REFERENCE: Chapter 2: Manitoba's Preferred Development Plan Facilities; Section: 2.1.3; Page No.: 16

PREAMBLE: The environmental impact statement for the Keeyask Infrastructure, Generation and Transmission projects, currently under review, is beyond the scope of the NFAT review. Manitoba Hydro has provided a high-level summary to assist with a comparative analysis of the macro-environmental and socioeconomic effects of the PDP and alternative plans, as set out in the NFAT ToRs. (Chapter 2, Section 2.1.3, p.16).

The socioeconomic assessment for the Keeyask Project considered and assessed impacts on First Nations in the Local Study Area, but did not consider the Metis in the Local Study Area as a distinct and separate group that may be impacted by the project. Neither the environmental impact statement nor the NFAT contain an assessment and mitigation of potential socioeconomic impacts on the Metis.

QUESTION:

In the absence of sufficient information regarding the assessment and mitigation of potential socioeconomic effects, as these may be distinctly experienced by the Metis, particularly in the Local Study Area, provide the information that was used to determine that the Preferred Development Plan is superior to alternatives with respect to the Metis.

RESPONSE:

Please see Manitoba Hydro's response to MMF/MH I-001b.

REFERENCE: Chapter 2: Manitoba's Preferred Development Plan Facilities; Section: 2.1.3; Page No.: 16

PREAMBLE: The environmental impact statement for the Keeyask Infrastructure, Generation and Transmission projects, currently under review, is beyond the scope of the NFAT review. Manitoba Hydro has provided a high-level summary to assist with a comparative analysis of the macro-environmental and socioeconomic effects of the PDP and alternative plans, as set out in the NFAT ToRs. (Chapter 2, Section 2.1.3, p.16).

The socioeconomic assessment for the Keeyask Project considered and assessed impacts on First Nations in the Local Study Area, but did not consider the Metis in the Local Study Area as a distinct and separate group that may be impacted by the project. Neither the environmental impact statement nor the NFAT contain an assessment and mitigation of potential socioeconomic impacts on the Metis.

QUESTION:

In the absence of sufficient information regarding the assessment and mitigation of potential socioeconomic effects on the Metis for the Preferred Development Plan, explain how the PDP was compared to the Alternatives with respect to the Metis.

RESPONSE:

Please see CAC/MH I-231a. The NFAT submission has drawn information from existing sources, which include Manitoba Hydro's experience with past projects and plans for future projects, including the Keeyask environmental impact statement (see chapter 2 of the NFAT submission). Although the information does not distinguish the Metis per se, the information does consider effects on the Metis.

The MMF posed questions in the first round of the CEC IRs similar to MMF/MH I-0001(b). The response to MMF-0024 in the first round of CEC IRs stated:

> Based on existing studies of the project area and the experience and expertise of the Keeyask Cree Nations, the Keeyask Hydropower Limited Partnership does not currently have any knowledge of how the Metis, as a distinct group of people within the study area, would be affected any differently by the Keeyask Project than the general population.
>
> Manitoba Hydro (acting on behalf of the Partnership) and the MMF have reach an agreement on a workplan and budget to undertake a Metis-specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment and historical narrative for the Keeyask region. It is anticipated that these studies will assist in furthering *our* understanding of the Metis community in the Keeyask region and any potential effects that may be experienced as a result of the Project.

That study is expected to be completed in November of this year.

In response to regulatory requirements of the environmental reviews, the Keeyask Partnership reviewed existing sources of information regarding Metis resource use. The following was noted in MMF-0038c from the first round of CEC IRs:

> …the Partnership has provided a document entitled "Manitoba Metis: A review of available information on the current use of lands and resources for traditional purposes in the Keeyask resource use regional study area and potential effects of the Keeyask Generation Project on those uses". The MMF had the opportunity to review this document prior to it being submitted to regulators and notes that it disagrees with the report's conclusions.

The response to MMF-0023 in the first round of CEC IRs also noted:

To the extent that there are Metis or other Aboriginal citizens in the Local Study Area, these individuals are included in the assessments of effects of the Project on people in the Local Study Area, and are also captured in the total and Aboriginal populations (where available) identified for each Local Study Area community (please also refer to the responses to CEC Rd 1 MMF-0024g and MMF-0024h).

It is evident from the foregoing that the matter of Metis use of the Keeyask area is being considered in the environmental reviews.

On September 30, 2013 Manitoba Hydro undertook to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation. The matrices summarize the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13. PUB Order 119/13 added DSM to the resource options to be considered in the matrices, and Manitoba Hydro has chosen to also include transmission projects.

REFERENCE: Chapter 2: Manitoba's Preferred Development Plan Facilities; Section: 2.1.3.1, 2.1.3.2; Page No.: 16, 26

PREAMBLE: To address residual impacts on resource use, Manitoba Hydro refers to the Adverse Effects Agreements and states that these are expected to offset adverse effects to KCN resource users. Based on their review of existing information regarding other Aboriginal resource use, Manitoba Hydro predicts adverse effects to other Aboriginal resource users to be minimal (Chapter 2, Section 2.1.3.2, p.26). The MMF is being funded to undertake a Metis-specific Traditional Land Use and Knowledge Study (TLUKS), historical narrative and socioeconomic impact assessment (Chapter 2, Section 2.1.3.1, p.16).

QUESTION:

If new/additional impacts on the Metis are identified through ongoing studies, explain whether, and how the Partnership will identify new mitigation measures and revise existing mitigation measures as necessary.

RESPONSE:

IRs related to the question posed above were filed by the MMF as part of the CEC IR process. For example, in response to MMF-0039a in the first round of CEC IRs, the Keeyask Hydropower Limited Partnership noted, in part:

> Manitoba Hydro, on behalf of the Partnership, has reached an agreement (June 21, 2013) with the MMF to undertake Metis-specific studies including a Keeyask Traditional Land Use and Knowledge Study, a socio-economic impact assessment and two historical narratives to better understand the potential effects of the Keeyask Project on the Metis.

The response to MMF-0039a in the first round of the CEC IRs concludes:

> The Partnership has committed to consider any information that is provided in these studies.

REFERENCE: Chapter 2: Manitoba's Preferred Development Plan Facilities; Section: Section 2.2.3.4; Page No.: 50

PREAMBLE: The Proponent has identified "increases in access for resource users" as one of the socioeconomic residual effects of the Conawapa Outlet Transmission Project (Chapter 2, Section 2.2.3.4, p.50). While this effect is beneficial for land and resource users' access, it can be adverse if it results in over-use of land and resources, particularly as a result of opening up an area to recreational land users.

QUESTION:

Explain how Manitoba Hydro will manage access issues, especially increased pressure on land and resources as a result of increased use caused by changed access, particularly as these effects may be experienced by the Métis.

RESPONSE:

In accordance with Order 119/13 no response is required to this Information Request at this time.

REFERENCE: Chapter 2: Manitoba's Preferred Development Plan Facilities; Section: 2.2.3.3 and 2.3; Page No.: 50

PREAMBLE: With regard to the Conawapa Outlet Transmission Project, the text states that "Transmission projects also avoid undesirable socioeconomic effects to the extent practicable during the site selection process" and then lists three mitigation measures to address potential socioeconomic effects. The mitigation measures pertain to trapline compensation, construction crew accommodation, and heritage resource management (Chapter 2, Section 2.2.3.3, p.50).

The identification of potential socioeconomic effects does not include the assessment or mitigation of potential socioeconomic impacts as these may be experienced by the Metis and other Northern Residents in the vicinity of the proposed Project.

Further, for each of the North-South Transmission System Upgrade Project (Chapter 2, Section 2.3) and the Manitoba-Minnesota Transmission Project (Chapter 2, Section 2.4), the Business Case Submission refers back to Section 2.2.3.3 for "general approaches to avoiding and mitigating potential effects of transmission projects" (p.54).

QUESTION:

In the absence of sufficient information regarding the assessment and mitigation of potential socioeconomic effects of the Conawapa Outlet Transmission Project, the North-South Transmission System Upgrade Project, and the Manitoba-Minnesota Transmission Project, as these may be distinctly experienced by the Metis, particularly in the Local Study Area, describe the information that was used to determine that the Preferred Development Plan is superior to alternatives with respect to the Metis.

RESPONSE:

Please see CAC/MH I-231a. There has been no determination as to whether the Preferred Development Plan is superior to the alternative plans with respect to the Métis specifically.

Section 14.7 does, however, conclude Pathways 4 and 5 provide the highest beneficial package of socio-economic impacts and benefits to Northern and Aboriginal Communities. This is based on opportunities for training, employment, business, income sharing, and participation in environmental and socio-economic protection.

As well, on September 30, 2013 Manitoba Hydro undertook to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation. The matrices summarize the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13.

PUB Order 119/13 added DSM to the resource options to be considered in the matrices, and Manitoba Hydro has chosen to also include transmission projects.

REFERENCE: Chapter 2: Manitoba's Preferred Development Plan Facilities; Section: 2.2.3.3 and 2.3; Page No.: 50

PREAMBLE: With regard to the Conawapa Outlet Transmission Project, the text states that "Transmission projects also avoid undesirable socioeconomic effects to the extent practicable during the site selection process" and then lists three mitigation measures to address potential socioeconomic effects. The mitigation measures pertain to trapline compensation, construction crew accommodation, and heritage resource management (Chapter 2, Section 2.2.3.3, p.50).

The identification of potential socioeconomic effects does not include the assessment or mitigation of potential socioeconomic impacts as these may be experienced by the Métis and other Northern Residents in the vicinity of the proposed Project.

Further, for each of the North-South Transmission System Upgrade Project (Chapter 2, Section 2.3) and the Manitoba-Minnesota Transmission Project (Chapter 2, Section 2.4), the Business Case Submission refers back to Section 2.2.3.3. for "general approaches to avoiding and mitigating potential effects of transmission projects" (p.54).

QUESTION:

In the absence of sufficient information regarding the assessment and mitigation of potential effects on the Métis for the Preferred Development Plan, how was the PDP compared to the Alternatives?

RESPONSE:

Please see CAC/MH I-231a. The NFAT submission has relied on existing sources of information to evaluate the Preferred Development with the Alternatives, including the manner they would affect Aboriginal people.

For more discussion regarding information on Métis, please see MMF/MH I-001b.

On September 30, 2013 Manitoba Hydro undertook to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation. The matrices summarize the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13.

PUB Order 119/13 added DSM to the resource options to be considered in the matrices, and Manitoba Hydro has chosen to add transmission projects.

REFERENCE: Chapter 2: Manitoba's Preferred Development Plan Facilities; Section: 2.2.3.3 and 2.3; Page No.: 50

PREAMBLE: With regard to the Conawapa Outlet Transmission Project, the text states that "Transmission projects also avoid undesirable socioeconomic effects to the extent practicable during the site selection process" and then lists three mitigation measures to address potential socioeconomic effects. The mitigation measures pertain to trapline compensation, construction crew accommodation, and heritage resource management (Chapter 2, Section 2.2.3.3, p.50).

The identification of potential socioeconomic effects does not include the assessment or mitigation of potential socioeconomic impacts as these may be experienced by the Metis and other Northern Residents in the vicinity of the proposed Project.

Further, for each of the North-South Transmission System Upgrade Project (Chapter 2, Section 2.3) and the Manitoba-Minnesota Transmission Project (Chapter 2, Section 2.4), the Business Case Submission refers back to Section 2.2.3.3 for "general approaches to avoiding and mitigating potential effects of transmission projects" (p.54).

QUESTION:

Consistent with the PUB Order 92/13 definition of socioeconomic impacts and benefits, "...including such things as employment, training and business opportunities; infrastructure and services; personal, family and community life; and resource use" provide additional information regarding these potential socioeconomic impacts and benefits in relation to (1) the Conawapa Outlet Transmission Project, (2) the North-South Transmission System Upgrade Project, and (3) the Manitoba-Minnesota Transmission Project.

RESPONSE:

Please see CAC/MH I-231a. On September 30, 2013 Manitoba Hydro undertook to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa,

gas turbines and wind generation. The matrices summarize the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13.

PUB Order 119/13 added DSM to the resource options to be considered in the matrices, and Manitoba Hydro has chosen to also include transmission projects.

REFERENCE: Chapter 3: Trends and Factors Influencing North American Electricity Supply; Section: 3.1; Page No.: 1

PREAMBLE: The text indicates: "Electricity demand in both Canada and the U.S. is expected to continue to increase over the 35-year planning horizon. The Energy Information Administration's (EIA) Annual Energy Outlook 2013 reference case projects overall U.S. load growth of 28% between 2011 and 2040 (0.9% per 23 year)." Growth in electricity demand in the U.S. has dropped every decade since the 1950s, as noted by the EIA Annual Energy Outlook 2013.

QUESTION:

Provide p.71 of the EIA Annual Energy Outlook 2013 dealing with Electricity demand.

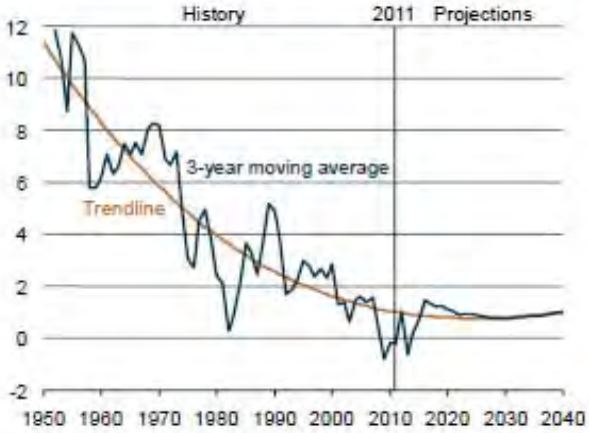
RESPONSE:

The US EIA's Annual Energy Outlook 2013 (AEO2013), is a publically accessible reference and can be found at the following link http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf.

Page 71 of AEO2013 is provided below.

Growth in electricity use slows but still increases by 28 percent from 2011 to 2040

Figure 75. U.S. electricity demand growth, 1950-2040 (percent, 3-year moving average)



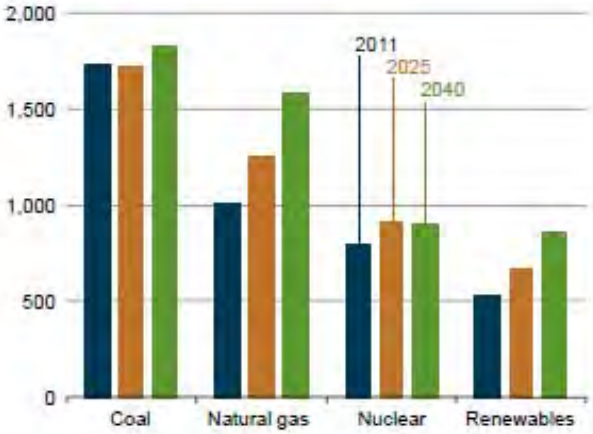
The growth of electricity demand (including retail sales and direct use) has slowed in each decade since the 1950s, from a 9.8-percent annual rate of growth from 1949 to 1959 to only 0.7 percent per year in the first decade of the 21st century. In the *AEO2013* Reference case, electricity demand growth remains relatively slow, as increasing demand for electricity services is offset by efficiency gains from new appliance standards and investments in energy-efficient equipment (Figure 75). Total electricity demand grows by 28 percent in the projection (0.9 percent per year), from 3,839 billion kilowatthours in 2011 to 4,930 billion kilowatthours in 2040.

Retail electricity sales grow by 24 percent (0.7 percent per year) in the Reference case, from 3,725 billion kilowatthours in 2011 to 4,608 billion kilowatthours in 2040. Residential electricity sales also grow by 24 percent, to 1,767 billion kilowatthours in 2040, spurred by population growth and continued population shifts to warmer regions with greater cooling requirements. Led by demand in the service industries, sales of electricity to the commercial sector increase by 27 percent, to 1,677 billion kilowatthours in 2040. Sales to the industrial sector grow by 17 percent, to 1,145 billion kilowatthours in 2040. Electricity sales to the transportation sector, although relatively small, triple from 6 billion kilowatthours in 2011 to 19 billion kilowatthours in 2040 with increasing sales of electric plug-in LDVs.

Electricity demand can vary with different assumptions about economic growth, electricity prices, and advances in energy-efficient technologies. In the High Economic Growth case, demand grows by 42 percent from 2011 to 2040, compared with 18 percent in the Low Economic Growth case and only 7 percent in the Best Available Technology case. Average electricity prices (in 2011 dollars) increase by 5 percent from 2011 to 2040 in the Low Economic Growth case and 13 percent in the High Economic Growth case, to 10.4 and 11.2 cents per kilowatthour, respectively, in 2040.

Coal-fired plants continue to be the largest source of U.S. electricity generation

Figure 76. Electricity generation by fuel, 2011, 2025, and 2040 (billion kilowatthours)



Coal-fired power plants continue to be the largest source of electricity generation in the *AEO2013* Reference case (Figure 76), but their market share declines significantly. From 42 percent in 2011, coal's share of total U.S. generation declines to 38 percent in 2025 and 35 percent in 2040. Approximately 15 percent of the coal-fired capacity active in 2011 is expected to be retired by 2040 in the Reference case, while only 4 percent of new generating capacity added is coal-fired. Existing coal-fired units that have undergone environmental equipment retrofits continue to operate throughout the projection.

Generation from natural gas increases by an average of 1.6 percent per year from 2011 to 2040, and its share of total generation grows from 24 percent in 2011 to 27 percent in 2025 and 30 percent in 2040. The relatively low cost of natural gas makes the dispatching of existing natural gas plants more competitive with coal plants and, in combination with relatively low capital costs, makes plants fueled by natural gas an alternative choice for new generation capacity.

Generation from renewable sources grows by 1.7 percent per year on average in the Reference case, and the share of total generation rises from 13 percent in 2011 to 16 percent in 2040. The nonhydropower share of total renewable generation increases from 38 percent in 2011 to 65 percent in 2040.

Generation from U.S. nuclear power plants increases by 0.5 percent per year on average from 2011 to 2040, with most of the growth between 2011 and 2025, but the share of total U.S. electricity generation declines from 19 percent in 2011 to 17 percent in 2040, as the growth in nuclear generation is outpaced by growth in generation using natural gas and renewables.

1

REFERENCE: Chapter 3: Trends and Factors Influencing North American Electricity Supply; Section: 3.2; Page No.: 6

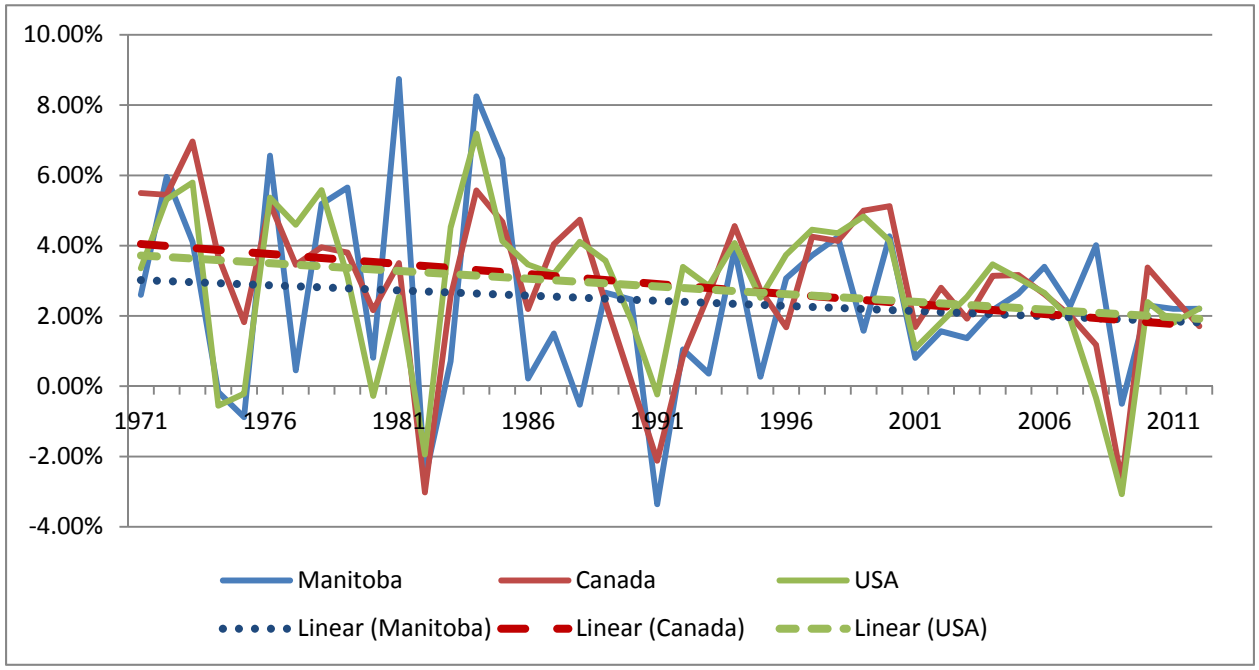
PREAMBLE: Figure 3.3 illustrates a downward trend in real GDP since 1971.

QUESTION:

Create a figure showing the best-fit straight line for the real GDP data shown in Figure 3.3.

RESPONSE:

The following chart shows the best-fit straight line for real GDP (%) as shown in Figure 3.3.



REFERENCE: Chapter 3: Trends and Factors Influencing North American Electricity Supply; Section: 3.2; Page No.: 6

PREAMBLE: Figure 3.3 illustrates a downward trend in real GDP since 1971.

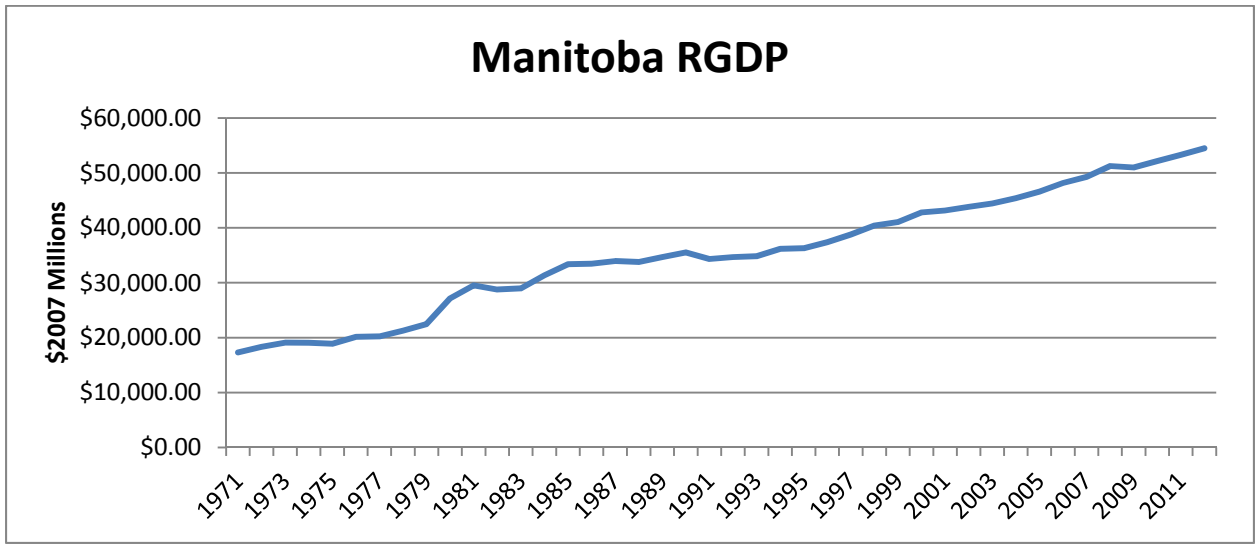
QUESTION:

Identify the key social, economic and other factors influencing changes in real GDP in Manitoba since 1971 and provide available information concerning the relative contribution of these factors to the Province's GDP since that time.

