



Master Plan

For the Reduction of Greenhouse Gas (GHG) Emissions within Parks Canada's Operations

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Name: Master Plan for the Reduction of GHG Emissions within Parks Canada's Operations

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Intranet:

Our Work/Environmental and Fleet Management/Environmental Management/ Greenhouse Gas Emissions

Rescinded Document:

This document replaces all previous versions of the Master Plan for the Reduction of Greenhouse Gas Emissions within Parks Canada's Operations (2002 and 2011).



Executive Summary

As a commitment under the Federal Sustainable Development Strategy (FSDS) and the Parks Canada Report on Plans and Priorities, Parks Canada's target is to reduce its greenhouse gas emissions by 10.1% by 2021 from 2005-06 levels at a rate of 1.1% per year beginning in 2011-12.

This Master Plan outlines Parks Canada's overall GHG reduction strategy and is intended to provide field units with strategies in three major areas: facilities, fleet, and awareness.

Parks Canada's GHG reduction strategies are to:

- 1) Improve the energy-efficiency of its buildings and facilities, through conservation initiatives, energy management, retrofits, and renewable energy projects;
- 2) Improve the energy-efficiency of its fleet through fleet rationalization, rejuvenation, right-sizing, and the use of alternate fuels;
- 3) Increase employee awareness by communicating program objectives on the importance of GHG reduction by developing an intranet site, sharing annual progress reports, and through correspondence and various fora.

Each field unit (FU) was given a GHG reduction target beginning in 2011-12. GHG output for each field unit has been and will continue to be tracked by national office using energy expenditure data from the financial system. GHG output reports will be shared annually.



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Master Plan for the Reduction of GHG Emissions within Parks Canada's Operations

1 Objectives of the Master Plan

This Master Plan describes Parks Canada's overall greenhouse gas (GHG) reduction strategy and outlines strategies that will lead to the reduction of emissions from the three major areas: facilities, fleet, and awareness. It also serves as a communications tool to demonstrate Parks Canada's commitment to reducing GHG emissions from its operations, as required by the [Federal Sustainable Development Strategy \(FSDS\) 2013-2016](#).

2 Introduction

The atmosphere is composed of a complex mixture of gases that surrounds the Earth. These gases play a role in regulating the Earth's temperature by trapping the sun's heat near the Earth's surface, much like the glass of a greenhouse traps the sun's warmth inside. The main heat trapping gases, known as greenhouse gases (GHGs), are water vapour, carbon dioxide (CO₂), methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride. Emissions generated by human activity are rapidly increasing the concentration of GHGs in the atmosphere and there is scientific consensus that these rising concentrations will increase the average temperature of the Earth, resulting in rising sea levels, shifts in climatic zones, and increased frequency and severity of weather extremes.

A significant source of GHG emissions (and the only one considered within this program) is from the consumption of fossil fuels. Energy from fossil fuels is used to power, heat, and cool buildings as well as power vehicles, and releases GHG emissions into the atmosphere. GHG emissions are tracked and measured in tonnes (1,000 kilograms) of CO₂ equivalent. To help in visualizing GHG emissions, one tonne of GHGs in the atmosphere is roughly equivalent to the volume of an average two storey house. An average household will produce 15 tonnes of GHG emissions annually and an average vehicle will produce 5 tonnes of GHG emissions annually, for a total of 20 tonnes annually for the average family.

2.1 Parks Canada Context

Parks Canada's asset base is diverse and complex, and has an estimated replacement cost of over \$16 billion. It comprises more than 4,000 buildings, 5 town sites, and 1,150 kilometres of highway; as well as 2,600 vehicles, boats, and equipment in its fleet. Total energy expenditures required to operate Parks Canada owned facilities and fleet have averaged \$13 million per year since 2005-2006. In 2013-2014, Parks Canada's GHG output was 36,819 tonnes of carbon dioxide equivalent emissions.



In striving to reduce emissions, the Agency faces challenges including geography, limited capital budgets, and the fact that many low-cost high return opportunities have already been implemented.

2.2 Parks Canada Reduction Target

Figure 1 demonstrates that Parks Canada's emissions make up 3% of applicable government-wide emissions.

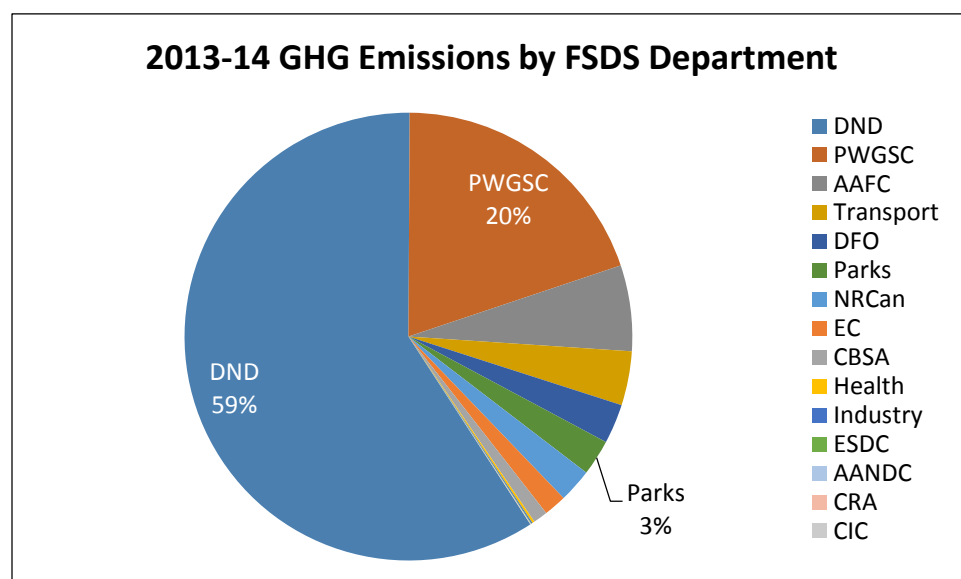


Figure 1: Government of Canada GHG emissions, by department, in 2013-14.

As a commitment under the [Federal Sustainable Development Strategy](#) (FSDS) and the Report on Plans and Priorities, Parks Canada's target is to reduce its greenhouse gas emissions by 10.1% by 2021 from 2005-06 levels, at a rate of 1.1% per year beginning in 2011-12. The specific annual targets are shown in Figure 2. Each field unit (FU) is given the same target percentage (1.1% per year, leading to an overall 10.1% reduction in emissions). Individual performance charts are shared annually with the PCX community.

