

Practices to Improve the Efficiency of On-Road Freight

Short-term opportunities to reduce GHG emissions from Canada's freight trucks

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Executive summary

Freight trucks are an increasing source of greenhouse gas (GHG) emissions in Canada and greatly contribute to air pollution. While significant progress has been made to reduce the impacts of transportation through these measures, there are still several ways by which the efficiency of freight operations in Canada can be improved. While it's important to support technological solutions that facilitate a shift to near- and zero-emission on-road freight vehicles, it's also important to target vehicle efficiency improvements that can benefit existing freight trucks that will be on the road for years to come. Hence, this report highlights practices that can be adopted by heavy-duty truck carriers in Canada to reduce emissions and improve the efficiency of freight trucks on the road now.

Our report highlights a suite of practices that fall under the following four categories:

1. Improve vehicle efficiency
2. Improve capacity utilization
3. Promote fuel efficient driving behaviour
4. Adopt fuel efficient vehicle routing practices

In particular, it is important to highlight practices and technologies that require lower levels of effort to implement, but which can still generate notable reductions in GHG emissions. Table ES1 outlines each of the practices and technologies highlighted in this report according to the relative level of effort required for their implementation, as well as their estimated level of impact on fuel efficiency and GHG emission reductions.

While these practices are expected to reduce GHG emissions, rates of adoption are still fairly low in Canada. Based on interviews with assessors involved in Natural Resources Canada's Green Freight Assessment program, there are several factors which can affect the rate of adoption, such as a high level of disruption to operations, driver or mechanic acceptance and capital cost constraints. While fiscal measures, such as taxing fuels or providing incentives can support the adoption of practices and technologies to reduce GHG emissions from freight trucks, educational tools can also play an important role. We recommend that comprehensible resources highlighting the effectiveness of best practices be showcased in an easily accessible location for fleets. Moreover, future research is needed to quantify the expected GHG emission benefits of practices where

this has not already been done in order to focus efforts on those with the greatest potential.

Table ES1. Estimated level of impact on fuel efficiency and GHG emission reductions for the identified practices and technologies, and the estimated level of effort required for implementation.

Practice/Technology	Level of effort	Estimated level of impact
Participate in driver training programs	Low	High
Undergo routine preventative maintenance	Low	Moderate
Install low rolling resistance tires	Low	Moderate
Right-size delivery solutions	Low	Moderate
Cap vehicle speed	Low	Moderate
Allow private truck drivers to perform for-hire routes	Low	Moderate
Minimize the tractor-trailer gap	Low	Low
Cover open loads with tarps	Low	Low
Optimize cargo loading practices	Low	Low
Implement driver recognition and reward programs	Low	Low
Use apps or websites to locate parking	Low	Low
Use long combination vehicles	Moderate	High
Install eco-driving feedback systems	Moderate	High
Install aerodynamic devices	Moderate	Moderate
Use idle reduction technologies	Moderate	Moderate
Use long trailers	Moderate	Moderate
Use tracking and tracing systems	Moderate	Moderate
Adopt eco-navigation systems	Moderate	Moderate
Perform off-peak deliveries	Moderate	Moderate
Improve the efficiency of loading/unloading by scheduling appointments with shippers	Moderate	Moderate
Leverage hubs to consolidate cargo	Moderate	Moderate
Install automatic tire monitoring and inflation systems	Moderate	Low
Reduce packaging	Moderate	Low
Leverage multimodal distribution	High	High

The adoption of practices outlined in this report can help Canada reach its climate targets of 30% below 2005 levels by 2030 and net-zero by 2050. While it's important to accelerate the development, testing and uptake of near- and zero-emissions heavy-duty truck technologies that offer the potential to achieve the deep emissions reductions required to meet our long-term commitment of net-zero by 2050, it's also important to maximize short-term opportunities to reduce emissions and improve the efficiency of

existing and new diesel fleets which are expected to continue to dominate key segments of the freight industry for years to come. The practices outlined in this report will not only help Canada reach its climate targets but can also lead to important cost savings for fleets.

1. Introduction

1.1 Improving the efficiency of on-road freight

Supporting a shift to a cleaner on-road freight sector must be a pillar of climate action, and the federal government has an important role to play. Given the high energy demands of on-road freight vehicles coupled with the rise in activity, it is of particular importance to further accelerate fuel savings and efficiency in the sector. However, there are still barriers to the widespread integration of energy efficient measures in Canada's on-road freight sector. On-road freight has been and will be more difficult to decarbonize due to the industry's higher energy demands that stem from heavier payloads, longer annual distance travelled, as well as limited awareness or adoption of measures that can be implemented by businesses. As such, there is a need for public, private, and non-governmental sectors to collectively advance energy efficient solutions that can be widely adopted and scaled in order to improve Canada's on-road freight sector. It is vital to identify best practices that could be implemented by public and private fleet operators and owners to improve the on-road freight supply chain in Canada, in order to bring a host of benefits to businesses and communities, including fuel cost savings (with cost reductions potentially being passed on to consumers), air quality improvements, a reduction of transportation-related GHG emissions, potentially faster deliveries, and reduced congestion.

1.2 Freight as a growing source of emissions

Goods movement accounted for over 40% of all transportation related GHG emissions in Canada in 2017. Since 1990, GHG emissions from freight, including aviation, rail, marine and trucks, increased by 160% (see Figure 1).

Freight trucks are the fastest-growing portion of Canada's transport-related GHG emissions. Freight trucks also tend to have a higher carbon intensity (measured in grams of CO₂e per tonne-kilometre) than other modes of freight transport.¹ Between 1990 and 2015, GHG emissions from freight trucks (including light-, medium- and

¹ Alan McKinnon, "Freight Transport in a Low-Carbon World," *TR News*, November-December 2016, 11. <http://onlinepubs.trb.org/onlinepubs/trnews/trnews306feature.pdf>

heavy-duty freight trucks) alone doubled.² This growth can largely be attributed to a growth in the size of the vehicle pool, as well as the total vehicle kilometres travelled.³ Just-in-time delivery practices have also placed additional demand on Canada's freight sector, whereby freight trucks are forced to act as virtual warehouses and respond quickly to demand.⁴