RESPONSE:

Manitoba Hydro does not agree with the preamble of this question as Figure 3.3 does not illustrate a downward trend in real GDP since 1971.

The data for Manitoba used to develop Figure 3.3 is shown in the following chart, and demonstrates that real GDP for Manitoba has increased since 1971.



Manitoba Hydro does not have the capacity to perform the research requested within the timeframe of this hearing process.

REFERENCE: Chapter 3: Trends and Factors Influencing North American Electricity Supply; Section: 3.2; Page No.: 7

PREAMBLE: The text notes: "After 2013, forecasters anticipate slightly higher recovery-level growth before realigning with long-term average economic growth of between 2 to 3% per year. While economic growth is expected to continue to be volatile, the long-term average is expected to be consistent with the historic average."

QUESTION:

Reconcile this comment concerning long-term real GDP with the information contained in Table A-1 of Appendix F, which indicates a long-term real GDP in Manitoba of 1.7% per year, clarifying the source(s) of the information used in the NFAT.

RESPONSE:

Table A-1 of Appendix F provides the "Manitoba / Canada Economic Statistics" on a fiscal year basis as projected in the Economic Outlook for 2012 – 2033, which was prepared in the spring of 2012. At that time, long-real GDP growth in Manitoba was projected to be 1.7% per year.

Table A-1 of Appendix G provides the "Manitoba / Canada Economic Statistics" on a fiscal year basis as projected the Economic Outlook for 2013 – 2034, which was prepared in the spring of 2013. At that time, long-real GDP growth in Manitoba was projected to be 2.0% per year.

The reference from Chapter 3, Section 3.2 on page 7, which states that long-term average economic growth in Manitoba, Canada and the U.S. will be between 2 to 3% per year, refers to the whole of North America and is consistent with Manitoba Hydro's most current forecast of long-term GDP growth for Manitoba as projected in the Economic Outlook for 2013 -2034.

REFERENCE: Chapter 3: Trends and Factors Influencing North American Electricity Supply; Section: 3.3.4; Page No.: 21

QUESTION:

Update the Ontario solar tariff prices by providing the most recent data available for all technologies under the feed-in-tariff from the Ontario Power Authority dated August 26, 2013. (http://fit.powerauthority.on.ca/sites/default/files/news/2013-FIT-Price-Schedule-Tables.pdf)

RESPONSE:

Ontario's solar tariff prices are a matter of public record and are available at:

http://fit.powerauthority.on.ca/sites/default/files/news/2013-FIT-Price-Schedule-Tables.pdf

As of August 26, 2013, the FIT/microFIT price schedule for Solar (PV) is in the range of 28.8 to 39.6 ¢/kWh.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.1; Page No.: 2

PREAMBLE: The text notes that: "Manitoba's domestic electrical energy consumption has grown, on average, at an annual rate of 1.7% over the past ten years. Observed domestic energy usage includes the effect of energy codes and standards and Manitoba Hydro's past DSM programs. Manitoba's domestic energy usage would have grown another 0.4% per year in the absence of DSM."

QUESTION:

Quantify the effect of energy codes and standards on the reduction of growth of electrical energy consumption for each of the past 10 years in Manitoba as a percentage of the annual electrical energy growth.

RESPONSE:

The following table presents the effect of energy codes and standards as a percent of load growth based upon evaluated energy savings compared to weather adjusted actuals from the 2013 Electric Load Forecast as presented in Appendix D.

Year	Codes & Standards Reductions (GW.h)	Gross Annual Load Growth (GW.h)	Codes & Standards Reductions as a % of Load Growth
2003/04	19	252	7.6%
2004/05	45	965	4.7%
2005/06	70	1,547	4.5%
2006/07	95	1,801	5.3%
2007/08	124	2,315	5.3%
2008/09	153	2,617	5.9%
2009/10	202	2,297	8.8%
2010/11	253	2,508	10.1%
2011/12	310	2,918	10.6%
2012/13	347	3,008	11.5%

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.1; Page No.: 2

PREAMBLE: The text notes that: "Manitoba's domestic electrical energy consumption has grown, on average, at an annual rate of 1.7% over the past ten years. Observed domestic energy usage includes the effect of energy codes and standards and Manitoba Hydro's past DSM programs. Manitoba's domestic energy usage would have grown another 0.4% per year in the absence of DSM."

QUESTION:

Clarify whether the effect of DSM on domestic energy use, noted as 0.4% per year, includes the effect of codes and standards and, if so, indicate the effect of DSM without the codes and standards as a percentage of the annual load growth for each of the past 10 years.

RESPONSE:

Please see Manitoba Hydro's response to MMF/MH I-0010a.

The following table presents the effect of DSM programs as a percent of load growth based upon evaluated energy savings compared to weather adjusted actuals from the 2013 Electric Load Forecast as presented in Appendix D.

Year	DSM Programs Reductions (GW.h)	Gross Annual Load Growth (GW.h)	DSM Programs as a % of Load Growth
2003/04	39	252	15.4%
2004/05	116	965	12.0%
2005/06	225	1,547	14.5%
2006/07	432	1,801	24.0%
2007/08	492	2,315	21.3%
2008/09	612	2,617	23.4%
2009/10	715	2,297	31.1%
2010/11	836	2,508	33.3%
2011/12	883	2,918	30.3%
2012/13	899	3,008	29.9%

1

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.1; Page No.: 2

PREAMBLE: The text notes that: "Manitoba's domestic electrical energy consumption has grown, on average, at an annual rate of 1.7% over the past ten years. Observed domestic energy usage includes the effect of energy codes and standards and Manitoba Hydro's past DSM programs. Manitoba's domestic energy usage would have grown another 0.4% per year in the absence of DSM."

QUESTION:

Describe the nature and duration of any conservation rates that were in place at any time in the last 10 years in any rate class, and quantify the effects of those conservation rates on changes to the electrical energy growth in the Province as a load growth percentage reduction (or increase).

RESPONSE:

Manitoba Hydro implemented residential inclining block rates between July 1, 2008 and March 31, 2011 as shown in Manitoba Hydro's response to CAC/MH I-139. Rates in effect during this 33 month period were designed with the intent of sending an appropriate price signal to customers to conserve energy by charging a higher price per kWh for electrical consumption in excess of 900 kWh per month.

It is difficult to quantify what effect, if any, these rates had on electrical consumption in the Province as there are other factors that need to be taken into consideration:

1) The level of inversion in the rates during the 33 month period was relatively small. The largest inversion occurred with rates effective April 1, 2010 which had a less than 3% differential between the first block energy rate and the run-off rate (first 900 kWh at 6.38¢ versus the tail block rate of 6.57¢).

2) Weather plays a significant role in customer usage and resultant energy bills, especially in the Residential rate class, as noted on page 43 of the 2013 Electric Load Forecast (Appendix D of the NFAT Submission) which states: *"The Residential sector has a larger proportional effect of weather, varying from an increase of 7% in a record cold winter to a decrease of 7% in a record warm winter, and a possible additional increase of 3% due to a record hot summer and a 2% decrease due to a record cool summer."*

The average use for the Residential rate class over the past 13 years, adjusted for weather, is shown in the following table (as obtained from page 17 of the 2013 Electric Load Forecast with customer count added to calculate average use). The three years highlighted (2008/09 to 2010/11) reflect the period during which inverted rates were applicable. Manitoba Hydro is unable to determine what impact the inclining block rate structure had on residential load growth.

	Res Cust Count	Residential Sales	Weather Adjustment	Adjusted Sales	Weather Adj Average Use	Load Growth
2000/01	413,182	5737	-26	5711	13,822	
2001/02	415,765	5674	140	5814	13,984	1.2%
2002/03	417,936	6266	-255	6011	14,383	2.9%
2003/04	420,834	6170	10	6181	14,688	2.1%
2004/05	420,827	6275	22	6297	14,963	1.9%
2005/06	423,742	6171	263	6434	15,184	1.5%
2006/07	427,886	6443	-9	6434	15,037	-1.0%
2007/08	432,144	6736	-71	6664	15,421	2.6%
2008/09	437,263	6847	-146	6701	15,325	-0.6%
2009/10	441,710	6786	144	6930	15,689	2.4%
2010/11	445,882	6952	94	7046	15,802	0.7%
2011/12	450,748	6818	313	7131	15,820	0.1%
2012/13	456,130	7223	-4	7219	15,827	0.0%

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.1; Page No.: 2

QUESTION:

Explain or otherwise reconcile the statement that in the absence of DSM, Manitoba's domestic energy usage would have grown another 0.4% per year in the previous ten years, and the statement that projected DSM programs would reduce the energy use growth rate by a much smaller 0.1% per year.

RESPONSE:

The historical rate of 0.4% per year includes both the effects of codes and standards and the effect of DSM programs. Over the last 10 years, electricity usage in Manitoba would have increased at a rate of 1.6% in the absence of DSM. With the impacts of DSM, actual electricity usage in Manitoba increased 1.2%.

Under the 2013 Load Forecast, energy use is projected to grow at a rate of 1.6% per year over the next 10 years including the anticipated influence of codes and standards. In the absence of DSM codes/standards impacts, electricity use would be forecast to grow at a rate of 1.8%. With the impacts of DSM programs included, electricity use over the next 10 years would be forecast to grow at a rate of 1.4% per year, representing an overall reduction in growth due to all DSM efforts of 0.4% per year.

The 0.1% per year reduction in annual growth in electricity use referenced reflects the average annual reduction over the next 20 year period due to DSM programs only and excludes the impacts of codes and standards.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.1; Page No.: 2

PREAMBLE: The text notes that: "Peak demand is forecast to continue to grow at an average rate of 1.6% per year for the next 20 years. This reflects future savings due to codes and standards but not DSM programs. Forecast DSM programs would reduce the forecasted demand growth rate by approximately 0.1% resulting in an average rate after DSM of 1.5%."

QUESTION:

Quantify the effect of energy codes and standards on the reduction of growth of electrical peak demand for each of the past 10 years in Manitoba as a percentage of the annual growth.

RESPONSE:

The following table presents the effect of energy codes and standards as a % of load growth based upon evaluated energy savings compared to weather adjusted actuals from the 2013 Electric Load Forecast as presented in Appendix D.

Year	Codes & Standards Reductions (MW)	Gross Annual Load Growth (MW)	Codes & Standards Reductions as a % of Load Growth
2003/04	5	49	9.7%
2004/05	11	180	6.2%
2005/06	17	287	5.9%
2006/07	23	327	7.1%
2007/08	30	427	7.1%
2008/09	38	489	7.7%
2009/10	46	434	10.5%
2010/11	54	463	11.7%
2011/12	64	537	12.0%
2012/13	73	555	13.1%

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.1; Page No.: 2

PREAMBLE: The text notes that: "Peak demand is forecast to continue to grow at an average rate of 1.6% per year for the next 20 years. This reflects future savings due to codes and standards but not DSM programs. Forecast DSM programs would reduce the forecasted demand growth rate by approximately 0.1% resulting in an average rate after DSM of 1.5%."

QUESTION:

Clarify whether the effect of DSM on peak demand, noted as 0.1% per year, includes the effect of codes and standards and, if so, indicate the effect of DSM without the codes and standards as a percentage of the annual peak load growth for each of the past 10 years.

RESPONSE:

The effect of future DSM noted as 0.1% per year does not include the effects of codes and standards, but only includes the effect of DSM programs.

The following table presents the effect of past DSM programs as a % of load growth based upon evaluated energy savings compared to weather adjusted actuals from the 2013 Electric Load Forecast as presented in Appendices D.

Year	DSM Programs Reductions (MW)	Gross Annual Load Growth (MW)	DSM Programs as a % of Load Growth
2003/04	7	49	14.4%
2004/05	19	180	10.8%
2005/06	51	287	17.9%
2006/07	67	327	20.6%
2007/08	86	427	20.1%
2008/09	108	489	22.1%
2009/10	136	434	31.4%
2010/11	160	463	34.5%
2011/12	175	537	32.6%
2012/13	179	555	32.2%

1

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.1; Page No.: 2

PREAMBLE: The text notes that: "Peak demand is forecast to continue to grow at an average rate of 1.6% per year for the next 20 years. This reflects future savings due to codes and standards but not DSM programs. Forecast DSM programs would reduce the forecasted demand growth rate by approximately 0.1% resulting in an average rate after DSM of 1.5%."

QUESTION:

Describe the nature and duration of any conservation rates that were in place at any time in the last 10 years in any rate class, and quantify the effects of those conservation rates on changes to the electrical peak demand growth in the Province as a peak load growth percentage reduction (or increase).

RESPONSE:

Please see Manitoba Hydro's response to MMF/MH I-010c.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.1; Page No.: 5

PREAMBLE: The text notes that "Customer self-generation is recognized as avoided load; the avoided load is not in the load forecast."

QUESTION:

Provide any available data concerning estimates of current self-generation of electricity in Manitoba and any available forecasts for self-generation within Manitoba during the planning period.

RESPONSE:

There is currently one major consumer in Manitoba with operational customer-owned self generation capability. This customer currently dominates self-generation capacity and output in the Province. The customer-owned self-generation system has a peak capacity of 15 – 20 MW and is capable of providing between 10 and 100 GWh of energy annually for displacement of customer load. Annual output from this customer-owned generation source is highly variable with generation output dependent on the availability and cost of fuel (waste biomass), operational requirements and ongoing operating/maintenance intervals/costs. Annual output over the past several years has been in the range of 10 to 120 GWh with an average output of approximately 50 to 70 GWh over the past two years.

Manitoba Hydro is actively exploring biomass-to-energy conversion through a series of smaller-scale bioenergy demonstrations that are intended to evaluate the technical potential and economic viability of five biomass-to-energy pathways. It is anticipated that these demonstrations will provide Manitoba Hydro and its customers with the expertise and operational experience needed to support the development of additional customer-owned generation capability within Manitoba. Opportunities exist for Manitoba Hydro to support such development through the Bioenergy Optimization Program, which is targeting demand and

energy reductions at generation of 8.0 MW and 69.7 GWh by the benchmark year of 2027/28 through increased use of smaller scale customer-owned systems. Larger scale installations will be dealt with through the program on a case-by-case basis.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.1; Page No.: 6

PREAMBLE: The historic energy consumption information in Figure 4.1 is not sufficient to understand long-term trends in electricity load growth.

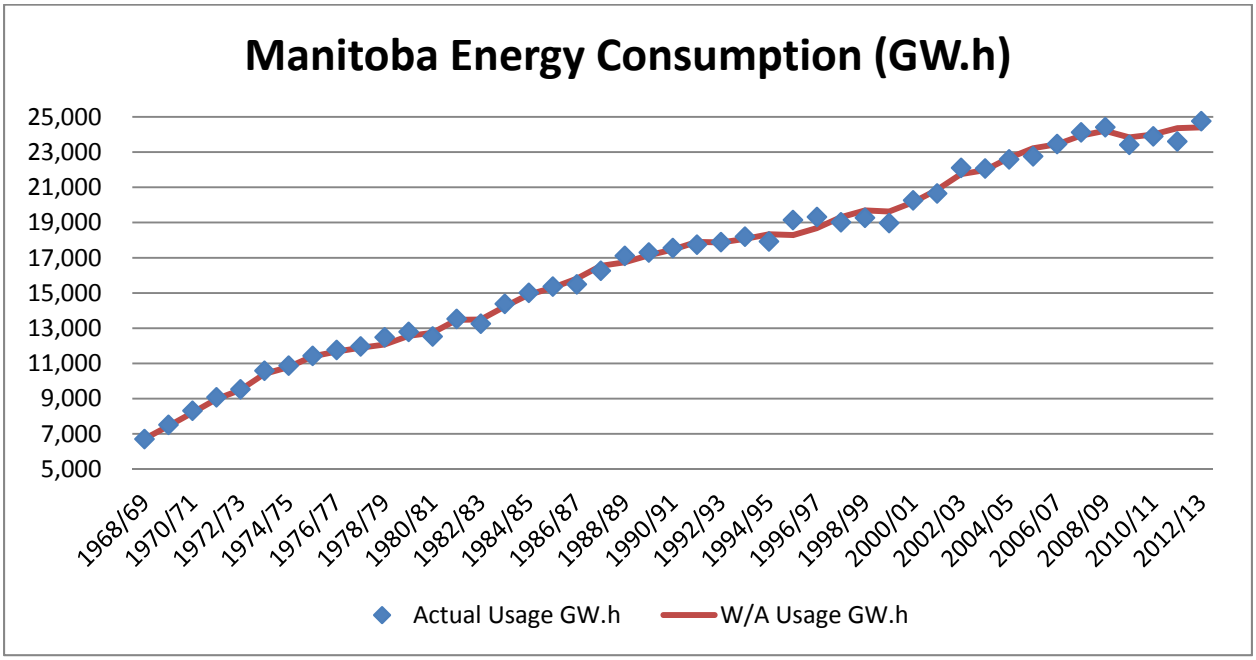
QUESTION:

Provide Manitoba electrical energy consumption data dating back to the 1950s or as long as the data are available in a tabular format and a graphical format showing the change in load growth each year.

RESPONSE:

Historical Annual Energy Consumption

Fiscal Year	Actual Usage GW.h	W/A Usage GW.h	Growth %	Fiscal Year	Actual Usage GW.h	W/A Usage GW.h	Growth %
1968/69	6,709	6,709		1991/92	17,748	17,895	2.4%
1969/70	7,517	7,442	10.9%	1992/93	17,894	17,867	-0.2%
1970/71	8,313	8,197	10.1%	1993/94	18,201	18,067	1.1%
1971/72	9,080	8,970	9.4%	1994/95	17,929	18,334	1.5%
1972/73	9,528	9,499	5.9%	1995/96	19,148	18,284	-0.3%
1973/74	10,581	10,411	9.6%	1996/97	19,321	18,690	2.2%
1974/75	10,872	10,794	3.7%	1997/98	19,014	19,304	3.3%
1975/76	11,432	11,394	5.6%	1998/99	19,273	19,681	2.0%
1976/77	11,768	11,673	2.5%	1999/00	18,971	19,622	-0.3%
1977/78	11,962	11,889	1.8%	2000/01	20,262	20,144	2.7%
1978/79	12,483	12,067	1.5%	2001/02	20,656	20,859	3.5%
1979/80	12,797	12,560	4.1%	2002/03	22,110	21,743	4.2%
1980/81	12,529	12,743	1.5%	2003/04	22,069	21,976	1.1%
1981/82	13,527	13,469	5.7%	2004/05	22,589	22,663	3.1%
1982/83	13,260	13,485	0.1%	2005/06	22,757	23,220	2.5%
1983/84	14,387	14,228	5.5%	2006/07	23,464	23,449	1.0%
1984/85	15,014	14,903	4.7%	2007/08	24,122	23,934	2.1%
1985/86	15,366	15,297	2.6%	2008/09	24,417	24,207	1.1%
1986/87	15,495	15,817	3.4%	2009/10	23,412	23,838	-1.5%
1987/88	16,260	16,538	4.6%	2010/11	23,892	23,998	0.7%
1988/89	17,108	16,737	1.2%	2011/12	23,605	24,351	1.5%
1989/90	17,298	17,140	2.4%	2012/13	24,760	24,405	0.2%
1990/91	17,553	17,469	1.9%				


Manitoba Energy Consumption (GW.h)
25,000
23,000
21,000
19,000
17,000
15,000
13,000
11,000
9,000
7,000
5,000
1968/69
1970/71
1972/73
1974/75
1976/77
1978/79
1980/81
1982/83
1984/85
1986/87
1988/89
1990/91
1992/93
1994/95
1996/97
1998/99
2000/01
2002/03
2004/05
2006/07
2008/09
2010/11
2012/13
Actual Usage GW.h
W/A Usage GW.h

1

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.1; Page No.: 6

PREAMBLE: The historic peak consumption information in Figure 4.3 is not sufficient to understand long-term trends in electricity load growth.

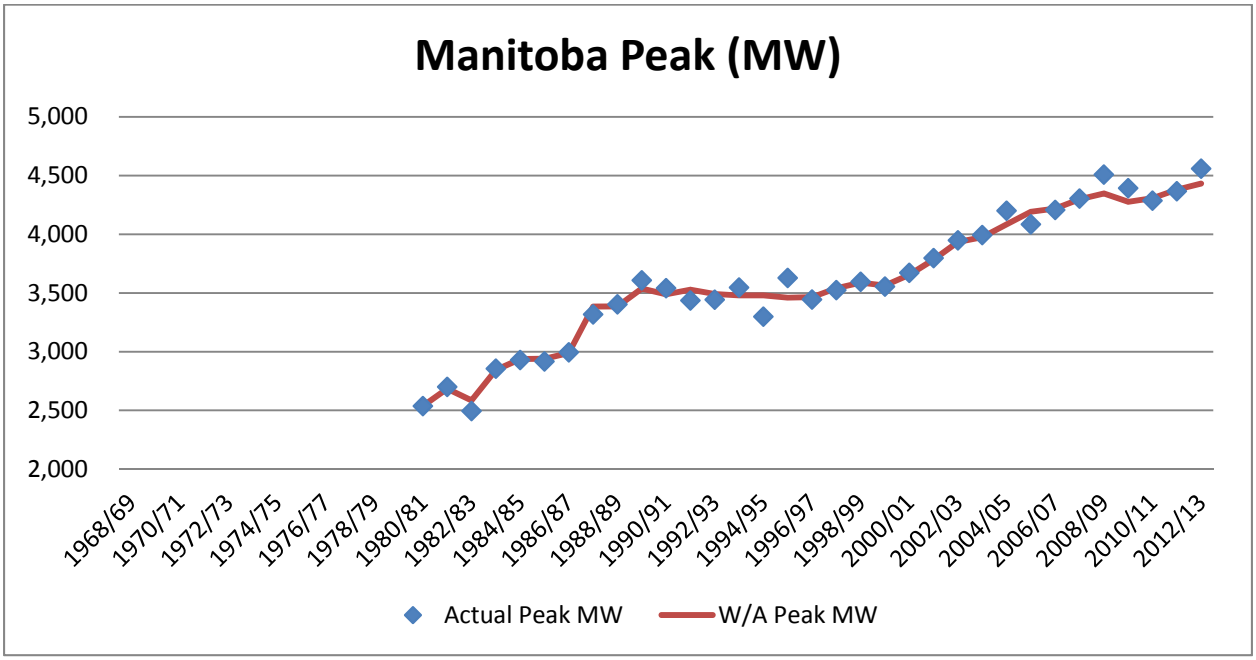
QUESTION:

Provide Manitoba electrical peak load data dating back to the 1950s or as long as the data are available in a tabular format and a graphical format showing the change in load growth each year.

