



Government
of Canada

Gouvernement
du Canada

PROPOSED RISK MANAGEMENT APPROACH

for

Petroleum and Refinery Gases
[Industry-Restricted]

Chemical Abstracts Service Registry Numbers (CAS RN):

68131-75-9

68477-33-8

68477-85-0

68527-19-5

Environment Canada
Health Canada

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CanadaThe wordmark for Canada, with a small red maple leaf icon integrated into the top right of the letter 'a'.

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This proposed risk management approach document builds on the previously released risk management scope document for industry-restricted petroleum and refinery gases and outlines the proposed control actions for these substances. Stakeholders are invited to submit comments on the content of this proposed risk management approach or provide other information that would help to inform decision making. Following this consultation period, the Government of Canada will initiate the development of the specific risk management instrument(s) and/or regulation(s) where necessary. Comments received on the proposed risk management approach will be taken into consideration in developing the instrument(s) and/or regulation(s). Consultation will also take place as instrument(s) and/or regulation(s) are developed.

Summary of Proposed Risk Management

The Government of Canada will consider the following action with respect to industry-restricted petroleum and refinery gases:

- Develop a regulation under the *Canadian Environmental Protection Act, 1999* (CEPA 1999) focusing on additional practices and technologies, or the improved implementation of existing requirements, for reducing fugitive emissions from petroleum facilities (such as refineries, upgraders and natural gas processing facilities).

Note: This summary is an abridged list of the instruments and tools proposed to risk-manage these substances. Refer to section 9.1 of this document for a complete explanation of risk management.

1. ISSUE

1.1 Categorization and the Petroleum Sector Stream Approach

The *Canadian Environmental Protection Act, 1999* (CEPA 1999) (Canada 1999) requires the Minister of the Environment and the Minister of Health (the Ministers) to categorize substances on the Domestic Substances List (DSL). Categorization involves identifying those substances on the DSL that, in accordance with the criteria in section 73 of the Act, a) are considered to be persistent (P) or bioaccumulative (B), based on the criteria set out in the *Persistence and Bioaccumulation Regulations* made under the Act (Canada 2000a), and “inherently toxic” (iT) to humans or other organisms, or b) may present, to individuals in Canada, the greatest potential for exposure (GPE). In addition, the Act requires the Ministers to conduct screening assessments of substances that meet the categorization criteria. The assessment further determines whether the substance meets one or more of the criteria set out in section 64 of the Act.¹

In December 2006, the Petroleum Sector Stream Approach identified approximately 160 petroleum substances through categorization which became high priorities for assessment due to their hazardous properties and their potential to pose risks to human health and the environment.

¹ A determination of whether one or more of the criteria of section 64 are met and whether risk management may be required is based upon an assessment of potential risks to the environment and/or to human health associated with exposures in the general environment. For humans, this includes exposures from ambient and indoor air, drinking water, foodstuffs and the use of consumer products. A conclusion under CEPA 1999 on the substances in the Chemicals Management Plan is not relevant to nor does it preclude an assessment against the hazard criteria specified in the Workplace Hazardous Materials Information System *Controlled Products Regulations* for products intended for workplace use. Similarly, a conclusion based on the criteria contained in section 64 of CEPA 1999 does not preclude actions being undertaken under other sections of CEPA 1999 or other Acts.

These substances were included in the Petroleum Sector Stream Approach because they are related to the petroleum sector and are all combinations of petroleum hydrocarbons.

Information-gathering authority in section 71 of CEPA 1999 is being used to gather specific information where it is required. The information that is collected through the Petroleum Sector Stream Approach is used to make informed decisions and appropriately manage any risks that may be associated with these substances.

The four petroleum and refinery gases listed below were included in Stream 2 of the Petroleum Sector Stream Approach under the Chemicals Management Plan. The Ministers have conducted an assessment under section 74 of CEPA 1999 to assess whether these substances meet one or more of the criteria as set out in section 64 of CEPA 1999.