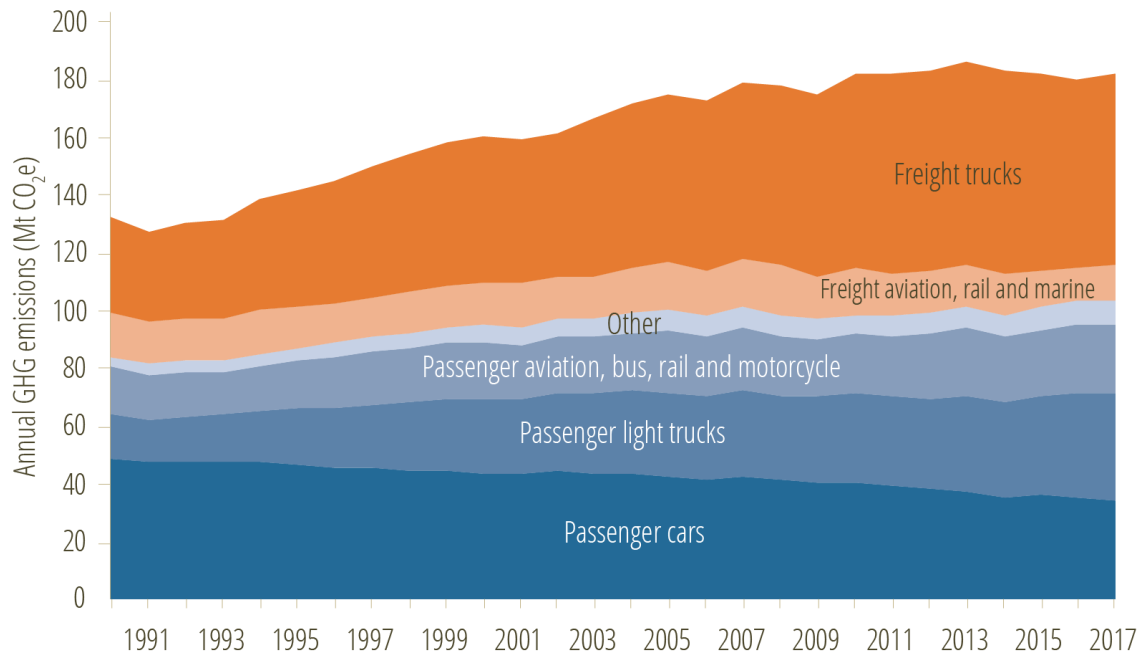


Figure 1. Canadian transportation sector GHG emissions.

Data Source: Natural Resources Canada⁵

Freight trucks also contribute disproportionately to concentrations of air pollutant emissions that can contribute to the formation of smog and localized air pollution that can be harmful to human health.⁶ In fact, concentrations of local air pollutant emissions depend more on the presence of large trucks on the road rather than total traffic

² Natural Resources Canada, "Table 8: GHG Emissions by Transportation Mode," *Comprehensive Energy Use Database*.
<http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP§or=tran&juris=ca&rn=8&page=0>

³ Environmental and Climate Change Canada, "National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada - Part 1," 2019, 40-42. <https://unfccc.int/documents/194925>

⁴ "National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada - Part 1," 42.

⁵ "Table 8: GHG Emissions by Transportation Mode"

⁶ Environment Canada "Air pollutants – Criteria Air Contaminants," 2017.
<https://www.ec.gc.ca/air/default.asp?lang=En&n=7C43740B-1>

volume.⁷ While the goods movement sector is an important component of the Canadian economy, growing freight activities have major implications on both climate change and the quality of life of Canadians, if they are not adequately managed and planned for.

1.3 The Government of Canada’s commitment to reducing the impact of freight

Since the establishment of the Pan-Canadian Framework on Clean Growth and Climate Change, Canada has established a clear action plan to support a cleaner transportation sector. Commitments include: setting emission standards and improving efficiency by developing new requirements for heavy-duty trucks to install fuel saving devices, putting more zero-emission vehicles on the road, shifting from high- to lower-emitting modes, investing in low-carbon charging and refueling infrastructure, and using cleaner fuels, including the development of a Clean Fuel Standard.⁸ In addition, current and proposed federal heavy-duty vehicle GHG emissions standards will help to reduce emissions from this sector, albeit for new vehicles and engines rather than existing vehicles that are already in-use.⁹

In the mandate letter to the Minister of Infrastructure and Communities following the 2019 federal election, the prime minister called for investments to support the adoption of zero-emission transit and school buses, and in the mandate letter to the Minister of Natural Resources, to invest in 5,000 additional vehicle charging stations along the Trans-Canada Highway.^{10,11} Promoting the uptake of zero-emission heavy-duty vehicles in market-ready segments can spur adoption and technological development of zero-emission vehicles in other heavy-duty segments, such as freight. While it’s important to support technological solutions that facilitate a shift to near- and zero-emission on-

⁷ Southern Ontario Centre for Atmospheric Aerosol Research, *Near-Road Air Pollution Pilot Study* (2019). <https://www.soccar.utoronto.ca/wp-content/uploads/2019/10/SOCAAR-Near-Road-Air-Pollution-Pilot-Study-Summary-Report-Fall-2019-web-Final.pdf>

⁸ Environment and Climate Change Canada, *Pan-Canadian Framework on Clean Growth and Climate Change* (2016), 18. http://publications.gc.ca/collections/collection_2017/eccc/En4-294-2016-eng.pdf

⁹ “Canada’s Greenhouse Gas and Air Pollutant Emissions Projections 2018,” 23.

¹⁰ Justin Trudeau, Prime Minister of Canada, “Minister of Infrastructure and Communities Mandate Letter.” <https://pm.gc.ca/en/mandate-letters/minister-infrastructure-and-communities-mandate-letter>

¹¹ Justin Trudeau, Prime Minister of Canada, “Minister of Natural Resources Mandate Letter.” <https://pm.gc.ca/en/mandate-letters/minister-natural-resources-mandate-letter>

road freight vehicles, it's also important to target vehicle efficiency improvements that can benefit freight vehicles on the road now.

The SmartWay Program, administered by Natural Resources Canada (NRCan), has already facilitated efficiency improvements within Canada's freight sector. SmartWay is a public-private partnership that supports emissions reductions and the improved efficiency of freight operations through performance benchmarking and tracking. Companies benchmark their performance with respect to emissions, fuel consumption, idling hours, average payload, average kilometers travelled per truck, empty kilometers and capacity utilization. In 2017, \$170 million in annual fuel costs were saved as a result of participation in Canada's SmartWay program.¹² Complementary to SmartWay, NRCan also administers the SmartDriver program which provides training to professional drivers to target reductions in fuel consumption. Lastly, the Green Freight Assessment Program (GFAP) provides funding to help companies receive a third-party fleet assessment and improve a fleet's efficiency by implementing the recommendations outlined in their assessment. Recommendations received through a fleet assessment will help companies make data drive investment decisions, resulting in greater savings and reducing their overall environmental impact.

In addition to the aforementioned efforts that clearly target emissions reductions and efficiency improvements within Canada's freight sector, Transport Canada is also mandating the use of electronic logging devices for commercial vehicles under the Commercial Vehicle Drivers Hours of Service Regulations, which aligns closely with existing regulations in the United States.¹³ While the purpose of the mandate is to make it easier for commercial vehicle drivers to log, manage and store their hours of service records, the introduction of the technology is also expected to provide several other co-benefits. Electronic logging devices that transmit information wirelessly are essentially telematics systems.¹⁴ In addition to logging hours-of-service compliance, telematics systems can aid in monitoring on-board diagnostics that can signal maintenance issues such as malfunctioning exhaust aftertreatment systems, driver behaviour including

¹² Natural Resources Canada, *Energy Efficiency in Canada: Report to Parliament Under the Energy Efficiency Act 2017-2018* (2019), 35. http://publications.gc.ca/collections/collection_2019/rncan-nrcan/M141-15-2018-eng.pdf

¹³ Government of Canada, "Regulations Amending the Commercial Vehicle Drivers Hours of Service Regulations (Electronic Logging Devices and Other Amendments): SOR/2019-165," *Canada Gazette, Part II, Volume 153, Number 12* (2019). <http://www.gazette.gc.ca/rp-pr/p2/2019/2019-06-12/html/sor-dors165-eng.html>

¹⁴ Ben Sharpe and Dave Schaller, *Telematics in the Canadian Trucking Industry* (2019), 4. https://theicct.org/sites/default/files/publications/Telematics_Canadian_trucking_industry_20191210.pdf

speed, acceleration, braking and idling, GPS tracking and navigation, and dispatch and scheduling.¹⁵ This data collection can facilitate targeted performance improvements, particularly with respect to fuel efficiency.