RESPONSE:

Historical Annual Peak

Fiscal Year	Actual Peak MW	W/A Peak MW	Growth %	Fiscal Year	Actual Peak MW	W/A Peak MW	Growth %
1968/69	-	-		1991/92	3,436	3,528	1.2%
1969/70	-	-		1992/93	3,443	3,491	-1.1%
1970/71	-	-		1993/94	3,547	3,479	-0.4%
1971/72	-	-		1994/95	3,299	3,479	0.0%
1972/73	-	-		1995/96	3,628	3,461	-0.5%
1973/74	-	-		1996/97	3,444	3,464	0.1%
1974/75	-	-		1997/98	3,525	3,540	2.2%
1975/76	-	-		1998/99	3,596	3,587	1.3%
1976/77	-	-		1999/00	3,555	3,564	-0.6%
1977/78	-	-		2000/01	3,672	3,654	2.5%
1978/79	-	-		2001/02	3,797	3,785	3.6%
1979/80	-	-		2002/03	3,948	3,935	4.0%
1980/81	2,537	2,537		2003/04	3,994	3,975	1.0%
1981/82	2,700	2,684	5.8%	2004/05	4,201	4,084	2.7%
1982/83	2,494	2,585	-3.7%	2005/06	4,085	4,192	2.6%
1983/84	2,856	2,844	10.0%	2006/07	4,208	4,220	0.7%
1984/85	2,929	2,937	3.3%	2007/08	4,304	4,298	1.9%
1985/86	2,917	2,940	0.1%	2008/09	4,509	4,347	1.1%
1986/87	2,994	2,989	1.7%	2009/10	4,393	4,277	-1.6%
1987/88	3,317	3,384	13.2%	2010/11	4,286	4,308	0.7%
1988/89	3,404	3,385	0.0%	2011/12	4,367	4,380	1.7%
1989/90	3,608	3,537	4.5%	2012/13	4,559	4,432	1.2%
1990/91	3,541	3,488	-1.4%				


Manitoba Peak (MW)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1968/69
1970/71
1972/73
1974/75
1976/77
1978/79
1980/81
1982/83
1984/85
1986/87
1988/89
1990/91
1992/93
1994/95
1996/97
1998/99
2000/01
2002/03
2004/05
2006/07
2008/09
2010/11
2012/13
Actual Peak MW
W/A Peak MW

1

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.1.1; Page No.: 11

PREAMBLE: The text notes that Under Manitoba Hydro's 2012 Economic Outlook, Manitoba's population is forecast to grow from 1,255,000 in 2011/12 to 1,596,000 in 2031/32, representing an average annual growth rate of 1.2%. In the 2012 Load Forecast, the number of Residential Basic customers is expected to grow at an average annual rate of 1.2% over the next 20 years, reaching 576,545 customers by 2031/32.

QUESTION:

Provide the sources of population data used to determine Provincial population growth rates, which form the primary factor in forecasted GDP and electricity load growth in the NFAT.

RESPONSE:

The following table depicts the sources used to derive the forecast of Manitoba population for 2011/12 – 2032/33, as shown in Table A-1 of the 2012 Economic Outlook, filed as Appendix F.

Copies of the source forecasts are attached.

Economic Outlook 2012

Manitoba Population – 000's

	Fcst Date	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Spatial Economics	1-Jan-12	1251	1268	1286	1306	1326	1348	1371	1393	1411	1425	1435	1444	1453	1464	1475	1486	1500	1516	1535	1554	1573	1590	1604
Conference Board	16-Dec-11	1251	1267	1286	1305	1325	1345	1365	1385	1405	1426	1446	1466	1487	1507	1528	1548	1569	1590	1611	1631	1652	1673	1693
IHS Global Insight	16-Nov-11	1251	1266	1281	1295	1309	1324																	
Informetrica	27-Feb-12	1251	1266	1281	1297	1313	1330	1347	1364	1382	1399	1417	1435	1452	1470	1487	1505	1522	1540	1557	1574	1591	1608	1624
EO2012 - Calendar		1251	1267	1284	1301	1319	1336	1354	1371	1389	1406	1424	1441	1459	1476	1493	1510	1527	1543	1560	1576	1592	1608	1624

	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33
EO2012 - Fiscal	1255	1272	1289	1306	1323	1340	1358	1375	1393	1411	1428	1446	1463	1480	1497	1514	1531	1547	1564	1580	1596	1612
% change	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0

Note: 2011 is actual data.

CONFERENCE BOARD - DECEMBER 2011

Table 8
Key Economic Indicators: Manitoba

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
GDP at market prices (current $)	56,823	59,563	62,671	65,437	68,524	71,299	73,966	76,735	79,593	82,421	85,268	88,245	91,424	94,790	98,289	101,881	105,670	109,644	113,866	118,333	122,841	127,582	132,492
	6.2	4.8	5.2	4.4	4.7	4.1	3.7	3.7	3.7	3.6	3.5	3.5	3.6	3.7	3.7	3.7	3.7	3.8	3.9	3.9	3.8	3.9	3.8
GDP at basic prices (current $)	53,040	55,521	58,395	60,945	63,817	66,378	68,834	71,394	74,037	76,644	79,263	82,008	84,948	88,063	91,302	94,624	98,130	101,809	105,725	109,867	114,038	118,425	122,967
	6.2	4.7	5.2	4.4	4.7	4.0	3.7	3.7	3.7	3.5	3.4	3.5	3.6	3.7	3.7	3.6	3.7	3.7	3.8	3.9	3.8	3.8	3.8
GDP at basic prices (constant 2002 $)	40,424	41,483	42,708	43,834	45,124	46,217	47,242	48,162	49,159	50,104	51,034	51,949	52,964	53,999	55,049	56,098	57,193	58,354	59,554	60,796	62,010	63,288	64,579
	2.1	2.6	3.0	2.6	2.9	2.4	2.2	1.9	2.1	1.9	1.9	1.8	2.0	2.0	1.9	1.9	2.0	2.0	2.1	2.1	2.0	2.1	2.0
Consumer Price Index (2002=1.0)	1.184	1.204	1.231	1.259	1.285	1.312	1.342	1.373	1.404	1.436	1.469	1.502	1.535	1.569	1.603	1.637	1.672	1.706	1.745	1.782	1.820	1.858	1.898
	2.9	1.7	2.3	2.2	2.0	2.1	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Implicit price deflator—	1.312	1.338	1.367	1.390	1.414	1.436	1.457	1.482	1.506	1.530	1.553	1.579	1.604	1.631	1.659	1.687	1.716	1.745	1.775	1.807	1.839	1.871	1.904
GDP at basic prices (2002=1.0)	4.0	2.0	2.2	1.7	1.7	1.6	1.4	1.7	1.6	1.6	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8
Average weekly wages (level $)	744	762	782	803	826	848	871	894	917	941	965	990	1016	1042	1067	1092	1118	1145	1172	1199	1228	1256	1286
(industrial composite)	4.5	2.5	2.8	2.7	2.8	2.8	2.7	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3
Personal income (current $)	43,514	45,040	47,036	49,052	51,088	53,160	55,226	57,324	59,537	61,833	64,207	66,685	69,255	71,904	74,602	77,402	80,326	83,358	86,488	89,706	93,043	96,476	100,016
	4.3	3.5	4.4	4.3	4.2	4.1	3.9	3.8	3.9	3.9	3.8	3.9	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.7	3.7	3.7	3.7
Personal disposable income (current $)	34,758	35,776	37,212	38,671	40,180	41,716	43,250	44,801	46,446	48,152	49,915	51,754	53,661	55,617	57,660	59,656	61,796	64,010	66,286	68,624	71,035	73,536	76,049
	3.7	2.9	4.0	3.9	3.9	3.8	3.7	3.6	3.7	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.6	3.5	3.5	3.5	3.5
Personal savings rate	1.2	0.2	-0.3	-0.6	-0.7	-0.7	-0.8	-1.0	-1.2	-1.4	-1.5	-1.5	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.5	-1.5	-1.5	-1.5	-1.6
Population (000s)	1,248	1,267	1,286	1,305	1,325	1,345	1,365	1,385	1,405	1,426	1,446	1,466	1,487	1,507	1,528	1,548	1,569	1,590	1,611	1,631	1,652	1,673	1,693
	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2
Labour force (000s)	660	671	684	695	704	713	721	729	737	744	751	759	767	776	784	793	802	811	821	831	841	852	863
	0.8	1.6	2.0	1.6	1.4	1.2	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3
Employment (000s)	625	636	649	660	669	678	686	693	700	708	715	722	730	738	746	754	763	772	782	791	801	811	821
	0.8	1.8	2.1	1.6	1.4	1.3	1.2	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3
Unemployment rate (percentage)	5.3	5.2	5.1	5.0	5.0	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Retail sales (current $)	16,963	16,978	17,632	18,263	18,865	19,439	20,044	20,658	21,302	21,950	22,586	23,225	23,859	24,488	25,111	25,731	26,362	26,994	27,628	28,256	28,887	29,517	30,158
	3.9	3.8	3.8	3.6	3.3	3.0	3.1	3.1	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.5	2.5	2.4	2.3	2.3	2.2	2.2	2.2
Housing starts (units)	5,898	6,144	6,823	7,655	8,345	8,473	8,498	8,473	8,476	8,487	8,511	8,532	8,565	8,586	8,626	8,722	8,831	8,872	8,892	9,008	9,043	9,112	9,178
	-3.2	7.8	11.1	12.2	9.0	1.5	0.3	-0.3	0.0	0.1	0.3	0.2	0.4	0.2	0.5	1.1	1.2	0.5	0.2	1.3	0.4	0.8	0.7

Shaded area represents forecast data.
All data are in millions of dollars, seasonally adjustrates, unless otherwise specified.
For each indicator, the first line is the level and the s the percentage change from the previous period.

Sources: The Conference Board of Canada; StatistCMHC Housing Time Series Database.

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INFORMETRICA

Contents
Basic Indicators

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Reference February 27, 2012																								
Population (000s)																								
Population	1251	1265.5	1280.6	1296.5	1312.9	1329.8	1346.9	1364.2	1381.6	1399.2	1416.8	1434.5	1452.2	1469.8	1487.4	1504.9	1522.3	1539.5	1556.8	1573.8	1590.7	1607.5	1624.1	1640.7
Source Population	946.8	957.6	968.7	980	991.5	1003	1014.5	1026.1	1038	1049.9	1062.1	1074.7	1087.6	1100.7	1113.9	1127.3	1140.7	1154.2	1167.8	1181.5	1195.2	1208.9	1222.5	1236.1
Households	478.4	485	491.7	498.8	506.3	513.9	521.4	528.9	536.4	543.8	551.1	558.3	565.3	572.5	579.3	586.2	593	599.9	606.6	613.8	620.7	627.7	634.7	641.9
Family	328.9	330.5	334.2	338.2	342.5	346.9	351.1	355.2	359.3	363.3	367.2	371	374.6	378.2	381.8	385.3	388.8	392.3	395.9	399.5	403.4	407.4	411.5	415.7
Non-family	151.5	154.5	157.5	160.6	163.8	167.1	170.3	173.7	177.1	180.5	183.9	187.3	190.7	194.1	197.5	200.9	204.2	207.6	211	214.2	217.3	220.3	223.2	226.1
Labour Markets (000s)		689.5	700.4	708.5	716.9	724.2	732.5	739.8	747.4	754.8	762.6	769.5	776.5	783.7	790.9	798.1	805.3	813.7	821.0	828.2	835.4	842.6	849.8	856.6
Labour Force	672.8	689.5	700.1	708.7	716.5	724.2	732.2	740.1	747.8	755.1	762.2	769.3	776.4	783.6	790.9	798.4	805.9	813.2	820.6	827.8	834.9	842.2	849.5	856.7
Participation Rate (%)	71.0	72	72.3	72.3	72.3	72.2	72.2	72.1	72	71.9	71.8	71.6	71.4	71.2	71	70.8	70.6	70.5	70.3	70.1	69.9	69.7	69.5	69.3
Employment	628.9	636.7	644.4	650.3	656	662.2	668.6	675.7	682.5	690	697.8	705.8	713.9	722.2	730.4	738.7	747.2	755.7	764.6	773.4	782.3	791.3	800.5	809.8
Unemployment Rate (%)	6.4	7.7	8	8.2	8.4	8.6	8.7	8.7	8.7	8.6	8.5	8.3	8	7.8	7.6	7.5	7.3	7.1	6.8	6.6	6.3	6	5.8	5.5
Gross Domestic Product ($97 Mns)	2.5	2.7	2.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Total	38309	39356	40395	41158	41942	42767	43639	44574	45554	46538	47544	48609	49741	50871	52072	53289	54547	55825	57119	58445	59708	61159	62564	63998
Goods	10116	10361	10639	10898	11152	11416	11668	11956	12220	12498	12735	12986	13277	13573	13913	14247	14566	14857	15167	15490	15785	16066	16368	16684
Energy (1)	1269	1179	1175	1171	1171	1178	1181	1184	1182	1182	1180	1177	1177	1179	1181	1182	1181	1179	1176	1173	1170	1166	1163	1161
Non-energy, Energy-intensive (2)	1333	1373	1409	1439	1463	1493	1528	1561	1587	1626	1661	1699	1742	1798	1860	1921	1977	2028	2087	2151	2208	2261	2314	2368
Other	7574	7810	8055	8289	8519	8745	8959	9211	9451	9690	9894	10112	10358	10599	10872	11144	11408	11651	11905	12166	12407	12639	12891	13155
Services	28193	28995	29756	30259	30789	31351	31970	32618	33334	34040	34809	35622	36464	37297	38159	39042	39981	40968	41951	42956	44013	45093	46196	47314
Transportation & Warehousing	2581	2671	2742	2784	2818	2848	2888	2935	2983	3030	3077	3128	3183	3234	3288	3340	3391	3443	3494	3547	3598	3646	3693	3741
Public Administration & Social Services	7549	7489	7614	7707	7816	7921	8031	8150	8273	8404	8545	8699	8858	9020	9187	9359	9539	9726	9917	10110	10310	10520	10731	10945
Other Services	18254	18834	19400	19769	20155	20582	21051	21533	22078	22606	23187	23795	24423	25043	25684	26342	27051	27800	28540	29298	30105	30927	31772	32628
Output per Employee ($1997 000s)	60.8	61.6	62.7	63.3	63.9	64.6	65.3	66	66.7	67.4	68.1	68.9	69.7	70.4	71.3	72.1	73	73.9	74.7	75.6	76.4	77.3	78.2	79

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Manitoba

	2011	2012	2013	2014	2015	2016
Source Population (Thousands)	953	966	976	987	997	1,007
Participation Rate (%)	69.0	68.7	68.9	69.2	69.3	69.3
Labour Force (Thousands)	657	664	672	682	691	698
Employment (Thousands)	624	632	642	650	658	665
Unemployment (Thousands)	33	32	31	32	32	33
Unemployment Rate (%)	5.0	4.8	4.6	4.7	4.7	4.8
Average Wage $s per Year	42,838	44,586	46,360	48,158	49,405	50,473
Wages, Salaries, Supplementary Labour Income (Millions of dollars)	28,163	29,587	31,174	32,666	34,119	35,224
Other Personal Income (Millions of dollars)	15,963	16,543	16,928	17,677	18,765	19,890
Personal Income (Millions of dollars)	44,126	46,130	48,102	50,343	52,884	55,113
Federal Personal Income Taxes Paid (Millions of dollars)	3,415	3,715	4,075	4,646	5,271	5,837
Provincial Personal Income Taxes Paid (Millions of dollars)	2,627	2,919	3,098	3,338	3,595	3,841
Contributions to Social Insurance Programs, Etc. (Millions of dollars)	3,057	3,186	3,309	3,454	3,576	3,686
Disposable Personal Income (Millions of dollars)	35,028	36,310	37,619	39,105	40,443	41,750
Retail Sales (Millions of dollars)	16,221	16,731	17,161	17,642	18,269	18,913
CPI 2002 = 100 (Index)	118.2	120.2	122.4	125.0	127.5	130.3
Total Motor Vehicle Sales (Units)	47,232	47,221	48,619	52,140	52,752	51,592
GDP at Market Prices (Millions of dollars)	57,198	59,791	62,366	65,446	68,524	71,657
GDP Price 2002 = 1.00 (Index)	1.281	1.314	1.342	1.369	1.395	1.421
GDP at Market Prices (Millions of chained 2002 dollars)	44,665	45,518	46,483	47,809	49,107	50,411
Real GDP % chge	2.1	1.9	2.1	2.9	2.7	2.7
Housing Starts (Units)	5,988	5,480	4,417	4,396	4,223	4,570
Investment in Residential Construction (Millions of dollars)	3,414	3,170	2,943	3,067	3,170	3,621
Investment in Residential Construction Price 2002 = 1.00 (Index)	1.558	1.599	1.638	1.677	1.718	1.760
2002 Dollar Investment in Residential Construction (Millions of chained 2002 dollars)	2,191	1,983	1,797	1,829	1,845	2,057
Investment in Non-Residential Construction (Millions of dollars)	4,051	4,382	4,412	4,880	5,274	5,416
Investment in Non-Residential Construction Price 2002 = 1.00 (Index)	1.456	1.497	1.541	1.586	1.632	1.679
2002 Dollar Investment in Non-Residential Construction (Millions of chained 2002 dollars)	2,782	2,927	2,863	3,076	3,231	3,225
Population (Thousands)	1,251	1,266	1,281	1,295	1,309	1,324

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SPATIAL ECONOMICS

Key Economic Indicators: Manitoba January 2012 Provincial Forecast	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Real GDP ($Millions)	44600	45665	46868	47851	49203	50436	51649	52548	53257	53793	54270	54757	55376	56032	56988	57995	59091	60243	61383	62443	63370	64199	64943
% Change	2	2.3	2.6	2.1	2.8	2.5	2.4	1.7	1.4	1	0.9	0.9	1.1	1.2	1.7	1.8	1.9	2	1.9	1.7	1.5	1.3	1.2
GDP Deflator (Reference Year=1)	1.277	1.291	1.306	1.32	1.334	1.352	1.374	1.397	1.423	1.449	1.476	1.503	1.529	1.554	1.579	1.605	1.634	1.664	1.696	1.734	1.773	1.813	1.853
% Change	2.9	1.1	1.1	1.1	1	1.3	1.6	1.7	1.9	1.9	1.9	1.8	1.7	1.6	1.6	1.7	1.8	1.8	1.9	2.2	2.2	2.3	2.2
Nominal GDP ($Millions)	56973	58959	61203	63174	65634	68171	70951	73385	75764	77958	80121	82312	84694	87058	90001	93109	96548	100232	104110	108276	112328	116380	120337
% Change	5	3.5	3.8	3.2	3.9	3.9	4.1	3.4	3.2	2.9	2.8	2.7	2.9	2.8	3.4	3.5	3.7	3.8	3.9	4	3.7	3.6	3.4
Consumer Price Index (2002=100)	1.182	1.195	1.213	1.232	1.25	1.27	1.293	1.317	1.343	1.37	1.397	1.424	1.451	1.477	1.504	1.531	1.558	1.587	1.617	1.652	1.688	1.727	1.767
% Change	2.8	1.1	1.5	1.5	1.5	1.6	1.8	1.9	2	2	2	2	1.9	1.8	1.8	1.8	1.8	1.8	1.9	2.2	2.2	2.3	2.3
Hourly Labour Income ($)	26.6	26.9	27.4	27.8	28.4	29	29.8	30.6	31.5	32.3	33.1	33.9	34.7	35.5	36.3	37.2	38.2	39.5	40.7	42	43.3	44.5	45.7
% Change	2.7	1.4	1.4	1.6	2	2.3	2.7	2.7	2.8	2.6	2.5	2.4	2.3	2.2	2.3	2.6	2.9	3	3.1	3.3	3.1	2.9	2.8
Employment (000s)	624	629	638	648	662	674	685	691	695	696	696	697	699	702	708	716	724	730	742	750	757	762	767
% Change	0.7	0.8	1.4	1.6	2.1	1.8	1.7	1	0.6	0	0	0.1	0.4	0.4	0.9	1.1	1.2	1.2	1.2	1.1	0.9	0.8	0.7
Unemployment Rate (%)	5.4	5.7	5.7	5.7	5.3	5	4.7	4.8	4.9	5.1	5.3	5.4	5.5	5.5	5.3	5	4.7	4.5	4.5	4.6	4.8	5.2	5.5
Participation Rate (%)	69.5	69	69	69.1	69.5	69.3	69.2	69.6	69.6	69.3	67.9	67.7	67.5	67.3	67.2	67.1	67	66.9	66.8	66.6	66.5	66.5	66.5
Real Hourly Labour Productivity ($)	43.32	42.94	43.35	43.6	43.87	44.15	44.49	44.9	45.34	45.87	46.39	46.74	47.06	47.45	47.76	48.03	48.3	48.61	48.94	49.28	49.62	49.94	50.24
% Change	1.3	1.5	1	0.6	0.6	0.6	0.8	0.9	1	1.2	1	0.9	0.7	0.8	0.7	0.6	0.6	0.6	0.7	0.7	0.7	0.6	0.6
Population (000s)	1251	1268	1286	1306	1326	1348	1371	1393	1411	1425	1435	1444	1453	1464	1475	1486	1502	1518	1535	1554	1573	1592	1609
% Change	1.3	1.4	1.5	1.5	1.5	1.7	1.7	1.6	1.2	1	0.7	0.6	0.6	0.7	0.7	0.8	0.9	1.1	1.3	1.2	1.2	1.1	0.9

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REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.1.1; Page No.: 11

PREAMBLE: The text notes that under Manitoba Hydro's 2012 Economic Outlook, Manitoba's population is forecast to grow from 1,255,000 in 2011/12 to 1,596,000 in 2031/32, representing an average annual growth rate of 1.2%.

QUESTION:

Provide a summary of the information pertaining to Manitoba population growth rates contained in Statistics Canada's most recent "Population Projections for Canada, Provinces and Territories" Catalogue no.: 91-520-XWE (http://www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=91-520-XWE&lang=eng), including in relation to the six scenarios contemplated in this report.

RESPONSE:

Manitoba Hydro notes that a chart entitled "*Population observed (1981 to 2009) and projected (2010 to 2036) according to six scenarios, Manitoba"* is provided on page 65 of the report. Manitoba Hydro is not in a position to review and comment on analysis that it was not involved in, such as the report from Statistics Canada (referenced in the question).

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.1; Page No.: 20

PREAMBLE: The potential success of future DSM programs and codes and standards are not presented in a manner that permits ready comparison with total annual energy or peak load growth.

QUESTION:

Provide future total annual reductions in energy (GWh) during the planning period attributable to DSM as a percentage of gross annual load growth (i.e. before DSM and codes and standards).

RESPONSE:

The following table presents energy savings from DSM programs as a % of load growth based upon the 2013 – 2016 Power Smart Plan compared to the 2013 Electric Load Forecast as presented in Appendices E and D, respectively.

