the Region's Purchasing Department and fleet stakeholders identify vehicle options and specifications that meet operational needs and align to the Region's GHG emission reduction targets. Develop business practice enhancements (for example procurement evaluation matrices) to have an increased environmental focus so that in addition to vehicles meeting the operational needs will also consider vehicle tailpipe and lifecycle emissions.

Action 10 Identify aftermarket technologies, in addition to those available through vehicle manufacturers, which can be applied to various vehicle types and classes in Peel's fleet to achieve GHG emission reduction benefits.

Action 11 Continue to identify and pursue grant funding and incentive opportunities to reduce the capital budget pressure for fleet vehicle acquisitions and related equipment.

## 5. Stakeholder Engagement, Education and Outreach Tactics, and Fleet Operational Best Practices

Internally, Peel has maintained good collaborative working relationships among fleet users but there is an opportunity to increase dialogue with fleet stakeholders on the goals of the Strategy and corporate GHG emission reduction targets. Stakeholder engagement will be vital to achieving many of the identified actions of this Strategy and can only be successful through an increased dialogue with cost centre managers and those that have a strong understanding of the operational requirements of fleet vehicles. Stakeholder operations may also offer overlap opportunities with the Green Fleet Strategy that can be explored through working groups and pilot studies

Education and outreach enhancements and new tactics will be an important component of addressing fleet driver behaviours and understanding how these behaviours can positively or negatively impact the objectives of the Strategy.

Fleet operational best practices are those that address operational fleet needs while balancing environmental benefits and financial implications. Common fleet operational best practices include tactics that reduce unnecessary vehicle trips, the reduction or elimination of underutilized fleet vehicles, modal shift for travel, and employee training enhancements or additions.

Action 12 Identify stakeholders in the organization who will be impacted through the vehicle replacement cycle and that will require new vehicle acquisitions for their operations over the next five years.

Action 13 Form a stakeholder working group with identified stakeholder groups, as a component of advancing the actions of the Green Fleet Strategy. The stakeholder working group will also assist in planning for change management in the fleet, as opportunities are identified and implemented.

Action 14 Develop internally focused education and outreach tactics to reduce excessive idling and improve driving behaviours in Peel's fleet in the short-term (2018-2022), medium-term (2023-2027) and long-term (2028-2050) Strategy implementation phases. This may include an enhancement to driver training education activities and the development of increased driver awareness around idling statistics and impacts on the fleet GHG emission profile. Refine these tactics as necessary to account for change management requirements and achievements toward the corporate and Strategy GHG emission reduction targets.

Action 15 Identify opportunities with stakeholder operations that have the potential to advance the objectives of the Green Fleet Strategy and reduce fleet related GHG emissions. For example, this may include the opportunity to use renewable natural gas produced from anaerobic digestion of the Region's organic waste as a fuel source for Peel's fleet vehicles in the medium and long-term implementation phases.

This Strategy is intended to be a living document that will be reviewed and refreshed every five years to assess progress and future opportunities in the short-term (2018-2022), medium-term (2023-2027) and long-term (2028-2050) implementation phases.

# Section 1

## Background

### 1.1 The Region of Peel’s Strategic Objectives and Alignment to Green Fleet Strategy

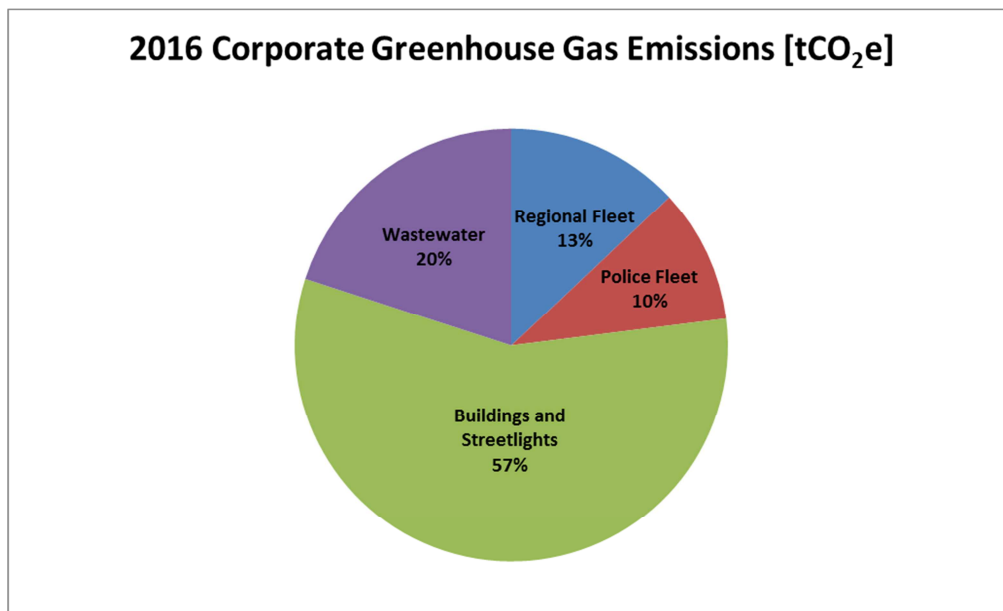
The Region of Peel is one of the fastest growing municipalities in Ontario, with a population of over 1.4 million people and is comprised of the City of Mississauga, the City of Brampton and the Town of Caledon.

The Region has recently launched its revised Strategic Plan (2015-2035), which consists of three Areas of Focus for Peel’s 20 year Strategic Objectives and four year Term of Council Priorities (TOCPs). One of the TOCPs is to ‘Adapt To and Mitigate the Effects of Climate Change’. To guide the Region of Peel in its efforts to reduce GHG emissions related to its internal operations, this Green Fleet Strategy has been developed with initiative options and their quantified potential impact on GHG emission reduction, forecasted to 2050 based on currently available technologies. This Strategy is intended to provide a strategic roadmap to guide the Region in its efforts to adapt to and mitigate the effects of climate change through its internal fleet operations.

### 1.2 The Corporate Greenhouse Gas (GHG) Inventory

The Region’s Corporate GHG inventory consists of three primary streams: Buildings and Streetlights, Fleet/Equipment (shown as Regional and Peel Police Fleet), and Wastewater. The overall distribution of these emissions can be seen in Figure 1. This Strategy focuses on the Regional Fleet as the Peel Police are exploring their fleet greening opportunities independently.

FIGURE 1 – Peel Corporate GHG Emissions (2016)



Peel’s fleet across the corporation (excluding Peel Police) is comprised of approximately 700 vehicles including light-duty, medium-duty, and heavy-duty and an additional 465 pieces of equipment.

In the Region of Peel, the ‘Adapt To and Mitigate the Effects of Climate Change’ Term of Council Priority sets an overall corporate emission reduction target of 80 percent reduction below 1990 emission levels by 2050.

Similar to other municipal peers, the Region of Peel is taking a leading role to demonstrate its commitment to implement initiatives that reduce the negative impacts of GHG emissions both locally and globally from its corporate emissions.

### 1.3 Peel’s Fleet Related GHG Emissions

It is well documented that the impact of transportation systems is a significant contributor to local community emissions and global climate change. While Peel’s corporate emission profile includes other Regional services, operations and facilities, the internal fleet of focus for this Strategy accounts for 13% of the corporate emission profile or the equivalent of 10,181 tonnes of carbon dioxide emissions (tCO<sub>2</sub>e) in 2016. The historical emissions are detailed below in Table 1.

**TABLE 1 – Peel’s Fleet Historical GHG Emissions (excluding Peel Police and Employee Mileage)**

	1990	2010	2013	2014	2015	2016
<b>GHG Emissions (tCO<sub>2</sub>e)</b>						
<b>TOTAL</b>	<b>3,957</b>	<b>6,785</b>	<b>8,723</b>	<b>9,679</b>	<b>9,601</b>	<b>10,181</b>

In 2017, a review of fleet policies, practices and emerging opportunities was started in order to develop and implement a Green Fleet Strategy to build on the emission savings that have been achieved to date in internal fleet operations. This Strategy forms part of the overall action plan for reducing Peel’s corporate emission profile which will be included in the Climate Change Master Plan currently in development.

## Section 2

# Peel's Current State

To support the development of the Green Fleet Strategy, in 2017, the Operations Support Division in partnership with other internal representatives led engagement with a consultant team and stakeholder engagement sessions with internal fleet users and management teams. This was completed in order to gather information on current fleet practices and policies, identify opportunities for efficiencies with internal operations, and review current and emerging technologies that support the overall strategic reduction of GHG emissions from Peel's fleet.

Peel's current fleet emission profile has steadily increased since 2010 when the Region first started to measure its emission impact. In 2010, the Regional emission profile was back casted to estimate the Region's emissions in 1990 (the baseline year). The emission contribution for fleet was estimated to be 3,958 tCO<sub>2</sub>e in 1990 which took into consideration adjustments for services that were not part of Peel's operations at that time.

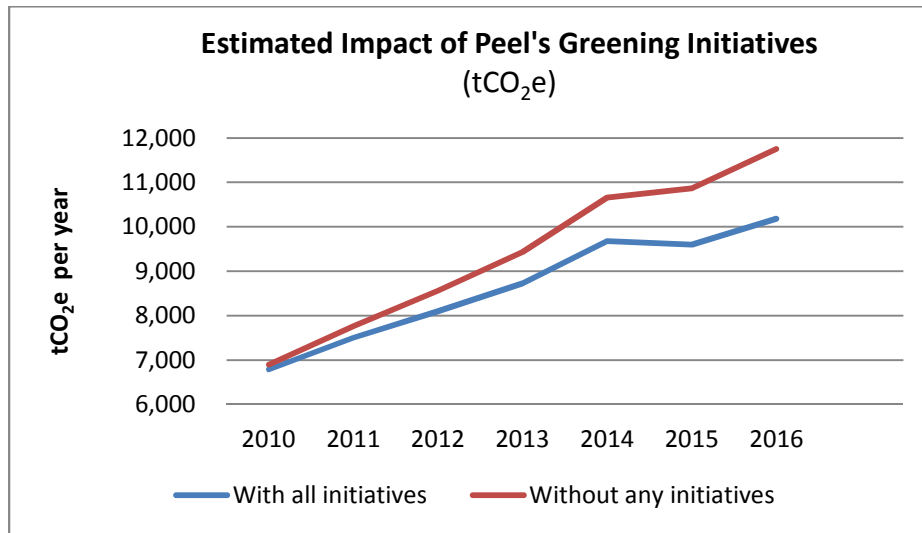
### 2.1 Peel's Historical Fleet GHG Reduction Initiatives

The Region of Peel has historically explored efficiency opportunities and continues to explore opportunities to improve GHG emissions from fleet operations as initiatives become available. This includes piloting and implementing alternate and supplementary technologies to enhance vehicle performance and reduce emissions (e.g. anti-idling devices, LED lighting, lighter vehicle components, etc.), working with client groups to identify and implement the right size vehicle for the operational business needs, introducing hybrid vehicles in the fleet, and the piloting of alternate lower carbon fuel vehicles. These initiatives have resulted in 13% emission avoidance or the equivalent of 1,570 tCO<sub>2</sub>e since 2010 as shown in Table 2 and Graph 1.