While significant progress has been made to decarbonize the transportation sector through these measures, more needs to be done. In particular, efforts need to be targeted at supporting low risk, high impact practices that can support GHG emission reductions from heavy-duty freight vehicles on the road now. While market-ready low- and zero-emission freight vehicles either currently exist or are expected to exist in the near-term, existing freight vehicles will be on the road for many years to come.

¹⁵ *Telematics in the Canadian Trucking Industry*, 2.

2. Efficiency practices to implement in the short-term

The freight sector in Canada is a highly competitive industry. There are, however, a wide range of accessible and affordable practices that can be implemented by heavy-duty fleet owners and operators no matter their size or scale that can lead to efficiency improvements and a reduction in GHG emissions. We've identified the following best practices to improve the environmental performance of freight trucks in Canada:

1. **Promote optimal vehicle efficiency** by undergoing routine preventative maintenance, installing low rolling resistance tires, covering open loads with tarps, minimizing the tractor-trailer gap, installing aerodynamic devices, using idle reduction technologies, installing automatic tire monitoring and inflation systems and leveraging multimodal distribution, when possible.
2. **Improve vehicle capacity utilization** by right-sizing delivery solutions, optimizing cargo loading practices, using long combination vehicles, using long trailers and reducing packaging.
3. **Promote fuel efficient driving behaviour** by participating in driver training programs, capping vehicle speed, implementing driver recognition and reward programs and installing eco-driving feedback systems.
4. **Adopt fuel efficient vehicle routing practices** by allowing private truck drivers to perform for-hire routes, using apps or websites to locate parking, using tracking and tracing systems, adopting eco-navigation systems, performing off-peak deliveries, improving the efficiency of loading/unloading by scheduling appointments with shippers and leveraging hubs to consolidate cargo.

2.1 Improve vehicle efficiency

While there are some major technological solutions that can be adopted to improve vehicle efficiency such as engine efficiency improvements, there are also several lower intervention practices that can improve the efficiency of freight trucks. These include undergoing routine preventative maintenance, installing low rolling resistance tires, covering open loads with tarps, minimizing the tractor-trailer gap, installing

aerodynamic devices, using idle reduction technologies, installing automatic tire monitoring and inflation systems and leveraging multimodal distribution, when possible. Each of these practices result in a reduction in fuel consumption, translating to a reduced GHG emission output.

2.1.1 Undergo routine preventative maintenance

Preventative maintenance can have a notable impact on fuel consumption. Fleets have reported fuel consumption improvements on the order of 5-10% following the implementation of preventative maintenance practices.¹⁶ This process involves monitoring components such as lubricants/engine oil, intake/exhaust systems and diesel particulate filters, engine cooling, air compressors, wheel alignment, tires, fuel filter systems, aerodynamic systems, electrical systems and air conditioning. Improper maintenance of these components can result in an increase to a vehicle's fuel consumption and hence, higher GHG emissions. Proactive, preventative maintenance can ensure any issues are detected early on.

2.1.2 Install low rolling resistance tires

It's estimated that 13% of a fully loaded tractor trailer's fuel consumption is required to overcome rolling resistance.^{17,18} Low rolling resistance tires, including wide-base single tires or energy efficient dual tires can play an important role in improving truck efficiency by reducing rolling resistance and aerodynamic drag. Moreover, wide-base single tires can provide weight savings for carriers, thereby allowing more valuable cargo to be stored on-board. Wide-base single tires and wheels are 360 to 450 kg lighter than standard tires and wheels outfitted on a typical combination tractor trailer.¹⁹ By installing low rolling resistance tires, the U.S. Environmental Protection Agency's (EPA) SmartWay Program branch estimates that carriers can achieve a reduction in fuel consumption of over 2-5%.²⁰ Meanwhile, Canada's National Research Council and the Alberta Motor Transport Association estimate that low rolling resistance tires can

¹⁶ North American Council for Freight Efficiency, "Confidence Report: Maintenance," 2015, 21.
<https://nacfe.org/report-library/confidence-reports/>

¹⁷ National Research Council, *Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles* (2010), 91.

¹⁸ "12 Ways to Save Fuel: Tires," *Heavy Duty Trucking*, June 17, 2014.
<https://www.truckinginfo.com/155093/121-ways-to-save-fuel-tires>

¹⁹ U.S. Environmental Protection Agency, *Low Rolling Resistance Tires*.
<https://19january2017snapshot.epa.gov/sites/production/files/2016-06/documents/420f16024.pdf>

²⁰ *Low Rolling Resistance Tires*.

reduce fuel consumption by 3 to 10%, translating to notable reductions in GHG emissions.^{21,22}

Low rolling resistance tires aren't expected to necessarily come with a higher price tag. The U.S. EPA's SmartWay branch, as well as the Alberta Motor Transport Association estimate that the cost of new generation wide base single tires with low rolling resistance is in fact comparable to or lower than standard dual tire fittings.^{23,24}

2.1.3 Minimize the tractor-trailer gap

In a study testing the effectiveness of various drag reduction strategies and add-ons, the National Research Council Canada (NRC) found that reducing the gap between a tractor and a trailer by only a foot can lead to GHG emission reductions on the order of 2,100 kg CO₂e per tractor per year.²⁵ On the other hand, the International Council on Clean Transportation (ICCT) estimates that reducing the tractor-trailer gap can improve fuel consumption by up to 2%.²⁶ As the NRC report states, a one foot gap reduction is operationally feasible for many vehicles on the road today and wouldn't require carriers to purchase new technology.

2.1.4 Cover open loads with tarps

Open loads on trailer flatbeds can reduce the aerodynamic capabilities of a heavy-duty vehicle by increasing drag. To minimize drag, drivers can cover open loads with a tarp. By doing so, the ICCT estimates that a 2-4% reduction in fuel consumption and the associated GHG emissions can be achieved.²⁷

²¹ National Research Council, *Reducing the Fuel Consumption of Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles, Phase Two: First Report* (2014), 70-71.

²² Alberta Motor Transport Association, *Climate Change White Paper* (2017), 4. https://amta.ca/wp-content/uploads/2017/05/Climate-Change-White-Paper-Web-Version_Official.pdf

²³ *Climate Change Whitepaper*, 4.

²⁴ *Low Rolling Resistance Tires*.

²⁵ Transport Canada, "Improving the Aerodynamic Efficiency of Heavy-Duty Vehicles – Wind Tunnel Test Results of Trailer-Based Drag Reduction Technologies," 2018. <https://www.tc.gc.ca/en/programs-policies/programs/ecotechnology-vehicles-program/etv-technical-papers/improving-aerodynamic-efficiency-heavy-duty-vehicles-wind-tunnel-test-results-trailer-based-drag-reduction-technologies.html>

²⁶ The International Council on Clean Transportation, *Green Freight Programs and Technology Verification* (2015), 10. https://theicct.org/sites/default/files/publications/ICCT_GrnFrgh_tech-verification_20150403.pdf

²⁷ *Green Freight Programs and Technology Verification*, 11.