Year	DSM Programs Reductions (GW.h)	Gross Annual Load Growth (GW.h)	DSM Programs as a % of Load Growth
2013/14	108	901	12.0%
2014/15	204	1,403	14.5%
2015/16	288	1,846	15.6%
2016/17	362	2,250	16.1%
2017/18	433	2,601	16.7%
2018/19	501	3,055	16.4%
2019/20	548	3,505	15.6%
2020/21	588	3,950	14.9%
2021/22	628	4,410	14.2%
2022/23	667	4,846	13.8%
2023/24	696	5,270	13.2%
2024/25	712	5,699	12.5%
2025/26	728	6,136	11.9%
2026/27	751	6,575	11.4%
2027/28	773	7,000	11.0%

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.1; Page No.: 20

PREAMBLE: The potential success of future DSM programs and codes and standards are not presented in a manner that permits ready comparison with total annual energy or peak load growth.

QUESTION:

Provide future total annual reduction in energy (GWh) during the planning period attributable to codes and standard as a percentage of gross annual load growth (i.e. before DSM and codes and standards).

RESPONSE:

The following table presents energy reduction attributable to codes and standards as a % of load growth based upon the 2013 – 2016 Power Smart Plan compared to the 2013 Electric Load Forecast as presented in Appendices E and D, respectively.

Year	Codes & Standards Reductions (GW.h)	Gross Annual Load Growth (GW.h)	Codes & Standards Reductions as a % of Load Growth
2013/14	66	901	7.3%
2014/15	131	1,403	9.3%
2015/16	237	1,846	12.8%
2016/17	332	2,250	14.7%
2017/18	399	2,601	15.4%
2018/19	456	3,055	14.9%
2019/20	511	3,505	14.6%
2020/21	565	3,950	14.3%
2021/22	617	4,410	14.0%
2022/23	645	4,846	13.3%
2023/24	661	5,270	12.5%
2024/25	685	5,699	12.0%
2025/26	718	6,136	11.7%
2026/27	754	6,575	11.5%
2027/28	779	7,000	11.1%

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REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.1; Page No.: 20

PREAMBLE: The potential success of future DSM programs and codes and standards are not presented in a manner that permits ready comparison with total annual energy or peak load growth.

QUESTION:

Provide future total annual reductions in peak load (MW) during the planning period attributable to DSM as a percentage of gross annual peak load growth (i.e. before DSM and codes and standards).

RESPONSE:

The following table presents peak savings from DSM programs (excluding capacity savings from the Curtailable Rates Program) as a % of load growth based upon the 2013 – 2016 Power Smart Plan compared to the 2013 Electric Load Forecast as presented in Appendices E and D, respectively.

Year	DSM Programs Reductions (MW)	Gross Annual Load Growth (MW)	DSM Programs as a % of Load Growth
2013/14	24	185	12.9%
2014/15	46	280	16.6%
2015/16	67	367	18.2%
2016/17	85	449	18.9%
2017/18	101	518	19.4%
2018/19	116	601	19.4%
2019/20	126	683	18.5%
2020/21	135	764	17.7%
2021/22	144	847	17.0%
2022/23	152	927	16.4%
2023/24	157	1,001	15.7%
2024/25	161	1,077	15.0%
2025/26	165	1,155	14.3%
2026/27	169	1,235	13.7%
2027/28	174	1,310	13.3%

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REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.1; Page No.: 20

PREAMBLE: The potential success of future DSM programs and codes and standards are not presented in a manner that permits ready comparison with total annual energy or peak load growth.

QUESTION:

Provide future total annual reduction in peak load (MW) during the planning period attributable to codes and standard as a percentage of gross annual peak load growth (i.e. before DSM and codes and standards).

RESPONSE:

The following table presents peak reduction attributable to codes and standards as a % of load growth based upon the 2013 – 2016 Power Smart Plan compared to the 2013 Electric Load Forecast as presented in Appendices E and D, respectively.

Year	Codes & Standards Reductions (MW)	Gross Annual Load Growth (MW)	Codes & Standards Reductions as a % of Load Growth
2013/14	16	185	8.6%
2014/15	32	280	11.3%
2015/16	57	367	15.6%
2016/17	80	449	17.9%
2017/18	93	518	18.0%
2018/19	103	601	17.1%
2019/20	113	683	16.5%
2020/21	122	764	16.0%
2021/22	132	847	15.5%
2022/23	137	927	14.7%
2023/24	137	1,001	13.7%
2024/25	140	1,077	13.0%
2025/26	144	1,155	12.5%
2026/27	151	1,235	12.2%
2027/28	154	1,310	11.8%

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REFERENCE: Chapter 4: The Need for New Resources; Section: 4.4; Page No.: 49

QUESTION:

Explain why there is no difference between the Total Demand and Net Manitoba Load in Figure 4.22 beyond 2025/2026.

RESPONSE:

Figure 4.22 illustrates the need for new dependable energy resources when no new generation is assumed. There is no difference between Total Demand and Net Manitoba Load beyond 2025/26 in this figure because the existing export contracts all expire by that date and Net Manitoba Load is the only remaining demand.

REFERENCE: Chapter 5: The Manitoba Hydro System Interconnections and Export Markets; Section: 5.1; Page No.: 2

PREAMBLE: The approach used to determine the dependable energy appears to be unnecessarily conservative. The text notes that "dependable energy is that energy expected to be produced by each resource under the lowest water flow conditions on hydraulic record (e.g. severe drought) – also referred to as dependable generation". The dependable energy of the entire system is then determined in Table 5.1 by summing the dependable energy for each resource. This would be the case if the resources were entirely dependent on the same flow conditions, but as can be seen in Figure 5.7, this is not the case.

QUESTION:

Provide the complete rationale for the apparent assumption that the sum of the dependable energy of the individual hydro resources is equal to the dependable hydro energy of the entire hydroelectric system.

RESPONSE:

The dependable energy of the system was determined based on the lowest overall system inflow, and the resultant generation was evaluated to determine the contribution from each of the plants. Thus the system dependable energy was determined first, and allocated back to the plants as the values shown in Table 5.1.

Figure 5.7 from Chapter 5 of the NFAT submission illustrates the geographic distribution of average energy, not dependable energy, across the water sheds. For example, on average 39% of the energy generated from Manitoba Hydro's hydro-electric stations is derived from rainfall over the Winnipeg River water shed. This water will flow through all the generating stations on the Winnipeg River and the Nelson River, generating power along the way.

REFERENCE: Chapter 5: The Manitoba Hydro System Interconnections and Export Markets; Section: 5.2.4; Page No.: 20

PREAMBLE: The trends in the export sales history are difficult to discern in the manner in which the data is presented.

QUESTION:

Present the information contained in Figure 5.3 in terms of revenue per unit energy (i.e. prices) in real dollars in tabular and graph formats.

RESPONSE:

Figure 5.3 indicates how the export volume of electricity has increased over time as a result of developing northern hydro resources. Corresponding to this increase in volume, Figure 5.3 also indicates the annual revenues Manitoba Hydro has received. These revenues are from all the products Manitoba Hydro sells, beyond just spot market energy and just normalizing for the time value of money would not provide a fair comparison over time of prices received.

The table below indicates average prices received by Manitoba Hydro since 2000 for both long term dependable sales contract and opportunity sales. These prices have not been normalized for exchange rates, water flow conditions or inflation. Manitoba Hydro does not have historical data available at this level of detail prior to 2000.

	DEPENDABLE SALES	OPPORTUNITY SALES
	AvgPrice ($/MWh)	AvgPrice ($/MWh)
2000/01	40.64	37.39
2001/02	51.65	46.63
2002/03	53.37	42.97
2003/04	48.46	48.46
2004/05	51.44	51.44
2005/06	59.25	47.73
2006/07	59.67	46.53
2007/08	53.22	44.42
2008/09	57.12	43.64
2009/10	56.99	22.98
2010/11	51.09	24.77
2011/12	46.79	22.18
2012/13	48.69	25.18

For insight into the factors that lead to these historical prices and an analysis of future trends please refer to Chapter 3, Trends and Factors Influencing North American Electricity Supply, especially Section 3.4 Energy Price Considerations.

REFERENCE: Chapter 6: The Window of Opportunity; Section: 6.5.1; Page No.: 27

PREAMBLE: The text indicates: "For those development plans in which Keeyask G.S. and Conawapa G.S. are both constructed, it is expected that transmission improvements will be required in the Manitoba Hydro system once the second plant comes into service to be able to transmit all the firm power to southern Manitoba. As the additional north-south transmission would not be required for over ten years, the final determination of the design will be made nearer to the time it is needed."

QUESTION:

Clarify that the costs of this future transmission infrastructure are included in the costs of the Preferred Development Plan and, if not, explain why not.

RESPONSE:

The costs of this additional north-south future transmission infrastructure are included in the costs of the Preferred Development Plan.

REFERENCE: Chapter 6: The Window of Opportunity; Section: 6.1.2; Page No.: 3

PREAMBLE: The text in the overview notes that: "Manitoba Hydro has signed or is in the process of negotiating several new long-term export contracts with prices substantially more attractive than those in Manitoba Hydro's existing firm export contracts." Again, in this section 6.2.1, the text indicates the "proposed new export sales provide Manitoba Hydro with financially attractive fixed prices for the contracted capacity and energy volumes." The prices of new long-term contracts would be expected to be higher (at least in actual dollars) than existing contracts. These new contracts may also appear to be more attractive because existing contracts are priced too low and fail to properly access available revenue opportunities.

QUESTION:

For each prior and existing contract, provide a comparison of the contract prices and actual market prices during the contract period and assess the extent to which the existing and historic contracts were properly priced to gain maximum available benefits for Manitoba's hydroelectric resources.

RESPONSE:

In Order 119/13 the PUB determined that it did not require the Information Request to be answered.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1; Page No.: 3

PREAMBLE: The text presents screening characteristics of resource technologies in Table 7.1, Section 7.1.1. This table summarizes how options were screened out based on technical, environmental, social & policy, and economic characteristics. Under the Hydro resource technology, Land Use Impacts are identified as either "flooded area" or "limited flooding". The table does not appear to include any indication of the environmental impacts associated with hydro transmission lines (e.g., transmission upgrade system, Bipole III, Manitoba-Minnesota line).

QUESTION:

Indicate where the environmental impacts of transmission lines are covered in Table 7.1. If they are not, explain why the impacts of the transmission lines are not explicit in the table.

RESPONSE:

The environmental impact of associated resource transmission requirements are taken into consideration under the characteristic of “Proximity to Load Centre”. This characteristic provides a broad characterization of the linear distance from where particular resources are most likely to be developed and the major load centre of Winnipeg. It is intended to capture a wide range of issues that includes the environmental impact of transmission projects.

The impacts of Bipole III are not associated with Keeyask or Conawapa because Bipole III is being built regardless of whether new hydro generation is built or not.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1; Page No.: 3

PREAMBLE: Manitoba Hydro presents screening characteristics of resource technologies in Table 7.1, Section 7.1.1. This table summarizes how options were screened out based on technical, environmental, social/policy, and economic characteristics. Under the Imports resource technology, new transmission right-of-ways are included under Land Use Impacts.

QUESTION:

Describe the new transmission projects that are necessary for imports.

RESPONSE:

Manitoba Hydro has not designed any new transmission lines solely for import. The additional import capability associated with a number of the development plans described in Chapter 8 of the NFAT Business Case include increased import capability associated with the proposed 250 MW or 750 MW export lines

Chapter 2 Section 2.4 provides a further description of the US interconnection. Chapter 8 Section 8.2.3.1 and Section 8.2.3.2 describe the development plans with a US interconnection with 750 MW of import and export capability and plans with a US interconnection with 250 MW of export capability and 50 MW of import capability, respectively.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1; Page No.: 3

PREAMBLE: Manitoba Hydro presents screening characteristics of resource technologies in Table 7.1, Section 7.1.1. This table summarizes how options were screened out based on technical, environmental, social/policy, and economic characteristics. Under the Imports resource technology, new transmission right-of-ways are included under Land Use Impacts.

QUESTION:

Indicate if the transmission projects for imports are also necessary for exports, or if exports would require additional infrastructure.

RESPONSE:

In general terms, transmission lines connecting different utilities can be used for both import and/or export. There are often differences between the import capacity and the export capacity, which are related to design limits at the transmitting/receiving station. Please also see Manitoba Hydro's response to MMF/MH I-029a.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1; Page No.: 3

PREAMBLE: Manitoba Hydro presents screening characteristics of resource technologies in Table 7.1, Section 7.1.1. This table summarizes how options were screened out based on technical, environmental, social/policy, and economic characteristics. Under the Imports resource technology, new transmission right-of-ways are included under Land Use Impacts**.**

QUESTION:

Explain why export transmission projects are not included in Table 7.1 if they are part of the PDP and have an associated environmental footprint.

RESPONSE:

Chapter 7 provides an overview of the screening of technologies as individual resources only from a supply perspective.

The resource technology identified as "imports" in Table 7.1 is considered in isolation as a new supply resource unto itself and not in combination with other resources.

Transmission required to connect individual resources to the load centre of Winnipeg is taken into consideration within each resource technology but does not consider interconnections to other jurisdictions. Constructing additional transmission to other jurisdictions is not a requirement for developing individual resources but is an option available that may be considered within a development plan in order to improve a development plan's overall economics.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1; Page No.: 3

PREAMBLE: Manitoba Hydro presents screening characteristics of resource technologies in Table 7.1, Section 7.1.1. This table summarizes how options were screened out based on technical, environmental, social & policy, and economic characteristics. Under the In-Lake Wind resource technology, "resource user impacts" is listed under Land Use Impacts.

QUESTION:

Describe what is included under "resource user impacts".

RESPONSE:

The screened-out resource technology, In-Lake Wind, is the only option that is not land based. As a result, the characteristic column, Land Use Impacts, was used to capture “resource user impacts” as described on page 18 of 39 of Chapter 7 which states, “Additional issues include potential adverse impacts affecting existing commercial and recreational lake users.” This would include traditional resource harvesting.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1 and 7.3; Page No.: 3, 39

PREAMBLE: As described in the text, resource technologies were screened on basis of three ""Social and Policy Characteristics"", including (1) proximity to load center, (2) regulatory constraints, and (3) social acceptability (Chapter 7, Section 7.1.1, Table 7-1, p.3). This screening resulted in a short list of resource technologies that were identified as specific resource options, which were screened on the basis of "Socioeconomic/Provincial" considerations to arrive at list of resource options to carry forward as candidates with development plans (Chapter 7, Section 7.3, Table 7-6, p.39). The social and policy characteristics are broad; while the socioeconomic/provincial considerations are less so, they include health concerns, safety concerns, and economic aspects (business, employment, and royalties and taxes). Neither include other aspects from the PUB (Order 92/13) definition of socioeconomic effects and benefits, i.e. infrastructure and services; personal, family and community life; and resource use. Further, it is not clear what criteria were used, or what process was followed, in the use of the "Social and Policy Characteristics" to screen resource technologies, and in the use of the "Socioeconomic/Provincial" considerations to eliminate resource options. Lastly, there is no explanation as to how the screening considered or included the perspective of Northern and Aboriginal communities (including the Métis). There is concern that the screening criteria and process would have yielded different results if such a perspective was taken into account, (e.g. resource economy impacts due to changes in harvesting, or socio-cultural impacts as a result of changes in land use, for example).

QUESTION:

Explain what process was followed, or what criteria were used, to screen (a) the resource technologies, and (b) the resource options.

RESPONSE:

The purpose of the screening process is to provide a methodology for filtering through the wide range of resource technologies potentially available, and to identify those specific resource options that are suitable for further detailed analysis and evaluation. To achieve this, a short list covering a broad range of characteristics was identified which has the potential to play a significant role in the consideration of different resource technologies and resource options.

While the list is not exhaustive, it covers a range of key areas within the technical, environmental, socioeconomic and economic areas with commonly available information.

The screening process is not intended to address the requirements of PUB Order 92/13. However, within the resource technology screening process as summarized in Table 7.1 of Chapter 7, socioeconomic considerations are captured within the Social and Policy Characteristics group. They include screening characteristics of proximity to load centre, regulatory constraints, and social acceptability which are all described on pages 8 and 9 of Chapter 7. In the case of screening individual hydro-electric resource options, socioeconomic considerations have been incorporated at a preliminary stage by only considering sites previously identified within the Manitoba Treaty Land Entitlement Framework Agreement (MFA) process and those not sited on rivers designated as a Canadian Heritage River. More detailed social considerations are initiated at a more advanced stage of evaluation and once specific resource locations have been selected.

Table 7.6 of Chapter 7 provides a comparison of the various resource options that have been selected for further evaluation. This table contains several socioeconomic aspects or characteristics not utilized within the resource technology screening process in order to better facilitate a comparison of the selected resource options.

Manitoba Hydro has undertaken to submit a matrix with a comparison of the macro-economic and socioeconomic effects of Keeyask, Conawapa, natural gas-fired turbines and wind resource options.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1 and 7.3; Page No.: 3, 39

PREAMBLE: As described in the text, resource technologies were screened on basis of three "Social and Policy Characteristics", including (1) proximity to load center, (2) regulatory constraints, and (3) social acceptability (Chapter 7, Section 7.1.1, Table 7-1, p.3). This screening resulted in a short list of resource technologies that were identified as specific resource options, which were screened on the basis of "Socioeconomic/Provincial" considerations to arrive at list of resource options to carry forward as candidates with development plans (Chapter 7, Section 7.3, Table 7-6, p.39). The social and policy characteristics are broad; while the socioeconomic/provincial considerations are less so, they include health concerns, safety concerns, and economic aspects (business, employment, and royalties and taxes). Neither include other aspects from the PUB (Order 92/13) definition of socioeconomic effects and benefits, i.e. infrastructure and services; personal, family and community life; and resource use. Further, it is not clear what criteria were used, or what process was followed, in the use of the "Social and Policy Characteristics" to screen resource technologies, and in the use of the "Socioeconomic/Provincial" considerations to eliminate resource options. Lastly, there is no explanation as to how the screening considered or included the perspective of Northern and Aboriginal communities (including the Metis). There is concern that the screening criteria and process would have yielded different results if such a perspective was taken into account, (e.g. resource economy impacts due to changes in harvesting, or socio-cultural impacts as a result of changes in land use, for example).

QUESTION:

Explain whether and how the screening results of (a) the resource technologies, and (b) the resource options would be different if they included other aspects from the definition of socioeconomic impacts and benefits.

RESPONSE:

The definition of macro-environmental and socioeconomic in Order 92/13 is more detailed and specific than is appropriate for a high level screening process. Rather, it is more appropriately applied after particular resource options have been selected and sited in order to compare and contrast resources to one another. From a high level planning perspective, characteristics

included in Table 7.1, such as technological maturity and the levelized cost of electricity, have a greater impact to the screening of resources than many of the aspects identified within the macro-environmental and socioeconomic definitions. Additionally, many resources are not location dependent which makes it very challenging to evaluate the environmental and socioeconomic impacts if it is unknown where a resource will be developed.

Table 7.6 in Chapter 7 has been included to facilitate a comparison of a wider range of characteristics and aspects of the selected resources. In addition, Appendix 9.1 contains a table that combines the wider range of characteristics of the various resources contained within each development plan. On September 30, 2013, Manitoba Hydro undertook to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation. The matrices will address the PUB's definitions of macro environmental and socio-economic as set out in PUB Order 92/13.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1 and 7.3; Page No.: 3, 39

PREAMBLE: As described in the text, resource technologies were screened on basis of three "Social and Policy Characteristics", including (1) proximity to load center, (2) regulatory constraints, and (3) social acceptability (Chapter 7, Section 7.1.1, Table 7-1, p.3). This screening resulted in a short list of resource technologies that were identified as specific resource options, which were screened on the basis of "Socioeconomic/Provincial" considerations to arrive at list of resource options to carry forward as candidates with development plans (Chapter 7, Section 7.3, Table 7-6, p.39). The social and policy characteristics are broad; while the socioeconomic/provincial considerations are less so, they include health concerns, safety concerns, and economic aspects (business, employment, and royalties and taxes). Neither include other aspects from the PUB (Order 92/13) definition of socioeconomic effects and benefits, i.e. infrastructure and services; personal, family and community life; and resource use. Further, it is not clear what criteria were used, or what process was followed, in the use of the "Social and Policy Characteristics" to screen resource technologies, and in the use of the "Socioeconomic/Provincial" considerations to eliminate resource options. Lastly, there is no explanation as to how the screening considered or included the perspective of Northern and Aboriginal communities (including the Metis). There is concern that the screening criteria and process would have yielded different results if such a perspective was taken into account, (e.g. resource economy impacts due to changes in harvesting, or socio-cultural impacts as a result of changes in land use, for example).

QUESTION:

Explain whether and how the screening results of (a) the resource technologies, and (b) the resource options would be different if they included the perspective of the Metis in particular, and other Northern community residents in the vicinity of the project in general, in the identification of criteria used to screen and in the screening process itself.

RESPONSE:

The purpose of the screening process is to provide a methodology for filtering through the wide range of resources technologies and options potentially available, and to identify those suitable for further detailed analysis and evaluation.

The results would not have been altered if the perspectives of Metis and other northern residents had been a specific characteristic in the resource technology screening phase.

These perspectives are more fully analyzed and evaluated in an environmental assessment process, which is a more advanced, comparative examination that occurs after the screening process.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.2; Page No.: 11

PREAMBLE: The text notes that: "The high-level screening of technologies uses a general characterization to determine whether a technology will proceed to the next stage of evaluation" (Section 7.1.2, p. 11). There are three possible outcomes from this process: screened out, some concern, minimal concern or positive.

QUESTION:

Describe the procedure used to conclude screened out vs. some concern vs. minimal concern or positive. In other words, provide detailed methods that would allow the results of the high-level screening to be reproduced by an independent party.

RESPONSE:

The process used for screening the range of resource technologies shown in Table 7.1 is based on the knowledge and experience related to individual resource technologies and their respective characteristics. As a result, Table 7.1 represents Manitoba Hydro's current knowledge, understanding and experience related to each technology at this point in time as described in Appendix 7.2.

The general process utilized to create Table 7.1 consists of the following steps. Each cell within the table was first considered individually and then within the context of the characteristic across all resource technologies. A very brief description is then provided within each cell summarizing the main factor affecting each characteristic by resource technology. Each cell is then categorized as follows:

- Green – Minimal Concerns or Positive
- Yellow – Some Concerns
- Red – Screened Out

If an individual cell has been noted as “none” or “not significant” or is even determined to be a benefit to a screening characteristic, the cell is assigned the “Green – Minimal Concerns or Positive” classification. If a cell has been associated with a factor having potentially negative effects which could most likely be satisfactorily addressed or mitigated, the cell is assigned the “Yellow – Some Concerns” category. If no specific negative or positive implications in a specific cell are known, then the cell is assigned the “Yellow – Some Concerns” category as it is the default or neutral classification in the screening table. If an identified factor has been determined to be detrimental to the development of a particular resource and likely cannot be suitably addressed over the life of the development, then it is assigned the “Red – Screened Out” category. Any resource technology having at least one “Red – Screened Out” classification is removed from the list of technologies selected at this time for further consideration and evaluation.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1; Page No.: 3; Chapter 10; Section 10.3.4; Page No.: 58; Chapter 15; Section: 15.4.2; Page No.: 19; CEAA (Canadian Environmental Assessment Agency) 2008. Operational Policy Statement, Addressing "Need for", "Purpose of", "Alternative to" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012. © Her Majesty the Queen in Right of Canada, 2008. Catalogue No.: 978-0-662-47685-6, ISBN: En106-77/2008E-PDF

PREAMBLE: Section 10.3.4 discusses how Species at Risk contribute to uncertainty in the economic analysis. Manitoba Hydro indicates that if sturgeon were to be listed under SARA, then the Keeyask and Conawapa projects could be cancelled. In Section 15.4.2, Manitoba Hydro indicates that the "potential listing of Lake Sturgeon under SARA poses a significant regulatory risk". Furthermore, in Section 15.4.2.1, Manitoba Hydro indicates that "If the Government of Manitoba were to adopt this [CEC] recommendation [to conduct a Regional Cumulative Effects Assessment for all Manitoba Hydro projects] and require such an assessment be carried out prior to licensing the Keeyask Generating Project, a delay could ensue." In Table 7.1, one of the characteristics considered is Regulatory Constraints. Under this characteristic, Hydro projects have a "lengthy approval process" and are categorized as "some concern" while Nuclear power has a "complex and lengthy approval process" and is categorized as "screened out". According to CEAA Operational Policy Statement (OPS) on Addressing "Need for", "Purpose of", "Alternative to" and "Alternative Means" under the CEAA (2008), criteria need to be developed to identify the major environmental, economic and technical costs and benefits. The criteria used for the high-level screening do not appear to be well-defined.