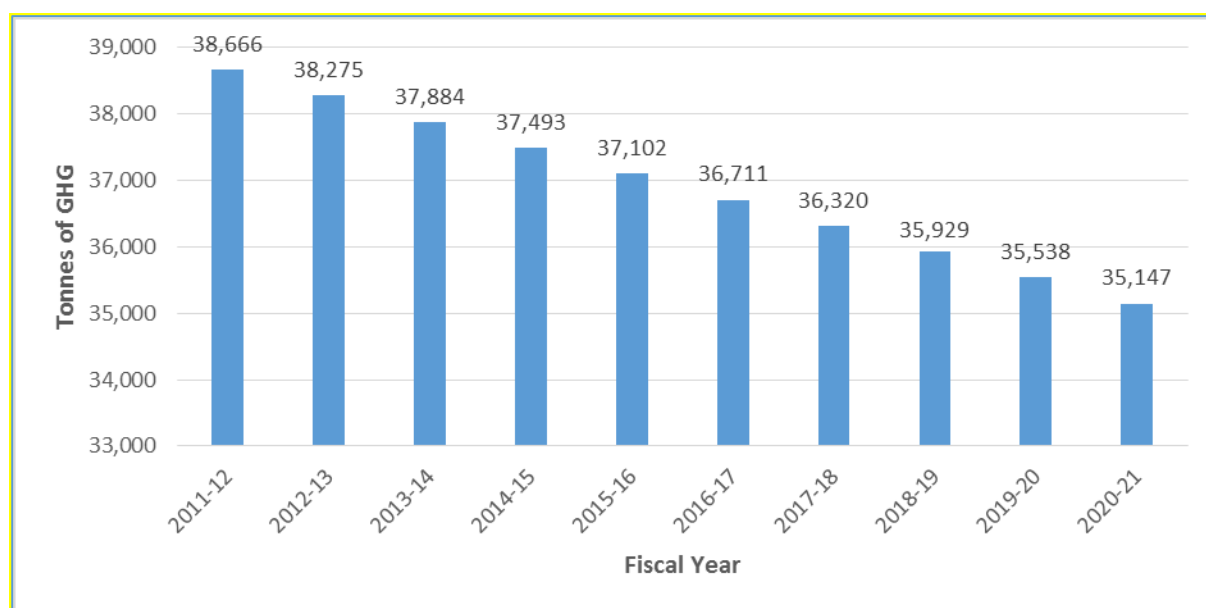


Figure 2: Parks Canada's annual GHG reduction targets

2.3 Scope

Emissions included in Parks Canada's GHG reduction program include GHG emissions generated by the consumption of energy from assets that are owned and operated by Parks Canada. This includes fleets and facilities where Parks Canada is directly paying for energy. Exclusions are:

- Staff housing (unless Parks Canada is paying for the energy)
- Aircraft fuel
- Rental vehicles for business travel
- Leased office space (e.g., Gatineau Office)
- Non-energy source emissions (e.g., landfill sites, fires)

2.4 Governance

2.4.1 Government of Canada

Canada's pledge under the Copenhagen Accord (2009) is to reduce its greenhouse gas (GHG) emissions by 17%, from 2005 levels, by 2020-21. In order to achieve a 17 percent reduction in its emissions by 2020, Canada is developing and implementing a comprehensive suite of national policies and measures to address all sources of GHG emissions.

2.4.2 Federal Departments – Federal Sustainable Development Strategy

The *Federal Sustainable Development Act (2008)* is administered by Environment Canada and requires the development of a Federal Sustainable Development Strategy. The first Federal Sustainable Development Strategy was tabled in Parliament in October 2010. It took effect April 1, 2011 and had a three year lifecycle (2010-2013). The most current FSDS is applicable from 2013 through to 2016. The Strategy promotes sustainable development goals, targets, and implementation strategies that reflect current government priorities. Beginning with the 2011-2012 fiscal year, departmental sustainable development strategies are to support the Federal Sustainable Development Strategy and be incorporated into the Report on Planning and Priorities (RPP) process. Within Parks Canada, the Departmental Sustainable Development Strategy (DSDS) is a supplementary table within the RPP.



Goal 6 of the Federal Sustainable Development Strategy establishes specific targets for each Department and Agency bound by the *Federal Sustainable Development Act* and aims to reduce the Government of Canada's environmental footprint including reducing energy resources consumption, waste, greenhouse gas emissions, and other air polluting emissions.

2.4.3 Public Works and Government Services Canada: Greening Government Operations

The Office of Greening Government Operations (OGGO) was created in April 2005 within Public Works and Government Services Canada (PWGSC). The OGGO's mandate is to accelerate the greening of the government's operations by working closely with other federal departments, particularly Treasury Board Secretariat and Environment Canada. It holds the responsibility of providing guidance and tracking for greening government operations. Parks Canada, along with all other federal custodial departments and agencies, must submit its GHG output on an annual basis to the OGGO. The federal GHG output is then determined to monitor the Government of Canada's progress in greening this aspect of its operations.

2.4.4 Parks Canada

Within Parks Canada, the Environmental Management section of Strategy and Plans is responsible for tracking GHG emissions and providing guidance on GHG reduction strategies. Field units are responsible for implementing reduction strategies and accurately reporting energy acquisitions in the financial system. More information on Parks Canada's reporting of GHG emissions can be found in section 4.1.3 of this Master Plan (pg. 24).

2.5 Benefits of Reducing GHG Emissions

Since GHG emissions are directly proportional to energy consumption, lower GHG emissions are associated with a decrease in fuel and electricity consumption. By decreasing the amount of conventional energy consumed, cost-benefits associated with fuel and electricity purchases may be gained. In addition, since GHG emissions are often associated with the emission of other airborne pollutants, GHG emission reductions will also contribute to improved air quality and consequently positive impacts on human health.

3 Strategies to Reduce GHG Emissions

Parks Canada will focus on the following area:

- 3.1 Improving the energy-efficiency of its facilities
- 3.2 Improving the energy-efficiency of its fleet as well as switching to renewable fuels
- 3.3 Fostering awareness



3.1 Facilities

The facilities category includes any fixed structure that consumes energy such as office buildings, visitor centres, kiosks, shops, potable water and wastewater treatment plants, and street lighting, as well as stationary generators and miscellaneous appliances. Parks Canada owns and operates over 4,000 buildings. The energy consumed by these facilities accounts for 68% of the Agency's total GHG emissions. As operational needs change to meet new challenges, the Agency's energy demands could increase and so too will the cost of energy. Having a better understanding on energy expenditures and options for reduction is one of the best tools facility and asset managers can use for future planning.



Solar panels at Tanquary Fjord Parks Canada Camp, Quttinirpaaq National Park of Canada

3.1.1 Building Retrofits

In 2014-15, almost \$3 billion in infrastructure funding was provided to Parks Canada to address accumulated deferred work in Parks Canada's built assets. One-third of this funding is expected to go to facilities and structures. Upcoming projects will have many opportunities to improve facilities for more efficient energy consumption and reduced GHG emissions.



Key GHG reduction strategies for buildings are as follows:

- The enhancement of energy efficiency and management of energy demand of existing buildings by focusing on lighting, mechanical systems, building envelope, and energy management.
- The implementation of the Federal Buildings Initiative (FBI) where feasible, including the evaluation of bundling smaller facilities that may not otherwise be FBI candidates.