2.1.5 Install aerodynamic devices

Aerodynamic devices can be installed on vehicles to reduce drag and improve vehicle efficiency. These devices, such as fairings, side skirts or gap reducers, can altogether reduce aerodynamic drag by as much as 30%.²⁸ Aerodynamic retrofits provide greater fuel savings in colder climates with denser air, yielding 20% larger reductions to aerodynamic drag and 10% larger increases to fuel efficiency than in warmer regions.²⁹ For trailers, aerodynamic add-ons offer some of the most significant GHG emission reduction potential and cost-effectiveness.³⁰ These factors have no doubt contributed to the popularity of aerodynamic devices: a 2015 study estimated that up to 50% of new box trailers sold in Canada were equipped at least one type of aerodynamic feature, the most popular being side skirts.³¹

The U.S. EPA's SmartWay branch has verified and catalogued a number of aerodynamic devices on their website, including gap reducers, boat tails, side skirts, other under trailer devices, aerodynamic splash guards (tire mud flaps), as well as other trailer devices. The EPA categorizes devices and device combinations into groups that can achieve fuel savings ranging from 1 to over 9%.³²

2.1.6 Use idle reduction technologies

Idle reduction technologies are a broad class of solutions that reduce the amount of time that a truck spends pulling power from its internal combustion engine to power auxiliary systems. Idle reduction technologies particularly benefit long haul drivers who require a temperature-controlled sleeper cabin on overnight trips. Moreover, they can

²⁸ Jeff Patten, Brian McAuliffe, William Mayda, and Bernard Tanguay, *Review of Aerodynamic Drag Reduction Devices for Heavy Trucks and Buses* (National Research Council Canada, 2012), 7. <https://www.tc.gc.ca/en/programs-policies/programs/ecotechnology-vehicles-program/etv-technical-papers/review-aerodynamic-drag-reduction-devices-heavy-trucks-buses.html>

²⁹ *Review of Aerodynamic Drag Reduction Devices for Heavy Trucks and Buses*, 6.

³⁰ Ben Sharpe, Mehul Garg, and Oscar Delgado, *Compliance Pathways in The U.S. Phase 2 Heavy-Duty Vehicle Efficiency Regulation* (International Council on Clean Transportation, 2017), 10. <https://www.theicct.org/publications/compliance-pathways-US-phase-2-HDV>

³¹ Ben Sharpe, Derek May, Bob Oliver, and Husam Mansour, *Costs and Adoption Rates of Fuel-Saving Technologies for Trailers in the Canadian On-Road Sector* (International Council on Clean Transportation and Pollution Probe, 2015), 11. <https://theicct.org/publications/costs-and-adoption-rates-fuel-saving-technologies-trailers-canadian-road-freight-sector>

³² U.S. Environmental Protection Agency, "Verified Technologies for SmartWay and Clean Diesel." <https://www.epa.gov/verified-diesel-tech/learn-about-smartway-verified-aerodynamic-devices>

benefit drivers loading or unloading cargo over long periods of time. According to the NRC, these technologies fall into five categories³⁵:

1. Automatic shut-down/start-up systems
2. Battery-powered
3. Fuel-operated heaters
4. Auxiliary power units (APUs) or generator sets
5. Truck stop electrification

Each category presents its own respective merits and drawbacks, and vary in their impact on idle time, benefit to fuel consumption and cost of installation. A comprehensive comparison of each idle reduction system has been performed by the NRC.³⁴ Ultimately, a reduction in fuel consumption ranging from over 1% for fuel-operated heaters to 9% for battery-powered units and truck stop electrification is expected.³⁵

2.1.7 Install automatic tire monitoring and inflation systems

Tire pressure can have a notable impact on a vehicle's fuel consumption. As tire pressure decreases, fuel consumption increases as a result of increasing rolling resistance. Experts at the media outlet Heavy Duty Trucking estimate that a tire underinflated by 10% can lead to a 2-4% increase in fuel consumption.³⁶ Tire pressure monitoring systems can prevent this from happening by providing drivers with a notification when pressure dips below an acceptable threshold.

Additionally, automatic tire inflation systems are available which can maintain the desired tire pressure level. The ICCT estimates that automatic tire inflation systems can improve fuel consumption by up to 2%, on average.³⁷ Unfortunately, automatic tire pressure monitoring and inflation systems can be less reliable in cold weather due to the impact of ambient temperature on tire pressure.

³⁵ *Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles*, 120.

³⁴ *Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles*, 125.

³⁵ Ibid.

³⁶ "12 Ways to Save Fuel: Tires"

³⁷ *Green Freight Programs and Technology Verification*, 10.

2.1.8 Leverage multimodal distribution

Apart from airplanes, trucks tend to have one of the highest carbon intensities of goods distribution per tonne-kilometer.³⁸ Rail and marine shipping have notably lower carbon intensities than truck or air. Hence, finding ways to adopt multimodal shipping practices that integrate rail and marine distribution can have a positive impact on a fleet's carbon footprint. Multimodal distribution will almost always have a lower carbon intensity than shipping by truck exclusively.

Canada has a number of existing multimodal hubs spread out across the country. These facilities give carriers the flexibility to integrate multiple modes of transport into their goods movement strategies. It's important to identify ways to promote the use or expansion of these facilities. CN Rail recently announced \$320 million in funding to expand and strengthen the company's rail network across Ontario, including setting up a satellite intermodal facility to support additional capacity at the company's existing intermodal terminal in Brampton, Ontario.³⁹ By giving carriers the opportunity to switch from road to rail or marine, the carbon intensity of goods distribution can be reduced.

For the domestic distribution of goods, rail is the likely candidate for mode switching from truck. Railway systems in Canada are already playing and continues to have a vital role in the distribution of goods across the country. Since 2008, the annual gross tonne-kilometers shipped by rail have increased 6.8% year-over-year.⁴⁰

2.2 Improve capacity utilization

Empty runs, or time spent driving without a payload, are an inefficiency within Canada's freight sector. Data from the most recent Canadian Vehicle Survey indicates that in 2009 15.1% of the vehicle kilometers travelled by heavy-duty trucks were empty.⁴¹ There are several reasons why carriers may be travelling with an empty vehicle, such as an inability to find cargo on a backhaul. In addition to empty runs, carriers are also making trips without fully loading their vehicles. The increasing prevalence of just-

³⁸ "Freight Transport in a Low-Carbon World"

³⁹ CN Rail, "CN Investing Approximately \$320 Million to Expand and strengthen Ontario's Rail Infrastructure in 2019," *News*, April 1, 2019. <https://www.cn.ca/en/news/2019/04/cn-investing-approximately-320-million-to-expand-and-strengthen/>

⁴⁰ Railway Association of Canada, *Rail Trends* (2018), 8. <https://www.railcan.ca/wp-content/uploads/2018/12/2018-Rail-Trends.pdf>

⁴¹ Natural Resources Canada, *Canadian Vehicle Survey* (2009), 34. <http://oe.nrcan.gc.ca/Publications/statistics/cvs05/pdf/cvs05.pdf>

in-time and expedited delivery means that more carriers are optimizing for time as opposed to truckload.

Of course, there are certain constraints on vehicle capacity utilization. Vital driver hours of service regulations, a lack of cargo availability, or incompatibilities between truck and cargo (i.e. the need for refrigerated goods to be transported when a carrier is equipped with a dry van) can limit a carrier's ability to maximize their capacity utilization. However, when possible, improving the capacity utilization of freight trucks can reduce costs, increase revenue and reduce the number of vehicles on the road thereby leading to lower GHG emissions.⁴²

Optimizing the capacity utilization of freight trucks is a complex task. The process involves coordinating cargo location, freight truck location, freight truck capacity availability, delivery schedules and regulated driver working hours and preferences. A number of best practices have been identified to facilitate this difficult task and improve the capacity utilization of freight trucks. These include right-sizing delivery solutions, optimizing cargo loading practices, using long combination vehicles and trailers, and reducing packaging.