QUESTION:

Explain why hydro projects were not screened out during the high-level screening process due to Regulatory Constraints. This question underlines the importance of the previously mentioned concern about screening procedures and the reproducibility of results.

RESPONSE:

Hydroelectric resources as a technology group were not screened out during the technology screening stage as there are currently no regulatory prohibitions that would forbid the

construction of new hydroelectric generating stations on non-heritage rivers in Manitoba, as described in Appendix 7.2. Hydro was recognized as a technology subject to regulatory constraints that would be of "some concern". This indicates that regulatory constraints, such as fisheries issues for example, may restrict the development of an individual hydroelectric facility at a specific site, but this does not prohibit all hydroelectric development throughout the entire province. In the overall screening process, the classification of "some concern" in the Regulatory Constraints characteristic did not result in technologies being screened out.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1.4; Page No.: 9

PREAMBLE: The text indicates that "The unit cost of DSM varies by program; information on the cost of additional DSM is not available at this time."

QUESTION:

Clarify when the costs of additional DSM will be made available and indicate how this information will be included in future submissions.

RESPONSE:

Please see Manitoba Hydro's response to PUB/MH I–265.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.1.1.4; Page No.: 11

PREAMBLE: Figure 7.3 illustrates the levelized unit cost of resource technologies developed in Manitoba.

QUESTION:

Explain the relationship between the information in Figure 7.3 and that in Table 7.2-1 and Table 7.2-2 of Appendix 7.2.

RESPONSE:

The information provided within Tables 7.2-1 and 7.2-2 of Appendix 7.2 provides a summary of the levelized costs of the various resource technologies and options included within Appendix 7.2, Range of Resource Options, and are presented in 2012$. The levelized cost values from Table 7.2-1 and 7.2-2 of Appendix 7.2 have been escalated to 2014$ and presented in Figure 7.3 in Chapter 7.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.2.2; Page No.: 25

PREAMBLE: Table 7.3 presents characteristics of the hydro resource options, including levelized costs.

QUESTION:

Explain the relationship between the information in Table 7.3 and that in Table 7.2-2 of Appendix 7.2.

RESPONSE:

The information provided within Tables 7.2-1 and 7.2-2 of Appendix 7.2 provides a summary of the levelized costs of the various resource technologies and options included within Appendix 7.2, Range of Resource Options, and are presented in 2012$. The levelized cost values within Table 7.2-2 have no relationship with the levelized cost values in Table 7.3 of Chapter 7.

The levelized cost values of hydro resource options within Table 7.2-1 have been escalated to 2014$ and utilized to create Table 7.3 in Chapter 7.

REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.2.5; Page No.: 36

PREAMBLE: The text notes that the import limit will not change until new transmission interconnections are built or existing transmission interconnections are upgraded.

QUESTION:

Clarify the maximum increase to the import capability that could be achieved entirely through transmission upgrades (i.e. no additional interconnections).

RESPONSE:

Adding phase shifting transformers to the existing Glenboro to Rugby interconnection would increase the import limit of the existing interconnections. As both a new 500kV line and these facilities were deemed necessary to increase the import capability by 750 MW to 1450 MW, the impact of only adding the phase shifting transformers on import capability was not studied.

It is expected that adding the phase shifter by itself would have minimal positive effect on the 700 MW import limit. The limit is based on preventing voltage collapse in the US following loss of the existing 500 kV line between Dorsey and Forbes. The phase shifter could offload the 500 kV line pre-contingency but there would also need to be additional reactive support needed to prevent voltage collapse.

Other transmission upgrades like reconductoring or resagging increases the thermal rating of an element. These types of upgrades would have no effect on improving the import limit. Adding series capacitors to the Richer to Moranville 230 kV line might increase the import limit by 50 to 100 MW.

REFERENCE: Chapter 8: Determination and Description of Development Plans; Section: Section 8.1; Page No.: 2

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said to consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

QUESTION:

Consider and evaluate each of the fifteen development plans in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

RESPONSE:

Please refer to NFAT Submission chapters 2, 7 and 13 and Appendices 2.2, 2.3, 7.2 and 9.1. Please also refer to Manitoba Hydro's response to CAC/MH I-231a.

REFERENCE: Chapter 8: Determination and Description of Development Plans; Section: 8.1; Page No.: 2

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said to consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

QUESTION:

In the identification and evaluation of socioeconomic impacts and benefits of each of the fifteen development plans, explain how these impacts and benefits might be experienced by the Métis in the vicinity of the project.

RESPONSE:

The primary variables between the development plans are the Keeyask and Conawapa hydroelectric projects, the Manitoba-Minnesota Transmission Project, gas turbines, and wind generators.

These same variables are covered in an undertaking by Manitoba Hydro on September 30, 2013 to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation. The matrices summarize the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13.

PUB Order 119/13 added DSM to the resource options to be considered in the matrices, and Manitoba Hydro will also include the Manitoba-Minnesota Transmission Project.

Please see CAC/MH I-231a for these matrices and supporting text. Please also see Manitoba Hydro's response to MMF/MH I-001b regarding effects on Métis.

REFERENCE: Chapter 8: Determination and Description of Development Plans; Section: 8.1; Page No.: 2

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said to consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

QUESTION:

Compare each of the fifteen development plans to each other in consideration of the socioeconomic impacts and benefits, particularly as these may be experienced by the Métis in the vicinity of the project.

RESPONSE:

Please see Manitoba Hydro's response to MMF/MH I-038b.

REFERENCE: Chapter 9: Economic Evaluations - Reference Scenario; Section: 9.0; Page No.: 1-27

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 9 of the Business Case Submission presents an evaluation of the economics of the 15 development plans, and on the basis of this evaluation, reduces the list of development plans for further consideration to 12 (Chapter 9, Section 9.0, p.1). This reduction of development plans has, however, been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether, and how, the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) was considered in each of the 15 development plans.

RESPONSE:

Please refer to Manitoba Hydro's response to MMF/MH I-038a.

REFERENCE: Chapter 9: Economic Evaluations - Reference Scenario; Section: 9.0; Page No.: 1-27

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 9 of the Business Case Submission presents an evaluation of the economics of the 15 development plans, and on the basis of this evaluation, reduces the list of development plans for further consideration to 12 (Chapter 9, Section 9.0, p.1). This reduction of development plans has, however, been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether, and the extent to which, the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) was considered in the elimination of three of the development plans.

RESPONSE:

As indicated on page 1 Chapter 9, the NFAT Submission Appendix 9.1 – High Level Development Plan Comparison Table provides a summary of the key technical,

socio-economic/provincial, environmental and economic characteristics and provides an indicative measure of the impact of each on the 15 development plans.

The three sequences eliminated from further, more detailed evaluation (CCGT/C26, Wind/C26 and K22/C29) were compared at a screening level in Appendix 9.1. The three plans that were eliminated were not found to have any advantages over the other 12 plans that warranted their inclusion in the more detailed evaluations.

REFERENCE: Chapter 9: Economic Evaluations - Reference Scenario; Section: 9.0; Page No.: 1-27

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 9 of the Business Case Submission presents an evaluation of the economics of the 15 development plans, and on the basis of this evaluation, reduces the list of development plans for further consideration to 12 (Chapter 9, Section 9.0, p.1). This reduction of development plans has, however, been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether and how (a) the evaluation of each of the 15 development plans, and (b) the elimination of 3 of the development plans, would have been different if these included the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) as these might be experienced by the Metis in the vicinity of the PDP and the alternatives.

RESPONSE:

When Manitoba Hydro evaluated each of the development plans and eliminated three of them, it had an understanding of the range of socioeconomic impacts and benefits as these might be experienced by non-KCN member communities in the vicinity of the PDP and the alternatives.

Please also see Manitoba Hydro's responses to MMF/MH I-001b and CAC/MH I-231a.

REFERENCE: Chapter 9: Economic Evaluations - Reference Scenario; Section: 9.0; Page No.: 1-27

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 9 of the Business Case Submission presents an evaluation of the economics of the 15 development plans, and on the basis of this evaluation, reduces the list of development plans for further consideration to 12 (Chapter 9, Section 9.0, p.1). This reduction of development plans has, however, been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether and how (a) the evaluation of each of the development plans, and (b) the elimination of three of the development plans, would have been different if these included the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) as these might be experienced by non-KCN member communities in the vicinity of the PDP and the alternatives.

RESPONSE:

The evaluation of each of the development plans and the elimination of three of the development plans have included the range of socioeconomic impacts and benefits as these might be experienced by non-KCN member communities in the vicinity of the PDP and the alternatives.

REFERENCE: Chapter 9: Economic Evaluations - Reference Scenario; Section: 9.3.1; Page No.: 15

PREAMBLE: Figure 9.2 presents NPV differences between the 15 development plans considered.

QUESTION:

Present the NPV of the costs and the revenues of each of the 15 developments (i.e. not as differences in NPVs), and present the differences relative to the All Gas Plan as percentages of the NPV of the All Gas Plan.

RESPONSE:

The table below provides the following:

- the NPV of each of the 15 development plans as provided in Tables 001 through 015 in Appendix 9.3 of the NFAT submission, and
- the differences in the NPV of each of the development plans relative to the All Gas plan presented as a percentage of the NPV of the All Gas plan.
- Percentages of the NPV of the All Gas Plan are not a meaningful measure because the NPV of the All Gas Plan could arbitrarily be much higher or lower by virtue of different choices of what to include in the analysis.

Development Plan	Economic Summary Table from Appendix 9.3	NPV (millions of 2014 dollars)	Incremental NPV to All Gas plan (millions of 2014 dollars)	Incremental NPV to All Gas plan as a percentage of the NPV of the All Gas plan
K19/C25/750MW (WPS Sale & Inv)	Table 001	-$2,921	$1,696	-37%
K19/C25/750MW	Table 002	-$3,191	$1,427	-31%
K19/Gas25/750MW (WPS Sale & Inv)	Table 003	-$3,521	$1,097	-24%
K19/C31/750MW	Table 004	-$3,257	$1,360	-29%
K19/Gas31/750MW	Table 005	-$3,527	$1,091	-24%
K19/C25/250MW	Table 006	-$3,323	$1,295	-28%
K19/Gas24/250MW	Table 007	-$3,271	$1,346	-29%
K19/C31/250MW	Table 008	-$3,402	$1,215	-26%
All Gas	Table 009	-$4,617	$0	0%
Wind/Gas	Table 010	-$5,393	-$775	17%
K22/Gas	Table 011	-$3,730	$887	-19%
K22/C29	Table 012	-$3,811	$806	-17%
SCGT/C26	Table 013	-$3,879	$738	-16%
CCGT/C26	Table 014	-$3,834	$784	-17%
Wind/C26	Table 015	-$4,087	$531	-12%

REFERENCE: Chapter 10: Economic Uncertainty Analysis - Probabilistic Analysis and Sensitivities; Section: 10.1.1.4; Page No.: 8

PREAMBLE: Figure 10.4 illustrates the probabilities for the highest impact factors.

QUESTION:

Explain how the probabilities for the high and low capital costs account for the fact that natural gas, wind and alternatives to hydroelectric development are modular. In other words, that the probability that multiple smaller-scale projects each exceed capital cost estimates by 30% is far less likely than an equivalent single larger-scale project exceeding capital costs by 30%.

RESPONSE:

The probabilities associated with high and low capital costs, as described in Chapter 10, Section 10.1.1.4, are used to weight the Capital Cost factor in scenarios that include high or low capital costs. The probability of 30% is the percentage weight applied to scenarios with high capital costs. The probability of 30% does not represent a factor that capital cost estimates are multiplied by to determine a high scenario cost estimate. A description of the derivation of the probability weightings for each of the highest impact factors, including capital costs, is included in Appendix 9.3 Section 2.3.

REFERENCE: Chapter 10: Economic Uncertainty Analysis - Probabilistic Analysis and Sensitivities; Section: 10.2.3; Page No.: 50

PREAMBLE: The text notes that: "Under low and high load forecasts the resources are adjusted, as applicable, to accommodate the change in the load forecast." In the case of natural gas and wind, which are modular, development can be delayed as a result of decreased load requirements, and scaled-up as a result of increased load requirements; however, the same cannot be said of large-scale hydroelectric development, which is developed as a single large resource and cannot be undeveloped without stranding substantial assets.

QUESTION:

Provide a sensitivity analysis of a decrease in Manitoba load to the 10th percentile load growth commencing following the point at which Keeyask must proceed to full development (i.e. near, at or immediately following commissioning, whichever is most sensitive to a reduction in load growth), and present the findings in a table similar to Table 10.14.

RESPONSE:

The low load sensitivity analysis presented in Table 10.14 includes a cumulative load reduction greater than that proposed in the Information Request by the time that Keeyask is in service in the Preferred Development Plan. The low load sensitivity presented in Table 10.14 allowed resources to be deferred until required for Manitoba load in all plans except the Preferred Development Plan, thereby including the economic impact of low load growth while holding in-service dates constant in the Preferred Development Plan, and allowing the other plans to defer the capital cost of new generation until required. The proposed analysis would not be expected to yield economic impacts on the Preferred Development Plan relative to the other development plans beyond those presented in Table 10.14.

The proposed analysis requires significant new work and cannot be completed within the time allotted for this process. However, the proposed analysis would not be expected to change the conclusion of the load sensitivity analysis included in the NFAT filing, that is, the economic ranking of the development plans studied does not change.

REFERENCE: Chapter 10: Economic Uncertainty Analysis - Probabilistic Analysis and Sensitivities; Section: 10.3.1.1; Page No.: 54

PREAMBLE: The text references a Globe and Mail article regarding U.S. policy concerning energy independence, which is not an authoritative source.

QUESTION:

Provide further details concerning the "technical, legal and regulatory issues that need to be monitored on an ongoing basis to minimize the potential for a negative impact on export power sales", including a description of these issues, their historic evolution and their expected future evolution.

RESPONSE:

A key part of the technical, legal and regulatory issues is to minimize the seams between Manitoba Hydro and adjacent market regions so that all types of transactions can be made without undo restrictions. Seams issues can be separated into two general categories – market rules and legislative requirements.

Manitoba Hydro has participated in the initial/ continued development of market rules in MISO and Ontario over the last 12 years in order to be able to understand their implications now and in the future. Market rules govern not only internal market participants but must also accommodate external market participants such as Manitoba Hydro, whose domestic load and/or generating resources are not directly served under the MISO Transmission and Energy Market Tariff (TEMT). Manitoba Hydro dispatches its own generation to serve the domestic Manitoba load, and sells any surplus energy into the MISO market at the Canada-US border. When major changes in the MISO market rules are contemplated, such as the development of the ancillary services market or the enhanced resource adequacy construct, Manitoba Hydro through the stakeholder process, reviews the proposed market rules to ensure sufficient rule

provisions that permit external market participation in these new markets on a comparable basis to generators internal to the MISO market footprint. As a result of such efforts, Manitoba Hydro is able to sell ancillary services into the MISO market, and will be able to participate in MISO's annual capacity auction. Manitoba Hydro continues to monitor market rule developments and notes there are no major pending market rules changes proposed at this time.

Over the last decade, legislative barriers to energy trade have not been a major factor in Manitoba Hydro's export sales. Manitoba Hydro continues to actively monitor the US state regulatory and legislative environments as well as industry trends in those states in which the Corporation transacts bilaterally. However, while not a major factor, there are some smaller barriers that continue to exist. For example, in Minnesota, legislation continues to disallow hydro resources greater than 100 MW from qualifying as an eligible renewable energy technology under Minnesota renewable portfolio standards. Manitoba Hydro continues to monitor for changes in such restrictions in order to maximize the value of its surplus electricity exports.

There is no federal level Renewable Portfolio Standard (RPS) in the US, although various bills have been proposed over the years, such as American Clean Energy and Security Act of 2009. The American Clean Energy and Security Act of 2009 passed the US House of representatives but did not pass the Senate. Draft bills including a federal RPS requirement vary but can include a 15-20% renewable energy requirement and generally include a more expansive definition of renewable energy and/or energy efficiency than state level RPSs, and may include all or incremental hydropower in the renewable definition. Manitoba Hydro continues to monitor for changes in federal legislation in order to maximize the value of its surplus electricity exports.

REFERENCE: Chapter 11: Financial Evaluation of Development Plans; Section: 11; Page No.: 8

PREAMBLE: The text indicates that: "Rate increases are required for all evaluated alternatives." Given the low levelized cost of DSM reported in Figure 7.3, it is unclear whether rates would increase under a program of aggressive DSM until such time as the marginal cost of DSM rose above rates.

QUESTION:

Determine the date in the future at which a program of aggressive DSM (i.e. all DSM with a lower LUEC than real rates) results in an increase in real rates (i.e. when DSM is no longer less expensive than the levelized value of the avoided cost).

RESPONSE:

In Order 119/13 the PUB determined that it did not require the Information Request to be answered.

REFERENCE: Chapter 11: Financial Evaluation of Development Plans; Section: 11.2; Page No.: 7

QUESTION:

Describe the rates classes currently used by Manitoba Hydro, the current rates within each of those classes, and the evolution of those rates over the past 10 years.

RESPONSE:

Manitoba Hydro has three primary rate classes: Residential, General Service, and Area and Roadway Lighting. Embedded within these classes are several sub-classes. A brief description of these sub-classes and the current rates for each is provided below, followed by a high-level summary of their evolution over the past ten years. For additional information, please see Manitoba Hydro's current approved rate schedules found as an attachment to this response.

The history behind some of these rates is quite complex and detailed in nature. In the absence of time and for purposes of this response therefore, only the final approved rates are discussed with brief mention of some of the issues and intents of Manitoba Hydro's rate design noted.

RESIDENTIAL RATE CLASS:

Description of Sub-classes:

The Residential class can be further broken down into Residential Basic, Residential Seasonal, Residential Diesel and Residential Flat Rate Water Heating.

Residential Basic – represents the majority of residential households in Manitoba. As of August 2013 there were approximately 461,000 customers on this rate which is comprised of a monthly Basic Charge and an Energy Charge. Effective May 1, 2013 the monthly Basic Charge, if

served at 200 amps or less, is $7.09 or if served at over 200 amps, $14.19. The energy charge is 7.183¢ per kWh.

Residential Seasonal – represents residential accounts that are used on a seasonal basis, such as cottages. As of August 2013 there were approximately 20,770 seasonal accounts. They are charged the same rate as Residential Basic customers however are only billed twice a year – in April and October. The April bill is for the annual Basic Charge (the monthly Basic Charge times 12 months), plus any past winter consumption. The October bill is for summer consumption only.

Residential Diesel – represents residential customers living in the four communities of Brochet, Lac Brochet, Tadoule Lake and Shamattawa, who are all served by diesel generation. As of August 2013 there were 580 Residential Diesel customers. The current rate billed to these customers is the same rate billed to Residential Basic customers.

Residential Flat Rate Water Heating (FRWH) – with the advent of electric water heating in the 1950's, the water heater was not served through the customer's meter. The customer was billed a flat rate charge on the estimated energy usage needed to heat the water. Over time, that practice has been changed and the majority of customers today have their water tank connected to their electricity meter to record consumption. However, there are still approximately 3,900 services, mainly in the older parts of Winnipeg, that continue to have unmetered water heating and therefore continue to be billed a monthly flat rate amount dependent on element size. Sizes range from 500 watts ($14.63 per month) to 6,000 watts ($97.21 per month).

Residential Rate Design:

Residential Basic - Manitoba Hydro's response to CAC/MH I-139 provides the historical Residential Basic rates from 2001 to current. As noted in the response, there are three distinct forms of rate design that have been used throughout the thirteen year period. From 2001 to 2007, the rate structure was that of a declining block rate whereby customers paid a higher rate for the first 175 kWh of usage per month, then a slightly lower rate for all remaining energy consumed. There was little or no change to the monthly Basic Charge throughout the 6 year period.

In 2007, Manitoba Hydro proposed a Residential rate design that was intended to promote greater energy conservation. The rates proposed and approved effective July 1, 2008 were inverted, meaning that customers paid a higher energy rate on consumption in excess of 900 kWh per month. Rather than applying all of the rate increase to the energy charge component, the monthly Basic Charge was increased slightly to mitigate the impact of the inverted rate on customers. The next few rate changes saw a greater percentage of the overall class increase applied to the tail block energy rate than to the first block energy rate such that the level of inversion would get larger with time, ultimately approaching marginal cost. However, in Order 40/11 the PUB directed the establishment of a single energy charge for rates effective April 1, 2011, stating that the inverted rate design was causing undue hardship on those customers who had little option but to heat with electricity (those in non-gas available areas). This single energy rate design remains in place today. In accordance with Order 43/13, the rate increase effective May 1, 2013 was applied equally to both the Basic Charge and the Energy Charge.

Residential Diesel – As of November 1, 2011, Residential customers in the four Diesel communities have been charged the same rates as on-grid Residential Basic customers, however this has not always been the case. During the period May 1, 2004 to October 31, 2011 Residential Diesel customers paid the full cost rate on any consumption in excess of 2,000 kWh per month. The full cost rate, which varied between 35.0¢ to 41.27¢ a kWh during the seven

year period, was intended to recover the cost of providing service to these customers. It was viewed that the full cost rate together with the restricted 60 Amp service in the homes in these communities would sufficiently discourage customers from using supplementary electric space heat which is prohibited and is an inefficient use of resources. The full cost portion of the rate was discontinued for rates effective November 1, 2011 as directed and approved by the PUB in Board Orders 134/10 and 148/11.

Residential Flat Rate Water Heating (FRWH) - Rates for FRWH have increased over the past 10 years according to the overall Residential class percentage rate increase being applied for and approved.