The four petroleum and refinery gases that are covered under this proposed risk management approach are:

CAS RN ^a	DSL name
68131-75-9	Gases (petroleum), C ₃ -C ₄
68477-33-8	Gases (petroleum), C ₃ -C ₄ , isobutene-rich
68477-85-0	Gases (petroleum), C ₄ -rich
68527-19-5 ^b	Hydrocarbons, C ₁ -C ₄ , debutanizer fraction

^a CAS RN = Chemical Abstracts Service Registry Number

^b CAS RN 68527-19-5 is now considered a site-restricted petroleum and refinery gas

Note: A final screening assessment report (Canada 2013a) and proposed risk management approach (Canada 2013b) for 40 petroleum and refinery gases under Stream 1 (site-restricted) of the Petroleum Sector Stream Approach were published on June 1, 2013. As a result of the final assessment, it was concluded that these 40 petroleum and refinery gases are toxic to human health as defined under paragraph 64(c) of CEPA 1999, and it was proposed that the 40 substances be added to the List of Toxic Substances in Schedule 1 of CEPA 1999.

1.2 Final Screening Assessment Report Conclusion for Industry-Restricted Petroleum and Refinery Gases

A Notice summarizing the scientific considerations of a final screening assessment report for industry-restricted petroleum and refinery gases was published by Environment Canada and Health Canada in the *Canada Gazette*, Part I, on January 18, 2014, under subsection 77(6) of CEPA 1999. The final screening assessment report concluded that these four petroleum and refinery gases meet the criteria in paragraph 64(c) of CEPA 1999 as they are entering or may enter the environment in a quantity or a concentration or under conditions that constitute or may constitute a danger in Canada to human life or health.

The final screening assessment report also concluded that these four petroleum and refinery gases do not meet the criteria in paragraphs 64(a) and 64(b) of CEPA 1999 as they are not entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity or that constitute or may constitute a danger to the environment on which life depends.

Based on the available information, many components of these petroleum and refinery gases meet the atmospheric persistence criteria as defined in the *Persistence and Bioaccumulation Regulations* (Canada 2000a). However, no components were identified that meet the bioaccumulation criteria in the Regulations.

For further information on the final screening assessment report conclusion for these four petroleum and refinery gases, refer to the final screening assessment report (Canada 2014).

1.3 Proposed Measure

As a result of a screening assessment of a group of substances under section 74 of CEPA 1999, the group of substances may be found to meet the criteria under section 64 of CEPA 1999. The Ministers can propose to take no further action with respect to the substances, to add the substances to the Priority Substances List for further assessment, or to recommend the addition of the substances to the List of Toxic Substances in Schedule 1 of the Act. Under certain circumstances, the Ministers must make a specific proposal to recommend the implementation of virtual elimination.

In the case of these four petroleum and refinery gases, the Ministers proposed to recommend the addition of the four substances to the List of Toxic Substances in Schedule 1 of CEPA 1999. As a result, the Ministers will develop a regulation or instrument respecting preventive or control actions to protect the health of Canadians and the environment from the potential effects of exposure to these substances. This regulation or instrument will also address the 40 site-restricted petroleum and refinery gases referred to in Section 1.1.

These four petroleum and refinery gases are not subject to the virtual elimination provisions under CEPA 1999 and will be managed using a life cycle approach, to prevent or minimize their release into the environment.

2. BACKGROUND

2.1 Substance Information

Petroleum and refinery gases are a category of saturated and unsaturated petroleum light hydrocarbons produced by natural gas processing, petroleum refining and upgrader facilities (API 2001). The composition of petroleum and refinery gases varies depending on the source of the crude oil, bitumen or natural gas, as well as the process operating conditions and processing units involved (Speight 2007). According to their CAS RN descriptions, these four petroleum and refinery gases are composed of a limited number of alkanes and alkenes, including C₁ (methane), C₂ (ethane, ethene), C₃ (propane, propene), C₄ (butane, isobutane, butene, butadienes) and C₅ (pentane, isopentanes).

1,3-Butadiene is a component of particular interest because of its physical-chemical properties (e.g., volatility) and toxicological properties (e.g., carcinogenicity). Although very limited data on the 1,3-butadiene content of petroleum and refinery gases are available, the American Petroleum Institute (API 2009a,b) identified 1,3-butadiene in each of these four petroleum and refinery gases up to a concentration of approximately 3% by weight for CAS RN 68527-19-5.