2.2.1 Right-size delivery solutions

A crucial step in maximizing capacity utilization is ensuring that vehicles are an appropriate size for the task that is going to be carried out. This may mean using a smaller or larger vehicle depending on the size of the available shipment. However, right-sizing solutions is much easier for freight companies with large fleets. Some small for-hire carriers, for instance, may not have a choice between different vehicle sizes. For these carriers, right-sizing delivery solutions may mean ensuring that a sufficient number of less-than-load (LTL) shipments are combined. Several platforms have recently been developed to facilitate cargo consolidation (see Section 2.4.7).

2.2.2 Optimize cargo loading practices

2.2.2.1 Load mixing

Trucks have both a spatial and weight limit. While some freight is heavy and limited by a vehicle's weight capacity, other freight is light and limited by the vehicle's spatial

⁴² Eugene Wong, Allen Tai, Emma Zhou, "Optimising Truckload Operations in Third-Party Logistics: A Carbon Footprint Perspective in Volatile Supply Chain," *Transportation Research Part D* 63 (2018), 650.

capacity. In general, freight trucks tend to be limited by volume rather than weight.⁴³ Load mixing, or combining heavy and light loads, can ease some of these limitations. Load mixing is most effective when the demand for lighter products is greater (i.e. when there is a higher proportion of heavy products, load mixing is less effective).⁴⁴

2.2.2.2 Load positioning

In addition to load mixing, carriers might also find new efficiencies by simply changing the way they load their parcels or pallets onto a truck. In one instance, Walmart was able to increase the number of pallets loaded onto a vehicle from 26 to 30 by simply changing the orientation of the pallets.⁴⁵

2.2.3 Use long combination vehicles

Long combination vehicles are multi-trailer combination vehicles that are particularly well-suited for carriers whose freight tends to cube out rather than weigh out (i.e. is constrained by volume rather than weight limits). By transporting cargo using a single long combination vehicle as opposed to two standard tractor trailers, approximately one-third less fuel is consumed. GHG emission reductions on the order of 30-37% are expected per vehicle.^{46,47}

The provinces of Ontario and Quebec are currently conducting a long combination vehicle program that allows certain types of long combination vehicles to be piloted on a selection of the region's highways.⁴⁸ The provinces are also working with Nova Scotia and New Brunswick to ensure that the participating long combination vehicles can travel seamlessly between all four provinces.

⁴³ OECD, *Moving Freight with Better Trucks: Improving Safety, Productivity and Sustainability* (2011), 62. https://read.oecd-ilibrary.org/transport/moving-freight-with-better-trucks_9789282102961-en#page71

⁴⁴ Crystal Wilson, "Load Mixing to Improve Container Utilization," *Theses and Dissertations* 761 (2013), 16. <http://scholarworks.uark.edu/cgi/viewcontent.cgi?article=1760&context=etd>

⁴⁵ Jason Mathers, "Improve Freight Capacity Utilization to Reduce Truck Emissions," *Environmental Defense Fund + Business*, 2015. <http://business.edf.org/blog/2015/06/30/improve-freight-capacity-utilization-to-reduce-truck-emissions>

⁴⁶ Ontario Ministry of Transportation, "Long Combination Vehicle Program: Questions and Answers." <http://www.mto.gov.on.ca/english/trucks/long-combination-vehicles-faq.shtml>

⁴⁷ *Climate Change Whitepaper*, 4.

⁴⁸ Ontario Ministry of Transportation, "Long Combination Vehicle Program Conditions." <http://www.mto.gov.on.ca/english/trucks/long-combination-vehicles-program-conditions.shtml#program-overview-and-principles>

2.2.4 Use long trailers

While the standard semitrailer length is currently 53' (16.2 m), certain companies and jurisdictions are investigating widespread use of 60' (18.3 m) semitrailers. Similar to long combination vehicles, long semitrailers are particularly attractive for carriers whose freight cubes out, as weight restrictions for these vehicles would remain unchanged. It's estimated that a 60' semitrailer could transport 14-28% more cargo by volume than a standard 53' semitrailer.⁴⁹ As a single vehicle is responsible for transporting a larger amount of goods, fuel consumption and GHG emissions per tonne-km can be reduced by adopting long semitrailers.

Ontario's Ministry of Transportation has previously conducted a 60' semitrailer trial, the results of which have yet to be released.⁵⁰ Canadian Tire is currently working with Canadian Pacific Railway to develop and deploy a 60' intermodal container that will be the first of its kind in North America.⁵¹ Walmart previously piloted a 60' semitrailer in the past as part of its "Supercube" truck pilot.⁵²

According to the BC Trucking Association, who have expressed their support for 60' semitrailers, a 60' semitrailer can adhere to standard dimension limits, including a length of 23 m (75.5').^{53,54} However, due to differences in the vehicle configuration, the BC Trucking Association has recommended additional oversight for tractors with 60' trailers in order to ensure their safe operation.

2.2.5 Reduce packaging

A surplus of packaging can take up valuable space on a freight truck. By limiting the amount of packaging to what is only absolutely necessary, carriers can increase the

⁴⁹ BC Trucking Association, "BCTA Adopts New Position on "60 foot" Trailers," May 16, 2016. <https://www.bctrucking.com/bulletin/2016/05/16/bcta-adopts-new-position-%E2%80%9C60-foot%E2%80%9D-trailers>

⁵⁰ Ontario Trucking Association, "MTO Accepting Applications for Modified 60-ft Trailer Trial," January 26, 2018. <http://ontruck.org/mto-accepting-applications-for-modified-60-ft-trailer-trial/>

⁵¹ Canadian Tire, "Environmental Sustainability." <https://corp.canadiantire.ca/sustainability/environmental-sustainability/default.aspx>

⁵² Andrew Telfer, "The Next Phase of Walmart Canada's Supercube Truck," January 7, 2014. <https://corporate.walmart.com/newsroom/sustainability/20140107/the-next-phase-of-walmart-canadas-supercube-truck>

⁵³ "BCTA Adopts New Position on '60 foot' Trailers"

⁵⁴ Task Force on Vehicle Weights and Dimensions Policy, *Heavy Truck Weight and Dimension Limits for Interprovincial Operations in Canada* (2019), 8. <https://comt.ca/english/programs/trucking/MOU%202019.pdf>

amount of cargo that can be transported by each truck. The Government of Canada has already announced a ban on single-use plastics for consumers goods and that it will be working with provinces and territories to set standards for companies that sell items with plastic packaging.⁵⁵ It is possible that as this trend matures, the ban on single-use plastics could expand to other areas, such as product manufacturing and distribution.

Packsize is a company that aims to right-size packaging for businesses.⁵⁶ The company develops custom product packaging to ensure that boxes are as small as possible and the lowest amount of fill is required. Minimizing package size not only leads to lower levels of waste, but also improved shipping efficiency stemming from the freed-up space. Packsize supplies custom packaging to the office supply company Staples.⁵⁷

Asos, a UK-based fashion retailer, improved the efficiency of their package deliveries by shifting from loading packages onto a pallet, to loading loose parcels directly onto the trailer.⁵⁸ The company estimates that each truck can now transport an additional 8,000 parcels per truck.

