



Locomotive Emissions Monitoring Program 2011 - 2015 Action Plan for Reducing GHG Emissions

The action plan may consist of the following elements:

Education and Awareness

The industry maintains a number of initiatives and specialized forums that are designed to promote best practices and innovation including:

- *RAC Environment Award Program* – this annual program is applicable to freight and passenger railway members and is designed to share and assess initiatives undertaken by railways to improve their environmental performance.
- *RAC Environment Committee* – this committee includes representation from Class I, shortline, and passenger and commuter railways and is committed to meeting four times a year to review and analyze a variety of environmental issues that are relevant to the railway industry. It provides a forum for exchanging ideas and best practices to enhance environmental performance, including opportunities to reduce emissions.
- *Railway Fuel Conservation Teams* – North American Class I railways maintain personnel that are dedicated to identify opportunities to conserve fuel. These resources exchange information on best practice solutions, technologies and related information regarding operating practices that reduce emissions on an activity basis.
- *Carbon Disclosure Project* – Currently Canada's Class I railways participate in this project which continues to maintain the largest collection of self-reported climate change data in the world. Through improved disclosure of environmental impacts, the project provides a forum to identify opportunities for managing environmental risks.
- *Crew Training* – Railways have ongoing programs that promote fuel conservation awareness and practices. Awareness raising initiatives could include targeted training (e.g. operational and handling), driver incentive programs, and performance reviews.

Locomotive and Car Equipment Related Initiatives

Freight and passenger railways are committed to implementing the technologies outlined below:

- *Locomotive Fleet Renewal* – Canadian railways are progressively renewing their fleets by acquiring new locomotives that are compliant with U.S. EPA emission standards¹. This trend is expected to continue over the course of the MOU.
- *Engine Retrofits* – railways continue to explore options for retrofitting existing locomotive engines with ones that are compliant with U.S. EPA emission standards.
- *Fleet Remanufacturing and Maintenance* – Canadian railways will continue to conform to United States emission standards (Title 40 of the Code of Federal Regulations of the United States, Part 1033). This includes the implementation of maintenance programs aimed at realizing fuel conservation gains and emission reductions (e.g. fuel injector change outs every 3 years).

¹ U.S. EPA, <http://www.epa.gov/otaq/locomotives.html>

- *Low Idle* – railways will continue to apply the low idle feature to their locomotives where feasible. Currently all new Tier 2 locomotives are equipped with a low idle feature. *Engine*
- *Anti-Idling Systems* – railways are installing devices on locomotives for both line-haul and yard switching services. These devices include auxiliary power units (APU) and automatic engine stop/start systems (AESS).
- *Bio-diesel Fuel* – Canadian federally regulated railways are committed to meeting the 2% renewable fuel content requirement presented in the Renewable Fuels Regulations. Railways continue to identify innovative opportunities to integrate renewable fuels to their operations.
- *Freight Car Technology Improvements* – freight railways continue to embrace a number of technologies and innovations that allow their operations to achieve their maximum allowable axle load, which leads to greater fuel economy and fewer emissions. *Electronically*
- *Controlled Pneumatic Brakes (ECP)* – ECP technologies will be evaluated and introduced to freight and passenger operations where feasible. Currently a number of freight carriers apply ECP technologies to fixed routes under specific conditions. *Passenger Train*
- *Equipment Initiatives* – passenger, intercity, and commuter railways implement a number of initiatives to reduce coach energy requirements including the installation of reflective windows and light-emitting diode and low-mercury fluorescent tube lighting. Lowering air conditioning demand and removing redundant electrical equipment also help reduce energy and fuel consumption.
- *Passenger Train Layover Systems* – commuter and intercity passenger railways are committed to shutting down locomotives during layover, and have introduced wayside electrical power to control passenger comfort levels and layover heating systems to keep engine coolant and crankcase oil warm and batteries charged during winter months.

Emerging Technologies

- *Natural Gas Fuelled Locomotives* - Canadian freight railways are exploring opportunities to use of natural gas as a potential alternative to conventional diesel fuel. Pilot programs are underway and commercial application is being reviewed.
- *Genset* – these locomotives are currently in use and continued to be considered for new yard and road switching operations. This emerging technology includes a threefold reduction in HC, CO and PM and less than half of the NOx emissions compared to conventional Tier 0 switcher locomotives.