3. WHY WE NEED ACTION

3.1 Characterization of Risk

A critical health effect for the initial categorization of these four petroleum and refinery gases was carcinogenicity, based primarily on classifications by international agencies. The European Union has identified petroleum and refinery gases containing 1,3-butadiene at concentrations greater than 0.1% by weight as carcinogens. Additionally, 1,3-butadiene has been identified by Health Canada and several international regulatory agencies as a carcinogen and was added to the List of Toxic Substances in Schedule 1 of CEPA 1999.²

1,3-Butadiene was found to be a multi-site carcinogen in rodents by inhalation, increasing the incidence of tumours at all concentrations tested. It also exhibits genotoxicity *in vitro* and *in vivo*, and a plausible mode of action for induction of tumours involves direct interaction with genetic material. Based on available information, 1,3-butadiene is considered to be present in these four petroleum and refinery gases. Therefore, consistent with the approach used to assess the site-restricted petroleum and refinery gases (Canada 2013a), 1,3-butadiene was selected as a high-hazard component to characterize potential exposure to the general population.

Both air dispersion modelling and calculations based on the application of emission factors indicate that unintentional releases of petroleum and refinery gases contribute to the overall 1,3-butadiene concentration in ambient air in the vicinity of refinery, upgrader and natural gas processing facilities. The estimated 1,3-butadiene concentrations decline with increasing distance from these release sources. Using the estimates of carcinogenic potency previously developed by the Government of Canada (Canada 2000b), together with the high- and low-end estimates of exposure derived from dispersion modelling of 1,3-butadiene as a high-hazard component of the petroleum and refinery gases, margins of exposure were derived for increasing distances from the release source.

Map analysis determined that the general population may reside as close as 200 m from a potential source of release. Accordingly, this distance was selected to characterize risk to the general population. For the high end of the exposure range, at a distance of 200 m from the centre of the release source, the margin of exposure is 5300. At 500 m the margin of exposure is 10 500, which equates to an exposure concentration equal to the Canadian average annual ambient air concentration found in urban centres (0.22 µg/m³). Although the magnitude of risk would vary with the cancer potency metrics selected (e.g., TC₀₅; unit risks derived by U.S. EPA and Texas Commission on Environmental Quality based on linear low-dose extrapolation models), use of a conservative cancer potency metric is considered appropriate given the uncertainties related to health effects. For the high end of the exposure range, the margin of exposure at 200 m from the release source is considered potentially inadequate to address uncertainties related to health effects and exposure.

4. CURRENT USES AND INDUSTRIAL SECTORS

² For more information on the assessment of 1,3-butadiene and additional risk management measures related to this substance, refer to [1,3-Butadiene - Ongoing risk management activities](#).

Industry-restricted petroleum and refinery gases are produced in three types of petroleum facilities: petroleum refineries (where crude oils are converted into finished petroleum products, such as gasoline, jet fuel or base oils for lubricants), upgraders (where oil-sand derived bitumen is converted into synthetic crude oil for further processing at a refinery) and natural gas processing facilities (where raw natural gas is processed into pipeline-quality natural gas and other C₂–C₅ hydrocarbons). According to information submitted under section 71 of CEPA 1999, and other information, the industry-restricted petroleum and refinery gases are consumed at the facility or transferred to other industrial facilities for use as feedstock or fuel or blended into substances leaving the site under different CAS RNs (many of which are also addressed under the Chemicals Management Plan) (Environment Canada 2008, 2009).

In the rare instances when these gases leave a petroleum facility as a mixed stream, these hydrocarbon mixtures are generally sent to a fractionation plant where the gases are separated for market as individual gases (e.g., propane and butane). Alternatively, the mixed stream may be sent to a petrochemical facility where the components are separated and then used internally as petrochemical feedstocks or possibly sold as separated products (e.g., propane and butane) (ChemInfo 2009).

5. PRESENCE IN THE CANADIAN ENVIRONMENT AND EXPOSURE SOURCES

5.1 Releases to the Environment

Potential releases of these four petroleum and refinery gases include releases within facilities from activities associated with their processing, as well as releases related to their transportation between industrial facilities.

Within petroleum facilities, there are potential unintentional releases (including fugitive releases) of these gases into the atmosphere. In general, the common sources of fugitive releases from a petroleum facility are compressor seals, processing valves, flanges, pressure relief valve seals, storage tanks, loading operations, sample lines and open-ended lines (CCME 1993; CPPI 2011). Despite the fact that some measures and practices are in place to reduce the releases of petroleum substances within the facility, it has been recognized that fugitive releases of the petroleum and refinery gases into the atmosphere can occur due to their much higher volatility (lower boiling point) and higher mobility as compared to liquid substances (US EPA 1995; CPPI 2011; CAPP 2007).