Amazon has developed “Frustration-Free Packaging” which is designed for items that are meant to be shipped in their original packaging therefore reducing the need for additional shipping boxes.⁵⁹ Between 2008 and 2018, the company avoided 215,000 tons of packaging. Though this initiative was designed to cut waste and improve customer experience, it also frees up space during transport.

While minimizing packaging can play an important role in improving capacity utilization of freight trucks, only a limited number of carriers influence this portion of the supply chain. Minimizing packaging for the sake of freight efficiency improvements would likely be limited to private carriers, as well as truck carriers that are part of larger third-party logistics (3PL) providers.

⁵⁵ Justin Trudeau, Prime Minister of Canada, “Canada to Ban Harmful Single-Use Plastics and Hold Companies Responsible for Plastic Waste,” June 10, 2019. <https://pm.gc.ca/en/news/news-releases/2019/06/10/canada-ban-harmful-single-use-plastics-and-hold-companies-responsible>

⁵⁶ Packsize, “Packsize.” <https://www.packsize.com/>

⁵⁷ Staples, “Staples Delivers Custom Box Sizes with Every Order for More Convenience, Reduced Waste,” November 27, 2012. <https://news.staples.com/press-release/products-services/staples-delivers-custom-box-sizes-every-order-more-convenience-reduc>

⁵⁸ Carbon Smart, *Asos Greenhouse Gas Report 2015/16*, 13. https://www.asosplc.com/~/_media/Files/A/Asos-V2/documents/corporate-responsibility/reporting-and-policies/public-ghg-report-2015-16.pdf

⁵⁹ Amazon, “Frustration-Free Packaging.” <https://www.aboutamazon.com/sustainability/packaging/frustration-free-packaging>

2.3 Promote fuel efficient driving behaviour

A freight truck's carbon footprint is closely linked to its fuel consumption. There are several ways to reduce fuel consumption by influencing driver behaviour. For one, eco-driving feedback systems and driver recognition and reward programs can be employed to promote behaviours learned during driver training. Additionally, vehicle speed limiters can be an effective way to control the speed of drivers and thereby fuel consumption.

2.3.1 Participate in driver training programs

Driver training programs are already being administered by NRCan through the SmartDriver program. The program educates drivers on fuel-efficient driving techniques, such as reducing acceleration and deceleration, and identifying optimal speeds. The program is free to fleets and helps to improve fuel efficiency, costs and GHG emissions and can lead to efficiency improvements up to 35%.⁶⁰ Driver training requires minimal effort to implement and can have a large impact on a carrier's fuel consumption and GHG emission output.

2.3.2 Cap vehicle speed

Fuel consumption is expected to increase significantly when vehicles reach a certain speed. As such, speed limiters have been proposed as one way to control the fuel consumption of freight trucks. By reducing the speed of a truck from 115 to 105 km/h, fuel consumption can be reduced by approximately 7%.⁶¹

Speed limiters are already widely used across North America: approximately 60% of freight truck fleets have employed the use of speed limiters.⁶² A speed of 105 km/h is the average limit.⁶³ Two provinces to date – Ontario and Quebec – have passed speed limiter legislation, and the BC Trucking Alliance has shown support for the law.⁶⁴

⁶⁰ NRCan, "SmartDriver Training Series," 2019. <https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-transportation/greening-freight-programs/smartdriver-training-series/21048>

⁶¹ Paul Landry, "Speed Limiters: A Law We Can Live With," *BC Trucking Association*, February 5, 2010. <https://www.bctrucking.com/news/speed-limiters-law-we-can-live>

⁶² Government of Canada, "Summary Report – Assessment of a Heavy Truck Speed Limiter Requirement in Canada," 2013. <https://www.tc.gc.ca/eng/motorvehiclesafety/tp-tp14808-menu-370.htm>

⁶³ "Summary Report – Assessment of a Heavy Truck Speed Limiter Requirement in Canada"

⁶⁴ "Speed Limiters: A Law We Can Live With"

Speed limiters are also expected to improve road safety. After introducing mandatory speed limiter legislation in Ontario, speed-related collisions involving large commercial vehicles dropped by 73%.⁶⁵

2.3.3 Implement driver recognition and reward programs

Providing incentives for fuel efficient driving can be an effective way to reduce a fleet's fuel consumption and GHG emissions. Incentives can take the shape of recognition or monetary rewards. Truck Enterprises, a Manitoba-based company, achieved annual fuel consumption savings of 0.42 km/L through the implementation of a driver reward program.⁶⁶ As part of this program, the company publicly tracked the fuel consumption of each individual truck, in addition to other metrics, and rewarded drivers that reached a minimum fuel saving target with a gift card. The greater the fuel savings, the greater the value of the gift card. Modern tracking technology, including telematics, can be leveraged to track employees fuel consumption.⁶⁷ Natural Resources Canada has developed a handbook to guide the development of incentive programs to support fuel efficiency.⁶⁸

2.3.4 Install eco-driving feedback systems

Eco-driving feedback systems can be installed in vehicles to inform drivers of their driving performance in real time. These systems can provide warnings with respect to speed, acceleration, braking and idling, and can also provide information on the vehicle's current fuel consumption and expected fuel savings.⁶⁹ Drivers are often provided with a score at the end of their trip.

⁶⁵ Ontario Trucking Association, "MTO Study: Speed Limiters Drastically Improve Truck Highway Safety," June 27, 2017. <http://ontruck.org/mto-study-speed-limiters-drastically-improve-truck-highway-safety/>

⁶⁶ Natural Resources Canada's Office of Energy Efficiency, *Driving for Fuel Efficiency: An Incentive Program Handbook* (2011), 17. <http://www.obac.ca/Web/pdf/Driving%20for%20fuel%20Efficiency%20-%20An%20Incentive%20Program%20Handbook.pdf>

⁶⁷ Transport Topics, "Fleets Implementing Tracking Technology to Fairly Reward Fuel-Efficient Drivers," *Transport Topics*, April 30, 2018. <https://www.ttnews.com/articles/fleets-implementing-tracking-technology-fairly-reward-fuel-efficient-drivers>

⁶⁸ *Driving for Fuel Efficiency: An Incentive Program Handbook*.

⁶⁹ Kanok Boriboonsomsin, Alexander Vu and Matthew Barth, *Environmentally Friendly Driving Feedback Systems Research and Development for Heavy Duty Trucks* (National Center for Sustainable Transportation, 2016), 7-8. <https://ncst.ucdavis.edu/project/environmentally-friendly-driving-feedback-systems-research-and-development-heavy-duty>

In a simulator study conducted by researchers at the University of California Davis, fuel consumption was reduced by as much as 27% when truck drivers were asked to drive a simulation of a typical trip with eco-driving feedback.⁷⁰ Eco-driving feedback systems can act as a complementary measure to NRCan's SmartDriver program by reinforcing the driving practices taught through this program.

2.4 Adopt fuel efficient vehicle routing practices

Opportunities for efficiency improvements also lie in vehicle routing and scheduling. In general, it is good practice to reduce the vehicle kilometers travelled by a freight truck, however it is also important to keep in mind a vehicle's fuel consumption along a chosen route. Additionally, high levels of visibility in the supply chain can lead to improvements in coordination that can reduce the number of kilometers driven by empty freight trucks. We recommend fleet's consider allowing truck drivers to perform for-hire routes, using apps or websites to locate parking, using tracking and tracing systems, adopting eco-navigation systems, performing off-peak deliveries, improving the efficiency of loading/unloading by scheduling appointments with shippers and leveraging hubs to consolidate cargo.