**TABLE 2 - Estimated Impact of Peel's Greening Initiatives on GHG emissions (2010 to 2016)**

tCO <sub>2</sub> e	2010	2011	2012	2013	2014	2015	2016
<b>With all initiatives</b>	6,785	7,500	8,100	8,723	9,679	9,601	10,181
<b>Without any initiatives</b>	6,895	7,758	8,562	9,430	10,657	10,867	11,751
<b>Estimated reductions (cumulative)</b>	<b>110</b>	<b>258</b>	<b>462</b>	<b>707</b>	<b>978</b>	<b>1,266</b>	<b>1,570</b>
<b>Estimated reductions as a cumulative percentage</b>	2%	3%	5%	7%	9%	12%	13%

**GRAPH 1 - Estimated Impact of Peel's Greening Initiatives on GHG Emissions (2010 to 2016)**

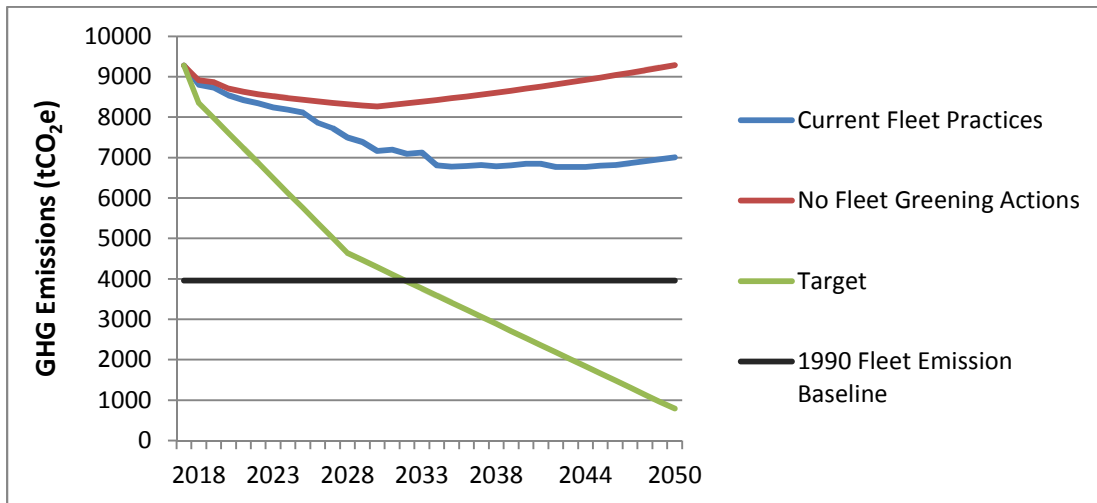


## 2.2 Current Fleet Practice Comparison to Corporate Target

When looking at the current fleet practices and efforts to reduce GHG emissions, while positive, they are not enough in order to achieve significant reductions in Peel's fleet emissions in the longer-term. If comparing a business as usual scenario if no initiatives were implemented to Peel's current fleet practices, there is still a significant gap to the long-term corporate target of 80 percent reduction below 1990 emission levels by 2050. In part, reaching the long-term target is related to future vehicle technology which is not currently available for consideration into the emission reduction forecasts and will improve over time as well as current vehicle technologies that are available in the market but difficult to obtain at this time (e.g. battery electric vehicles).

However, aside from these challenges, Peel will need to take a more aggressive approach to implementing emission reduction initiatives in its fleet for meaningful change and to accelerate the reduction of fleet emissions to achieve the desired long-term corporate target. This comparison is shown in Graph 2.

**GRAPH 2 – Current GHG Projection (Compared to No Fleet Greening Actions, Current Fleet Practice and Fleet GHG Target)\***



\*Includes Fleet growth projections

In the Region of Peel, a small scale biodiesel initiative has been ongoing in the Waste Management Division since 2007. This initiative has resulted in the creation and trial of various blends of biodiesel made from used cooking oil delivered to Peel’s Community Recycling Centre network by residents and small businesses. In 2016, approximately 3,000 litres of biodiesel fuel was made and used in 19 light and heavy-duty vehicles.

In addition to past and current initiatives, recent advancements in vehicle technologies and lower carbon fuel availability now make it possible to achieve substantial emission reductions by implementing available technologies and fuels as vehicles reach the end of their lifecycle if a more aggressive approach is taken. Some of the emerging technologies and practices that have been reviewed and implemented in the past where feasible include data gathering technologies to identify fleet statistics and opportunities, hybrid vehicles, alternate lower carbon fuel pilots, and green vehicle specifications through procurement processes.

### 2.3 Peel’s Fleet and Equipment Composition

As mentioned, Peel’s fleet is comprised of approximately 700 vehicles which are used for various functions and delivery of services across the organization with an additional 465 pieces of equipment. The fleet composition is described below in Table 3 but is regularly changing based on vehicle replacements and new acquisitions as approved through operational planning and the annual budgeting process.

**TABLE 3 - Peel's Current Fleet and Equipment Composition (as of March 2018)**

Vehicle Classification	Unit Count	Example Vehicles and Equipment
Light-Duty Vehicles	614	Passenger Cars, Vans, and SUV's, Ambulances, TransHelp Buses
Medium-Duty Vehicles	38	Construction and Low Profile Dump Trucks
Heavy-Duty Vehicles	58	Dump and Vactor Trucks
Heavy-Duty Equipment	45	Articulated Loaders and Backhoe's
Standard Equipment	420	Forklifts, Generators and Pumps
<b>Total</b>		<b>710 vehicles, 465 equipment</b>

In Peel's fleet there are currently over 50 hybrid light-duty vehicles in use which began in 2004 as this vehicle technology became available in the market. In addition, the Region is working on the procurement of 16 fully electric light-duty cars (BEV) and a potential pilot initiative with seven electric (BEV) or plug-in hybrid electric (PHEV) light-duty pickup trucks (pending market availability).

## 2.4 Preliminary Stakeholder Engagement for the Green Fleet Strategy

To support the development of the Green Fleet Strategy, internal fleet users and stakeholders were consulted on various opportunities in fleet operations and current available vehicle technologies. Stakeholder sessions were held with both front-line representatives from across the Region's internal operations as well as supervisors, managers and director's to determine feasibility of different consultant proposed opportunities for implementation.

Stakeholders were provided information about Peel's historical initiatives and the impact on the fleet emission profile and asked about various opportunities to reduce emissions in fleet operations. Participants were polled on their level of agreement with their individual or sectional ability to reduce fleet related emissions, idling reduction, lower-carbon fuel switching, green vehicle specifications and operational best practices. Participants were also offered the opportunity to identify and discuss additional initiatives and possible challenges.

In general, across fleet users there is strong support to improve fleet emissions and demonstrate the Region's commitment to reducing its impact on climate change. While there are limited formal processes currently in place related to an environmental focus of fleet operations there was consensus to improve processes as appropriate while maintaining the collaborative culture already in place.

### 2.4.1 Idling Reduction Feedback

Fleet users and management staff were asked about possible conditions that may impact vehicle idling in the fleet related to their operations. In some conditions idling may not be completely avoidable (for example in idling to maintain temperatures for medications in the Paramedic fleet) while in other responses the main reasons for idling included cabin comfort and perceived need for idling to maintain the ability to operate on-vehicle equipment. Stakeholders were supportive of reducing idling in the fleet

and identified that vehicles in their operations idled more than 30% of the time based on their experience and that there is an opportunity to reduce the amount of idle time. Stakeholders were also very supportive of the use of anti-idling devices and increased awareness and fact based educational approaches to reducing idle time in the fleet.

Available data suggests that the reduction of idling through a refreshed policy and Automatic Vehicle Location (AVL) data with educational support could be an early and cost-effective opportunity to improve the fleet emission profile in the near future.

### **2.4.2 Alternate and Renewable Lower-Carbon Fuel Feedback**

Both stakeholder groups were supportive of considering and implementing alternate fuels where appropriate. All agreed that the implementation of alternate fuels would need to be supported through feasibility for the operations and business case development for emission reduction and environmental benefits when compared to financial implications.

Stakeholders identified that the use of alternate fuels could be looked at for short-term gains and long-term gains. Some of the fuels (biodiesel and ethanol) are more readily available in the market in the short-term and require less financial and infrastructure considerations for implementation. These were identified as being fuels that could be introduced in the near-future to provide more immediate emission reduction benefits.

Other fuel types (propane, compressed natural gas, renewable natural gas, and hydrogen) were those that stakeholders identified as needing much more research and information on to determine where these applications may be feasible. There was alignment identified for the possible use of CNG in the fleet which could be further supported through RNG available in the future from the processing of Peel's organic waste through anaerobic digestion. These fuel types were determined as longer-term opportunities following full research and business case development.

As the implementation of the Green Fleet Strategy proceeds, short and long-term considerations will be refined to identify upcoming vehicle replacements and acquisitions and where different opportunities could be piloted and evaluated. This will aid in the continued prioritization of short and long-term work and research to support future emission reductions in fleet applications.

### **2.4.3 Green Vehicle Specification Feedback**

In general, stakeholders were supportive of the implementation of green vehicle specifications provided that the vehicles selected are able to meet the operational requirements for the job. This included reviewing procurement practices and specifications to implement more environmental considerations in vehicle selection criteria and matrix ranking for procurement award which prioritized the overall lifecycle emissions of vehicles.

Additional green vehicle specifications included review and confirmation of the required vehicle size with department managers, lighter vehicles, low maintenance demand vehicles, aerodynamic design, and low rolling resistance vehicles.