3.1.2 Understanding Energy Sources

Not all fuels and energy sources are created equal with regards to their production of GHG emissions and cost premium. Where feasible, field units are encouraged to switch to lower-GHG-intensity fuels or energy sources. The average Canadian household consumes approximately 100 Gigajoules (GJ) of energy annually.

Table 1 compares the various energy types for cost and GHG output for 100 GJ of energy. It demonstrates that, on average and per 100 GJ, natural gas produces the least emissions.

Table 1: Cost and GHG emissions of various energy types, in order of least emissions.

Energy Type	Quantity (to produce 100 GJ)	Unit	Average Unit Cost	Total Cost	GHG Emissions (tonnes)
Natural Gas	2,614	m ³	\$0.26/ m ³	\$784	5
Propane	3,951	L	\$0.54/L	\$3,161	6
Diesel	2,583	L	\$1.02/L	\$2,635	7
Heating Oil	2,577	L	\$0.97/L	\$2,190	7
Electricity	27,777	kWh	\$0.10/kWh	\$2,778	Vary by province and territory (see Table 4 on pg. 23)

3.1.3 Energy Audits

Performing a facility energy audit is a productive first step in any energy management program. An energy audit refers to the procedure of collecting and analyzing available energy-related data, in order to establish the most accurate breakdown of energy consumption for a particular facility. This information can then be used to identify potential energy saving opportunities. Energy audits may be cursory, or extremely comprehensive and detailed. In either case, simple calculations of the energy savings opportunities available can determine payback and savings for each potential action.

Audits may be conducted in-house or through professional energy consultants. In-house audits are suggested for smaller and less complex facilities. Professional audits are recommended for larger and more complex facilities. The cost of a professional energy audit can range between \$5,000 to \$25,000 depending on the size, complexity, and remoteness of the facility. Regardless of the type of audit selected, a properly conducted audit will provide facility custodians with the necessary information to make facility energy management decisions.



Parks Canada Example – Energy Audit at the Halifax Citadel

An energy audit conducted at the Halifax Citadel by Kaladar EnerSave Management, Inc., in 2008 found that upgrades of approximately \$188,000 could save Parks Canada around \$40,000 annually because of decreased or alternative energy purchases and maintenance costs. The savings in consumption are estimated to reduce GHG emissions by a minimum of 250 metric tonnes of CO₂ equivalent. The table below summarizes the findings of the report:

Measure	Capital Cost	Annual Savings	Return on Investment (years)
Electrical (Lighting)	\$28,000	\$12,000	2.3
Electrical (Space Heating)	\$5,000	\$1,000	5.0
Electrical (Miscellaneous)	\$33,000	\$7,000	4.7
Fuel Oil (Conversion to Natural Gas)	\$80,000	\$15,000	5.3
Fuel Oil (Heating Controls)	\$12,000	\$2,000	6.0
Water	\$10,000	\$1,000	10.0
Building Envelope	\$10,000	\$1,000	10.0
Miscellaneous Measures	\$10,000	\$1,000	10.0
Total	\$188,000	\$40,000	10.0

3.1.4 Energy Savings Opportunities

In order to maximize the energy-saving benefit of any intervention, it is recommended to focus on facilities that are energy intensive. Once the candidate facilities are identified and prioritized, each should be analysed to identify components that are potential opportunities for upgrade (components on which minimal-cost actions can be taken to achieve the largest reduction of energy use) and for the selection of suitable energy savings measures. Common components include lighting, heating, cooling and ventilation systems, as well as water systems. Common energy-saving measures include reducing heating temperatures, installing timers or sensors on lighting, putting in place policies to turn off idle equipment, etc.

Facility Use

Maximizing facility use can reduce the number of facilities required or even allow some facilities to be used seasonally instead of annually. Closing a facility or reducing heat for half the year will result in saved costs and emissions.

Facility Envelope

A properly insulated and sealed facility envelope with insulated doors and windows, will realize emissions reductions and energy savings. Here are some key examples:

- Upgrade insulation to higher “R-values”
- Caulk, weather strip, seal and damper doors, and windows to stop air infiltration in and out of a building
- Upgrade windows and doors



Lighting

The market provides endless opportunities in lighting choices. Many variations of energy efficient lighting are currently available.

- Upgrade old style magnetic fluorescent lighting (T12) to electronic T8 or T5
- Exit signs should be upgraded to photoluminescent signs (now approved in the National Building and Fire Codes) that do not consume electricity nor produce GHG emissions. Alternatively, LED lighting can also be used.
- Traffic lights (roads and on canals) and street lighting upgraded to LED
- Display lights are available in high efficient halogen
- Incandescent should be replaced with compact fluorescent lighting.
- LED nightlights in buildings or areas where low light night time illumination is required.
- Occupancy/Noise sensors in hallways, washrooms and other rooms with infrequent occupants

Improving lighting efficiency also reduces waste heat and can consequently reduce the strain on air conditioning. Table 2 provides greater detail about the energy savings from alternative lighting.

Did You Know?

Converting 100 existing incandescent signs to LED

1. Reduction of 2.4 tonnes of CO₂ per year
2. Savings of over \$6,153 per year in maintenance and energy costs

Converting 100 existing incandescent signs to Photoluminescence

1. Reduction of 9.2 tonnes of CO₂ per year
2. Savings of over \$18,566 per year in maintenance and Energy Costs
3. Qualifies for LEED Credit (see section 3.1.7)

Table 2: Finances and life span of alternative lighting types.

	Traditional incandescent	Halogen incandescent	CFL (compact fluorescent)	LED (light-emitting diodes)	Photoluminescent
\$ saved from lighting energy bill (vs. traditional incandescent)	-	25%	70-75%	75+%	100% (zero energy consumption)
Annual energy cost, USD*	\$4.80	\$3.50	\$1.20	\$1.00	-
Life span	1,000 hours	1,000 – 3,000 hours	10,000 hours	25,000 hours	25 years

Outdoor Lighting - Dark Skies

Light directed towards the sky represents inefficiency and waste. Focussing light to where it is needed as well as minimizing light output levels and duration will reduce electricity costs and greenhouse gas emissions. For more information on the Dark Skies program, please refer to the guideline found on the Dark Skies Intranet page ([Our Work/Environmental and Fleet Management/Environmental Management/Dark Skies](#)).

Exhibit Lighting

In museum and exhibit lighting, designers may focus on colour rendering and glare control instead of energy efficiency. Staff should work closely with exhibit designers to ensure that energy-efficiency is always a consideration.