GENERAL SERVICE RATE CLASS:

Description of Sub-Classes:

The General Service rate class is broken down into several sub-classes, with the majority of accounts billed as General Service Small, Medium or Large. Smaller sub-classes include Seasonal, Flat Rate Water Heating, Diesel, Limited Use of Billing Demand Rate and the Surplus Energy Program rate. Some sub-classes such as the Short-Term Power Rate, Unmetered Services, and Short-Duration Intermittent Rate are billed on either of the General Service Small, Medium or Large rates but have specific terms of condition applied. Some customers also participate in the Curtailable Rate Program which is a DSM initiative to reduce peak demand during times of emergency and constraint.

General Service Small – represents small establishments (such as hair salons, convenience stores, churches, schools, irrigation pumps, and farm outbuildings), whose monthly billing demand is less than 200 kV.A and whose transformation is owned by Manitoba Hydro. There are approximately 64,000 accounts on this rate, with the majority (81%) using less than 50 kVA a month. The rate is comprised of a monthly Basic Charge, a blocked Energy Charge and a Demand Charge. The rate effective May 1, 2013 is as follows:

Basic Charge – single phase	$19.20
Basic Charge - three phase	$27.07
First 11,000 kWh @	7.545¢ per kWh
Next 8,500 kWh @	5.237¢ per kWh
Balance of kWh @	3.457¢ per kWh
First 50 kV.A @	$0.00 per kV.A
Balance of kV.A @	$8.85 per kV.A

For accounts whose monthly billing demand is 50 kVA or less within the past 12 month period, all energy in excess of 11,000 kWh is charged at 5.237¢ per kWh.

General Service Medium – represents medium-sized establishments (such as retail outlets, larger grocery stores, Hutterite colonies, universities and colleges) whose monthly billing demand exceeds 200 kV.A per month and whose transformation is owned by Manitoba Hydro. There are approximately 1,940 General Service Medium accounts. They are charged the same rate as General Service Small customers with the exception that their monthly Basic Charge is $28.57 per month.

General Service Large – represents large establishments who own their own transformation and who are primarily engaged in mining and/or manufacturing activities. This class is further divided into three categories based on the transformation voltage used to serve the customer. As of August 2013 there were a total of 349 accounts in this class, 293 of which are served at voltage under 30 kV; 37 served at between 30kV to 100 kV; and 13 served at over 100 kV. The rates for the General Service Large include only a energy charge and demand charge. The rates effective May 1, 2013 are as follows:

Exceeding 750 V to Not Exceeding 30 kV:
Energy Charge @ 3.25¢ per kWh
Demand Charge @ $7.51 per kV.A

Exceeding 30 kV to Not Exceeding 100 kV:
Energy Charge @ 3.022¢ per kWh
Demand Charge @ $6.43 per kV.A

Exceeding 100 kV:
Energy Charge @ 2.929¢ per kWh
Demand Charge @ $5.72 per kV.A

General Service Seasonal – represents small commercial accounts used on a seasonal basis (such as concession stands, and washroom facilities in campgrounds). As of August 2013 there were 858 accounts on this rate. They are billed the same rate applicable to General Service Small customers, but like Seasonal Residential, are billed only twice a year, in April and October.

General Service Flat Rate Water Heating – similar to Residential Flat Rate Water Heating except applicable to commercial services, these accounts are few in existence with only 395 as of August 2013. Element sizes range from 500 W at $15.56 per month to 25,000 W at $585.81 per month.

General Service Diesel – this rate is applicable to commercial accounts served by diesel generation within the communities of Brochet, Lac Brochet, Tadoule Lake and Shamattawa. There are currently 177 General Service Diesel customers, which are sub-divided in Diesel (non-government) accounts and Government and First Nation Education accounts. The Diesel (non-government) rate applies to establishments such as grocery stores, churches, band offices, and recreation halls. They are charged the same rate as regular General Service Small customers on the first 2,000 kWh of energy consumed in the month, with any usage in excess of 2,000 kWh charged at the full cost rate of 38.605¢ per kWh. Government and First Nation Education accounts represent all Federal and Provincial departments, Agencies, Crown Corporation

accounts and First Nation Education accounts. They are billed the same Basic Charge as General Service Small accounts, but their energy charge is $2.3495 per kWh which includes a surcharge of $1.68 per kWh. This surcharge is applied to subsidize the lower equivalent-to-grid rates applicable to Residential Diesel and General Service Diesel under 2,000 kWh.

General Service Limited Use of Billing Demand (LUBD) – represents customers who use relatively little energy yet establish a high monthly demand. Such accounts may include services used for field irrigation, pumping stations, grain elevators and outdoor recreational facilities. Customers on this rate are classed as LUBD Small, Medium or Large based on the same criteria discussed above. To take advantage of this rate, a customer's typical average annual load factor should be at or below 18%. Generally a customer with a load factor above this amount would be best billed on the regular General Service rate. As of August 2013, there were a total of 76 LUBD customers, 54 of which are Small, 16 Medium, and 6 Large. The rates applicable to these customers include a Basic Charge which is the same as for regular General Service customers; a Demand Charge which represents approximately 25% of the regular General Service Small, Medium or Large Demand Charge; and an Energy Charge. As of May 1, 2013 LUBD rates were as follows:

LUBD Small:	Basic Charge – single phase	$19.20
	Basic Charge – three phase	$27.07
	Energy Charge @	8.56¢ per kWh
	First 50 kV.A @	$0.00 per kV.A
	Balance of kV.A @	$2.21 per kV.A

LUBD Medium: Rates are the same as for LUBD Small except that the Basic Charge is $28.57.

LUBD Large:	<u>Exceeding 750 V to Not Exceeding 30 kV</u>:	
	Energy Charge @	7.58¢ per kWh
	Demand Charge @	$1.88 per kV.A

Exceeding 30 kV to Not Exceeding 100 kV:	
Energy Charge @	6.73¢ per kWh
Demand Charge @	$1.61 per kV.A
Exceeding 100 kV:	
Energy Charge @	6.21¢ per kWh
Demand Charge @	$1.46 per kV.A

Surplus Energy Program (SEP) – customers on this program are billed at spot market energy prices which vary from week to week, and between peak, shoulder and off-peak periods. To minimize the risk of high prices and to avoid the potential of supply interruption, customers must have an alternate on-site working back-up energy source to supply their needs. As of August 2013 there were a total of 28 customers on SEP.

Curtailable Rate Program (CRP) – customers on this program are called upon to curtail their energy usage on short notice in exchange for a monthly credit on their hydro bill. The amount of the monthly credit is dependent on the amount of curtailable load the customer makes available, the curtailment option selected by the customer and, in most cases, the customer's on-peak load factor. Customers must have a minimum of 5 MW of load available to curtail in order to be eligible for the program. The number and duration of curtailments that customers can be subjected to is dependent on the curtailment option selected by the customer. Curtailments are initiated by Manitoba Hydro when responding to contingencies and disturbances on the hydro-electric system or when required to maintain sufficient levels of planning and/or operating reserves to maintain reliable operation of the bulk electric system and compliance to NERC reliability standards. There are currently three customers on this program.

General Service Rate Design:

General Service Small and Medium – rates for the General Service Small customer class have historically been based on a Basic Charge (single phase and three phase), a declining block

Energy Charge and a Demand Charge applicable to demand in excess of 50 kV.A. The premise of this rate design is to recognize that:

35) Customers with connected loads less than 50 kV.A do not have a demand meter in place to record demand as they are more expensive to install

36) The higher first block energy charges are intended to make up the revenue loss associated with not charging customers for the first 50 kV.A of demand.

Prior to 2008, General Service Medium customers were billed a Basic Charge, a single Energy Charge and Demand Charge applicable to all kV.A billed. Aside from the level of their respective demand, there was little to distinguish a Small customer from a Medium customer as both were served by utility-owned transformation. As previously noted, Small customers are designated as those whose monthly demand is less than 200 kV.A, and Medium customers as those whose monthly demand exceeds 200 kV.A. Prior to 2008, if a Small customer exceeded 200 kV.A more than once in a 12 month period, they would be moved to the Medium rate. Conversely, if a Medium customer failed to exceed 200 kV.A in a 12 month period, they would be moved to the Small rate. In 2008, Manitoba Hydro proposed to consolidate the two rate classes.

With rates effective April 1, 2010 Manitoba Hydro nearly achieved full consolidation with the exception of the Basic Charge. Rate increases proposed thereafter were based on increases to the Basic Charge for Small customers so that they would catch up to the Medium Basic Charge which was being left constant. In Order 43/13, the PUB directed that the approved May 1, 2013 rate increase would be applied to all rate components and as such, full consolidation has not yet been achieved.

General Service Large – rates for the three General Service Large sub-classes are based on an energy charge and demand charge. Up until September 2012, the demand charge for each of

these sub-classes remained the same, with all increases in prior years having been applied solely to the Energy Charge. This has been in keeping with the PUB's comments, as outlined in Board Order 7/03, regarding the proportion of recovery of costs from demand and energy charges. At that time, the PUB found Manitoba Hydro's demand charges to be in the mid to high range compared to other Canadian jurisdictions, while the utility's energy charges were amongst the lowest. Manitoba Hydro was directed to file a report and make recommendations with respect to rebalancing demand and energy charges. Two reports on Energy/Demand Rebalancing were filed with the PUB – May 15, 2007 and July 31, 2009 – resulting in the continuation of increases being applied to the Energy Charge only. This changed however with rates effective September 1, 2012 and May 1, 2013 as both energy and demand components of the rates were increased.

In 2008, Manitoba Hydro proposed an Energy Intensive Industrial Rate (EIIR) applicable to existing General Service Large customers served at over 30 kV who were planning to expand their operations and to new customers of this size that were considering to locate in Manitoba primarily due to Manitoba's low energy rates. When proposed, export rates were in excess of domestic rates and this proposal attempted to address the concern by charging large industrial customers an energy rate closer to marginal cost. Manitoba Hydro's proposal was denied by the PUB in Order 112/09. Manitoba Hydro has since concentrated its efforts in designing Time-of-Use (TOU) rates for this group of customers, having filed such a proposal as part of its 2012/13 & 2013/14 General Rate Application. On November 6, 2012, the PUB advised that it elected to defer the review of Manitoba Hydro's TOU rate proposal until a separate hearing can be held.

General Service Diesel – the rate design for this sub-class of customer has remained the same over the last 10 years with Diesel (non-government) customers being charged grid rates for the first 2,000 kWh of energy consumed per month and the balance of kWh charged at full cost rates. The Energy Charge paid by Government and First Nation Education accounts on all energy

consumed has historically included a surcharge that serves to subsidize the other customers in the Diesel communities.

General Service Flat Rate Water Heating (FRWH) - rates for FRWH have increased over the past 10 years according to the overall increase to the General Service rate class.

General Service Limited Use of Billing Demand (LUBD) – increases to LUBD customers have been based on increases to the corresponding regular General Service Small, Medium and Large rate classes. Given that Demand Charges for the regular rate classes have remained relatively constant over the 10 year period, so too have the Demand Charges for LUBD customers, which are based on approximately 25% of the regular Demand Charge. The Basic Charge applicable to LUBD customers is the same as that approved for regular General Service customers. Increases to LUBD Energy Charges are typically calculated such that the overall bill calculation is revenue neutral to the corresponding regular General Service rate at an 18% load factor.

AREA AND ROADWAY LIGHTING

The Area and Roadway Lighting (ARL) class is comprised of Sentinel Lighting and Street Lighting. Within each of these sub-classes are numerous sizes and types of lights.

Description of Sub-Classes:

Sentinels – previously referred to as Dusk-to-Dawns, these lights are typically located in rural areas such as farm yards to provide light during periods of darkness. Sentinels are classified as either Metered (rental only) or Flat Rate (energy and rental) depending on whether the light can be connected to the customer's main meter to record consumption. If metered, the customer pays only for the rental of the light and pays separately for the energy. Unmetered light loads are charged a flat rate which includes both the rental plus estimated consumption. There are two main types of sentinels, mercury vapor (MV) and high pressure sodium (HPS). As

of August 2013 there were 25,722 Metered Sentinels and 20,357 Flat Rate Sentinels. The table below provides the monthly rates applicable for both sentinel types based on wattage and type as of May 1, 2013:

	Metered	Flat Rate
175W MW	$6.56	$9.83
400W MV	$8.96	$16.26
100W HPS	$6.56	$9.52
150W HPS	$8.96	$12.61

Street Lighting – includes all the various styles and types of lighting fixtures found on roadways and back lanes. Each light is classified by wattage (ranging from 20 Watt to 1000 Watt) and type of light (incandescent, fluorescent, compact fluorescent, metal halide, mercury vapor, high pressure sodium, or quartz). They are further categorized as Exclusive or Shared depending on the pole on which the light resides. An Exclusive Pole is a Corporate-owned pole used for the primary purpose of supporting outdoor lighting devices. A Shared Pole is a pole used for the primary purpose of supporting electrical circuits other than just outdoor lighting devices. As of April 2013 there were a total of 127,900 street lights. Rates range from $2.07 for a 20W Compact Fluorescent to $41.27 for a 1,000W High Pressure Sodium.

Area and Roadway Lighting Rate Design:

During the last 10 years, rates for the Area and Roadway Lighting have only increased five times as shown below. With each rate change, the rates for each type and size of light have increased in proportion to the overall ARL rate increase approved.

August 1, 2004	3.3%
April 1, 2005	2.25%
April 1, 2012	2.0%
September 1, 2012	2.5%
May 1, 2013	3.5%

RATE SCHEDULES

EFFECTIVE

MAY 1, 2013

PURSUANT TO

BOARD ORDER 43/13

April 30, 2013

Manitoba Hydro

TABLE OF CONTENTS

DEFINITIONS

All Rates Schedules in the publication are applied on a MONTHLY basis except as noted.

The following expressions shall have the following meanings:

a) "Basic Charge": a fixed charge that that does not change with the amount of electricity used. This includes the direct costs of metering, portions of the distribution system, as well as billing administration.

b) "Billing Demand": The greatest of the following (expressed in kVA)
   i. measured demand; or
   ii. 25 % of contract demand; or
   iii. 25% of the highest measured demand in the previous 12 months.

c) "Billing Month": the period of time, generally 30 days, in which Energy and/or Demand is consumed and thereafter billed to the Customer.

d) "Demand": the maximum use of power within a specified period of time.

e) "Demand Charge": that portion of the charge for electric service based upon the electric capacity (kVA) consumed and billed on the basis of the billing demand under an applicable rate schedule.

f) "Energy": power integrated over time and measured or expressed in kilowatt-hours (kWh).

g) "Energy Charge": that portion of the charge for electric service based upon the electric energy (kWh) consumed or billed.

h) "Kilo-Volt Amperes (kVA)": also referred to as apparent power, is the product of the volts times current of a circuit divided by 1000. It is composed of both real and reactive power.

i) "Kilowatt Hour (kWh)": the basic unit of electric energy equal to one kilowatt of power supplied to or taken from an electric circuit steadily for one hour.

j) "Measured Demand": the highest demand recorded in the Billing Month.

k) "Power Factor": is the ratio of real power (kW) to apparent power (kVA) for any given load and time. Generally it is expressed as a percentage ratio.

l) "Watt (W)": the electrical unit of power or rate of doing work; the rate of energy transfer equivalent to one ampere flowing under a pressure of one volt at unity power factor.

RESIDENTIAL RATES

RESIDENTIAL - *TARIFF NO. 2013-01*

Basic Charge:	$ 7.09
PLUS	
Energy Charge:	
All kWh	@ 7.183 ¢ / kWh
Minimum Bill:	$ 7.09

Services over 200 amps will have $7.09 added to the Basic Charge.

Applicability:

The Residential rate is applicable for all residential purposes as follows:

a) individually metered single family dwellings including those in multiple residential projects and single or three phase farm operations served through the same meter if:

   i. the connected business load does NOT exceed 3 kW; or
   ii. the combined agricultural and residential load does NOT exceed a demand of 50 kW.

b) services for personal use outside the home, such as residential water wells, private garages, boat houses and swimming pools (use can be for household, recreational and hobby activities).

c) single metered multiple residential projects meeting all the following criteria:

   i. monthly demand does not exceed 50 kVA;
   ii. the meter serves four or less individual suites or dwelling units;
   iii. none of the units are used for business purposes;
   iv. individual dwelling units are:
      - self-contained rental apartments with common facilities; or
      - row housing with self-contained rental dwelling units and common facilities; or
      - buildings with condominium type dwellings incorporated under *the Condominium Act*; or individual residential services within a trailer park established prior to May 1, 1969.

RESIDENTIAL RATES

SEASONAL - *TARIFF NO. 2013-02*

Annual Basic Charge:	$ 85.08
PLUS	
Energy Charge:	
All kWh	@ 7.183 ¢ / kWh
Minimum Annual Bill:	$ 85.08

The account is billed twice a year, April and October, each for a six-month period. The April billing is for the Annual Basic Charge plus past winter season's consumption. The October billing is for the summer season's consumption only.

Applicability:

The Seasonal rate is applicable to customers outside of the Winnipeg area using less than 7,500 kWh per season and is for residential purposes on an individually metered service when usage is of a casual or intermittent nature.

DIESEL - *TARIFF NO. 2013-03*

Basic Charge:	$ 7.09
PLUS	
Energy Charge:	
All kWh	@ 7.183 ¢ / kWh
Minimum Bill:	$ 7.09

Applicability:

The Residential rate applies to all residential services in the Diesel Communities, provided the service capacity does not exceed 60 A, 120/240 V, single phase.

RESIDENTIAL

FLAT RATE WATER HEATING RATES

(NOT available for new services)

	TARIFF NO. 2013-09	***TARIFF NO. 2013-10***
Element Size	Controlled	Uncontrolled
500 W	$ 11.06	$ 14.63
600 W	$ 13.11	$ 17.39
750 W	$ 16.09	$ 21.45
900 W	$ 19.12	$ 25.50
1,000 W	$ 21.09	$ 28.22
1,200 W	$ 23.95	$ 31.67
1,250 W	$ 24.66	$ 32.58
1,500 W	$ 28.22	$ 36.76
2,000 W	$ 33.97	$ 44.32
2,500 W	$ 38.25	$ 49.65
3,000 W	$ 41.86	$ 55.06
3,500 W	$ 47.05	$ 61.32
4,000 W	$ 52.17	$ 67.59
4,500 W	$ 58.27	$ 75.05
6,000 W	$ -	$ 97.21
1,500 / 1,000 W	$ 21.96	$ 29.36
2,000 / 1,000 W	$ 22.52	$ 30.08
3,000 / 1,000 W	$ 23.01	$ 31.15
2,000 / 1,500 W	$ 30.56	$ 40.85
3,000 / 1,500 W	$ 31.28	$ 41.63
4,500 / 1,500 W	$ 32.35	$ 43.28
3,000 / 2,000 W	$ 37.57	$ 50.36

Applicability:

Available only for services continuously energized since November 11, 1969.

GENERAL SERVICE

0 TO NOT EXCEEDING 200 kVA

(Utility-Owned Transformation)

SMALL SINGLE PHASE - *TARIFF NO. 2013-20*

Basic Charge:	$ 19.20
PLUS	
Energy Charge:	
First 11,000 kWh	@ 7.545 ¢ / kWh
Next 8,500 kWh	@ 5.237 ¢ / kWh
Balance of kWh	@ 3.457 ¢ / kWh
PLUS	
Demand Charge:	
First 50 kVA of Monthly Billing Demand	No Charge
Balance of Billing Demand	@ $ 8.85 / kVA

Minimum Bill:
Demand Charge PLUS Basic Charge

SMALL THREE PHASE - *TARIFF NO. 2013-21*

Basic Charge:	$ 27.07
PLUS	
Energy Charge:	
First 11,000 kWh	@ 7.545 ¢ / kWh
Next 8,500 kWh	@ 5.237 ¢ / kWh
Balance of kWh	@ 3.457 ¢ / kWh
PLUS	
Demand Charge:	
First 50 kVA of Monthly Billing Demand	No Charge
Balance of Billing Demand	@ $ 8.85 / kVA

Minimum Bill:
Demand Charge PLUS Basic Charge

Accounts where the Monthly Billing Demand is 50 kVA or less within the past 12-month period, ALL energy in excess of 11,000 kWh will be charged @ 5.237 ¢ / kWh.

Primary metering of multiple Utility-Owned transformation services has an additional 2% added to the kVA for each transformation greater than one. There is also a 1% reduction on recorded demand and energy to account for transformer losses.

Applicability:

The General Service Small Rate is applicable to:

a) service with Utility-Owned transformation for all non-residential purposes including churches, community clubs and other community service and recreation facilities and all commercial and general purposes wherein the conduct of business activities or operation is associated with the distribution of goods and/or services.

b) occupied dwellings where the connected business load exceeds 3 kW to not exceeding 200 kW.

c) single metered multiple residential projects meeting any of the following criteria:

   i. monthly demand exceeds 50 kVA to not exceeding 200 kVA ; or
   ii. the meter serves five or more individual suites or dwelling units; or
   iii. any of the units are used for business purposes.

d) farm services:

   i. without an occupied dwelling being used for agricultural or commercial purposes; or
   ii. where the connected business load exceeds 3 kW to not exceeding 200 kW; or
   iii. where the combined agricultural and residential load exceeds a demand of 50 kVA to not exceeding 200 kVA.

GENERAL SERVICE

0 TO NOT EXCEEDING 50 kVA

(Utility-Owned Transformation)

SEASONAL - *TARIFF NO. 2013-22*

Annual Basic Charge:	$ 230.40
PLUS	
First 66,000 kWh	@ 7.545 ¢ / kWh
Balance of kWh	@ 5.237 ¢ / kWh
Minimum Annual Bill:	$ 230.40

SEASONAL THREE PHASE - *TARIFF NO. 2013-27*

Annual Basic Charge:	$ 324.84
PLUS	
First 66,000 kWh	@ 7.545 ¢ / kWh
Balance of kWh	@ 5.237 ¢ / kWh
Minimum Annual Bill:	$ 324.84

The account is billed twice a year, April and October, each for a six-month period. The April billing is for the Annual Basic Charge plus past winter season's consumption. The October billing is for the summer season's consumption only.

Applicability:

The General Service Seasonal rate is applicable for businesses outside of the Winnipeg area whose:

a) demand does NOT exceed 50 kVA;
b) usage is of an intermittent or casual nature;
c) consumption is primarily summer time and usage is limited in the winter; and
d) business load is greater than 3 kW in a residence.

GENERAL SERVICE

0 TO NOT EXCEEDING 200 kVA

(Utility-Owned Transformation)

COOKING AND HEATING STANDARD - *TARIFF NO. 2013-23*

Basic Charge:	$ 19.20
PLUS	
Energy Charge:	
First 11,000 kWh	@ 7.545 ¢ / kWh
Balance of kWh	@ 5.237 ¢ / kWh
Minimum Bill:	$ 19.20

COOKING AND HEATING SEASONAL - *TARIFF NO. 2013-24*

Annual Basic Charge:	$ 230.40
PLUS	
Energy Charge:	
First 66,000 kWh	@ 7.545 ¢ / kWh
Balance of kWh	@ 5.237 ¢ / kWh
Minimum Annual Bill:	$ 230.40

Seasonal Cooking and Heating accounts are billed twice a year, April and October, each for a six-month period. The April billing is for the Annual Basic Charge plus past winter season's consumption. The October billing is for the summer season's consumption only.