In addition to the potential unintentional on-site releases, releases may also occur during transportation between facilities. In general, three operating procedures are involved during the process of transportation: loading, transit and unloading. Loading and unloading of industry-restricted petroleum and refinery gases are normally conducted on industrial sites. To reduce the transported volumes and the potential for release, gases are normally transported as liquids or compressed gases through pressurized pipelines (Environment Canada 2009) or in pressurized containers (Noyes 1992; Kraus 1998; Miesner and Leffler 2006; Environment Canada 2009). Pipeline loading is associated with pumping a liquid or compressing a gas stream into a pipeline system. Loading operations occur at an inlet station where storage tanks, pumps or compressors are normally located. Unloading operations occur at an outlet station where liquid streams may enter into tanks, but gas streams can enter directly into a distribution network.

Apart from the releases from loading and unloading processes, the potential releases from auxiliary pipeline components are also part of the operational releases defined by the National Energy Board (NEB 2008a,b). The auxiliary components include pump/compressor stations located along the pipelines to assist the products in moving through the pipelines and valve stations equipped along the pipelines for pipeline protection and maintenance.

5.2 Exposure Sources

The general physical and chemical properties of the petroleum and refinery gases indicate that when these gaseous substances are released, they will rapidly disperse in the environment in the vicinity of refinery, upgrader and/or natural gas processing facilities. Furthermore, when these gases are released into the air, the individual chemicals constituting the petroleum and refinery gases will separate and partition in accordance with their own physical-chemical properties (API 2009a). As such, inhalation would be the primary potential route of exposure and was therefore the focus of the exposure assessment.

6. OVERVIEW OF EXISTING ACTIONS

6.1 Existing Canadian Risk Management

While Canadian regulations exist which manage hydrocarbons generally, none specifically name any of these four petroleum and refinery gases.

Transportation of petroleum substances in Canada is regulated under the *National Energy Board Act* (Canada 1985) (for onshore pipelines), the *Canada Shipping Act, 2001* (Canada 2001) (for ship transport), and the *Transportation of Dangerous Goods Act, 1992* (Canada 1992) (for truck and train transport).

The National Energy Board is responsible for pipelines that cross provincial and international boundaries. In 2013, the *National Energy Board Onshore Pipeline Regulations* (Canada 2013c) were amended to strengthen requirements for management systems regarding safety, pipeline integrity, security, environmental protection and emergency management.

The *Transportation of Dangerous Goods Act, 1992* is focused on the prevention of incidents when dangerous goods are imported, handled, offered for transport or transported. Petroleum and refinery gases are included in “Class 2: Gases: compressed, deeply refrigerated, liquefied or dissolved under pressure” of the associated *Transportation of Dangerous Goods Regulations* (Canada 2011).

Provincial or territorial requirements typically exist to prevent or manage the unintentional releases of substances and streams within a petroleum facility through the use of permits. For example, provincial operational permits may reference the Environmental Code of Practice for Measurement and Control of Fugitive VOC Emissions and Equipment Leaks (CCME 1993) and/or the Canadian Association of Petroleum Producers Best Management Practice for Fugitive Emissions Management (CAPP 2007), which identifies the typical key sources of fugitive emissions at upstream oil and gas facilities, and presents strategies for achieving cost-effective reductions in these emissions. Additionally, existing provincial/territorial occupational health and safety

legislation may specify measures to minimize occupational exposures to employees, and some of these measures also serve to reduce general population exposures.

Non-regulatory measures (e.g., guidelines, best practices) are also in place at many petroleum sector facilities to reduce releases. For example, the industry-proposed National Framework for Petroleum Refinery Emission Reductions, developed cooperatively by all levels of government, industry, and non-governmental environmental and health organizations, provides principles and methods for various jurisdictions to establish facility emission caps for air pollutants (CCME 2005).

6.2 Existing International Risk Management

In the United States, several regulations pertaining to refineries and natural gas processing facilities have been developed under the National Emission Standards for Hazardous Air Pollutants (NESHAP) program of the *Clean Air Act*. However, these four petroleum and refinery gases have not been assessed under the NESHAP program, which primarily deals with discrete substances.

Transportation of substances that may pose a flammability or explosion hazard is covered under the U.S. Department of Transportation's *Hazardous Materials Regulations* (CFR 2005). Similarly, transportation in Europe is addressed by the *Regulations Concerning the International Carriage of Dangerous Goods by Rail* (OTIF 2006), and similar measures for other modes of transportation.