#### 2.4.4 Fleet Operational Best Practices Feedback

Operational best practices included discussion with stakeholders regarding the use of pooled vehicles to reduce the number of kilometers driven in the Region through personal vehicle use, reducing the number of vehicles on operational job sites where possible, reducing overall number of kilometers driven by fleet vehicles through route optimization, and the implementation of a zero idling policy or refresh of the current anti-idling policy.

Stakeholders were supportive of these tactics and noted that there are opportunities to employ more of the operational best practices in the Region's current and future operations. These opportunities can be explored as the work plan for the Green Fleet Strategy is refined and prioritized through research and further stakeholder engagement.

## Section 3

# Greenhouse Gas Emission Reduction Goals

Corporately, the Region of Peel through its Term of Council Priority to 'Adapt To and Mitigate the Effects of Climate Change' has indicated an overall emission reduction target of 80 percent reduction below 1990 emission levels by 2050. Within the current Term of Council (2015-2018), an overall emission reduction target of 10 percent below 1990 levels by 2019 was set. The Region of Peel has been successful in achieving the 2019 target to date and continues to identify opportunities and strategies to address the 2050 target.

Of the corporate emission profile, fleet accounts for approximately 23% which is inclusive of all Region of Peel fleet activities. For this Green Fleet Strategy, the fleet emission profile captures 13% of the overall corporate fleet activities which does not include any fleet greening initiatives being planned and implemented for Peel Police fleet vehicles.

All initiatives of which this Green Fleet Strategy forms a component, will be included in the Climate Change Master Plan currently in development and anticipated to be complete by the end of 2018.

### 3.1 Green Fleet Strategy Targets

Fleet related GHG emission reduction targets were identified through the baseline technical work conducted to develop the Green Fleet Strategy. The targets were based on the review of current and past initiatives and their impact on the overall fleet emission profile as well as the current and future availability and refinement of vehicle technologies and alternate fuels that can help the Region achieve its long-term targets.

For the target development, the projected 2017 fleet emissions were used to determine the impact of various scenarios and fleet greening initiatives:

- 10 percent reduction of fleet emissions below 2016 levels by 2018
- 30 percent reduction of fleet emissions below 2017 levels by 2023
- 50 percent reduction of fleet emissions below 2017 levels by 2028
- 80 percent reduction of fleet emissions below 1990 levels by 2050

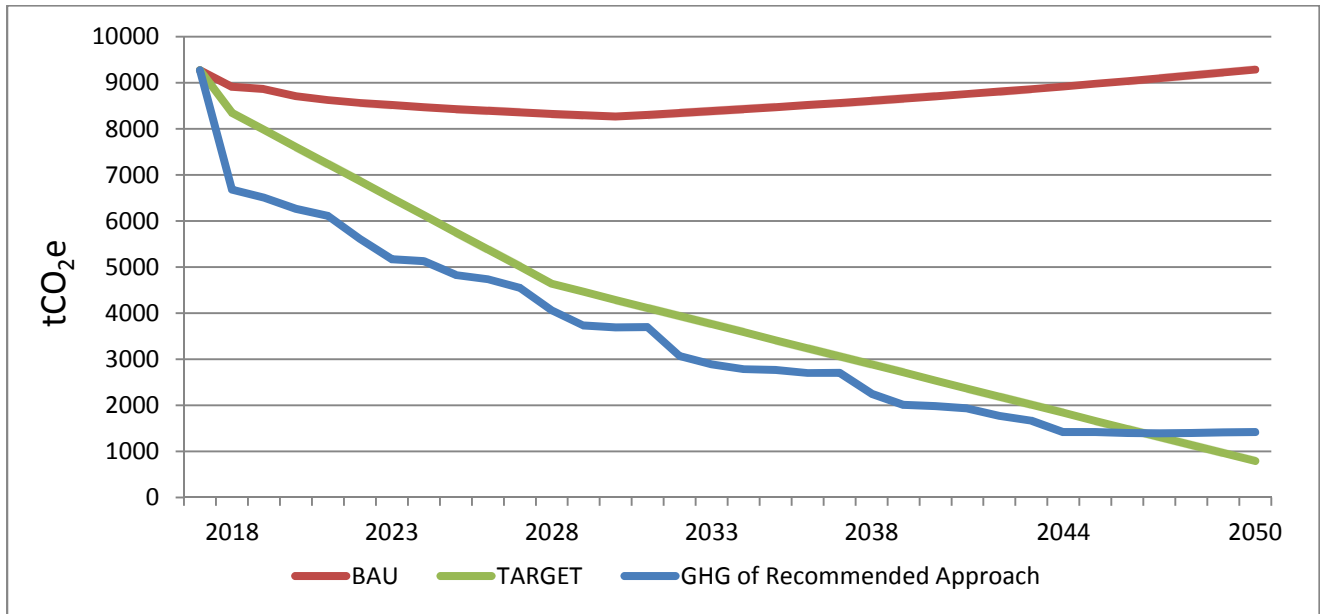
The goals of this Strategy and the recommended approach for implementation are based on those technologies and fuels that are currently available or which will be realistically available as Peel advances to the medium and longer-term phases of Strategy implementation (from 2023-2050).

Fleet technologies, vehicle advancements and alternate fuel types are constantly changing with enhancements and new opportunities emerging regularly. There are upcoming technologies currently at the prototype or pilot stage which may offer opportunities to accelerate the reduction of fleet emissions over the current scenario projections (for example through battery electric light-duty pickup trucks).

Based on the fleet related targets, current available technologies and fuels and the balanced approach that is recommended for the Green Fleet Strategy, the following GHG emission reduction may be possible as shown in Graph 3. It is important to note that based on current fuels and technologies it is not possible to meet the corporate target of 80 percent reduction below 1990 emission levels by 2050. It is

anticipated that over time as emerging technologies are refined and new technologies become available that the corporate target will be achievable.

**GRAPH 3 - GHG Emission Reduction Potential for Recommended Approach**



The Green Fleet Strategy will continue to be reviewed for relevance and updates every five years with regular reporting on outcomes to allow for the ongoing alignment to the interim and long-term corporate and Green Fleet Strategy GHG emission reduction targets.

## Section 4

# Advancements of Available Technologies and Fuels for Fleets

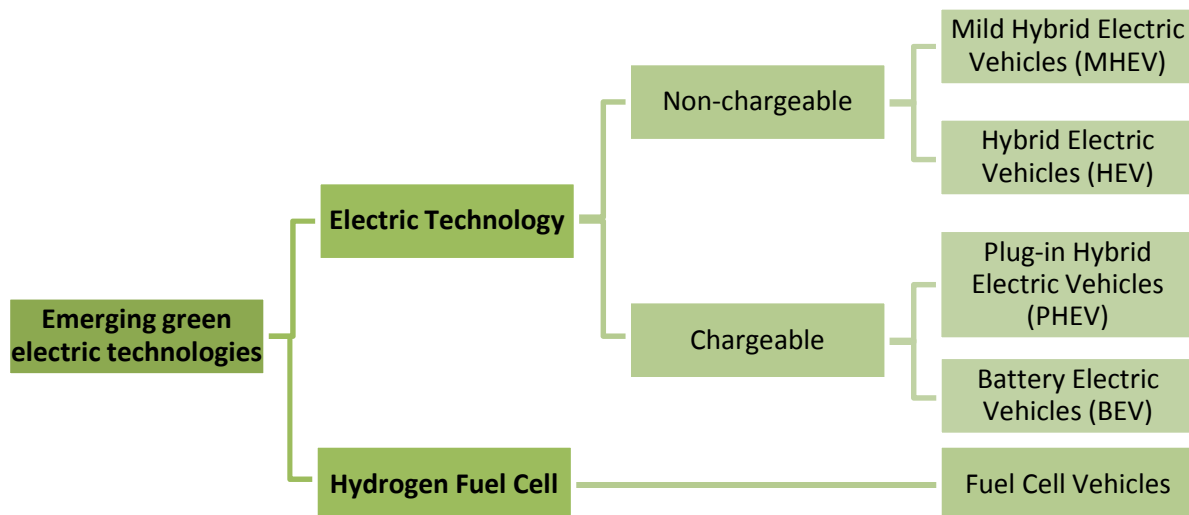
As part of the review of fleet practices, a scan of available technologies to support the reduction of fleet related emissions for Peel was completed. Vehicle technologies are constantly changing however feasible opportunities were identified for further consideration for Peel’s fleet as emerging technologies are refined and become more widely available in the market.

These opportunities include emerging Greening Electric Technologies, Alternative Lower Carbon Fuels, Green Vehicle Specifications, and Fleet Operational Best Practices.

### 4.1 Emerging Green Electric Technologies

Over the past few decades, electric transportation technologies have been rapidly developing and gaining popularity in the market. These technologies offer significantly reduced or no tailpipe emissions and vastly improved energy efficiency. An overview of available technologies is provided in Figure 2.

**FIGURE 2 – Emerging Green Electric Technologies**



#### 4.1.1 Electric Vehicles

There are a number of electric vehicle technologies currently available in the market. They include:

- Mild hybrid electric vehicles (MHEV) are generally vehicles equipped with internal combustion engines and a motor/generator in a parallel combination allowing the engine to be turned off whenever the car is coasting, braking, or stopped and which restart quickly. MHEV do not have an exclusive electric-only mode of propulsion.

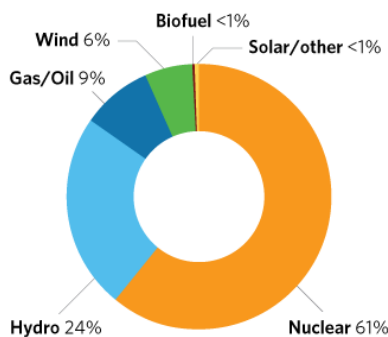
- Hybrid electric vehicles (HEV) use two or more distinct types of power, such as an internal combustion engine and an electric motor which as the modes of propulsion, albeit with very limited range when in electric mode.
- Plug-in hybrid electric vehicles (PHEV) are hybrid electric vehicles that use rechargeable batteries, or another energy storage device, that can be recharged by plugging it in to an external source of electric power. The PHEV travels considerable distances in electric-only mode. Once the battery power is low (usually ~80% depleted), the gasoline internal combustion engine turns on and extends the range. These vehicles typically have the same range as their gasoline counterparts.
- Battery electric vehicles (BEV) or all-electric vehicles, are propelled by one or more electric motors, using electrical energy stored in rechargeable batteries. Compared with cars with internal combustion engines, electric cars are quieter and have no tailpipe emissions. In recent years, BEV range has been extended considerably. This allows for much wider BEV applications in a variety of functions.