Heating, Ventilation and Air Conditioning (HVAC) Systems

HVAC Systems are the engines of the facility and can make the difference of whether or not it's a healthy workplace. Energy savings and emission reductions can be realized with these systems, without compromising their important role. Consideration should be given to the following suggestions:

- Use heat recovery systems
- Purchase higher efficiency HVAC systems. There is a recent standard for measuring the efficiency of gas and oil furnaces, which represents how much fuel is used for heating purposes instead of being wasted. The efficiency of furnaces has increased very much over the past few years. Ideally, furnaces purchased should be AFUE 80% efficiency or higher.
- Annual preventative maintenance saves money and emissions. Dirty air filters cause motor to work harder.
- Prepare for life cycle replacement of systems with renewable energy systems or high efficiency technology.
- Use electronic programmable thermostats. Setting heating systems back by one degree can save 3% and increasing cooling by one degree can save 1%.
- Install furnace shut off switches on garage doors for when they are open.
- Boiler tune ups before fall start up can save 2-3% in annual fuel bill.
- Train occupants and operators on how to use their building systems efficiently.

The Government of Ontario has introduced regulations that require furnaces in new residential construction to be 90% or higher, and the Government of British Columbia requires this for existing and new residential buildings. Be sure to look into any local requirements around HVAC systems.

Motors

Motors that run continuously are a big source of emissions and costs. By installing variable speed varieties or specific sensors, energy savings can be realized. Consider motors for the following:

- Water pumps
- Ventilation systems
- Bathroom Fans
- Cooling fans

Appliances and Technology

- All appliances purchased should be Energy Star® certified.
- Using power bars that can shut equipment down completely during non-working hours should be installed in offices and other areas where appliances stay on standby.
- Implement energy-efficient information technology infrastructure and services.
- Conduct office equipment energy audits and remind employees to shut down unneeded equipment.

Compressed Air/ Steam/Refrigeration

One of the key areas for saving can be within a compressed air system. Even finding the smallest of leaks can add up to significant savings over the course of a year. Equipment is available to find leaks in compressed air systems.



Water

Though much can be done to lower water use, emission reductions come with reduced hot water use, and lower pumping requirements. Here are a few suggestions:

- Install instantaneous hot water systems for low use areas
- Install solar heated water in campgrounds and areas with high use
- Install low flow automatic taps and aerators
- Insulate hot water piping and jackets on hot water tanks.
- Investigate heat recovery water to water systems
- Preventative maintenance: sediment in the hot water tank reduces heat output and hot water tank temperatures set too high waste energy.

3.1.5 Renewable Energy Technology

Renewable forms of energy constantly replenish themselves with little or no human effort. These technologies use the sun's energy and its direct and indirect effects on the earth (solar radiation, wind, falling water), gravitational forces (tides), and the heat of the earth's core (geothermal).

Renewable energy technology is a viable option for reducing GHG emissions, but does require capital investment. For additional guidance on renewable energy technology, refer to the [Parks Canada Guide to Small-Scale Renewable Energy Projects](#).

3.1.6 NRCan's Grants and Financial Incentives Web Tool

Natural Resources Canada (NRCan) provides information on a variety of grants and financial incentives offered by many levels of government, utilities, and other organizations. Federal departments are eligible for many of them but remember to double-check before taking action.

Start at the following web address: <http://www.nrcan.gc.ca/energy/funding/efficiency/4947>

- 1) Select a specific province or territory or "All provinces". (Note: Selecting "All provinces" provides a list of all programs offered. It is not necessarily a list of programs offered to all provinces and territories)
- 2) Click on "Modify search criteria". You will be directed to the "Search by Category" section.
- 3) You have several "Search by Category" options. To narrow your search, you can customize this section by selecting from the following categories:

- a. Location: You have the option here again to select a province or territory (by choosing "all" or "all provinces and territories" you will need to look through the results)
- b. Source: Selecting an item from the drop-down menu will only show results of programs offered by that source.
- c. Sector: For buildings, it is recommended to select "All Commercial/Institutional"
- d. Type of Program: Select both "Financial Incentive" and "Rebate" checkboxes



- 4) New search: To obtain different results or to narrow your search, click on the “New Search” button. Do not use the “back” arrow of your browser or mouse.

3.1.7 Other Cost Saving Opportunities

Electrical Billing: Each province and territory can have a different billing system but knowing and using the correct billing scheme can ensure costs are at a minimum.

Classification of Meters: Ensure each meter is classified properly so that the appropriate rate is being charged. Whether it's residential (staff housing), commercial regular (low use commercial buildings), commercial demand (higher use commercial buildings), or industrial use, each meter type has its advantages and disadvantages. Combining meters can also switch a meter to a new classification lowering monthly charges and bulk rates.

Demand Side Management: The largest bulk of the charge for demand meters can be the demand requirements. Managing this demand by working with the occupants of the building, upgrading demand technology, and monitoring use can result in reduced demand charges.

Seasonal Billing: Many provinces allow for seasonal billing for commercial operations but unless it is requested, it may not be automatically offered. Seasonal billing eliminates base charges in the winter, yet still allows minimal amount of electricity to be used to maintain the buildings.

3.1.8 Green Buildings

Certification Programs and Rating Systems

Green building rating systems have been developed in response to the market demand for a credible process of identifying buildings that are truly green. A green building rating system provides a framework for both understanding what makes any building green and for evaluating the performance of an individual building. Green building certification rewards buildings that achieve a defined level of performance through public recognition. There are a number of green building rating systems available in Canada.

Canada Green Building Council (LEED)

Leadership in Energy and Environmental Design (LEED) is a third-party certification program and an internationally accepted benchmark for the design, construction, and operation of high performance green buildings. Credits and prerequisites are organized into six categories:

- Sustainable Sites
- Water efficiency
- Energy and atmosphere
- Material and resources
- Indoor environmental quality
- Innovation and design

Four levels of LEED certification (Certified, Silver, Gold, and Platinum) are awarded based on the total number of credits earned in each of the six categories. There are a number of LEED Canada rating systems available to meet the needs of different building and project types such as New



Construction, Commercial Interiors, and Existing Buildings. For further information on LEED and the Canada Green Building Council, consult the CaGBC website: <http://www.cagbc.org>.

BOMA BEST

BOMA BEST (Building Owners and Managers Association Building Environmental Standards) is an online assessment tool which allows building operators to enter building data into a questionnaire. Data is organized and scored under the following categories: energy, water, waste reduction and site, emissions and effluents, indoor environment and environmental management. The online questionnaire includes a series of multiple choice and short answer questions addressing various environmental attributes of the building. For further information on BOMA BEST, please consult the following webpage: <http://www.bomabest.com/>.

Parks Canada is currently completing the environmental performance assessment of its 21 largest buildings across the country using the BOMA BEST Practices. Once received, these evaluations will be used to provide recommendations for improvement where possible.

Parks Canada Green Building Directive (2012)

The [Parks Canada Green Buildings Directive](#) provides guidance for the establishment of a strategic framework for the implementation of Green Building targets in the Federal Sustainable Development Strategy.