In Europe, the Directive for Integrated Pollution Prevention and Control (IPPC) sets out guidelines to minimize pollution from various point sources, including petroleum refining (EU 2008). Operators of industrial installations conducting activities covered by Annex I of the IPPC Directive (including refineries) are required to obtain an environmental permit from the national authority in their country. A Best Available Techniques reference document for the oil and gas refining sector was adopted by the European Commission in 2003, and addresses reducing volatile organic compound emissions, particularly fugitive emissions (EC IPTS 2003). In 2013, the Directive on Industrial Emissions (Integrated Pollution Prevention and Control) (EU 2010) replaced the IPPC Directive and the sectoral directives.

7. CONSIDERATIONS

7.1 Alternative Chemicals or Substitutes

Industry-restricted petroleum and refinery gases are produced in petroleum refineries, upgraders and natural gas processing facilities. According to information submitted under section 71 of CEPA 1999, and other information, these substances are consumed at the facility or transferred to other industrial facilities for use as feedstock or fuel or blended into substances leaving the site under different CAS RNs (many of which are also addressed under the Chemicals Management Plan).

Given that these petroleum and refinery gases are part of integrated processes for refining, upgrading and natural gas processing, there are no feasible alternative substances or substitutes.

7.2 Alternative Technologies and/or Techniques

No alternative technologies or techniques were identified that would minimize or eliminate the use of these four petroleum and refinery gases. However, technologies or techniques for reducing releases of these substances exist. Examples include equipment selection such as leak-proof valves and fittings, as well as work practices such as leak detection and repair programs for equipment leaks and during loading and unloading.

7.3 Socio-economic Considerations

Socio-economic factors will be considered in the development of regulations, instrument(s) and/or tool(s) as identified in the Cabinet Directive on Regulatory Management (Treasury Board of Canada Secretariat 2012a) and the guidance provided in the Treasury Board document *Assessing, Selecting, and Implementing Instruments for Government Action* (Treasury Board of Canada Secretariat 2007).

Socio-economic considerations for industry-restricted petroleum and refinery gases include:

- Industry-restricted petroleum and refinery gases are produced in petroleum refineries, upgraders and natural gas processing facilities. There are approximately 1200 such facilities in Canada.
- Industry-restricted petroleum and refinery gases are not typically sold, nor are they known to be contained in manufactured products. As such, information on the costs of these substances is not available.
- Information on domestic or international trends in the use of these substances is not available.

7.4 Children's Exposure

The Government of Canada considered, where available, risk assessment information relevant to children's exposure to these substances. Based on the information available, it is proposed that no risk management actions to specifically protect children are required for these substances at this time.

8. PROPOSED OBJECTIVES

8.1 Human Health Objective

A human health objective is a quantitative or qualitative statement of what should be achieved to address human health concerns identified during a risk assessment.

The proposed human health objective for these four petroleum and refinery gases is to minimize human exposure to the greatest extent practicable.

8.2 Risk Management Objective

A risk management objective is a target expected to be achieved for a given substance by the implementation of risk management regulations, instrument(s) and/or tool(s).

The proposed risk management objective for these four petroleum and refinery gases is to further reduce fugitive emissions from petroleum refineries, upgraders and natural gas processing facilities through the application of additional practices and technologies, or the improved implementation of existing requirements.

9. PROPOSED RISK MANAGEMENT

9.1 Proposed Risk Management Instrument

As required by the Government of Canada's Cabinet Directive on Regulatory Management (Treasury Board of Canada Secretariat 2012a) and criteria identified in the Treasury Board document entitled *Assessing, Selecting, and Implementing Instruments for Government Action* (Treasury Board of Canada Secretariat 2007), the proposed risk management instrument was selected using a consistent approach, and took into consideration the information that was received through the Chemicals Management Plan and other information available at the time.

As well, the Government of Canada is moving forward with the implementation of a "One-for-One" Rule to control administrative burden on business, following the release of the Red Tape Reduction Commission's Recommendations Report (Treasury Board of Canada Secretariat 2012b). This rule provides specific advice to departments and agencies on how to reduce unnecessary burdens on business. It also proposes that the government make systemic changes to the way it regulates businesses while ensuring that the environment and the health and safety of Canadians are not compromised. Depending upon the risk management tool(s) selected for industry-restricted petroleum and refinery gases, the "One-for-One" Rule may apply.