#### 4.1.1.1 Ontario Electric Supply

Plug-in hybrid electric vehicles (PHEV) and battery electric vehicles (BEV) require electricity to recharge the batteries therefore electricity is effectively a “fuel” in these types of vehicles. As such, the emissions from producing electricity should be taken into consideration when evaluating the benefits of this emerging technology.

Over the last decade, Ontario has changed from coal, as its source of deriving electricity and replaced this by wind power, solar energy, bioenergy, waterpower, refurbished nuclear and natural gas-fired resources. Ontario currently produces most of its electricity from nuclear sources (61%), followed by hydropower (24%). In addition, presently there are considerable developmental initiatives being taken with natural gas and wind production capacity increases. Please see Figure 3.

**FIGURE 3 - Ontario's Electricity Output by Source (2016)**



Source: IESO<sup>1</sup>

<sup>1</sup> IESO - <http://www.ieso.ca/en/power-data/supply-overview/transmission-connected-generation>

### Vehicle Technologies at a glance

STRENGTHS	MHEV	HEV	PHEV	BEV
Fossil fuel usage	Reduced by about 10%	Reduced by about 30%	Reduced by more than 60%	Eliminated
Tailpipe emissions	Reduced by about 10%	Reduced by about 30%	Reduced by more than 60%	None
Technology's availability today	Yes	Yes	Yes	Yes
Average pricing difference as compared to conventional vehicles	Insignificant (variation <15% of vehicles)	Insignificant (variation <15% of vehicles value)	\$12,200*	\$16,200*

\* Determined using the average price difference of currently available vehicles that are similar to vehicles in the Region of Peel's fleet.

The implementation of chargeable electric vehicles will require the inclusion of fleet charging stations and infrastructure at various Regional locations. Preliminary implementation has already begun with the intention of expanding this infrastructure as the introduction and demand for electric vehicles increases in Peel's fleet. Depending on the future scope of electric vehicles in Peel's fleet and timing, there is the opportunity to phase the introduction of this infrastructure with available grant funding and implement future needs based on the type of charging technology needed.

#### 4.1.1.2 Non-Chargeable Electric Vehicles

Non-chargeable hybrid vehicles (MHEV and HEV) are a good transition technology from gasoline powered vehicles to electric cars as they offer some of the benefits of electric vehicle without affecting the vehicle's range, driver habits (same vehicle fuelling and driving experience) and avoiding driver range anxiety. This makes this technology as a viable alternative to a gasoline powered vehicle if a hybrid counterpart is available. Currently the Peel fleet includes over 50 hybrid vehicles.

Hybrid vehicles typically will cost between \$5,000 and \$7,000 more than comparable gasoline powered vehicles. Given that hybrid vehicles use between 10% and 30% less fuel, any price difference is normally offset by the savings from reduced fuel consumption.

#### 4.1.1.3 Hydrogen Fuel Cells

Hydrogen and fuel cell technology are able to produce electricity with zero tailpipe emissions presenting enormous environmental and sustainable energy benefits. Fuel cells are flexible in size, power density

and application. Canada is one of the world's largest per capita producers of hydrogen and a global leader in the research and development of these technologies.<sup>2</sup>

Although fuel cell technology has been around since 1960, the adaptation of the technology has been fairly slow. Only in recent years, supported by the focus on the zero-emissions technologies, hydrogen fuel cell has regained momentum as leading vehicle manufacturers including Honda, Toyota and Hyundai have launched their first mass-production hydrogen powered vehicles. As of March 2018, this technology is not yet available in Ontario.

Hydrogen is the most abundant element in the universe. It can be produced from a number of sources:

- **Fossil sources** include natural gas, coal and oil
- **Renewable energy sources** such as wind, solar, geothermal and hydroelectric power

Hydrogen also has a potential to be made locally, at large central plants or in small distributed units at or near the point of use.<sup>3</sup>

Although hydrogen vehicles have no tailpipe emissions, currently most hydrogen is being produced from fossil sources. As a result, at this time there are no emissions benefit to switch to a hydrogen powered vehicle, because the lifecycle emissions are the same - or even higher - than those of the conventional fuels. However, the technology has a high potential to be very clean through use of renewable sources such as solar, wind and nuclear power but due to low demand this technology is still too expensive to be commercially viable at this time.

## 4.2 Alternate and Renewable Lower-Carbon Fuels

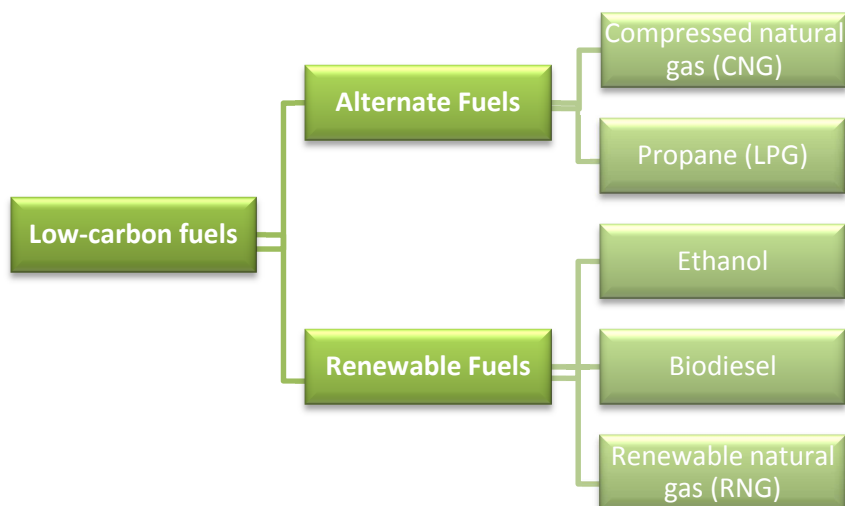
Among all fleet greening options low-carbon fuel switching is among the fastest ways to reduce emissions in the short-term. Low-carbon fuel switching is a process of diverting a fleet's fuel usage away from traditional fossil-based sources to either alternate or renewable energy sources. Figure 4 provides an overview of the lower-carbon fuel alternatives available that can support the reduction of a fleet's GHG emissions.

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<sup>2</sup> Source: <http://www.nrcan.gc.ca/energy/efficiency/transportation/7475>

<sup>3</sup> Source: Canadian hydrogen and fuel cell association - <http://www.chfca.ca/education-centre/where-hydrogen-comes-from/>

**FIGURE 4 – Lower-Carbon Fuel Opportunities**



As awareness of climate change issues increase, the use of low-carbon fuels, particularly renewable fuels, is gaining great interest both globally and domestically. According to the International Energy Agency’s – Canada report, renewable fuel consumption has doubled between 2010 and 2014.<sup>4</sup>

In 2016, the Region of Peel used a combined 4.5 million litres of fuel which was primarily gasoline, diesel and propane. When looking at alternate fuels there are several that have been in use for several years and may benefit through expansion or those that have been trialed in limited applications.

#### 4.2.1 Biodiesel

Biodiesel is a renewable fuel made from virgin feedstocks and also used vegetable oils. Biodiesel can be blended in a variety of ratios with conventional fossil diesel to obtain different blends such as B20 (20% biodiesel) or it can be used in higher blends (more than 20% biodiesel) and B100 (100% biodiesel). In Canada, primary feedstocks for biodiesel are used cooking oil, followed by canola oil and soybean oil.<sup>5</sup> Ontario has set a mandatory minimum content of 4% for diesel fuel that is currently being distributed, used, and sold in Ontario. In 2017, an average of 4% of the total volume of diesel fuel was required to be bio-based. The bio-based diesel component of this blend must have 70% lower GHG emissions than standard petroleum diesel.<sup>6</sup>

It is important to note that manufacturer vehicle specifications, biodiesel limitations and seasonality of use must be taken into consideration when implementing higher biodiesel blends. For the same work performed, the estimated GHG emissions as compared to conventional diesel are as follows:

- B10 – a reduction of 9%
- B20 – a reduction of 19%
- B100 – a reduction of 97%

<sup>4</sup> NRCan: <https://www.nrcan.gc.ca/19445>

<sup>5</sup> 2016 Biofuels in Canada – USDA GAIN report -

[https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual\\_Ottawa\\_Canada\\_8-9-2016.pdf](https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Ottawa_Canada_8-9-2016.pdf)

<sup>6</sup> <https://www.ontario.ca/page/greener-diesel-regulation>

## 4.2.2 Ethanol

Ethanol is obtained from the fermentation of sugar or converted starch contained in grains and other agricultural or agri-forest feedstock. In Canada, ethanol is presently made principally from corn and wheat.<sup>7</sup>

Ethanol is blended with gasoline to produce a fuel, which has environmental advantages when compared to gasoline. Most gasoline-powered vehicles manufactured since the 1980's can run on a blend of gasoline and up to 10 percent ethanol (E10)<sup>8</sup>. Some vehicles (i.e. flex-fuel vehicles) are specially manufactured to operate on an ethanol blend that contains up to 85 percent ethanol and at least 15 percent gasoline (E85). The 15 percent gasoline is needed to assist in engine starting because pure ethanol can be difficult to ignite in cold weather.<sup>9</sup>

According to Federal Renewable Fuels Regulations, gas companies, suppliers and sellers must include the minimum annual amount of ethanol in gasoline they distribute and/or sell. By law, they must maintain at least an annual average of 5% ethanol in the gasoline at all their facilities combined<sup>10</sup>. At the fuelling station, ethanol amounts can vary and most gasoline sold contains up to 10% ethanol.

Ethanol based fuels have a lower energy content than traditional gasoline or diesel. In absolute terms, an ethanol blend of E85 has a GHG emissions reduction potential of 84%. However, given that ethanol has an estimated loss of energy of about 35%, the emissions reduction for the same distance travelled are adjusted to 79% when compared to gasoline.

## 4.2.3 Propane

Propane, or liquefied petroleum gas (LPG), is a clean-burning fuel that can be used to power internal combustion engines. Although propane is a fossil fuel, it is recognized as an alternative fuel under the *Alternative Fuels Act* because of its environmental benefits as compared to conventional fuels. It has been used for the past several decades and is currently the world's third most common transportation fuel after gasoline and diesel<sup>11</sup>. Propane is an efficient and portable fuel composed of carbon and hydrogen atoms that is a derivative of natural gas processing and oil refining. It is a nontoxic fuel and presents no threat to soil, surface water, or groundwater.