- Construction of new buildings greater than 1,000 square metres shall meet the "Gold" level of LEED or equivalent and must be registered and certified by the Canada Green Building Council. Construction of new buildings less than 1,000 square metres shall meet the "Gold" level of LEED, but projects do not require registration or certification.
- Major renovations of existing buildings (excluding heritage buildings) over 1,000 square metres and of project value greater than \$1M, must meet Silver level of the applicable LEED® Canada rating system, or equivalent, and must be registered and certified by the Canada Green Building Council, or equivalent. Otherwise, major renovations of existing buildings shall meet LEED Silver or equivalent, but do not require registration or certification.
- Existing buildings deemed to have the greatest impact (environmental, operating cost, visibility) shall be assessed under the Building and Owners and Managers Association's Building Environmental Standards (BOMA BEST) Program.

Parks Canada Example

The Operations Building at Gulf Islands National Park Reserve in Sidney, BC, gives Parks Canada great pride as it is a leader in Canada's green building industry. It was the first government building to have achieved LEED Platinum certification. It is 75% more energy efficient than the average building of its size and operation. It includes photovoltaic electricity generation, an ocean-based heat pump system provides heating and hot water for marine wash water and sewage conveyance, and low-VOC materials and furniture. It also boasts 60% reduction of potable water use through a rainwater collection system.





3.1.9 Heritage Building Considerations

The Cultural Resource Management (CRM) Policy is part of Parks Canada's Guiding Principles and Operational Policies. It contains several principles and practices that limit the modifications that can be made to buildings that have heritage or historical significance. The objective of the policy is “to manage cultural resources administered by Parks Canada in accordance with the principles of value, public benefit, understanding, respect, and integrity”. Compliance with the principles of respect is particularly important when implementing energy-use interventions.

3.1.10 Programs

The following are various industry and government programs offering financial and technical assistance to reduce energy use in buildings and facilities

Federal Buildings Initiative (FBI)

Natural Resources Canada's (NRCan) Office of Energy Efficiency (OEE) offers the Federal Buildings Initiative to help federal organizations reduce energy and water consumption and greenhouse gas emissions. The Federal Buildings Initiative provides advice and consultation on project opportunities, model contracting documents, celebration and recognition opportunities, and a national network for energy management training. For more information regarding the services and products offered by the Federal Buildings Initiative, please consult the following:

<http://www.nrcan.gc.ca/energy/efficiency/communities-infrastructure/buildings/federal/4481>

Many provincial programs for greening operations are available to federal government establishments. Look for funding opportunities, incentives, and rebates under the provincial power provider website or under the energy department website for the province.

ENERGY STAR® program

The OEE also administers many programs that promote energy savings for the residential, commercial and transportation sectors. One of such programs is the ENERGY STAR® program. It is a labelling initiative supported by the Government of Canada, participating manufacturers, retailers, and other organizations that help identify products that are at the top of their class in terms of energy efficiency. It is therefore recommended to select products bearing the ENERGY STAR® label when purchasing replacement or new components, products or appliances. Details are available at:

<http://www.nrcan.gc.ca/energy/products/energystar/12519>

<http://www.energystar.gov/>

3.1.11 Tools, Training and Workshops

RETScreen Clean Energy Project Analysis Software

As a tool for determining project feasibility, RETScreen Clean Energy Project Analysis Software is recommended. It is provided free-of-charge by the Government of Canada through NRCan as part of Canada's recognition of the need to take an integrated approach in addressing climate change and reducing pollution.

Natural Resources Canada Energy Efficiency Workshops

NRCan - Energy Management Planning



NRCan - Spot the Energy Savings Opportunities

NRCan – Dollars to \$ense

Access to course material can be obtained from the [Natural Resources Canada website](http://www.oee.nrcan.gc.ca/industrial/training-awareness/participants/login.cfm) (password: participants):

<http://www.oee.nrcan.gc.ca/industrial/training-awareness/participants/login.cfm>

3.2 Fleet

The fleet category includes any piece of machinery that is mobile and has an internal combustion engine or motor such as cars and light trucks, heavy equipment (graders, dump trucks, etc.), and off road equipment (i.e., marine, snowmobiles, lawn tractors, generators, chainsaws, etc.).

Parks Canada manages the fourth largest fleet among federal departments, comprised of approximately 1,425 light fleet vehicles, 200 vessels, and 900 pieces of heavy equipment and off-road equipment, which account for 32% of Parks Canada's total GHG emissions.

The amount of carbon dioxide produced from an internal combustion engine is directly proportional to the amount of fuel burned. As such, a fuel-efficient vehicle travelling a given distance will produce less GHG emissions than a vehicle that is less fuel-efficient. It is important to note that vehicle emission rating systems such as ULEV (ultra low emissions vehicle) refer only to air polluting compounds that contribute to smog, and do not have a bearing on GHG emissions.

The fleet category has been divided into four sections: light fleet, heavy equipment, off-road equipment, and marine fleet. Aircrafts emissions are not included in Parks Canada's emissions since they are not owned and operated by the Agency. The following strategies will contribute to the reduction of GHG emissions from Parks Canada's fleet.

Best Practice Measures for Federal Fleet:

- Follow guidance provided in the Treasury Board Secretariat's Guide to Fleet Management for light-duty and executive vehicles.
- Utilize Natural Resources Canada's [ecoENERGY for Fleets](#) and [FleetSmart](#) programs.
- Purchase fuel-efficient and alternative fuel vehicles through the Government Motor Vehicles Ordering Guide (GMVOG) issued through PWGSC.
- Implement fleet rationalization/rejuvenation/right-sizing.
- Install after-market devices to reduce fuel consumption (e.g., anti-idling devices, or heat recovery systems).
- Undertake vehicle sharing (e.g., a central pool of administrative vehicles for use by all departments).
- Benchmark against government operations in other jurisdictions.

3.2.1 Light Fleet

Light fleet includes on-road passenger cars (sedans, station wagons) and light trucks (pick-ups, vans,





utilities) that may be utilized to transport up to 15 passengers or up to 1,820 kg (4000 lbs) of payload that are owned, leased, or rented by Parks Canada.

Light Fleet Renewal

New vehicles are on average 1.5 to 2.5% more fuel-efficient than vehicles from the previous model year, and auto manufacturers will likely continue these improvements into future years. Over time, with the appropriate fleet replacement, Parks Canada will benefit from improved fuel consumption, as well as lower maintenance costs.

Minimize Body Sizes and Vehicle Specifications

The way in which fleet assets are utilized can have a significant impact on GHG emissions. Field units are encouraged to review their fleet composition and deployment to ensure the most efficient use of assets. There are opportunities to save on operational costs and fuel use if efforts are made to purchase/use vehicles that do not exceed operational requirements.