Applicability:

The General Service Cooking and Heating rate is applicable to services existing prior to April 1, 1976 for separately metered cooking, heating, process heating or car plug service in the same building or an extension of that building where the primary requirement is for General Service.

GENERAL SERVICE

DIESEL - *TARIFF NO. 2013-40*

Basic Charge:	$ 19.20
PLUS	
Energy Charge:	
First 2,000 kWh	@ 7.545 ¢ / kWh
Balance of kWh	@ 38.605 ¢ / kWh
Minimum Bill:	$ 19.20

The General Service rate applies to all commercial accounts excluding those classed as Government and /or First Nation Education.

GOVERNMENT AND FIRST NATION EDUCATION - *TARIFF NO. 2013-41*

Basic Charge:	$ 19.20
PLUS	
Energy Charge:	@ $2.3495 / kWh
Minimum Bill:	$ 19.20

A surcharge of $1.68 per kWh is included in the Government and First Nation Education tariff which applies to all Federal and Provincial departments, Agencies, Crown Corporation accounts and First Nation Education accounts.

The First Nation Education rate is applicable to all Diesel First Nation facilities providing instructional services for members of the Diesel First Nations, including schools, teacherages and student residences.

GENERAL SERVICE

EXCEEDING 200 kVA

(Utility-Owned transformation)

MEDIUM - *TARIFF NO. 2013-30*

Basic Charge:	$ 28.57
PLUS	
Energy Charge:	
First 11,000 kWh	@ 7.545 ¢ / kWh
Next 8,500 kWh	@ 5.237 ¢ / kWh
Balance of kWh	@ 3.457 ¢ / kWh
PLUS	
* Demand Charge:	
First 50 kVA of Monthly Billing Demand	No Charge
Balance of Billing Demand	@ $ 8.85 / kVA

Minimum Bill:
Demand Charge PLUS Basic Charge

Monthly Billing Demand *

The greatest of the following (expressed in kVA):

a) measured demand; or
b) 25 % of contract demand; or
c) 25% of the highest measured demand in the previous 12 months.

Primary metering of multiple Utility-Owned transformation services has an additional 2% added to the kVA for each transformation greater than one. There is also a 1% reduction on recorded demand and energy to account for transformer losses.

Applicability:

The General Service Medium rate is applicable to services where the registered demand exceeds 200 kVA and where the transformation is provided by the Corporation.

Customers who, by nature of their business, do not require service during the months of December, January, and February may qualify for the General Service Short-Term Power rate. For further details see page 16.

GENERAL SERVICE

(Customer-Owned Transformation)

LARGE 750 V TO NOT EXCEEDING 30 KV - *TARIFF NO. 2013-60*

Energy Charge:	@ 3.250 ¢ / kWh
PLUS	
* Demand Charge:	@ $ 7.51 / kVA

Minimum Bill: Demand Charge

LARGE 30 KV TO NOT EXCEEDING 100 KV - *TARIFF NO. 2013-61*

Energy Charge:	@ 3.022 ¢ / kWh
PLUS	
* Demand Charge:	@ $ 6.43 / kVA

Minimum Bill: Demand Charge

LARGE EXCEEDING 100 KV - *TARIFF NO. 2013-62*

Energy Charge:	@ 2.929 ¢ / kWh
PLUS	
* Demand Charge:	@ $ 5.72 / kVA

Minimum Bill: Demand Charge

Monthly Billing Demand *

The greatest of the following (expressed in kVA):

a) measured demand; or
b) 25 % of contract demand; or
c) 25% of the highest measured demand in the previous 12 months.

Applicability:

The General Service Large rate is applicable to services where the transformation is provided by the customer and connected directly to the Corporation's distribution, subtransmission or transmission lines.

Customers who, by nature of their business, do not require service during the months of December, January and February may qualify for the General Service Short-Term Power rate.

GENERAL SERVICE LIMITED USE OF BILLING DEMAND RATE OPTION

0 TO NOT EXCEEDING 200 kVA

(Utility-Owned Transformation)

LUBD SMALL SINGLE PHASE - *TARIFF NO. 2013-50*

Basic Charge:	$ 19.20
PLUS	
Energy Charge:	@ 8.560 ¢ / kWh
PLUS	
Demand Charge:	
First 50 kVA of Monthly Recorded Demand	No Charge
Balance of Recorded Demand	@ $ 2.21 / kVA

Minimum Bill:
Demand Charge PLUS Basic Charge:

LUBD SMALL THREE PHASE - *TARIFF NO. 2013-51*

Basic Charge:	$ 27.07
PLUS	
Energy Charge:	@ 8.560 ¢ / kWh
PLUS	
Demand Charge:	
First 50 kVA of Monthly Recorded Demand	No Charge
Balance of Recorded Demand	@ $ 2.21 / kVA

Minimum Bill:
Demand Charge PLUS Basic Charge:

Primary metering of multiple Utility-Owned transformation services has an additional 2% added to the kVA for each transformation greater than one. There is also a 1% reduction on recorded demand and energy to account for transformer losses.

Eligibility:

Any customer eligible for service on the General Service Small rate can request billing on this option, except customers who have been billed on this option during the 12 months prior to their request, but subsequently reverted to billing at regular General Service Small rates.

GENERAL SERVICE LIMITED USE OF BILLING DEMAND RATE OPTION

EXCEEDING 200 kVA

(Utility-Owned Transformation)

LUBD MEDIUM - *TARIFF NO. 2013-52*

Basic Charge:	$ 28.57
PLUS	
Energy Charge:	@ 8.560 ¢ / kWh
PLUS	
* Demand Charge:	
First 50 kVA of Monthly Recorded Demand	No Charge
Balance of Recorded Demand	@ $ 2.21/ kVA

Minimum Bill:
Demand Charge PLUS Basic Charge

Monthly Billing Demand *

The greatest of the following (expressed in kVA):

a) measured demand; or
b) 25% of contract demand; or
c) 25% of the highest measured demand in the previous 12 months.

Primary metering of multiple Utility-Owned transformation services has an additional 2% added to the kVA for each transformation greater than one. There is also a 1% reduction on recorded demand and energy to account for transformer losses.

Eligibility:

Any customer eligible for service on the General Service Medium rate can request billing on this option, except customers who have been billed on this option during the 12 months prior to their request, but subsequently reverted to billing at regular General Service Medium rates.

GENERAL SERVICE LIMITED USE OF BILLING DEMAND RATE OPTION

(Customer-Owned Transformation)

LUBD LARGE 750 V TO NOT EXCEEDING 30 KV - *TARIFF NO. 2013-53*

Energy Charge:	@ 7.580 ¢ / kWh
PLUS	
* Demand Charge:	@ $ 1.88 / kVA

Minimum Bill: Demand Charge

LUBD LARGE 30 KV TO NOT EXCEEDING 100 KV - *TARIFF NO. 2013-54*

Energy Charge:	@ 6.730 ¢ / kWh
PLUS	
* Demand Charge:	@ $ 1.61 / kVA

Minimum Bill: Demand Charge

LUBD LARGE EXCEEDING 100 KV - *TARIFF NO. 2013-55*

Energy Charge:	@ 6.210 ¢ / kWh
PLUS	
* Demand Charge:	@ $ 1.46 / kVA

Minimum Bill: Demand Charge

Monthly Billing Demand *

The greatest of the following (expressed in kVA):

a) measured demand; or
b) 25 % of contract demand; or
c) 25% of the highest measured demand in the previous 12 months.

Eligibility:

Any customer eligible for service on the General Service Large rate can request billing on this option, except customers who have been billed on this option during the 12 months prior to their request, but subsequently reverted to billing at regular General Service Large rates.

GENERAL SERVICE

FLAT RATE WATER HEATING RATES

(NOT available for new services)

TARIFF NO. 2013-29

Element Size	Uncontrolled
500 W	$ 15.56
600 W	$ 18.61
750 W	$ 23.23
1,000 W	$ 31.22
1,200 W	$ 37.35
1,500 W	$ 46.47
2,000 W	$ 58.27
2,500 W	$ 70.06
3,000 W	$ 81.52
3,500 W	$ 92.98
3,800 W	$ 102.77
4,000 W	$ 104.45
4,500 W	$ 115.92
5,000 W	$ 127.38
6,000 W	$ 150.31
6,500 W	$ 166.42
7,000 W	$ 173.21
7,500 W	$ 189.99
8,000 W	$ 196.13
9,000 W	$ 219.04
10,000 W	$ 241.99
10,500 W	$ 253.49
12,000 W	$ 287.85
12,500 W	$ 299.32
13,000 W	$ 310.79
13,500 W	$ 322.12
14,500 W	$ 345.05
15,000 W	$ 356.61
16,000 W	$ 379.54
16,500 W	$ 402.21
18,000 W	$ 425.44
19,000 W	$ 461.09
20,000 W	$ 471.26
23,000 W	$ 555.44
24,000 W	$ 579.05
25,000 W	$ 585.81
3,000 / 1,000 W	$ 38.04
2,000 / 1,500 W	$ 48.17
3,000 / 1,500 W	$ 48.69
4,500 / 1,500 W	$ 49.89

GENERAL SERVICE

Short-Term Power Rate

The General Service Short-Term application is available throughout the Province of Manitoba except in the Diesel Zone, for customers with services exceeding 200 kVA who, by the nature of their business, do not require service during the months of December, January, and February. Qualifying customers will be billed at, and subject to the conditions of, the appropriate General Service Medium or Large rate.

Services must be disconnected from 00:00 hours, December 1 to 24:00 hours, February 28/29. Customers may use up to a maximum of 1,000 kWh during these months for security purposes only (i.e. alarm system, security lighting) but must notify Manitoba Hydro each year in advance of their operation shutdown.

Service must be taken for a minimum of four months, normally consecutively, during the period March 1 to November 30. Customers will be subject to the same 25% ratchet provisions as applicable to General Service Medium and Large customers, with the exception that no ratchets will apply for the months of December, January or February unless the customer exceeds the 1,000 kWh per month allowable use during those months.

General Service Short-Term is NOT available in conjunction with other services at the same point of delivery.

Unmetered Services

Billed on the General Service Small Rate Tariff No. 2013-20 or 2013-21:

The Unmetered Service rate is applicable:

a) for non-residential customers where the load is constant and the consumption is consistent and metering is unnecessary or undesirable, specifically including traffic signals, pedestrian walkway lighting, directional traffic signs, hazard flashers, cable television power amplifiers, telephone booths, transit shelters (both heated and unheated), cathodic protection rectifiers (for oil and natural gas pipelines), water gauge wells, highway traffic counters, governmental navigational lights (both nautical and aerial), municipal sirens and Canadian Emergency Measures Organization emergency siren alarms.

b) for existing railway crossings, sign lighting and window lighting. Customers will be required to provide metering facilities if additional load is connected.

c) for services such as fairs, summer midways, television production and welding schools where service is required for less than 30 days.

d) for oil field pumping services connected prior to April 1, 1980 with oil pumping motors of the counter balanced (nodding or piston) type.

GENERAL SERVICE

SHORT-DURATION, INTERMITTENT RATE

TERMS AND CONDITIONS

General

Manitoba Hydro will supply short-duration, intermittent power and energy to customers whose operation requires short periods of high demand combined with overall, very low energy consumption.

The Corporation may regulate timing of the customer's demand requirements so that they do not coincide with other system peak demands.

The Corporation may interrupt the supply at any time, for any length of time and for any reason.

Conditions of Service

Qualifying customers will be billed at, and subject to the conditions of, the appropriate General Service Large or Medium rate with the following provisions:

a) Measured demand will be reduced by 50% for billing purposes.

b) Customers will be assessed a monthly energy entitlement based on a 1% load factor (monthly demand x 0.01 x 730) to be billed at the applicable General Service rate.

c) Energy consumption in excess of the monthly energy entitlement will be billed at a rate equal to 10 times the usual applicable General Service rate.

Customers will be required to enter into a formal contract with Manitoba Hydro. The contract will document the above conditions as well as any others considered necessary due to the nature of a specific service.

Rate Application

The General Service Short-Term, Intermittent rate is available to all customers, except those in the Diesel Rate Zone, to customers qualifying for the General Service Large and General Service Medium rates.

AREA AND ROADWAY LIGHTING

OUTDOOR LIGHTING

LEGEND

I	Incandescent
F	Fluorescent
CF	Compact Fluorescent
MH	Metal Halide
MV	Mercury Vapour
HPS	High Pressure Sodium Vapour
Q	Quartz

Exclusive Pole:	A corporate-owned pole for the primary purpose of supporting outdoor lighting devices.
Shared Pole:	A pole of the primary purpose of supporting electrical circuits other than outdoor lighting.

AREA AND ROADWAY LIGHTING

(Incandescent and Mercury Vapour NOT available for new installations)

OUTDOOR LIGHTING RATE - *TARIFF NO. 2013-80:*

Watts	Rate Per Month	
	Shared	**Exclusive**
200 F	-	$ 9.66
20 CF	-	$ 2.07
100 I	$ 4.45	$ 9.66
150 I	-	$ 9.66
300 I	-	$ 13.78
500 I	$ 11.64	$ 18.99
400 MH	-	$ 23.13
175 MV	$ 8.60	$ 13.78
250 MV	$ 9.85	$ 15.60
400 MV	$ 13.51	$ 18.66
70 HPS	$ 7.40	$ 12.15
70 HPS 24 hours	-	$ 13.65
100 HPS	$ 7.68	$ 12.81
150 HPS	$ 9.41	$ 14.46
250 HPS	$ 11.99	$ 16.67
400 HPS	$ 13.76	$ 23.13
400 HPS 2/100'	-	$ 35.77
400 HPS 4/100'	-	$ 26.27
750 HPS	$ 21.32	$ 33.83
1 000 HPS	-	$ 39.24
1 000 HPS 1/60'	-	$ 40.15
1 000 HPS 2/100'	-	$ 48.12
1 000 HPS 4/100'	-	$ 41.27

Applicability:

The Area and Roadway rate is available throughout the Province of Manitoba and applies to area and roadway lighting installed by agreement for public authorities.

AREA AND ROADWAY LIGHTING

(NOT available for new installations)

FLOOD LIGHTING RATE - *TARIFF NO. 2013-81:*

Watts	Rate Per Month	
	Shared Pole/Luminaire	**Exclusive Pole/Luminaire**
100 I	$ 5.04	-
150 I	$ 5.04	$ 10.45
300 I	$ 9.19	-
500 I	$ 12.37	$ 20.24
250 MV	$ 11.39	$ 16.65
400 MV	$ 13.92	$ 18.69
500 Q	$ 19.12	$ 24.24

Applicability:

The Floodlighting rate is applicable for floodlighting services existing prior to April 1, 1976 for lighting of public buildings, structures, monuments, parks, grounds and Department of Highways overhead signs served from the Corporation distribution system where the Corporation owns and maintains the luminaires.

AREA AND ROADWAY LIGHTING

SEASONAL RATE - *TARIFF NO. 2013-82:*

Watts	Rate Per Month	
	Shared Pole/Luminaire	**Exclusive Pole/Luminaire**
70 HPS	$ 7.40	$ 12.15
100 HPS	$ 7.68	$ 12.81
150 HPS	$ 9.41	$ 14.46
250 HPS	$ 11.99	$ 16.67

Applicability:

The Seasonal Area and Roadway Lighting rate is available only outside the City of Winnipeg and is applicable for area and roadway lighting installed by agreement for Municipal Corporation, local government districts, Provincial and Federal Governments.

Lighting will be energized from May 1 to October 31 of each year and will be disconnected from November 1 to April 30.

AREA AND ROADWAY LIGHTING

SENTINEL LIGHTING RATE - *TARIFF NO. 2013-83:*

Watts	Rate Per Month	
	Flat Rate (Energy and Rental)	**Metered (Rental Only)**
100 HPS	$ 9.52	$ 6.56
150 HPS	$ 12.61	$ 8.96
175 MV	$ 9.83	$ 6.56
400 MV	$ 16.26	$ 8.96

Applicability:

Sentinel lighting is available for security lighting of private or public areas on a dusk-to-dawn basis throughout the Province of Manitoba. Rental units are intended for continuous year-round service and are not provided on a temporary basis.

Sentinel lighting is available for rental as follows:

a) on a flat rate basis when connected directly to the Manitoba Hydro distribution system; or
b) exclusive of electricity if connected to the customer's metered circuits.

AREA AND ROADWAY LIGHTING

FESTOON LIGHTING - *TARIFF NO. 2013-84*

Connected load @ $0.849/ kW per night of scheduled use:

Minimum Monthly Bill: $ 17.32

Applicability:

The Festoon Lighting rate is applicable only for existing unmetered municipally-owned festoon light strings suspended across streets and public thoroughfares. The customer is required to advise the Corporation prior to any changes in the nights contract for operation and/or the connected lighting kilowatts.

DECORATIVE LIGHTING - *TARIFF NO. 2013-85*

Connected load @ $0.849kW per night of scheduled use:

Minimum Monthly Bill: $ 17.32

Applicability:

The Decorative Lighting rate is applicable for new and existing unmetered municipally-owned decorative lights on frames or modules mounted on roadway lighting poles or ornamental standards and/or Christmas trees. The customer is required to advise the Corporation prior to any change in the nights contracted for operation and\or the connected lighting kilowatts.

CHRISTMAS LIGHTING - *TARIFF NO. 2013-86*

Connected load @ $0.0677/ kWh.

Applicability:

The Christmas Lighting rate is applicable to the City of Winnipeg Christmas lighting only. The customer is required to advise the Corporation prior to any change in the connected load.

REFERENCE: Chapter 11: Financial Evaluation of Development Plans; Section: 11.5; Page No.: 22

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 11 of the Business Case Submission presents a financial evaluation of 8 of the representative development plans, "...with a focus on the comparative impact on future customer rates and Manitoba Hydro's comparative exposure to financial risk" (Chapter 11, Section 11.5, p.22). This evaluation has been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether, and how, the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) was considered in each of the 8 development plans for which the financial evaluation was presented.

RESPONSE:

Please see Manitoba Hydro's response to MMF/MH I-038a. Also, please see CAC/MH-231a.

REFERENCE: Chapter 11: Financial Evaluation of Development Plans; Section: 11.5; Page No.: 22

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 11 of the Business Case Submission presents a financial evaluation of 8 of the representative development plans, "...with a focus on the comparative impact on future customer rates and Manitoba Hydro's comparative exposure to financial risk" (Chapter 11, Section 11.5, p.22). This evaluation has been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether and how the financial evaluation of each of the 8 development plans, would have been different if these included the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) as these might be experienced by the Metis in the vicinity of the PDP and the alternatives.

RESPONSE:

Financial evaluations include estimated costs to the projects related to dealing with project impacts on people, including the Métis, and benefit sharing with communities in the vicinity of the hydro projects. Financial evaluations do not analyze the qualitative issues associated with socioeconomic impacts and benefits.

REFERENCE: Chapter 11: Financial Evaluation of Development Plans; Section: 11.5; Page No.: 22

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 11 of the Business Case Submission presents a financial evaluation of 8 of the representative development plans, "...with a focus on the comparative impact on future customer rates and Manitoba Hydro's comparative exposure to financial risk" (Chapter 11, Section 11.5, p.22). This evaluation has been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether and how the financial evaluation of each of the 8 development plans would have been different if these included the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) as these might be experienced by non-KCN member communities in the vicinity of the PDP and the alternatives.

RESPONSE:

Financial evaluations include estimated costs to the projects related to dealing with project impacts on people, including non-KCN member communities, and benefit sharing with communities in the vicinity of the hydro projects. Financial evaluations do not analyze the qualitative issues associated with socioeconomic impacts and benefits.

REFERENCE: Chapter 12: Economic Evaluations - 2013 Update On Selected Development Plans; Section: 12.3.3; Page No.: 12

PREAMBLE: Table 12.5 illustrates the effect of different discount rates on the NPV differences between development plans.

QUESTION:

Provide similar information to that contained in Table 12.5 for the 2013 Assumptions for discount rates of 6%, 6.5%, 7%, 7.5% and 8%.

RESPONSE:

In accordance with Order 119/13 no response is required to this Information Request.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13; Page No.: 1

PREAMBLE: The text notes that: "The purpose of this chapter is to present the results of a multiple account benefit-cost analysis (MA-BCA) of Manitoba Hydro's Preferred Development Plan as compared to alternative plans with and without new U.S. interconnection capacity and new export sale commitments..." Order 92-13 provided a definition of macro-environmental impact as the "collective macro-environmental consequences of changes to air, land, water, flora and fauna, including the potential significance of these changes, their equitable distribution within and between present and future generations." The NFAT appears to have ignored aspects of this definition.

QUESTION:

Develop (or describe) the criteria for determining the significance of changes to air, land, water, flora and fauna used in comparing the development plans.

RESPONSE:

The analysis in Chapter 13 attempts to present the benefits and costs of the project from a broad public perspective in accordance with well established principles of benefit-cost analysis. With respect to the environmental consequences of the different projects in the different plans, it focuses on what external costs remain after mitigation and compensation – residual impacts not already reflected or accounted for in the project design, plans and expenditures. It is not meant to replicate project-specific environmental impact assessments, with the scope of analysis and definitions as defined by environmental regulators, including their technical usage of the term "significant". For more discussion about difference application of term "significant" in the environmental reviews and NFAT review, see MMF/MH I-053a.

On September 30, 2013 Manitoba Hydro undertook to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation consistent with the criteria set out in Order 92/13. The matrices summarize

the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.0 and 13.1.2; Page No.: 2, 14

PREAMBLE: "The objective of the Multiple Accounts - Benefit Cost Analysis (MC-BCA) is described as providing a systematic, comprehensive assessment of all of the benefits and costs to Manitobans in a manner that can assist the NFAT panel to address the question of overall socioeconomic benefit" (Chapter 13, Section 13.0, p.2). One of the accounts included in the MC-BCA is the Social Account, which considers other impacts on communities affected by the projects proposed in the different development plans, with the focus not on the impacts themselves, but on "...the externality they represent: the external net benefit or cost to affected communities as a result of impacts on services, infrastructure or well-being not avoided or offset by mitigation and compensation plans..." (Chapter 13, Section 13.1.2, p.14). Table 13.1 (p.16) lists items included in the analysis of the Social Account, one of which is "impacts on affected communities", and also lists indicators of such impacts, one of which is the "nature and extent of residual community impacts".

There is concern that this analysis of "impacts on affected communities" and that the indicator of "nature and extent of residual community impacts" do not include or consider social, economic, and cultural impacts, particularly as these might be experienced by Métis in the vicinity of the project.

QUESTION:

Explain the extent to which the analysis of "impacts on affected communities" takes into consideration social, economic, and cultural impacts on the Métis, as a distinct group residing in the communities in the vicinity of the project.

RESPONSE:

Please see CAC/MH I-231a. The Métis are not distinguished as a separate group in the MA-BCA.

MMF-0038c of the first round of CEC IRs noted:

> To the extent that there are Métis or other Aboriginal citizens in the Local Study Area, these individuals are included in the assessments of effects of the Project on people in

the Local Study Area, and are also captured in the total and Aboriginal populations (where available) identified for each Local Study Area community.

Please also see Manitoba Hydro's response to MMF/MH I-002b.