In absolute terms, a litre of propane has GHG emissions of about 66% as compared to a litre of gasoline. However, given that propane has an estimated loss of energy of about 30%, the emissions reduction for the same distance travelled are adjusted to 14% when compared to gasoline. On average, vehicle conversion costs to use propane fuel in fleet vehicles are estimated to be approximately \$6,000 per vehicle.

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<sup>7</sup> 2016 Biofuels in Canada – USDA GAIN report -

[https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual\\_Ottawa\\_Canada\\_8-9-2016.pdf](https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Ottawa_Canada_8-9-2016.pdf)

<sup>8</sup> In June 2011, the US EPA approved E15 for use in model year 2001 and newer passenger cars, light-trucks and medium-duty vehicles.

<sup>9</sup> <http://www.nrcan.gc.ca/energy/alternative-fuels/fuel-facts/ethanol/3493>

<sup>10</sup> <https://www.ontario.ca/page/ethanol-gasoline>

<sup>11</sup> [https://www.afdc.energy.gov/fuels/propane\\_basics.html](https://www.afdc.energy.gov/fuels/propane_basics.html)

## 4.2.4 Compressed Natural Gas (CNG) and Renewable Natural Gas (RNG)

Natural gas, a fossil fuel composed of mostly methane, is one of the cleanest burning alternative fuels. It can be used in the form of compressed natural gas (CNG) or liquefied natural gas (LNG) to fuel cars and trucks. Vehicles that use natural gas in either form are called natural gas vehicles or NGV. Natural gas is found in abundance in Canada in porous rock formations. It is extracted from the ground, processed to remove impurities and compressed to be stored and transported by pipeline. Canada is one of the largest producers of natural gas in the world.<sup>12</sup>

An alternative to fossil sources is renewable (also known as sustainable) natural gas (RNG), which is a methane biogas – a gaseous product of the decomposition of organic matter obtained through biochemical process such as anaerobic digestion. New natural gas vehicles for fleets typically cost between \$15,000 and \$45,000 more than conventional diesel fleet vehicles (based on truck classes 7, 8 and 9)<sup>13</sup>. Light-duty trucks conversions cost about \$6,000 or more per vehicle<sup>14</sup>. The higher initial investment/conversion costs for CNG fleet vehicles are typically offset by the fuel cost savings from using CNG natural gas over diesel or gasoline. The use of CNG or RNG would also require infrastructure and facility upgrades for larger scale implementation. There are currently government incentives available to support conversion costs for natural gas vehicles through the Ontario Green Commercial Vehicle Program which can be further explored as part of research and business case development.

Based on the same work performed, a natural gas vehicle has fewer emissions to a comparable diesel vehicle. For compressed natural gas the GHG reduction potential is 13% but for renewable natural gas the GHG reduction potential increases to approximately 79%.

Consideration for implementation of natural gas vehicles in Peel's fleet would need to be supported through strong business cases that consider the source of natural gas, lifecycle fuel costs, infrastructure requirements, available incentives, and overall emission reduction potential.

## 4.2.5 Comparison of Fuel GHG Emission Reduction Potential

As described, there is various GHG emission reduction possibilities depending on the fuel type used. When considering comparing fuel performance to traditional gasoline or diesel vehicles the following GHG emission reductions may be possible as shown in Table 4.

In some cases, the energy output per unit of fuel is less than that of the traditional fuel source which is noted where applicable. Because of this, the overall emission reduction potential may be impacted due to more fuel being used for the same amount of distance travelled which has been adjusted in the table below.

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<sup>12</sup> <http://www.nrcan.gc.ca/energy/alternative-fuels/fuel-facts/natural-gas/3525>

<sup>13</sup> Closing the Loop, a primer for municipalities; consultations with *Change Energy*.

<sup>14</sup> NRCan: <http://www.nrcan.gc.ca/energy/alternative-fuels/fuel-facts/natural-gas/3527>

**TABLE 4 - Comparison of Alternate and Renewable Fuels and the Potential GHG Emission Impact**

<b>Fuel</b>	<b>Traditional Fuel Source (as comparison)</b>	<b>Adjusted Emission Reduction Potential (%)</b>	<b>Energy Loss and Percentage</b>	<b>Vehicle Conversion Costs</b>
Ethanol (E85)	Gasoline	79%	Yes, 35% less energy per fuel unit	No
Propane	Gasoline	14%	Yes, 30% less energy per fuel unit	Yes
Biodiesel (B10)	Diesel	9%	Marginal	No
Biodiesel (B20)	Diesel	19%	Marginal	No
Biodiesel (B100)	Diesel	97%	Marginal	No
Compressed Natural Gas (CNG)	Diesel	13%	No	Yes
Renewable Natural Gas (RNG)	Diesel	79%	No	Yes

### 4.3 Green Vehicle Specifications

There are a number of vehicle specifications that can aid in fleet greening and produce significant lifecycle emissions reductions. The following opportunities are samples of green vehicle specifications and internal practices that can support measurable emission reductions.

#### 4.3.1 Smaller and Lighter Vehicles

Choosing an appropriate size of vehicle for the operational requirements (i.e. vehicle fleet right-sizing) is a best practice to manage the fuel consumption and GHG emissions without significant changes. The use of smaller and/or lighter vehicles can have a sizable impact onto reducing the overall fleet emissions but also provides capital and operational savings. As long as the vehicle sizing is done in accordance to operational requirements and risks are properly managed this type of initiative has no real down side.

#### 4.3.2 Purchasing Policies and Practices

When considering the procurement of new fleet vehicles and replacement of those at the end of their lifecycle there is an opportunity to integrate more environmental considerations into the vehicle specifications to evaluate the overall lifecycle eco-footprint of vehicles. Current procurement practices include some work with clients to determine the right-size vehicle based on the type of work performed and integration of fuel efficiency ratings where available into the vehicle specifications within contract documents. Future procurement approaches could include expanding the procurement document specifications to integrate more vehicle types that can meet Peel’s various operational requirements and determining and implementing other environmental criteria for various vehicle classes.

This would offer more opportunity to right-size with internal client groups (for example choosing the right sized vehicle with right cylinder size for the job), while increasing focus on environmental considerations in the responses received from vehicle vendors. Additionally, the scoring matrices for vendor responses to procurement documents can be focused on a combination of the environmentally focused specifications and price to get the best value and best environmental outcomes possible.

Internally, Peel can implement a more formalized process with client groups who require new or replacement fleet vehicles to allow for more lead time and dialogue on the type of vehicle for the work required. This could include a business case or planning template for clients to outline the required use of the vehicle, capacity needs, daily range requirements and other considerations that can be used to inform a suitable vehicle for operations. The information submitted by internal client groups could also be referenced to Peel's environmental considerations that can help to achieve emission reductions.

#### **4.4 Fleet Operational Best Practices**

Best practice in fleet management includes initiatives and activities that make the most efficient use of vehicles to balance operational requirements with financial impacts. There is an opportunity to increase the focus of environmental considerations with these existing requirements to achieve further efficiency in Peel's fleet operations.

##### **4.4.1 Enhanced Employee Training**

As fleet technologies improve and environmental focuses are prioritized in operational considerations, there are opportunities to refine driver training to improve driver behaviours and enhance training for technicians on optimal maintenance practices for emerging and new technologies in Peel's fleet.

For fleet users, there are supplementary training courses available that could be integrated with existing fleet training that have an environmental focus. Available enhancements can work to reduce idling and encourage efficient driving practices to minimize fuel waste and unnecessary emissions in Peel's fleet operation. For example, the AutoSmart Driver Education workshops and driver education kits offered through Natural Resources Canada are offered at no cost and provide tools that can be used for driver training. The education kit contains information for instructors on buying, driving, and maintaining a vehicle for fuel efficiency and how to integrate this information into existing in-class driver education programs.

For maintenance, depending on the new and emerging technologies that could be utilized in Peel's fleet there may be a need to enhance the knowledge of Peel's vehicle maintenance team. Additional or enhanced training would ensure that devices or new vehicle technologies are maintained properly for optimal performance and to achieve the expected environmental and efficiency outcomes of their integration into the fleet.

##### **4.4.2 Idling Reduction Devices and Policies**

A component of fleet best practices are initiatives that support the reduction of unnecessary idling to conserve costs related to fuel waste and more frequent required maintenance while achieving environmental benefits. The primary reasons in Peel's fleet for idling as indicated by drivers include vehicle cabin comfort, a perceived need to idle to keep essential equipment running, and frequent short stops.

Idling reduction devices are available as optional add-ons to new vehicle purchases from the manufacturer or as after-market additions. There are a number of idling-reduction technologies that vary in functionality, potential environmental outcomes, and cost. When paired with enhanced driver training to improve driver behaviours and motivation there is more opportunity to achieve greater

benefits. Some options for anti-idling devices include auxiliary power units, start/stop devices, auxiliary cab heaters, battery backup systems and block heaters/engine preheaters.

In addition to devices to limit unnecessary idling, there is the opportunity to refresh and relaunch anti-idling policies through enhanced employee training and staff engagement on the Region's climate change objectives.

#### **4.4.3 Fleet Pool Vehicles**

There are a number of reasons where an employee may need to use a personal vehicle to drive to and from locations for Regional business. These kilometers are captured through business expense claims and form a part of the Region's annual GHG emissions related to Regional business.

There may be an opportunity to further research the GHG emission impacts related to these kilometers and estimated fuel consumed by employees in personal vehicles. Using this information and the fuel consumption estimates, there may be value in retaining efficient fleet vehicles beyond their traditional lifecycle to implement a wider fleet pool reserve that can be booked by Regional staff for business needs. This practice could offer some GHG emission savings but would need to be researched further to evaluate current scale, emission considerations and financial impacts to implement various options.

#### **4.4.4 Fleet Routing Optimization**

Significant fuel consumption savings can be achieved through the optimization of the routing of the Region's fleet operations and service delivery. Engagement with fleet stakeholders identified that there may be opportunities to implement more efficient routing for the fleet or to work with Provincial partners (for example for the Paramedic Fleet) to realize greater efficiency in vehicle routing where possible.

Future technologies and support systems may have more opportunity to route internal staff and Regional operations in real time and based on the vehicle geographic location. This will offer the ability to better utilize staff and vehicle resources and will achieve some reduction in unnecessary kilometers driven. The full impact on emission reductions through route optimization will be determined through ongoing scoping for this initiative and the number of fleet vehicles that can be utilized more efficiently through this technological advancement.