Operational Related Initiatives

Management decisions and the implementation of operational best practices are essential to maximizing energy, conserving fuel, and lowering emissions. Strategic options available to railways include but are not limited to:

- *Longer Trains* – longer trains, in conjunction with technologies such as Distributed Braking Cars (DBC), will continue to be a key strategy for maximizing fuel use and producing fewer emissions. Currently trains up to 2.5 kilometers are in operation as a result of lengthened passing tracks and sidings.
- *Distributive Power* – this technology allows freight railways to optimize handling of longer trains by providing optimum locomotive power assignment and better air distribution for



braking and also helps to remove energy-dissipating slack action, enable shorter braking distance and reduce wheel/rail lateral forces.

- *Car consolidation* – this tactic allows railways to reduce delays at intermediate locations and increase fluidity at rail yards and terminals.
- *Manual shut down of locomotive engines* – railways have policies in place for trains that are not moving and not equipped with AESS or APU systems. These policies underline that locomotive engines should be shut down when ambient temperatures and other operational conditions permit.
- *Train Pacing and Braking Strategies* – train pacing practices, technologies (e.g. dynamic brake equipment, trip optimizer systems, etc.) and other braking strategies have a proven record of reducing fuel consumption and producing fewer emissions. Railways will continue to implement these practices where feasible.
- *Commuter Train Coach Door Management* – more and more passenger railways are applying best practices to eliminate the practice of opening all doors at long dwell-time station stops.
- *Coproduction* – railways continuously search for opportunities to move their trains expeditiously and efficiently. Collaborative agreements to share strategic sections of the freight network allow railways to reduce idle times and lower fuel consumption.
- *Network Improvements* – railways make strategic investments to enhance the efficiency of their networks, reduce dwell time, and maximize shipping efforts.

Infrastructure Related Initiatives

- *Improved Track Structures* – railways invest in improvements aimed at reducing friction that are caused by track features such as sharp curves, grades, uneven roadbeds, and jointed rail. Moreover, investments in double tracking and siding extensions of heavily used sections of the rail network are underway, which improve the fluidity of operations that yields reductions in fuel consumption and emissions.
- *Top of rail friction control* – Canadian railways implemented programs that aim to improve the wheel-rail drag friction of cars by applying proprietary liquid with a specific coefficient of friction of 0.30 to 0.35 to the railhead. This application has been shown to lower fuel consumption and associated emissions.

Government Programs & Research and Development

- Transport Canada's Clean Transportation Initiative supports scientific research that will improve understanding of the technical aspects of reducing emissions within the aviation, marine and rail sectors. The research will also help to identify, demonstrate, and bring to market new emission reduction operational procedures and technologies.
- Transport Canada's Clean Rail Academic Grant Program provides federal funds to academic research programs currently developing technologies and practices which aim to reduce air emissions from the rail sector. The Program also supports the communication of findings from funded research to other academic institutions or the rail industry. Sustainable
- Development Technology Canada (SDTC) administers two funding programs: the \$550 million SD Tech Fund™; and the \$500 million NextGen Biofuels Fund™. SDTC supports clean-technology projects through the critical stages of development and

demonstration: the points at which technologies leave the laboratory and undergo conclusive real-world testing.

- The National Research Council of Canada's Automotive and Surface Transportation offers the transportation industry access to: unique infrastructure and expertise; state of the art physical testing, dynamic modeling and experimentation services; rail vehicle/track interface optimization and specialized instrumentation to monitor track, railcar and road vehicle forces and health; advanced manufacturing processes; and novel materials and design concepts for vehicle lightweighting.
- The National Research Council-Industrial Research Assistance Program (NRC-IRAP) is NRC's primary vehicle for stimulating the innovation capabilities of Canadian small and medium-sized enterprises (SMEs). Regarded worldwide as one of the best programs of its kind, NRC-IRAP is a vital component of NRC's innovation strategy and a cornerstone of Canada's innovation system. The program stimulates wealth creation through technological innovation by providing technology advice, assistance and services to SMEs to help them build their innovation capacity. NRC-IRAP brings together a diverse network of organizations, services and programs to help Canadian SMEs develop and exploit technologies in the competitive, global, knowledge economy. Through expert technical and business advice, financial assistance, access to business information, contacts, and national and international networks, the program provides customized solutions to some 10,000 SMEs annually.
- Natural Resources Canada's CanmetENERGY administers repayable contribution funding for projects which fall within its technology areas. They manage science and technology programs and services, support the development of energy policy, codes and regulations, act as a window to federal financing and work with partners to develop more energy efficient and cleaner technologies in the following areas: Buildings and Communities; Clean Fossil Fuels; Bio Energy; Renewables; Industrial Processes; Oil Sands; and Transportation.