- Rather than purchasing a vehicle that can perform all tasks, it may be environmentally beneficial to purchase a smaller vehicle for daily use and to rent a larger one to perform the occasional specific tasks.
- Modified golf carts and utility vehicles may also be viable alternatives to pick-up trucks in situations where use of the vehicle is restricted to a specific site such as a campground. Benefits include greater manoeuvrability, quieter operation, emissions reduction, and reduced capital and lifecycle costs.

Preauthorized Vehicle List

As per the Parks Canada [Light Fleet Management Directive](#), the selection of new light fleet vehicles for acquisition must be made from the Parks Canada Preauthorized Vehicle List or exemption must be obtained from the respective Vice President. The Parks Canada Preauthorized Vehicle List is developed by the National Fleet Advisor and is posted on the intranet under [Our Work/Environmental and Fleet Management/Fleet Management/Acquisition and Disposal](#), and is sent by email to the national fleet network.

The list is created using the following criteria:

- Include vehicles chosen from the Government Motor Vehicle Ordering Guide;
- Include vehicles that are among the most fuel-efficient in their class;
- Include alternative fuel and hybrid vehicles;
- Include vehicles that have a fuel consumption rating that is equal or lower than that of a basic two-door full-size pick-up truck;
- Consider fuel consumption, costs, safety, standard equipment, public perception, and corporate identity requirements.

Alternative Fuels and Vehicle Technology

Below are brief descriptions of existing alternative fuels and vehicle technologies, their effectiveness at reducing GHG emissions and how they relate to Parks Canada.

Hybrid electric vehicles (HEVs): combine a battery powered electric motor with a conventional internal combustion engine. Thus they offer the extended driving range and rapid refuelling of conventional vehicles, together with many of the energy and environmental benefits of electric vehicles. HEVs generally reduce GHG emissions from vehicle operation and decrease upstream emissions by about 30 percent compared with conventional gasoline vehicles. A number of hybrid



vehicle models are widely available on the market today, with many manufacturers introducing an increasing number of hybrid electric/gasoline vehicles each year, many with plug-in ability.

Approximately 6 percent of Parks Canada's Passenger cars are hybrid vehicles. Many models are available through the Government Motor Vehicles Ordering Guide (GMVOG) issued through PWGSC.

Electric vehicle (EV): EVs operate using an electric motor powered by a series of batteries and can travel up to 150 km before having to be recharged. EVs produce zero emissions although the electricity required to recharge the batteries must be taken into consideration. Several Electric Vehicles are now commercially available. The recharging time, the limited range, availability of charging stations, and the cost are still constraints that must be considered.

Parks Canada has approximately 20 fully electric utility vehicles in its fleet, but no on-road light duty vehicles. A few models are available through the Government Motor Vehicles Ordering Guide (GMVOG) issued through PWGSC.

Biodiesel: is a non-toxic and biodegradable fuel that is made from vegetable oils, waste cooking oil, animal fats or tall oil (a by-product from pulp and paper processing). A 20 percent blend of biodiesel with petroleum diesel (B-20) produces 19 percent fewer emissions, and a 5 percent blend (B-5) produces 5 percent fewer emissions. An increasing number of manufacturers are endorsing the use of lower biodiesel blends such as B-5.

Biodiesel is commercially available in Canada. A 5 percent blend of biodiesel with petroleum diesel is currently being used by the mountain parks and comprises 44% of all diesel consumption at Parks Canada.

Ethanol: is a liquid alcohol made of oxygen, hydrogen, and carbon; and is obtained from the fermentation of sugar or converted starch contained in grains and other agricultural or agri-forest feedstocks, and as such is a renewable fuel. It also burns more cleanly and completely than gasoline or diesel fuel. There are two types available:

E-10: overall, use of E-10 increases fuel consumption by an average of 2 percent compared with pure gasoline. However, this is only a slight difference when compared with other factors that have a larger impact on fuel economy. All gasoline-powered vehicles can run on a blend consisting of gasoline and up to 10 percent ethanol, known as "E-10", which is available at many service stations across Canada.

Currently, E-10 comprises 43 percent of all gasoline consumption at Parks Canada.

E-85: Some vehicles were specially manufactured to operate on an ethanol blend that contains up to 85 percent ethanol and at least 15 percent gasoline, but are no longer being produced by manufacturers. E-85 is not commercially available in Canada. E-85 fuel has lower energy content, requiring larger quantities to achieve the same performance as regular gasoline. As such the reductions in GHG emissions are not significant.

Currently, Parks Canada has no E-85 fuel vehicles in its fleet and no models are available through the Government Motor Vehicles Ordering Guide (GMVOG) issued through PWGSC.



Compressed Natural Gas (CNG): CNG-powered vehicles produce about 25% less GHG emissions and up to 98% less smog related emissions than equivalent gasoline-powered vehicles.

At the present time, two CNG vehicles are being used by Parks Canada, and some light trucks and vans are available for purchase through the Government Motor Vehicles Ordering Guide (GMVOG).

Propane: Propane-powered vehicles produce about 20% less GHG emissions and up to 90% less smog related emissions than equivalent gasoline-powered vehicles. There are currently about 3,000 fuel outlets across Canada, with a higher concentration in British Columbia, Alberta, and Ontario.

Parks Canada has propane powered equipment in its fleet, but no on-road light duty vehicles. No models are available through the Government Motor Vehicles Ordering Guide (GMVOG) issued through PWGSC.

Fuel Cell Vehicles: Fuel cells generate electricity by electrochemically combining hydrogen and oxygen. On a life-cycle basis, they can produce zero or very low emissions. Many automobile manufacturers are working on prototypes for hydrogen fuel cell vehicles; however, at the present time fuel cell vehicles are limited in their commercial availability.

Natural Resources Canada provides more information on alternative fuels at the following webpages:

- <http://www.nrcan.gc.ca/energy/alternative-fuels/3487>
- Alternative Fuel Directory: <http://www.nrcan.gc.ca/energy/alternative-fuels/resources/3685>

Operational Strategies

Reduce use of vehicles

In some cases, where feasible, the simplest way to reduce emissions from the light fleet may be to reduce its use. Fleet managers and users are encouraged to identify and eliminate unnecessary use of the light fleet.

Avoid Unnecessary Engine Idling

Engine idling wastes fuel, negatively affects air quality, and increases vehicle maintenance costs. As per the Parks Canada Light Fleet Management Directive, unnecessary engine idling is prohibited. In some jurisdictions, it is often not permitted by legislation and bylaws.

Detailed information on the impacts of idling is available at the following website:

<http://www.nrcan.gc.ca/energy/efficiency/communities-infrastructure/transportation/idling/4397>

3.2.2 Heavy Equipment

The fuel efficiency of heavy equipment improves with each model year and manufacturers will continue these improvements into future years. Parks Canada's heavy fleet can significantly reduce fuel consumption by renewing the fleet on a shorter cycle. Consult the [Heavy Fleet Management Directive](#) for more information on the responsible possession and use of heavy fleet.