In order to achieve the risk management objective and to work towards achieving the human health objective, the risk management being considered for these four petroleum and refinery gases is a regulation under CEPA 1999 focusing on additional practices and technologies, or the improved implementation of existing requirements, for reducing fugitive emissions from petroleum facilities (such as refineries, upgraders and natural gas processing facilities). The same regulation would also be used for the risk management of 40 site-restricted petroleum and refinery gases in Stream 1 of the Petroleum Sector Stream Approach, for which the final assessment report (Canada 2013a) and notice proposing to recommend their listing on Schedule 1 of CEPA 1999 were published on June 1, 2013. This action would involve consultation with implicated federal, provincial and other regulatory agencies.

It is envisioned that the regulation would be integrated with the Air Quality Management System process under the Canadian Council of Ministers of the Environment to develop Base-Level Industrial Emissions Requirements (BLIERs) to manage the risks related to fugitive emissions of volatile organic compounds (VOCs) (CCME 2012). A single federal instrument addressing management practices, procedures and equipment specifications for key air emission sources from several oil and gas sectors could provide an efficient regulatory response to environmental concerns addressed under different programs. This is in keeping with the Petroleum Sector Stream Approach's objective of identifying synergies with other initiatives.

9.2 Implementation Plan

The proposed measure will be published in the *Canada Gazette*, Part I, by January 18, 2016, as per the timelines legislated in CEPA 1999.

The Government of Canada has been consulting with provinces, industry and other stakeholders to finalize the requirements for the reduction of VOC emissions under the BLIER process, and to develop a cost-effective implementation plan. The path forward may include adapting the current VOC requirements as necessary to address petroleum and refinery gases.

10. CONSULTATION APPROACH

The risk management scope document for industry-restricted petroleum and refinery gases, which summarized the proposed risk management under consideration at that time, was published on April 28, 2012. Industry and other interested stakeholders were invited to submit comments on the risk management scope document during a 60-day comment period. No comments were received on the risk management scope document.

Consultation for the proposed risk management approach document will involve publication on January 18, 2014, and a 60-day public comment period.

The primary stakeholders include:

- owners and operators of petroleum refineries, upgraders and natural gas processing facilities;
- non-governmental organizations;
- provincial/territorial governments; and
- other federal departments.

11. NEXT STEPS/PROPOSED TIMELINE

Actions	Date
Electronic consultation on the proposed risk management approach document	January 18, 2014 to March 19, 2014
Response to comments on the proposed risk management approach document	No later than the time of publication of the proposed instrument
Consultation on the draft instrument	July 2014 to January 2015
Publication of the proposed instrument	No later than January 2016
Formal public comment period on the proposed instrument	No later than January 2017
Publication of the final instrument	No later than July 2017

Industry and other interested stakeholders are invited to submit comments on the content of this proposed risk management approach or provide other information that would help to inform decision making. Please submit comments prior to March 19, 2014, since the risk management of industry-restricted petroleum and refinery gases will be moving forward after this date. During the development of regulations, instrument(s) and tool(s), there will be opportunity for consultation. Comments and information submissions on the proposed risk management approach should be submitted to the address provided below:

Program Development and Engagement Division
Environment Canada
Gatineau QC K1A 0H3
Tel.: 1-888-228-0530/819-956-9313
Fax: 819-953-7155
Email: Substances@ec.gc.ca