2.4.1 Allow private truck drivers to perform for-hire routes

Private fleets are typically constrained by the cargo availability of their respective company. Hence, there may be instances when there is no cargo available for a driver's backhaul. If limitations are placed on private fleets to exclusively carry cargo for their respective company, this can translate to empty kilometres driven. To avoid these empty kilometers, private carriers can allow their drivers to perform for-hire routes and promote productive backhauls. During a drop in shipment volumes in 2009, a number of private fleets in the United States obtained the authority to move goods on a for-hire basis in order to avoid empty backhauls.⁷¹

2.4.2 Use apps or websites to locate parking

Locating parking is a challenge for commercial vehicle drivers within multiple segments of on-road freight. Whereas last-mile commercial vehicle operators may have difficulty

⁷⁰ *Environmentally Friendly Driving Feedback Systems Research and Development for Heavy Duty Trucks*, 25.

⁷¹ John Gallagher, "Backhauls, For-Hire Authority Give Shippers Relief in Recession," *JOC.com*, May 4, 2009. https://www.joc.com/trucking-logistics/backhauls-hire-authority-give-shippers-relief-recession_20090504.html

finding suitable parking for loading and unloading in dense urban centres, drivers in the regional and long haul segments need to find parking often in order to comply with the federal hours of service regulation.

Several apps have been developed to help commercial vehicle drivers locate truck stops and parking. For instance, Trucker Path helps drivers find truck stops and check real-time truck parking availability in Canada and the U.S.⁷² Additionally, Geotab is collecting data to identify macro-level trends in parking, including the historic popularity of specific parking locations.⁷³

While in some cases it is a matter of simply locating rest stops and parking, in other cases, the infrastructure is lacking. Particularly in northern and remote communities, there are stretches of road hundreds of kilometres long without places for drivers to rest or pull off of the road.⁷⁴ In these cases, commercial vehicle drivers are unable to leverage the value of apps to locate parking, and instead are often forced to stop in the shoulder on the side of the highway.

2.4.3 Use tracking and tracing systems

Tracking and tracing systems convey real time information on the exact location and details of a truck, as well as cargo. These systems allow drivers to be notified if they are to be redirected to a nearby location for cargo pick-up.⁷⁵ By improving supply chain visibility, dispatchers can better coordinate cargo pick-up on the backhaul of freight trips thereby reducing the number of empty kilometres driven and the output of unnecessary GHG emissions.

2.4.4 Adopt eco-navigation systems

Eco-navigation systems optimize for fuel efficiency as opposed to the shortest distance or time by taking into account factors such as traffic and roadway conditions. Eco-navigation systems can reduce fuel consumption by 5-10%.⁷⁶ Unfortunately, the fuel-efficient route can sometimes have a longer travel time which may dissuade some

⁷² Trucker Path, “Trucker Path.” <https://truckerpath.com/>

⁷³ Geotab, “Truck Parking Locations.” <https://data.geotab.com/location-analytics/truck-parking>

⁷⁴ Government of Ontario, *Draft 2041 Northern Ontario Multimodal Transportation Strategy* (2017), 63. <https://northernontariommmts.files.wordpress.com/2017/07/draft-northern-ontario-multimodal-transportation-strategy1.pdf>

⁷⁵ *Moving Freight with Better Trucks: Improving Safety, Productivity and Sustainability*, 89.

⁷⁶ International Transport Forum, *Towards Road Freight Decarbonisation Trends, Measures and Policies* (2018), 61. <https://www.itf-oecd.org/towards-road-freight-decarbonisation>

drivers.⁷⁷ Additionally, eco-navigation systems may be less beneficial for long haul commercial vehicle operations who have fewer route options.⁷⁸

2.4.5 Perform off-peak deliveries

Performing deliveries during off-peak daytime hours or switching to night-time deliveries can lead to improved freight efficiency. Off-peak hours are associated with less congestion, and thus, vehicles spend less time on the road burning fuel. Off-peak deliveries can reduce peak traffic volumes and improve the efficiency of freight. There are certain regulatory barriers associated with the implementation of off-peak deliveries, including noise by-laws and local delivery restrictions, which may first need to be overcome.

The Region of Peel in Ontario recently completed an off-peak delivery pilot project with Loblaw's, Walmart and the LCBO, among other companies.⁷⁹ Preliminary results suggest that travel times were approximately 15% lower during off-peak hours. Additionally, it's estimated that GHG emissions and other air pollutant emissions including CO, NO_x, PM₁₀ and PM_{2.5} were each reduced by over 10% when deliveries were performed outside of peak hours. While the notion of off-peak deliveries often raises concerns surrounding noise complaints, not a single noise complaint was made during the period of study.

Even more recently, the Government of Ontario announced that they would be temporarily eliminating noise bylaws and local road restrictions to facilitate off-peak deliveries in light of an increasing demand for goods distribution due to the COVID-19 outbreak.⁸⁰ The Ontario Trucking Association will be working with the province to implement a more permanent off-peak delivery program that can facilitate reductions in fuel consumption and congestion.⁸¹

⁷⁷ *Environmentally Friendly Driving Feedback Systems Research and Development for Heavy Duty Trucks*, 4.

⁷⁸ *Towards Road Freight Decarbonisation: Trends, Measures and Policies*, 61.

⁷⁹ Kianoush Mousavi and Matthew Roorda, "Off-Peak Delivery Pilot in Region of Peel," *Smart Freight Centre*. http://smartfreightcentre.ca/wp-content/uploads/2019/11/3.5_MattRoorda-UofT_OffPeakDeliveryPilot.pdf

⁸⁰ Today's Trucking, "Industry Welcomes Easing of Delivery Restrictions," March 19, 2020.

<https://www.trucknews.com/health-safety/industry-welcomes-easing-of-delivery-restrictions/1003138222/>

⁸¹ *Ibid.*

2.4.6 Improve the efficiency of loading/unloading by scheduling appointments with shippers

Scheduling appointments with shippers can improve the efficiency of loading or unloading. When trucks arrive at a busy loading/unloading dock without a scheduled delivery time, bottlenecks can occur and long delays can result, which are often referred to as “detention time”. According to one survey, nearly 63% of drivers in the U.S. spend over three hours at a shipper’s dock to complete the process of loading or unloading.⁸² During this time, drivers will idle their trucks for comfort, to generate electricity for on-board accessories, to prevent fuel from gelling in the cold, or for other reasons, such as out of habit.⁸³ By scheduling deliveries in advance, arrival times can be coordinated translating to shorter wait times. According to the U.S. EPA’s SmartWay branch, one hour of idling will consume over three litres of fuel and emit over 8 kg of CO₂e.⁸⁴ For a facility that sees 25 trucks each idling 2 hours per day 300 days a year, an excess 122,000 kg CO₂e would be released as a result of idling alone. To help combat this issue, it’s also recommended that shipper’s implement “no idling” policies and practices at their facilities.⁸⁵

2.4.7 Leverage hubs to consolidate cargo

Strategically located hubs, including multimodal hubs, that facilitate cargo consolidation can make it easier for truck operators to increase their payload, right-size delivery vehicles and reduce empty runs.⁸⁶ Hubl is a third-party logistics provider operating in the UK.⁸⁷ The organization uses freight consolidation centres located on the edge of cities to consolidate deliveries destined for both B2B and B2C customers in the city centre. At these hubs, goods are consolidated onto a smaller number of fully loaded vehicles.