Operational Strategies

Minimize body size and vehicle specifications

Field units are encouraged to review their fleet composition and deployment to ensure the most efficient use of Heavy equipment. There are opportunities to save on operational costs and fuel use if efforts are made to purchase/use vehicles that do not exceed operational requirements.



Cabin heaters and anti-idling devices

Unnecessary engine idling wastes fuel and increases maintenance costs. The most common reason for unnecessary engine idling is to provide heat for the comfort of the cabin's occupants. Install a fuel-fired cab and coolant heater that provides heat to the cabin for comfort, and to the engine coolant for easy start-ups. They consume 85% less fuel than an idling engine, resulting in savings of up to four litres of diesel per hour. Auxiliary heaters are readily available and cost between \$1,000 and \$3,000 installed.

Anti-idling devices can be programmed to automatically shut off engines after a specified amount of time. In combination with cabin heaters, electronic anti-idling devices can help reduce fuel consumption without affecting the operator's comfort.

3.2.3 Off-Road Equipment

Operational Strategies

Purchase equipment with four-stroke engines

Four-stroke engines are up to 40% more fuel-efficient, 90% cleaner and 50% quieter than two-stroke engines. They also typically have a longer service life thus increasing their financial viability.

Reduce use of equipment

The simplest way to reduce emissions from equipment is reduce its use. There may be energy saving opportunities by simply changing existing practices. As an example, landscape architects have commented that in some places, Parks Canada cuts more grass than may be necessary.

3.2.4 Marine Fleet

Operational Strategies

Purchase of four-cycle or direct injection two-stroke engines

Four-cycle and direct injection two-stroke engines are 40% more fuel efficient, 90% cleaner and 50% quieter than conventional 2-cylce engines. They also typically have a longer service life thus increasing their financial viability.

OceanSMART Ecological Green Boating Guide

The [Green Boating Guide](#) is produced by the T. Buck Suzuki Environmental Foundation. The guide includes marine vessel operational and design measures that minimize fuel consumption and reduce the environmental impacts. The guide provides an excellent resource for vessel owners and operators.



3.3 Awareness and Education

An employee awareness program provides employees with information on how energy resources are used in the workplace and how their actions can directly affect energy consumption. By changing employees' attitudes and behavior, it is possible to significantly reduce energy use and contribute to the savings achieved through technical measures.

3.3.1 Employee Awareness

Employee awareness is critical in ensuring that staff has all the tools to implement change in energy use. While one operational section is usually responsible for energy costs, all sections are energy consumers. It is very easy for staff not responsible for the costs to become disconnected with the value of energy. Energy audits and monitoring allow regular reports to be fed back to all managers and staff on changes in energy use. Setting up feedback loops to employees is key to emission reductions.

Just by understanding how your building systems operate allows staff to make day-to-day decisions on the ways they can contribute to lowering energy costs, whether it is by turning off lights, managing standby power, turning thermostats up or down, or reporting a dripping tap.

For more information and guidance, a step-by-step [approach to designing and implementing an effective energy efficiency awareness program](#) is available from Natural Resources Canada.



3.3.2 Green Team

Through communications, awareness, training, and employee-driven initiatives, regional Green Teams aim to foster change in the mindset and subsequently the behaviour of Parks Canada employees to reduce the Agency's overall environmental impacts. The "Guidelines for Establishing Green Teams at Parks Canada – Recruitment and Resource Toolkit" is available on the Parks Canada Intranet site under [Our Work/Environmental and Fleet Management/Environmental Management/Green Teams at Parks Canada](#).

3.3.3 Engaging Visitors and Public Education

Parks Canada aims to provide visitors with innovative, practical, and cost-effective services and facilities; and offer activities that promote environmental sustainability. The visibility of renewable resource technology being used in Parks Canada facilities and sites, promoting wise use of electricity in our campgrounds and providing visitor opportunities to reduce vehicle use encourages visitor to continue being "green" while demonstrating Parks Canada's commitment to reducing GHG emissions.

3.3.4 Energy Saving Tips

- Adopt energy-saving habits (e.g., turning off devices when not in use).
- Walk or bike whenever possible.
- Take public transit or carpool whenever possible. Increase your fuel economy when driving by sticking to posted speed limits.
- Plan and combine trips and errands if driving.



- Conserve water by fixing drips and leaks, and by installing low-flow shower heads and toilets.
- Research where your power is coming from - wind, water, coal, or solar - and talk to your power provider to determine if a greater percentage could be coming from renewable resources.

4 Meeting the Target

Parks Canada's target is to reduce its greenhouse gas emissions by 10.1% by 2021 from 2005-06 levels at a rate of 1.1% per year beginning in 2011-12. Each field unit is given the same target percentage reduction.

4.1 Performance Measurement

4.1.1 GHG Emission Factors

Parks Canada's GHG emissions are calculated using data reports generated from the financial system. For each field unit, the energy consumption for each energy type is calculated. Emissions factors for each energy type have been determined by the Office of Greening Government Operations (OGGO) and are used by federal departments to calculate GHG emissions. The GHG emission factor converts the quantity of each energy type purchased into tonnes of CO₂ equivalent (CO₂ eq.).

For example: 1,000 litres of Gasoline used in on-road fleet

$$\begin{aligned}
 \text{GHG Emissions} &= (\text{quantity of energy purchased}) * (\text{GHG emission factor}) \\
 &= (1,000 \text{ litres of Gasoline}) * (2,243 \text{ g/litre of Gasoline}) \\
 &= (2,243,000 \text{ g of CO}_2 \text{ eq.}) * (1 \text{ tonne of CO}_2 \text{ eq.} / 1,000,000 \text{ g of CO}_2 \text{ eq.})
 \end{aligned}$$

$$\text{GHG Emissions} = 2.24 \text{ tonnes of CO}_2 \text{ equivalent}$$

Table 3 provides GHG output conversions of common energy sources used by fleet.

Table 3: GHG Conversion chart for common fuel types

Energy Consumption	Resulting GHG Emissions
445 litres of Gasoline	≈ 1 tonne of CO ₂ equivalent
470 litres of 10% Ethanol Gasoline (E-10)	
366 litres of Diesel	
385 litres of 5% Biodiesel (B-5)	

4.1.2 GHG Emissions from Electricity

In Canada, electricity is primarily generated by turbines that are powered by hydro-electric dams or steam produced by nuclear reactors; or the burning of coal, oil, or natural gas. While the consumption of electricity does not directly emit GHGs, the emissions produced by the production of this electricity are considered. Because each province uses different sources to generate electricity, provincial emission factors have been developed by the OGGO that are updated as necessary. As shown in Table 4 below, each field unit corresponds to a province for which an emission factor has been assigned and that is used to calculate the emissions produced from purchased electricity. These provincial coefficients have dramatic impact on the resulting GHGs from electricity and should be considered when developing a reduction strategy.