12. REFERENCES

- [API] American Petroleum Institute. 2001. Petroleum gases test plan. Revised October 2001. Submitted to the U.S. Environmental Protection Agency, Washington, DC, by the Petroleum HPV Testing Group. [cited 2008 Aug 14]. Available from: www.epa.gov/HPV/pubs/summaries/ptrlgas/c13224rt.pdf.
- [API] American Petroleum Institute. 2009a. Refinery gases category analysis and hazard characterization. Submitted to the U.S. Environmental Protection Agency, Washington, DC, by the Petroleum HPV Testing Group. Consortium registration no. 1100997. Available from: www.petroleumhpv.org/docs/pet_gases/2009_aug03_refinerygases_catanalysis_final_epasubmission_CAD%20FINAL%207-14-09.pdf.
- [API] American Petroleum Institute. 2009b. Petroleum hydrocarbon gases category analysis and hazard characterization. Submitted to the U.S. Environmental Protection Agency, Washington, DC, by the Petroleum HPV Testing Group. Consortium registration no. 1100997. Available from: www.petroleumhpv.org/pages/petroleumgases.html.
- Canada. 1985. *National Energy Board Act*. R.S.C., 1985, ch. N-7. Ottawa: Queen's Printer. Available from: <http://laws-lois.justice.gc.ca/eng/acts/N-7/index.html>.
- Canada. 1992. *Transportation of Dangerous Goods Act, 1992*. S.C., 1992, ch. 34. Ottawa: Queen's Printer. Available from: <http://laws-lois.justice.gc.ca/eng/acts/T-19.01/>.
- Canada. 1999. *Canadian Environmental Protection Act, 1999*. S.C., 1999, ch. 33. *Canada Gazette*. Part III. vol. 22, no. 3. Ottawa: Queen's Printer. Available from: <http://laws-lois.justice.gc.ca/eng/acts/C-15.31/>.
- Canada. 2000a. *Canadian Environmental Protection Act, 1999: Persistence and Bioaccumulation Regulations*. P.C. 2000-348, 23 March, 2000, SOR/2000-107, *Canada Gazette*. Part II, Vol. 134, No. 7, p. 607-612. Available from: <http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/index.html>.
- Canada. 2000b. 1,3-Butadiene. Ottawa (ON): Environment Canada, Health Canada (Priority Substances List assessment report). Available from: http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/1_3_butadiene/1_3_butadiene-eng.pdf.
- Canada. 2001. *Canada Shipping Act, 2001*. S.C., 2001, ch. 26. Ottawa: Queen's Printer. Available from: <http://laws-lois.justice.gc.ca/eng/acts/C-10.15/>.
- Canada. 2011. *Transportation of Dangerous Goods Act, 1992: Transportation of Dangerous Goods Regulations*, 3 March, 2011, SOR/2011-60, *Canada Gazette*. Part II, Volume 145, Issue 6. Available from: <http://laws-lois.justice.gc.ca/eng/regulations/SOR-2011-286/>.
- Canada. 2013a. Final Screening Assessment Report for the Petroleum Sector Stream Approach – Site-restricted petroleum and refinery gases. Available from: www.ec.gc.ca/ese-ees/default.asp?lang=En&n=08D395AD-1.
- Canada. 2013b. Proposed Risk Management Approach for Site-restricted Petroleum and Refinery Gases. Available from: www.ec.gc.ca/ese-ees/default.asp?lang=En&n=62D588DD-1.
- Canada. 2013c. *National Energy Board Act: National Energy Board Onshore Pipeline Regulations*, 10 April, 2013, SOR/2013-49. *Canada Gazette*. Part II, Volume 147, Issue 8. Available from: <http://laws-lois.justice.gc.ca/eng/regulations/SOR-99-294/index.html>

Canada. 2014. Final Screening Assessment Report for the Petroleum Sector Stream Approach – Industry-restricted petroleum and refinery gases. Available from: <http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=D5D72B57-1>.

[CAPP] Canadian Association of Petroleum Producers. 2007. Best management practices: Management of fugitive emissions at upstream oil and gas facilities. Available from: www.capp.ca/library/publications/policyRegulatory/pages/pubInfo.aspx?DocId=116116#tGzI3f2ZIDxR.

[CCME] Canadian Council of Ministers of the Environment. 1993. Environmental code of practice for the measurement and control of fugitive VOC emissions from equipment leaks. Prepared by the National Task Force on the Measurement and Control of Fugitive VOC Emissions from Equipment Leaks for CCME. ISBN: 1-895925-12-6. Available from: www.ccme.ca/assets/pdf/pn_1106_e.pdf.

[CCME] Canadian Council of Ministers of the Environment. 2005. National Framework for Petroleum Refinery Emission Reductions. Available from: www.ccme.ca/assets/pdf/nfprer_final_e.pdf.

[CCME] Canadian Council of Ministers of the Environment. 2012. Base-Level Industrial Emissions Requirements (BLIERs). Available from: www.ccme.ca/ourwork/air.html?category_id=146#493.

[CFR] Code of Federal Regulations. 2005. Title 49, Subtitle B, Chapter I: Pipeline and Hazardous Materials Safety Administration, Department of Transportation. Available from: www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfrv2_02.tpl.