#### **4.4.5 Technology Considerations, Vehicle Lifecycles and Available Funding**

Vehicle technologies are constantly changing in the market with new and more efficient opportunities emerging regularly. Fortunately with fleet vehicles there are opportunities to research and implement new initiatives and technologies between vehicle lifecycles which in Peel range from seven to ten years on average as shown in Table 5. When evaluating newer technologies, the Region should take a balanced approach between emission reduction potential, pilot testing and risk associated with these emerging technologies consistent with the corporate risk tolerances.

Initially, newer technologies and advancements in vehicles commonly have a price premium which reduces over time as it becomes more widely available. In some cases (e.g. battery electric vehicles and charging stations), there are currently government incentives to partially offset the price premium in these types of vehicles and new technologies.

**TABLE 5 – Peel’s Typical Vehicle Replacement Cycles**

<b>Vehicle Category</b>	<b>Average Replacement Cycle (yrs)</b>
Light-duty passenger	7
Light-duty pickup	8
Medium-duty gasoline	8
Medium and Heavy-duty diesel	10
Ambulances	7
TransHelp buses	7
Equipment	9

As Peel continues to research and determine the feasibility of new technologies, there is the opportunity to leverage funding through grants and incentive programs that support the adoption of emission reduction initiatives. Some examples of these grants and incentive programs include the Electric and Hydrogen Vehicle Incentive Program, Greenhouse Gas Challenge Fund, Green Commercial Vehicle Program, and Electric Vehicle Charging Incentive Program. These incentive programs, when available, will be explored and utilized to help offset the cost of implementing these future opportunities in Peel’s fleet which is consistent with current fleet practices.

## Section 5

# Opportunities and Risks to Greening Peel's Fleet

When considering future fleet greening opportunities it is important for Peel to be aware of its risks and opportunities in progressing toward reduced GHG emissions from fleet operations. There have been many positive contributions across the organization toward fleet greening practices in the past which has resulted in an estimated 13% emission avoidance. Continuing with these efforts is recommended to be approached strategically and through the implementation of the Strategy to research and evaluate the financial implications and environmental benefits across the fleet.

Preliminary risks and opportunities have been evaluated through the work of Peel's consultant and have identified the following considerations which must be kept in mind when moving forward with future initiatives.

### 5.1 Peel's Strengths in Fleet Greening

Currently in Peel, there is a culture of implementing new and emerging technologies and fleet advancements to positively influence emission reductions. This has been demonstrated through historical initiatives such as introducing hybrid vehicles as they emerged in the market, converting Peel's ambulance fleet to gasoline and TransHelp buses to propane to achieve fuel savings over a traditional diesel fuel fleet, working with client groups to ensure the right vehicles are selected for the required work and implementing Automatic Vehicle Location (AVL) technologies, along with various other pilot projects. In addition to internal fleet practices, Peel has started to require more environmental considerations through its contracted services such as the natural gas fleet for waste collection activities with the recent curbside waste program changes.

This historical and current work has been completed without a formal Green Fleet Strategy and does demonstrate that Peel is committed to reducing its fleet GHG emissions. The Term of Council Priority to 'Adapt To and Mitigate the Effects of Climate Change' and Peel's Corporate Social Responsibility framework demonstrates Regional Council's commitment to climate change efforts and balancing the Region's operations with environmental and social considerations.

Efforts to formalize the Region's commitment to corporate GHG emission reduction are ongoing through the development and implementation of the Climate Change Master Plan of which this Green Fleet Strategy is a component. This has been supported through the development of the newly created Office of Climate Change and Energy Management and dedication of staff and financial resources to support this work for the corporation.

## 5.2 Peel's Current Weaknesses to Fleet Greening

Historically, fleet initiatives and practices have been completed using best efforts (“good will”) to reduce emissions. These initiatives have been largely independent and based on opportunity and do not align under a formalized Strategy to guide Peel’s efforts to a long-term goal. This has resulted in fleet emission avoidances to slow the growth of Peel’s fleet related emission profile but has not been successful in working toward a reduction that aligns to the corporate target of 80 percent reduction below 1990 emission levels by 2050. As such, the fleet emission profile for Regional business continues to grow year over year or only achieve minimal emission savings and reductions when a greater potential is possible by consolidating efforts.

The commitment to the reduction of corporate GHG emissions are not currently aligned to current procurement policies and practices for fleet acquisitions and replacements which is mainly focused on meeting operational business needs only. While there is discussion around emission reduction opportunities, internal fleet use practices are largely focused on completing the work needs. These unaligned goals result in high unnecessary fleet idling practices and missed vehicle emission reduction opportunities which can be observed in many business areas throughout Regional operations.

The lack of a formalized Green Fleet Strategy and dedicated resources to focus on its implementation is a current gap for Peel and offers an opportunity to better structure the approach to future initiatives and work.

## 5.3 Peel's Opportunities for Fleet Greening

Vehicle technologies are constantly changing, with new advancements and available enhancements becoming available regularly. While many are emerging technologies (e.g. battery electric pickup trucks and heavier duty applications), there is an opportunity to introduce these more readily than in some other corporate emission reduction initiatives as the capital investment is often much lower for fleet applications and the typical vehicle lifecycle is much shorter than other assets. As the fleet composition is also very dynamic between light to heavy-duty vehicles and many differing applications to accommodate a wide variety of operations and services, there are opportunities to introduce emerging technologies or new vehicle options on a smaller multiple-pilot testing scale.

The Provincial and Federal Governments are also working toward addressing climate change and there are many emerging incentive programs and policies to support the inclusion of more sustainable technologies for vehicles. Currently there are battery electric and hydrogen vehicle and charging station incentives available through the Electric and Hydrogen Vehicle Incentive Program. In addition, there are currently Provincial policies that support increased benefits for electric vehicles through the Green Vehicle License Plate Program which provide access to High Occupancy Toll (HOT) and High Occupancy Vehicle (HOV) lanes at no additional charge. Other programs or incentives that have been explored or that are in development include the Green Commercial Vehicle Program and Greenhouse Gas Challenge Fund.

These funding opportunities help to reduce the capital cost premiums that would otherwise be experienced by fleets when considering implementing and piloting emerging technologies. Over time these incentive programs may no longer be available as the market evolves to have more of these technologies in place however all incentives that are available will be explored as the work plan for the Green Fleet Strategy is implemented.

There are several quick wins that are available in Peel's fleet that can help to accelerate the reduction of emissions from internal operations. With the new Automatic Vehicle Location (AVL) technologies in place across much of the fleet, there are idling reports that suggest there is an opportunity to reduce unnecessary idling across the fleet. This opportunity can offer a quick return on investment and can be managed at a relatively low cost through an anti-idling policy refresh and educational approaches with staff through their management team, and internally focused awareness and promotional tactics.

There are also opportunities to implement alternate fuel blends in the short term. This could include implementing the use of alternate blends of biodiesel that offers an emission reduction benefit with little to no cost premium or vehicle or tank conversion costs required. Depending on the blend considered for use which does require research on optimal blends for Peel's fleet and seasonality considerations, there is an opportunity to reduce diesel related emissions ranging from 9% to 19% or up to 541 tCO<sub>2</sub>e annually. The use of increased biodiesel blends was strongly supported by the stakeholder groups that were engaged for the fleet greening discussions.

In addition, there is also an opportunity pilot the use of higher ethanol blended gasoline as 250 of the light-duty fleet is currently capable of using this fuel. There is up to an estimated 35% premium for this fuel (depending on the blend used) as has less energy than traditional gasoline for the same distance travelled. However ethanol blended gasoline offers a significant emission reduction potential of up to 79% (for E85). Fleet stakeholders responded with strong support of higher ethanol blends of fuel in the short-term while long-term solutions are identified and refined. To support an ethanol pilot, a small tank conversion for approximately \$5,000 would be required at the Copper Works Yard as well as engagement with the selected fleet users and vehicles for the pilot. These can be completed for a relatively low cost to trial this fuel blends performance and can be accommodated within the current budgets for fleet. Larger scale implementation, if proven an effective alternate fuel type in the future would require additional funds that would be included in future fleet related budgets and presented to Council during annual budget cycles for endorsement.

## 5.4 Peel's Current and Future Fleet Greening Risks

There are several risks that have been identified as having the potential to negatively affect the Region and its reputation as it pursues the opportunity to research and implement activities to support the reduction of GHG emissions related to fleet operations.

Continuing with current practices and independent efforts and not working through a consolidated strategy and approach to greening the fleet will continue to support a disjointed approach. These types of initiatives can lead to savings in emissions as currently seen in past efforts but may not result in meaningful reductions which are aligned to the corporate target for an 80 percent reduction below 1990 emission levels by 2050 as they are not researched and evaluated for potential larger-scale implementation across comparable applications in the fleet and managed through a centralized approach.

Approaches that are not aligned to the target and reviewed and researched at a strategic level through a Green Fleet Strategy may negatively impact the Region's reputation and credibility in the future if the corporate targets are not achieved.

Future approaches that are not researched and validated at a strategic level can also lead to financial risks if they require large capital investments that do not provide a positive return both financially and environmentally toward the emission reduction targets. For these reasons, it is recommended to leverage current practices for seeking GHG reductions and strengthen the approach by implementation of the Green Fleet Strategy to guide the Region in its efforts to centralize and formalize these processes.

## Section 6

# Work Plan Development and Actions for Implementation of Green Fleet Strategy

Working toward the Green Fleet Strategy GHG emission reduction targets and recommended approach will require a coordinated and strategic approach to researching and evaluating different opportunities within Peel's fleet operations. This review and evaluation cannot be achieved without also engaging with internal fleet stakeholders to consider the operational requirements that need to be maintained as emission reduction opportunities are explored.

### 6.1 Recommended Approach

The recommended approach is based on the technical review where multiple scenarios with various factors and technologies were considered and compared against a business as usual scenario. The approach is focused on a balanced approach to incorporating feasible fuels and technologies and incorporating battery electric vehicle (BEV) technology. It focuses on more immediate changes to the fuels used to power fleet vehicles to influence emission reduction while balancing cost implications over time. It takes into consideration that while BEV light-duty vehicles are available in the market, it may be challenging to obtain them in the quantities needed and with the desired kilometer driving range considerations for the Region's operations. This is consistent with current findings in recent procurement processes for battery electric vehicles.