⁸² Mona McFadden, “The Secret to Combatting the Hidden Costs of Detention Time,” *Inbound Logistics*, March 4, 2019. <https://www.inboundlogistics.com/cms/article/the-secret-to-combatting-the-hidden-costs-of-detention-time/>

⁸³ U.S. Environmental Protection Agency, *Idle Reduction for Shippers* (2019). <https://www.epa.gov/sites/production/files/2019-07/documents/420f19012.pdf>

⁸⁴ Ibid.

⁸⁵ Ibid.

⁸⁶ OECD, *Moving Freight with Better Trucks: Improving Safety, Productivity and Sustainability* (2011), 70. https://read.oecd-ilibrary.org/transport/moving-freight-with-better-trucks_9789282102961-en#page71

⁸⁷ Hubl, “What We Do.” <http://www.hubl.co.uk/what-we-do/>

Several virtual consolidation networks have also recently emerged. Vancouver-based Freightera is an online consolidation hub.⁸⁸ The online platform connects businesses with transport carriers based on their load size, origin and destination. This allows carriers to easily identify available loads and avoid empty runs. Meanwhile, vHub is an online consolidation hub that connects shippers with available trailers nearby. The operations help ensure that available trailers are fully loaded.⁸⁹

⁸⁸ Freightera, “How it Works.” <https://www.freightera.com/en/company-profile#howItWorks>

⁸⁹ vHub, “vHub.” <https://www.vhubapp.com/>

3. Factors affecting the adoption of practices to improve efficiency

To gain insight into the factors that affect the adoption of practices that can improve a fleet's efficiency, the Pembina Institute interviewed several fleet assessors who have participated in NRCan's Green Freight Assessment Program. Assessors were asked to identify factors that make certain practices more appealing, as well as barriers that prevent adoption. Moreover, assessors were asked to identify which types of supports could boost levels of adoption.

When asked about the factors that make certain practices and technologies appealing, each of the assessors highlighted the importance of a clear return on investment. Many of the assessors also emphasized the importance of low capital costs and short payback periods. Ultimately, these responses suggest that fleets are less likely to adopt practices or technologies that may pose a financial risk. In addition to this, many of the assessors noted the importance of a low level of disruption to operations.

In general, there was less consensus among assessors with respect to barriers to the adoption of certain practices and technologies. A high level of disruption to operations, driver or mechanic acceptance and capital cost constraints were some of the most popular responses. Additionally, a clear understanding of the benefit of various practices and technologies also appears to play an important role as a few assessors noted the importance of both a lack of information and an uncertain return on investment as barriers to adoption.

With certain barriers in mind, assessors were also asked to identify the different types of measures that could support the adoption of low GHG practices and technologies with currently low rates of adoption. It was identified that fiscal measures play an important role in improving the uptake of low GHG practices and technologies in fleet management. Educational tools and fuel efficiency standards were identified as other important mechanisms to reduce GHG emissions.

4. Recommendations and conclusion

As Canada makes strides to reach its climate targets of 30% below 2005 levels by 2030 and net-zero by 2050, there is a strategic opportunity to direct efforts towards the adoption of practices and technologies that are expected to generate the greatest reduction in GHG emissions with the lowest amount of effort or capital involved. To achieve maximum impact, practices and technologies that have high estimated impacts on fuel efficiency and GHG emission reductions, such as leveraging multimodal distribution and incorporating lower-emitting modes of transport, using long combination vehicles, as well as participating in driver training programs and installing software that enforces smart driving should be targeted. However, some high impact practices and technologies may take a fair amount of effort and/or capital to implement. As such, what are some of the low hanging fruit, or some of the practices and technologies that require lower levels of effort to implement and can still generate notable improvements to fuel efficiency and GHG emission outputs? Table 1 outlines each of the practices and technologies highlighted in this report according to the relative level of effort required for their implementation, as well as their estimated level of impact on fuel efficiency and GHG emission reductions.

While the relative impact of each of practices and technologies in this report can be gleaned, it's also important to quantify the expected fuel efficiency improvements or GHG emission reductions for those where it has not yet been estimated. This includes quantifying the expected benefits of scheduling deliveries, right-sizing delivery solutions, optimizing cargo loading practices, allowing truck drivers to perform for-hire routes, providing customers with delivery notifications, implementing driver reward systems and making use of apps or websites to more efficiently find parking. By quantifying these benefits, private and public fleet operators and owners can be better positioned to implement practices that have a relatively high impact with low levels of effort.

Table 1. Estimated level of impact on fuel efficiency and GHG emission reductions for the identified practices and technologies, and the estimated level of effort required for implementation.

Practice/Technology	Level of effort	Estimated level of impact
Participate in driver training programs	Low	High
Undergo routine preventative maintenance	Low	Moderate
Install low rolling resistance tires	Low	Moderate
Right-size delivery solutions	Low	Moderate
Cap vehicle speed	Low	Moderate
Allow private truck drivers to perform for-hire routes	Low	Moderate
Minimize the tractor-trailer gap	Low	Low
Cover open loads with tarps	Low	Low
Optimize cargo loading practices	Low	Low
Implement driver recognition and reward programs	Low	Low
Use apps or websites to locate parking	Low	Low
Use long combination vehicles	Moderate	High
Install eco-driving feedback systems	Moderate	High
Install aerodynamic devices	Moderate	Moderate
Use idle reduction technologies	Moderate	Moderate
Use long trailers	Moderate	Moderate
Use tracking and tracing systems	Moderate	Moderate
Adopt eco-navigation systems	Moderate	Moderate
Perform off-peak deliveries	Moderate	Moderate
Improve the efficiency of loading/unloading by scheduling appointments with shippers	Moderate	Moderate
Leverage hubs to consolidate cargo	Moderate	Moderate
Install automatic tire monitoring and inflation systems	Moderate	Low
Reduce packaging	Moderate	Low
Leverage multimodal distribution	High	High

Though fiscal measures, such as incentives or taxation, are expected to improve the adoption of low-carbon practices and technologies, many of the assessors that were interviewed also identified educational tools as a means to promote the adoption of highly effective low-carbon practices and technologies. This is a promising, low effort mechanism that should be leveraged to support the adoption of practices and technologies that can reduce GHG emissions from commercial vehicles. While there is a fair amount of existing information on best practices and technologies, ensuring that resources are comprehensible and easily accessible is imperative.

While goods movement is an integral part of the Canadian economy, it is also a major source of GHG emissions: freight trucks alone account for nearly 9% of Canada's total GHG emissions. Hence, reducing GHG emissions from Canada's on-road freight sector will play an important role in reaching Canada's climate targets. It's important to advance both short- and longer-term strategies into achieving this target. This includes taking action now to accelerate the development, testing and uptake of near- and zero-emissions heavy-duty truck technologies that offer the potential to achieve the deep emissions reductions required to meet our long-term commitment of net-zero by 2050. At the same time, efforts are needed to maximize short-term opportunities to reduce emissions and improve the efficiency of existing and new diesel fleets which are expected to continue to dominate key segments of the freight industry for years to come. The practices outlined in this report will not only help Canada reach its climate targets but can also lead to important cost savings for fleets.