ChemInfo. 2009. Background technical study on the use, exposure and release potential of certain high priority petroleum substances under the Chemicals Management Plan, in sectors other than the petroleum sector. Liquefied Petroleum Gases, Final Report. ChemInfo Services, Inc. for Environment Canada.

[CPPI] Canadian Petroleum Products Institute. 2011. Codes of practice for developing an emission inventory for refineries and terminals. Rev. 13. Available from: [http://canadianfuels.ca/userfiles/file/CPPI_CoP_Rev13_Revised_for_Selenium\(1\).pdf](http://canadianfuels.ca/userfiles/file/CPPI_CoP_Rev13_Revised_for_Selenium(1).pdf).

[EC IPTS] European Commission, Joint Research Centre, Institute for Prospective Technological Studies. 2003. Best Available Techniques Reference: Refining of Mineral Oil and Gas. Available from: <http://eippcb.jrc.ec.europa.eu/reference/ref.html>.

Environment Canada. 2008. Data for petroleum sector stream substances collected under the *Canadian Environmental Protection Act, 1999*, section 71: *Notice with respect to certain high priority petroleum substances*. Data prepared by: Environment Canada, Oil, Gas, and Alternative Energy Division.

Environment Canada. 2009. Data for petroleum sector stream substances collected under the *Canadian Environmental Protection Act, 1999*, section 71: *Notice with respect to potentially industry-limited high priority petroleum substances*. Data prepared by: Environment Canada, Oil, Gas, and Alternative Energy Division.

[EU] European Union. 2008. Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (Codified version). Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0001:EN:NOT>.

[EU] European Union. 2010. Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010L0075:EN:NOT>.

Kraus RS. 1998. Storage and transportation of crude oil, natural gas, liquid petroleum products and other chemicals. In: Stellman JM, editor. *Encyclopaedia of occupational health and safety*. 4th ed. Vol. III, Part XVII. Services and trade. Chapter 102. Transport industry and warehousing. Geneva (CH): International Labour Office.

Miesner T, Leffler WL. 2006. Oil and gas pipelines in nontechnical language. Chapter 1. Tulsa (OK): PennWell, Inc.

[NEB] National Energy Board. 2008a. Focus on safety and environment: a comparative analysis of pipeline performance 2000–2006. Available from: www.neb.gc.ca/clf-nsi/rsftyndthnvrnmnt/sfty/sftyprfrmncndctr/fcsnsfty/2008/fctsht0825-eng.html.

[NEB] National Energy Board. 2008b. Canadian pipeline transportation system: transportation assessment. Available from: www.neb.gc.ca/clf-nsi/rmgynfntn/nrgyrprt/trnsprtrn/trnsprtntsssmnt2008/trnsprtntsssmnt2008-eng.html.

Noyes R. 1992. Aboveground storage tanks. In: Handbook of leak, spill and accidental release prevention techniques. Chapter 5. Park Ridge (NJ): Noyes Publications.

[OTIF] Intergovernmental Organisation for International Carriage by Rail. 2006. Amendments to the *Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID)*. Available from: www.otif.org/fileadmin/user_upload/otif_verlinkte_files/05_gef_guet/05_notifi_07/A_81-03_505_2006_E.pdf.

Speight JG. 2007. Hydrogen production. In: The chemistry and technology of petroleum. 4th ed. Boca Raton (FL): CRC Press, Taylor & Francis Group. p. 637–660.

Treasury Board of Canada Secretariat, 2007. *Assessing, Selecting, and Implementing Instruments for Government Action*. www.tbs-sct.gc.ca/ri-qr/documents/gl-ld/asses-eval/asses-eval-eng.pdf.

Treasury Board of Canada Secretariat. 2012a. *Cabinet Directive on Regulatory Management*. Available from: www.tbs-sct.gc.ca/rtrap-parfa/cdrm-dcgr/cdrm-dcgrtb-eng.asp.

Treasury Board of Canada Secretariat. 2012b. Red Tape Reduction Commission Recommendations. Available from: www.tbs-sct.gc.ca/media/nr-cp/2012/0118a-eng.asp.

[US EPA] United States Environmental Protection Agency. 1995. Protocol for equipment leak emission estimates. Emission Standard Division, Office of Air and Radiation, Office of Air Quality Planning and Standards, US Environmental Protection Agency, North Carolina. Publication No. EPA-453/R-95-017. Available from: www.epa.gov/ttnchie1/efdocs/equiplks.pdf.