#### 6.1.1 Short-Term (2018-2022) Approach Recommendations

In the short-term, the approach focuses a continued approach to introduce hybrid, plug-in hybrid electric and battery electric vehicles where possible for the light-duty fleet and introducing higher blends of ethanol fuels (E85) for flex-fuel capable vehicles in both light and medium-duty gasoline vehicles where possible. Approximately 250 light-duty and medium-duty vehicles in the fleet are currently flex-fuel capable. In the medium and heavy-duty diesel fleet, this scenario introduces a B20 biodiesel fuel blend to transition from using traditional diesel fuel only.

In the ambulance fleet, a pilot study of higher ethanol blends of fuel is recommended as the ambulance fleet is also flex-fuel capable. There are no recommended changes to the TransHelp fleet or Regional equipment in the short-term.

#### 6.1.2 Medium-Term (2023-2027) Approach Recommendations

In the medium-term, this approach moves away from hybrid and plug-in hybrid electric vehicles in the light-duty passenger and pickup fleet to increase the transition to full battery electric vehicles. It is recommended that all medium-duty gasoline vehicles be transitioned to flex-fuel capable and higher ethanol gasoline blends (E85) be used as vehicles reach the end of their lifecycle.

In the medium and heavy-duty diesel fleet, it is recommended to begin the implementation of CNG vehicles which may also be able to benefit from future Waste Management initiatives in anaerobic digestion as a source of RNG to further reduce the emission profile from these vehicles. It is also recommended to transition the ambulance fleet to higher blends of ethanol fuel and phase out traditional gasoline, trial electric bus testing for the TransHelp fleet and introduce B20 biodiesel blends of fuel for the Region's light and heavy-duty equipment.

### **6.1.3 Long-Term (2028-2050) Approach Recommendations**

Long-term projections are more challenging to confirm at this time but this approach focuses on fuels which are currently available with the opportunity to trial them in different Regional vehicle applications in the short to medium-term and long-term transitions to full battery electric vehicles.

This approach assumes that the ability to trial different applications over time will help to confirm future opportunities for long-term implementation in the fleet. In light-duty and medium-duty vehicles, it is recommended that full battery electric applications will be available by that time for full implementation in the fleet including in TransHelp buses. The ambulance fleet is recommended to be fully powered by high ethanol fuel (E85) but there may be electric options available as there are limited mild hybrid ambulance technologies available.

Equipment and medium and heavy-duty diesel vehicles are recommended to transition to full CNG and RNG in the long-term.

## **6.2 Emission Reduction Opportunities and Green Fleet Strategy Actions**

To achieve the objectives of the Green Fleet Strategy and align to the corporate and identified Strategy targets, current fleet practices will need to be reviewed and new fleet opportunities identified.

There are many great initiatives that have been undertaken in the past which has resulted in a 13% GHG emission avoidance or the equivalent of 1,570 tCO<sub>2</sub>e since 2010. This Strategy is meant to build on past successes and position the Region to be successful in achieving future fleet emission reduction targets.

The opportunities and Strategy actions currently identified through baseline technical review can be organized into 5 categories: Dedicated Resource to Green Fleet Strategy Implementation, Fleet Monitoring and Data Analysis, Alternate Lower-Carbon Fuel Research and Transitioning, Procurement Practices, Green Vehicle Specifications and Vehicle Selection Hierarchy, Education, Outreach and Stakeholder Engagement and Fleet Operational Best Practices.

### **6.2.1 Dedicated Resource to Green Fleet Strategy Implementation**

In order to facilitate ongoing development of work plans for the Green Fleet Strategy and their implementation, it is recommended that there be a dedicated Green Fleet resource to support the required actions of the Strategy.

This Green Fleet resource would be responsible to conduct and maintain the coordination of research and pilot studies on alternate technologies and fuels and their estimated emission reduction potential and larger-scale application in Peel’s fleet. This resource would initiate and lead a working group of internal fleet users and stakeholders to share fleet related statistics and data, review and implement internal processes and policies related to fleet replacements and new acquisitions and gather ideas and discuss operational practices and opportunities to advance the implementation of emission reducing actions in Peel’s fleet.

The Green Fleet resource would support the development of educational programs and enhancements, policy development or refinement and awareness campaigns to positively influence behaviour change among fleet users to achieve emission reduction benefits.

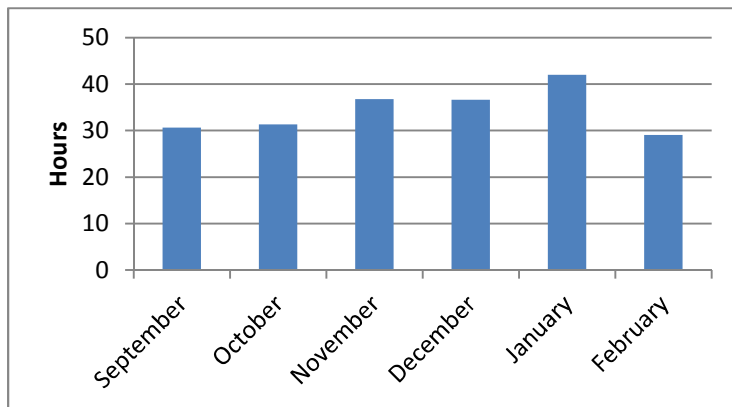
Action 1 Obtain a dedicated resource for continued work plan development and implementation of the Green Fleet Strategy.

### 6.2.2 Fleet Monitoring and Data Analysis

An important aspect of understanding Peel’s fleet and opportunities for efficiencies is the ability to gather and monitor relevant statistics to its operation. In 2016, an Automatic Vehicle Location (AVL) initiative was undertaken by the Operations Support Division to begin to gather and assess vehicle data. This system is now in use and the statistics that are available for the fleet include idling, time of day use, vehicle utilization, and speed monitoring. These statistics on usage and driver behaviours are further supported with estimated fuel consumption and cost impact information.

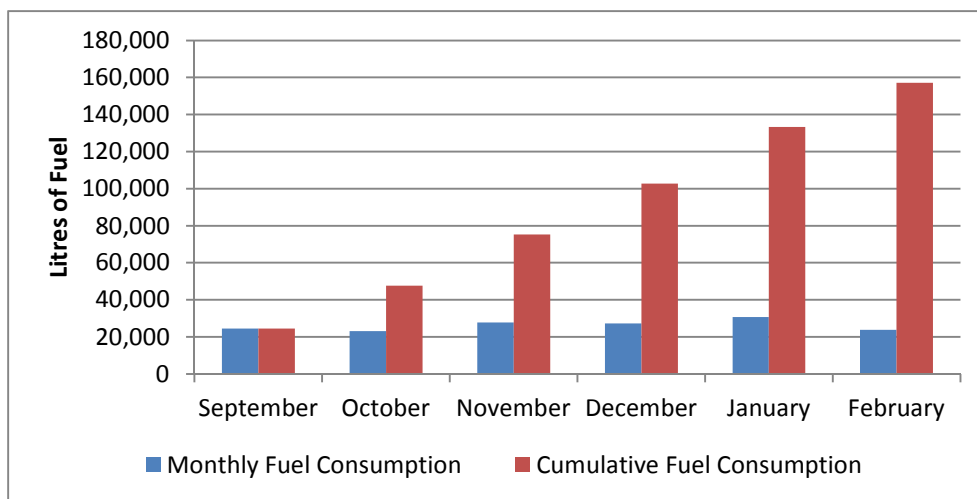
This type of vehicle technology can offer great insight into the Peel fleet and offer opportunities to focus efforts in the areas where environmental and cost saving benefits can be achieved. This AVL system is currently installed in the majority of the fleet with similar systems used in the Peel Paramedic and TransHelp fleets. For example, recent vehicle data collected indicates that there is an opportunity to reduce unnecessary idling in fleet vehicles to save emissions and fuel costs. Please see Graph 4 and 5.

**GRAPH 4 - Average Excessive Idling Time (> 3 min) per Vehicle by Month**



\*Does not include TransHelp data at this time

**GRAPH 5 - Monthly and Cumulative Fuel Consumption from Excessive Idling (Sept 2017-Feb 2018)**



\*Does not include TransHelp data at this time

Using an estimated average fuel price of \$1.00 per litre, Peel could have saved up to \$157,091.00 in fuel costs between September 2017 and February 2018 by implementing initiatives to address excessive idling. Options for this finding could include procuring remote starter systems for vehicles that allow for cabin comfort without excessively idling, manufacturer anti-idling devices such as start/stop systems, introducing enhanced driver training, education tactics and idling policy refinement and re-launch.

In addition to AVL data, a significant number of kilometers are driven by Regional employees for business purposes using their own personal vehicles which are reimbursed by the Region.

**TABLE 6 - Estimated Emissions from Regional Employee Personal Vehicle Business Travel**

Year	Estimated Kilometers Driven (km)	Estimated Emissions (tCO <sub>2</sub> e)
2014	2,958,029	626
2015	2,925,480	619
2016	3,007,644	636

These reimbursed kilometers are captured as part of Peel’s corporate emission reporting and by using fuel efficiency estimates, they may be contributing over 600 tCO<sub>2</sub>e annually to emissions related to Peel’s operations. There may be an opportunity to reduce these emissions through an enhanced Regional vehicle pool of fuel efficient vehicles and through corporate initiatives such as Workplace Modernization.

Action 2 Evaluate available AVL and other fleet data to refine the types of vehicles and conditions that lead to excessive idling in Peel’s fleet. This will allow us to identify vehicle utilization trends and efficiency opportunities in the fleet related to the number of vehicles and route optimization opportunities to reduce fuel consumption in vehicles used in various Regional operations.

- Action 3      Use excessive idling statistics to identify internal policy refinements and technological tactics to reduce idling in the fleet.
  
- Action 4      Gather and refine the data on the number of kilometers driven related to Peel’s employee personal vehicle business travel. Identify opportunities to reduce these kilometers through an enhanced Regional vehicle pool of high fuel efficient vehicles or other relevant tactics.

### 6.2.3 Alternate and Renewable Lower-Carbon Fuel Research and Transitioning

Within the current fleet, there are opportunities to pilot and evaluate lower-carbon fuel alternatives that can provide GHG emission reduction in the near-future. Approximately 250 vehicles currently in use in the fleet are flex-fuel capable and may provide environmental benefits through implementing a high ethanol fuel blend. In addition, there may be additional environmental benefits gained from evaluating the implementation of a biodiesel blend based on seasonality and suitability in the Region’s diesel fleet.