**Table 4:** Provincial Emission Factors for Purchased Electricity

Province	Field Units	GHG emission factor (g CO ₂ eq./kWh)
Alberta	Banff, Jasper, Highway Service Centre, Waterton	899
British Columbia	Coastal BC, LLYK, Glacier - Mt Revelstoke, Gwaii Haanas	24.3
Canada [default]		222
Manitoba	Manitoba, Riding Mountain	9.1
New Brunswick	Southern NB, Northern NB	395
Newfoundland and Labrador	NFLD East, NFLD West and Labrador	20.5
Northwest Territories	Southwestern Northwest Territories, Western Arctic	463
Nova Scotia	Cape Breton, Mainland Nova Scotia	902
Nunavut	Nunavut	463
Ontario	SW Ontario, Northern Ontario, Ontario Waterways, Georgian Bay and Eastern Ontario, Rouge	222
Prince Edward Island	PEI	102
Quebec	Gaspésie, La Mauricie and Western Quebec, Mingan, Quebec, Saguenay, Quebec Waterways, National Office	4.18
Saskatchewan	Northern Prairies, Saskatchewan South	780
Yukon	Yukon	66.5

For example, consider a proposed 100,000 kWh energy reduction strategy. Table 6 shows how the resulting GHG reduction benefits are highly dependent on the province. Because Quebec uses hydro to produce power, the coefficient is low. This means that the amount of electricity consumed or saved by field units in that province will have little impact on their GHG graph. On the other hand, the opposite conclusion can be made for field units in Alberta, where the coefficient is high.

Table 5: GHG Reduction Benefits by Province for 100,000 kWh of Electricity Purchased

Province	GHG Reduction Benefit per 100,000 kWh
Alberta	89.9 tonnes
Quebec	0.418 tonnes
New Brunswick	39.2 tonnes

4.1.3 Data Collection and Reporting Methods

Parks Canada is required to report its GHG emissions annually to the Office of Greening Government Operations (OGGO) as part of the requirements of the Federal Sustainable Development Strategy. The Environmental Management section of Strategy and Plans is responsible for calculating the Agency's GHG emissions using the method described in this section.

At the end of each fiscal year, the Chief Financial Officer Directorate provides Parks Canada's annual energy expenditure and consumption figures and presents this data to the Environmental



Management team. Annually, Environmental Management uses the following process for both internal and external GHG reporting:

- 1) Environmental Management receives a report of Parks Canada's energy purchases for the recently-ended fiscal year. This report includes expenditures and quantities of energy for both facilities and fleet. The GL codes searched are:

22502: Natural gas	22517: Gasoline
22526: Propane	22529: Ethanol gasoline
22514: Diesel	22525: Vehicle propane
22515: Fuel oil	22527: Vehicle diesel
22501: Electricity	22627: Vehicle biodiesel
	22528: Vehicle natural gas
- 2) The financial data is analyzed to determine how much energy of all possible types (e.g., biodiesel, natural gas, diesel, electricity, etc.) was purchased by each field unit, and how much it cost.
- 3) Analyzed data is sent to finance managers at each field unit for them to validate their units' numbers.
- 4) Once confirmed, the data is used to calculate GHG emissions (in carbon dioxide equivalents) based on factors calculated by Environment Canada. These emissions are compared with Parks Canada's emission targets.
- 5) Final reports are shared with Parks Canada's PCX community, posted on the Intranet, and sent to OGGO.

Because the accuracy of the GHG reporting process is dependent on the financial system, it is important that financial staff input energy consumption data correctly when paying energy invoices. Typical errors include incorrectly entering energy units and miscoding energy types.

4.1.4 Progress Reports

Using available data, the Environmental Management team produces yearly reports on Parks Canada's annual GHG output from the previous fiscal year (Figure 3 on pg. 26). These reports plot annual GHG output and show the reduction required (in tonnes of CO₂ equivalent), both per field unit and agency-wide. Because a field unit's GHG output will fluctuate from year to year due to factors such as weather conditions, expansion, or divestment; and the implementation of energy conservation initiatives, the level of GHG reduction required may also fluctuate.

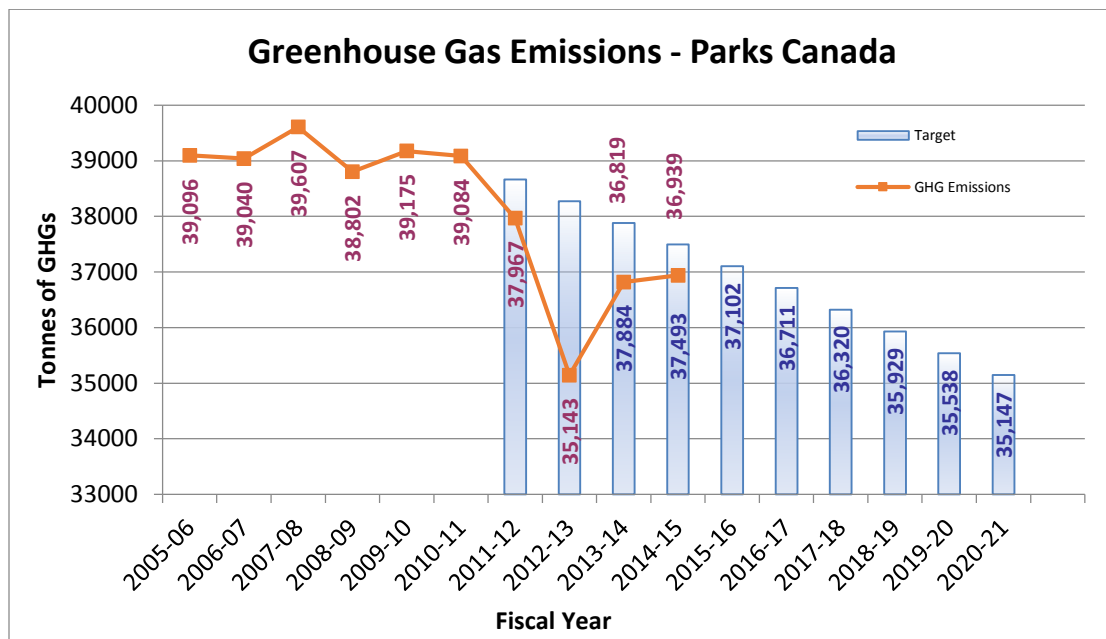


Figure 3: Parks Canada's progress in reducing its GHG emissions.

5 Acronyms

BOMA BEST: Building Operators and Managers Association – Building Environmental Standards

CO₂: carbon dioxide

DSDS: Departmental Sustainable Development Strategy

FSDS: Federal Sustainable Development Strategy

GHG: greenhouse gas

LED: light-emitting diode

LEED: Leadership in Energy and Environmental Design standard

NRCan: Natural Resources Canada

OEE: Office of Energy Efficiency, under NRCan

OGGO: Office of Greening Government Operations, under PWGSC

PWGSC: Public Works and Government Services Canada

PCX: Parks Canada executive