In the medium-term (2023-2027) and long-term (2028-2050) alternate and renewable fuels will form an important component of achieving the Strategy emission reduction targets. These emerging fuels and vehicle technology will continue to be evaluated for their feasibility and large-scale applications in the fleet.

Some of the potential alternate or renewable lower-carbon fuel considerations may include expanding the use of propane beyond the TransHelp fleet as this fuel is less expensive and lower in per unit GHG emissions than traditional gasoline and diesel. This would require vehicle conversion cost considerations (an estimated \$6,000 per vehicle) and increased infrastructure requirements to accommodate a larger propane fleet.

There is also the ability to consider the inclusion of CNG and/or RNG as a fuel source for many of the medium and heavy-duty fleet vehicles. This fuel can have high capital costs for new fuelling infrastructure and vehicle conversions (which can cost from \$15,000 to \$45,000 more in these larger vehicle classes). Given that there is no current source of RNG and CNG has higher per unit GHG emissions, this may be more suitable for evaluation as part of the medium and long-term implementation phases of the Strategy although current available incentives may indicate an earlier transition may be possible due to the financial benefits to doing so. During the later implementation phases, there may be opportunities to align with upcoming Waste Management facilities that may have RNG available as a fuel source from the anaerobic digestion of organic waste.

- Action 5      Evaluate and introduce pilot studies of alternate lower-carbon fuels for select vehicles in the fleet. This may include the trial of higher blend ethanol fuel and biodiesel blends based on seasonality considerations for select fleet vehicles across light, medium, and heavy-duty vehicle classes.
  
- Action 6      Evaluate larger-scale lower-carbon fuel transitions in Peel’s fleet based on the results of the alternate fuel pilot studies. Where appropriate, present recommendations to Regional Council for consideration and budget approval.

Action 7 Continue to evaluate medium-term (2023-2027) and long-term (2028-2050) fuel options and evolving vehicle technology for Peel’s fleet that aligns to Peel’s medium and long-term GHG emission targets.

#### **6.2.4 Procurement Practices, Green Vehicle Specifications and Vehicle Selection Hierarchy**

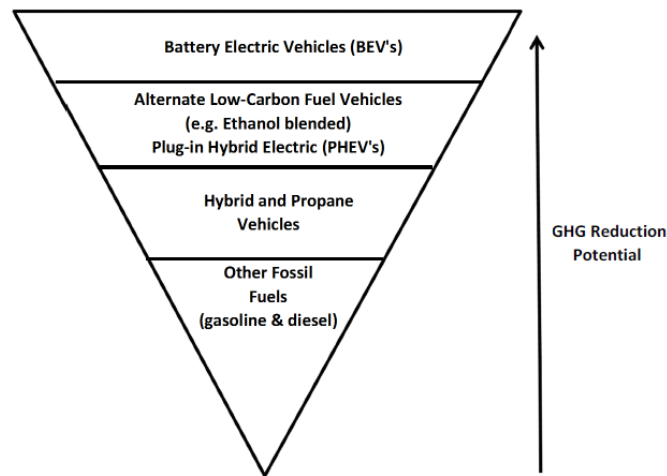
Through the baseline technical work for the development of the Green Fleet Strategy it was identified that there are opportunities to better align the GHG emission reduction goals with Peel’s internal procurement practices. Currently there are limited formal internal processes related to vehicle replacements and acquisitions for the fleet which can be a barrier when looking to influence meaningful GHG emission reduction.

Meaningful change can be achieved through a balanced approach which incorporates proactive collaborative stakeholder engagement, a more formal internal approach for fleet replacements and new acquisitions and the development and implementation of a vehicle selection criteria hierarchy for all vehicle classes.

Through stakeholder engagement and research, a vehicle selection hierarchy can be developed for all vehicle classes that ensure future fleet vehicles meet the basic operational requirements for the work while achieving GHG emission reduction benefits. This can include the selection of the right size vehicle for the work as well as the type of vehicle or fuel technology to be selected.

Using the information gathered through the development of the Green Fleet Strategy there is an opportunity to prioritize certain vehicle technologies or fuels in the short-term to begin improving the emission profile from fleet vehicles. This can be achieved through the implementation of vehicle selection hierarchies across all vehicle classes. An example vehicle selection hierarchy for light-duty fleet vehicles is shown in Figure 5. The selection hierarchy could be used through a formalized process with fleet users to determine the most appropriate class of vehicle and environmental benefits available given the operational need.

**FIGURE 5 - Example Vehicle Selection Hierarchy for Light-Duty Fleet Vehicles**



The development of more formal internal approaches and processes to vehicle selection to use with the vehicle selection hierarchy can also support improvement in the green vehicle specifications included in the Region's procurement practices and documents.

Currently, green vehicle specifications used in procurement practices are limited to fuel efficiency ratings which are not available for all classes of vehicles. Additionally in certain vehicle classes there are limited vehicle options to support greater emission reduction (e.g. battery electric vehicles). In these vehicle classes, other specifications could be developed through expertise and stakeholder engagement that would support greater ability for emission reduction. This could include the use of alternate fuels or fuel blends, factory or after-market anti-idling or start/stop technologies or the requirement for lighter vehicle components or aerodynamic design to support greater fuel savings.

The use of evaluation matrices that prioritize the reduction of fleet GHG and lifecycle emissions in procurement was supported by stakeholders to increase the environmental considerations for procured vehicles. A defined evaluation matrix written within procurement documents would demonstrate the Region's commitment to environmental benefits and result in more environmentally focused responses from potential vendors.

**Action 8** Through collaboration with fleet stakeholders, develop and launch vehicle selection criteria hierarchies for all vehicle classes across Peel's fleet. Refine and formalize internal vehicle request processes to have an increased focus on environmental objectives that increase vehicle selection dialogue and align to the goals of the Green Fleet Strategy and Corporate GHG emission targets.

**Action 9** Through collaboration with the Region's Purchasing Department and fleet stakeholders, identify vehicle options and specifications that meet operational needs and align to the Region's GHG emission reduction targets. Develop business practice enhancements (for example procurement evaluation matrices) to have an increased environmental focus so

that in addition to vehicles meeting the operational needs will also consider vehicle tailpipe and lifecycle emissions.

Action 10 Identify aftermarket technologies, in addition to those available through vehicle manufacturers, which can be applied to various vehicle types and classes in Peel's fleet to achieve GHG emission reduction benefits.

Action 11 Continue to identify and pursue grant funding and incentive opportunities to reduce the capital budget pressure for fleet vehicle acquisitions and related equipment.

### **6.2.5 Stakeholder Engagement, Education and Outreach Tactics and Fleet Operational Best Practices**

Internally, Peel has maintained good collaborative working relationships among fleet users but there is an opportunity to increase dialogue with fleet stakeholders on the goals of the Green Fleet Strategy and corporate GHG emission reduction targets. Stakeholder engagement will be vital to achieving many of the identified actions of this Strategy and can only be successful through an increased dialogue with cost centre managers and those that have a strong understanding of the operational requirements of fleet vehicles. Stakeholder operations may also offer overlap opportunities with the Green Fleet Strategy that can be explored through working groups and pilot studies. For example, in the Waste Management Division there will be a future anaerobic digestion facility to process Peel's organic waste that will produce a RNG that could be considered as a fuel source for fleet vehicles in the medium to long-term Strategy implementation phases.

Education and outreach enhancements and new tactics will be an important component of addressing fleet driver behaviours and understanding how these behaviours can positively or negatively impact the objectives of the Green Fleet Strategy. Tactics could include driver training education program enhancements, awareness campaigns or policy development and refinement to support the actions of the Strategy and reduced emissions from fleet operations.

Fleet operational best practices are those that address operational fleet needs while balancing environmental benefits and financial implications. Common fleet operational best practices include tactics that reduce unnecessary vehicle trips, the reduction or elimination of underutilized fleet vehicles, modal shift for travel, and employee training enhancements or additions. These operational best practices have many synergies with education and outreach and stakeholder engagement already identified as key components of advancing the Green Fleet Strategy. With the AVL system and other data sources on mileage reimbursement to Regional staff, there is a greater ability to identify trends in the use of Peel's fleet and determine tactics that will support the reduction of GHG emissions.

Action 12 Identify stakeholders in the organization who will be impacted through the vehicle replacement cycle and that will require new vehicle acquisitions for their operations over the next five years.

Action 13 Form a stakeholder working group with identified stakeholder groups, as a component of advancing the actions of the Green Fleet Strategy. The stakeholder working group will also assist in planning for change management in the fleet, as opportunities are identified and implemented.

- Action 14      Develop internally focused education and outreach tactics to reduce excessive idling and improve driving behaviours in Peel’s fleet in the short-term (2018-2022), medium-term (2023-2027) and long-term (2028-2050) Strategy implementation phases. This may include an enhancement to driver training education activities and the development of increased driver awareness around idling statistics and impacts on the fleet GHG emission profile. Refine these tactics as necessary to account for change management requirements and achievements toward the corporate and Strategy GHG emission reduction targets.
- Action 15      Identify opportunities with stakeholder operations that have the potential to advance the objectives of the Green Fleet Strategy and reduce fleet related GHG emissions. For example, this may include the opportunity to use renewable natural gas produced from anaerobic digestion of the Region’s organic waste as a fuel source for Peel’s fleet vehicles in the medium and long-term implementation phases.

## Section 7

# Conclusion

The implementation of the Green Fleet Strategy and the 15 preliminary identified actions from baseline research, technical review and stakeholder engagement will position the Region to be more aggressive in achieving fleet related GHG emission reductions. The reduction of fleet related emissions through the identified actions and recommended scenario through baseline research are aligned to the fleet targets and the corporate reduction target of 80 percent reduction below 1990 emission levels by 2050.

Progress made through stakeholder engagement and fleet user education and outreach tactics will also support the refinement and identification of future actions for the ongoing implementation phases of the Green Fleet Strategy in the medium-term (2023-2027) and long-term (2028-2050) to bring the Region closer to meeting the long-term GHG reduction target of 80 percent reduction below 1990 emission levels by 2050.

The Green Fleet Strategy is intended to be a living document that will be reviewed and refreshed on a regular basis every five years. This will allow changes to Peel's fleet composition to be evaluated against emerging technologies and new vehicle enhancements. These opportunities will reviewed for relevance in Peel's fleet and potential impacts on the medium and long-term targets which are more challenging to forecast at the present time.