On September 30, 2013 Manitoba Hydro undertook to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation. The matrices summarize the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13. PUB Order 119/13 added DSM to the resource options to be considered in the matrices, and Manitoba Hydro has chosen to also include transmission projects.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section 13.0 and 13.1.2; Page No.: 2, 14

PREAMBLE: "The objective of the Multiple Accounts - Benefit Cost Analysis (MC-BCA) is described as providing a systematic, comprehensive assessment of all of the benefits and costs to Manitobans in a manner that can assist the NFAT panel to address the question of overall socioeconomic benefit" (Chapter 13, Section 13.0, p.2). One of the accounts included in the MC-BCA is the Social Account, which considers other impacts on communities affected by the projects proposed in the different development plans, with the focus not on the impacts themselves, but on "...the externality they represent: the external net benefit or cost to affected communities as a result of impacts on services, infrastructure or well-being not avoided or offset by mitigation and compensation plans..." (Chapter 13, Section 13.1.2, p.14). Table 13.1 (p.16) lists items included in the analysis of the Social Account, one of which is "impacts on affected communities", and also lists indicators of such impacts, one of which is the "nature and extent of residual community impacts".

There is concern that this analysis of "impacts on affected communities" and that the indicator of "nature and extent of residual community impacts" do not include or consider social, economic, and cultural impacts, particularly as these might be experienced by Métis in the vicinity of the project.

QUESTION:

Explain whether the "nature and extent of residual community impacts", as an indicator, includes social, economic, and cultural impacts on the Métis, as a distinct group residing in the communities in the vicinity of the project.

RESPONSE:

The analysis in Chapter 13 does not specifically consider impacts on Métis as a distinct group living in the communities affected by the projects. Please also see Manitoba Hydro's response to MMF/MH I-001b.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.1; Page No.: 2

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 13 provides a Multiple Account - Benefit Cost Analysis (MC-BCA) on the PDP and three alternatives. This analysis has been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether, and how, the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) was considered in the PDP and each of the 3 alternatives included in the MC-BCA.

RESPONSE:

The Multiple Account Benefit-Cost Analysis (MABCA) presented in Chapter 13 is aligned with the NFAT Terms of Reference and with the PUB Order 92/13.

The overall objective of the benefit-cost analysis presented in Chapter 13 is to assess the net benefits of the alternative plans to Manitobans and to identify the key advantages and disadvantages of each of the alternatives and the key trade-offs for the different parties and

interests that are affected. The same principles and criteria are consistently applied to all the development plans contemplated in this analysis.

The starting point for this MABCA analysis, consistent with standard practices, is the valuation of the project from the perspective of the proponent (market valuation account). The "market valuation" account already reflects the direct costs of those socio-economic effects that have been identified in the project design, plans and expenditures. The other accounts (Manitoba Hydro Customer, Manitoba Government, Manitoba Economy, Environment and Social), adjust the market valuation to include social benefits and costs that the market valuation does not reflect. The table 13.1 in the NFAT submission shows a summary of the Multiple Account Framework detailing the main variables that have been identified for each account.

To the extent that socio-economic and other project data for each development plan has been available, it has been integrated in the analysis.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.1; Page No.: 2

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 13 provides a Multiple Account - Benefit Cost Analysis (MC-BCA) on the PDP and three alternatives. This analysis has been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether and how the results of the MC-BCA of the PDP and the 3 alternatives would have been different if it had included the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) as these might be experienced by the Métis in the vicinity of the PDP and the alternatives.

RESPONSE:

The analysis would have been the same.

Please also see Manitoba Hydro's response to MMF/MH I-001b.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.1; Page No.: 2

PREAMBLE: Development plans were formulated using the resource options selected in Chapter 7, and are said consider economic, financial, environmental, and socioeconomic/provincial characteristics. As noted above, the screening process is not considered adequate in achieving the objectives of the PUB (Order 92/13) definition of socioeconomic impacts and benefits. Further, the Business Case Submission states that the determination of the development plans includes consideration and analysis of economic, financial, environmental, and socioeconomic impacts (Chapter 8, Section 8.1, p.2). Chapter 8 provides a description of the fifteen development plans, but does not describe or consider these in light of the PUB (Order 92/13) definition of socioeconomic impacts and benefits.

Chapter 13 provides a Multiple Account - Benefit Cost Analysis (MC-BCA) on the PDP and three alternatives. This analysis has been conducted without prior consideration of the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) of each of the development plans.

QUESTION:

Explain whether and how the results of the MC-BCA of the PDP and the 3 alternatives would have been different if it had included the range of socioeconomic impacts and benefits (as per the PUB definition in Order 92/13) as these might be experienced by non-KCN member communities in the vicinity of the PDP and the alternatives.

RESPONSE:

The analysis would have been the same.

Please also see Manitoba Hydro's response to MMF/MH I-001b.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.1.2; Page No.: 4

PREAMBLE: The text states that "the MA-BCA addresses consequences for Manitoba Hydro customers, Manitoba taxpayers, the economy, the environment and affected communities that this market valuation does not capture or adequately reflect." Nowhere in this analysis are Manitobans considered as producers of electricity.

QUESTION:

Indicate what consideration, if any, was given in the MA-BCA or elsewhere in the NFAT to the benefits accruing to Manitobans as producers of electricity, either as individuals, energy co-operatives, employees, owners or shareholders in corporations other than Manitoba Hydro.

RESPONSE:

In all of the alternatives analyzed in the MA-BCA, the only party that is producing electricity is Manitoba Hydro and its project partners, and the consequences for them are reflected in the market valuation account.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.1.2; Page No.: 11

PREAMBLE: In relation to employment benefits, the text notes that "there are circumstances and regions where the net benefits can be significant."

QUESTION:

Provide criteria for determining significant employment benefits and give prior examples illustrating where the threshold of significance of employment in particular regions of the Province has been exceeded by an energy or other development project.

RESPONSE:

The employment benefits are going to be significant where the opportunity cost of labour is low relative to the wages paid. That will be where there is a high likelihood that those hired would otherwise have been un- or under-employed. The issue is not so much of a threshold as an increasing likelihood of significance the higher the probability of hiring people who would otherwise be un- or under-employed.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.1.2, 13.3.5, 13.3.7 (Table 3.19); Page No.: 13, 66; CEAA (Canadian Environmental Assessment Agency). 2013. Operational Policy Statement, Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012. Catalogue No.: En106-116/2013E-PDF. ISBN: 978-1-100-22263-9; Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling, and D. Stalker. 1999. Cumulative effects assessment practitioners guide. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency. Hull, Quebec. pp. 143; Lawrence, D.P. 2007. Impact significance determination - Pushing the boundaries. Environmental Impact Assessment Review 27: 770-788

PREAMBLE: With respect to the environment and a comparison of "residual biophysical" impacts between different resource options, the business case repeatedly states that "Aquatic and terrestrial impacts with hydro projects in preferred plan and plans with Keeyask; subject to detailed environmental hearings, residual effects and local external cost expected to be relatively small with initial design, extensive mitigation, monitoring, compensation and benefit-sharing arrangements" (Executive Summary, Section 13.3.7, Section 14.4). This is inadequate information to understand the environmental (biophysical) impacts and benefits of the Preferred Development Plan (PDP) and alternative development plans. Based on the Public Utilities Board (PUB) approved definition of macro-environment, the expectation was that environmental attributes would be measurable in a quantity-based approach that would describe “changes to air, land, water, flora and fauna” and that would facilitate comparison across development plans.

Section 13.3.5 provides an evaluation by environmental account. Manitoba Hydro indicates that "with respect to biophysical effects, the issue is whether there are residual impacts despite the mitigation and compensation built into the projects' plans and costs" (Section 13.1.2, p. 13). According to Hegmann et al. (1999), some insignificant effects may need to be elevated to significant when considering multiple cumulative impacts. This is echoed in the Canadian Environmental Assessment Agency’s (CEAA) operation policy statement on cumulative effects (2013) which states that a “cumulative environmental effects assessment should consider those VCs for which residual environmental effects are predicted after consideration of mitigation measures, regardless of whether those residual environmental effects are predicted to be significant”. The environmental account should consider the residual cumulative impacts, rather than a project-by-project account, since different development plans

contain multiple projects. Looking at project-specific residual impacts is not sufficient to understand the full environmental impact of any one development plan. Furthermore, according to the PUB approved definition of macro-environment, the "significance of these changes" to air, land, water, flora and fauna needs to be addressed. The significance of the environmental effects is dependent on the perspective of the different groups affected by the preferred and alternative development plans. According to Lawrence (2007), a determination of significance needs to be done collaboratively through effective public consultation.

QUESTION:

Provide a quantitative comparison of cumulative effects between the different development plans (PDP and alternatives) that would allow the reader to adequately assess Manitoba Hydro's conclusions with respect to environmental biophysical effects. Include maps showing hypothetical locations of all components of the PDP and alternative plans.

RESPONSE:

Please see the response to CAC/MH I-231a. The question is based on an incorrect assumption: The definition of macro-economic in Order 92/13 does not state that a quantitative comparison of cumulative effects is required.

On September 30, 2013 Manitoba Hydro undertook to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation. The matrices summarize the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13. PUB Order 119/13 added DSM to the resource options to be considered in the matrices, and Manitoba Hydro has chosen to include transmission projects.

Significance

It is also useful to distinguish between the manner the term "significant" is used in environmental reviews and the NFAT review.

The *Canadian Environmental Assessment Act* requires a determination of whether an adverse effect caused by a project will be "significant." The term is not defined in the act.

The definition and process of determining "significance" is a topic of discussion in the environmental reviews, including several IRs during the CEC's IR process. For example, in the response to MMF-0003a in the first round of CEC IRs, the Keeyask Hydropower Limited Partnership noted that it had outlined its methodology for determining significance in section 5.5 of the Response to the EIS Guidelines, filed as part of the Keeyask Environmental Impact Statement. The response added, "The term 'regulatory significance' was adopted by the Partnership in the EIS to help distinguish this very specific use of the term for the regulatory assessment purposes from other more common uses in very different contexts."

The specific use of "significance", as required in the environmental reviews, is not being applied in the NFAT review. Rather, as used in the NFAT submission, "significant" is synonymous with words such as important, major, noteworthy and substantial.

Baseline of Past Effects

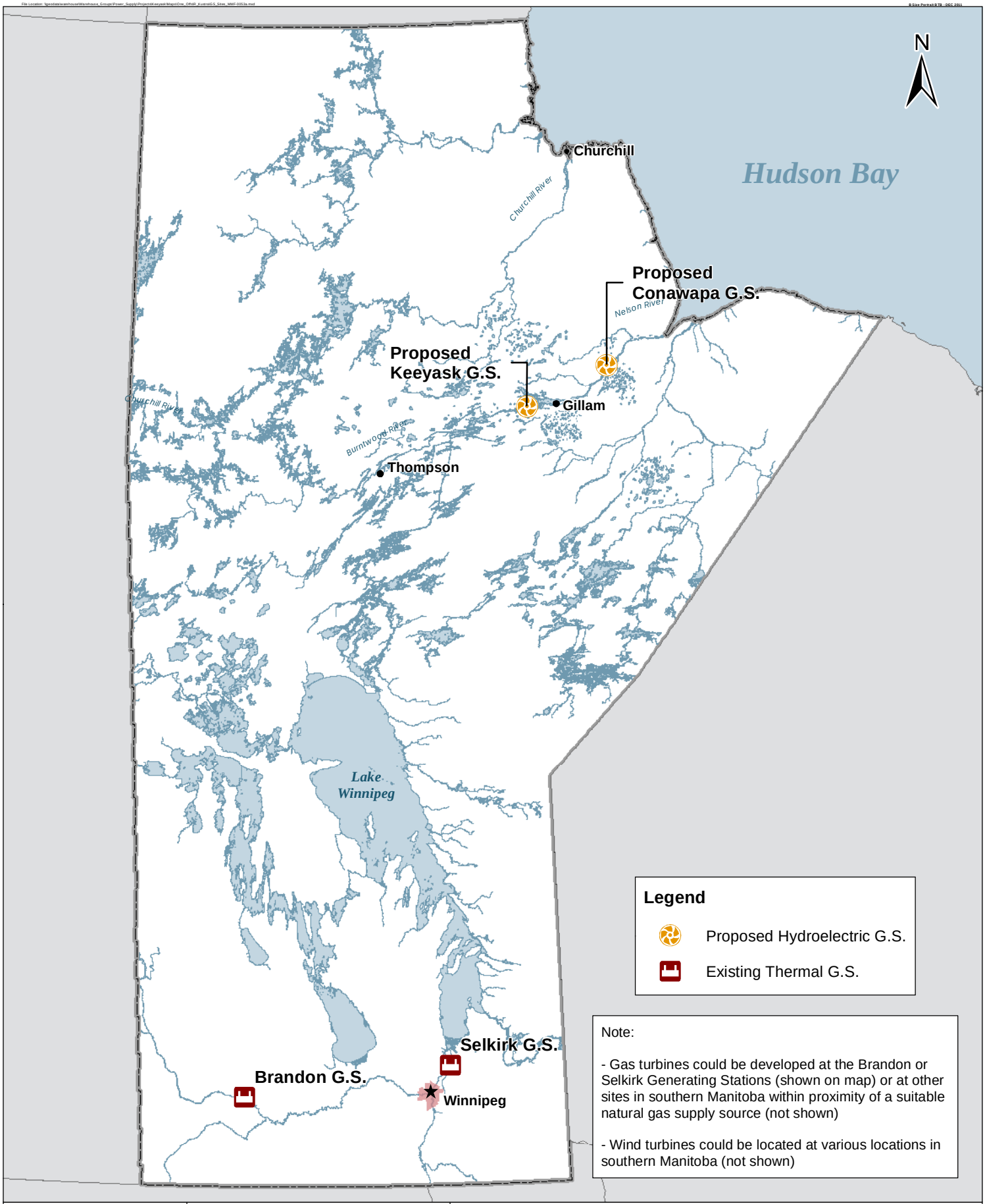
Environmental reviews require an assessment of cumulative effects. The Partnership outlined its methodology for the Keeyask cumulative effects assessment in section 5.4 of the Response to the EIS Guidelines, which is then applied in chapter 7 of that document. A cumulative effects assessment summary was filed in response to CEC-0020 of the first round of the CEC IRs. The cumulative effects assessments are within the scope and capacity of environmental reviews.

It not the intent of the NFAT review to duplicate the work of the environmental reviews. However, as per Order No. 119/13, the NFAT review will include "a summary of past

hydroelectric effects of upstream projects for the purposes of establishing a baseline in respect of the Board's assessment of macro environmental impacts." This summary of past effects is being filed as response to MMF/MH I-062.

Map of Future Projects

A map showing locations of Keeyask and Conawapa is included as an attachment to this response. Gas turbines could be located at many locations in southern Manitoba; Brandon and Selkirk, which have existing stations and would be candidates for future stations, are noted on the map. Wind turbines would be located in southern Manitoba, but their exact locations are not known at this time. DSM could be applied throughout the province.



Manitoba Hydro

DATA SOURCE: Manitoba Hydro; Government of Manitoba; Government of Canada

CREATED BY: Manitoba Hydro - Hydro Power Planning - GIS & Special Studies

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	02 MAY 12	17-OCT-13
0 40 80 Kilometres / 0 30 60 Miles	VERSION NO: 2.0	QA/QC: BPB/GDJ

Potential Generation Sites

Response to MMF - 0053a

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.1.2, 13.3.5, 13.3.7 (Table 13.9); Page No.: 13, 66; CEAA (Canadian Environmental Assessment Agency). 2013. Operational Policy Statement, Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012. Catalogue No.: En106-116/2013E-PDF. ISBN: 978-1-100-22263-9; Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling, and D. Stalker. 1999. Cumulative effects assessment practitioners guide. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency. Hull, Quebec. pp. 143; Lawrence, D.P. 2007. Impact significance determination - Pushing the boundaries. Environmental Impact Assessment Review 27: 770-788

PREAMBLE: With respect to the environment and a comparison of "residual biophysical" impacts between different resource options, the business case repeatedly states that "Aquatic and terrestrial impacts with hydro projects in preferred plan and plans with Keeyask; subject to detailed environmental hearings, residual effects and local external cost expected to be relatively small with initial design, extensive mitigation, monitoring, compensation and benefit-sharing arrangements" (Executive Summary, Section 13.3.7, Section 14.4). This is inadequate information to understand the environmental (biophysical) impacts and benefits of the Preferred Development Plan (PDP) and alternative development plans. Based on the Public Utilities Board (PUB) approved definition of macro-environment, the expectation was that environmental attributes would be measurable in a quantity-based approach that would describe “changes to air, land, water, flora and fauna” and that would facilitate comparison across development plans.

Section 13.3.5 provides an evaluation by environmental account. Manitoba Hydro indicates that "with respect to biophysical effects, the issue is whether there are residual impacts despite the mitigation and compensation built into the projects' plans and costs" (Section 13.1.2, p. 13). According to Hegmann et al. (1999), some insignificant effects may need to be elevated to significant when considering multiple cumulative impacts. This is echoed in the Canadian Environmental Assessment Agency’s (CEAA) operation policy statement on cumulative effects (2013) which states that a “cumulative environmental effects assessment should consider those VCs for which residual environmental effects are predicted after consideration of mitigation measures, regardless of whether those residual environmental effects are predicted to be significant”. The environmental account should consider the residual cumulative impacts, rather than a project-by-project account, since different development plans

contain multiple projects. Looking at project-specific residual impacts is not sufficient to understand the full environmental impact of any one development plan. Furthermore, according to the PUB approved definition of macro-environment, the "significance of these changes" to air, land, water, flora and fauna needs to be addressed. The significance of the environmental effects is dependent on the perspective of the different groups affected by the preferred and alternative development plans. According to Lawrence (2007), a determination of significance needs to be done collaboratively through effective public consultation.

QUESTION:

Describe how significance of cumulative residual effects is determined.

RESPONSE:

Environmental reviews for federal and provincial regulatory reviews require an assessment of cumulative effects, including a determination of the significance of adverse effects. This methodology is outlined in section 5.4 of the Keeyask Response to the EIS Guidelines and is applied in chapter 7 of that document. A cumulative effects assessment summary was filed in response to CEC-0020 of the first round of the CEC IRs.

Please also see the response to MMF/MH I-053a for a further discussion related to the characterization of "significance" in the context of the NFAT.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.2; Page No.: 28

PREAMBLE: The text notes that "the Preferred Development Plan would result in greater rate increases than the other plans in the short to medium term, ... However, the Preferred Development Plan would result in the lowest rates over the longer term."

QUESTION:

Provide the net present value of the rate increases of the Preferred Development Plan and compare this to the NPV of the rate increases of the other development plans considered in the rates analysis.

RESPONSE:

Please see the response to PUB/MH I-149a.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.4; Page No.: 35

PREAMBLE: Figure 13.5 and Figure 13.6 present employment during construction and operations for the various plans considered.

QUESTION:

Provide a table showing the person-years of annual employment for each of the alternative plans considered for the duration of the analysis (i.e. 2013 to 2047).

RESPONSE:

A table showing the total person-years of annual employment for each of the alternative plans, over the 35 year study period is provided in Appendix 9.1. The table provides both Direct Construction and Permanent O&M employment totals which are reported in units of person-years.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.4; Page No.: 39

PREAMBLE: The text notes that "With respect to the origin of the workers filling the jobs generated in the different plans, it is assumed that for the northern projects 70% of the construction positions would be filled by Manitobans…"

QUESTION:

Provide the definition of a "Manitoban" for the purposes of assigning employment benefits, including the criteria used to determine this definition.

RESPONSE:

'Manitoban' refers to residents of Manitoba.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.5; Page No.: 42

PREAMBLE: The text notes that "The development plan that Manitoba Hydro undertakes will affect GHG emissions both within and outside Manitoba." However, the NFAT provides no information as to why GHG emissions are relevant to the assessment of the plans, and what the implications of GHG emissions might be for Manitoba.

QUESTION:

Describe the current understanding of the potential "changes to air, land, water, flora and fauna, including the potential significance of these changes" within Manitoba that could result from increases of GHG emissions, including both beneficial and adverse changes based on available scientific information.

RESPONSE:

Manitoba Hydro studies the implications of climate change on its own operations but does not study the broader implications of climate change on other aspects of the provincial economy or the environment such as forestry, agriculture or individual species. Please see ***Appendix K – Manitoba Hydro Climate Change Report – Fiscal Year 2012-2013***. The climate change report documents Manitoba Hydro's efforts to understand the implications of climate change on its operations.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.5; Page No.: 42

PREAMBLE: The text notes that "The development plan that Manitoba Hydro undertakes will affect GHG emissions both within and outside Manitoba." However, the NFAT provides no information as to why GHG emissions are relevant to the assessment of the plans, and what the implications of GHG emissions might be for Manitoba.

QUESTION:

Based on the current understanding of the potential "changes to air, land, water, flora and fauna, including the potential significance of these changes" within Manitoba that could result from increases of GHG emissions, including both beneficial and adverse changes, on the balance of evidence is the effect of GHG emissions on the Manitoba enviroment beneficial or adverse?

RESPONSE:

Manitoba Hydro studies the implications of climate change on its own operations but does not study the broader implications of climate change on other aspects of the provincial economy or the environment such as forestry, agriculture or individual species.

Please see ***Appendix K – Manitoba Hydro Climate Change Report – Fiscal Year 2012-2013*.** The climate change report documents Manitoba Hydro's efforts to understand the implications of climate change. The studies, modeling and research being undertaken are part of a long-term complex process that is still evolving and is iterative in nature. As documented in the climate change report, preliminary conclusions based on climate change modeling and studies include increasing and earlier spring water availability and slightly decreased autumn water availability.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.5; Page No.: 44

QUESTION:

Provide the Environment Canada reference estimating the social cost of GHG emissions.

RESPONSE:

The reference can be found in footnote 14 of Chapter 13. The link is: http://gazette.gc.ca/rp-pr/p2/2013/2013-03-13/html/sor-dors24-eng.html#footnoteRef.82118 and a copy is attached.

ARCHIVED — Vol. 147, No. 6 — March 13, 2013

Registration

SOR/2013-24 February 22, 2013

CANADIAN ENVIRONMENTAL PROTECTION ACT, 1999

Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations

P.C. 2013-160 February 22, 2013

Whereas, pursuant to subsection 332(1) (see footnote a) of the *Canadian Environmental Protection Act, 1999* (see footnote b), the Minister of the Environment published in the *Canada Gazette*, Part I, on April 14, 2012, a copy of the proposed *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations*, substantially in the annexed form, and persons were given an opportunity to file comments with respect to the Regulations or to file a notice of objection requesting that a board of review be established and stating the reasons for the objection;

Therefore, His Excellency the Governor General in Council, on the recommendation of the Minister of the Environment, pursuant to sections 160 and 162 of the *Canadian Environmental Protection Act, 1999* (see footnote c), makes the annexed *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations*.

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HEAVY-DUTY VEHICLE AND ENGINE GREENHOUSE GAS EMISSION REGULATIONS

INTERPRETATION

Definitions

1. (1) The following definitions apply in these Regulations.

"Act"
« *Loi* »

"Act" means the *Canadian Environmental Protection Act, 1999*.

"adjusted loaded vehicle weight"
« *poids ajusté du véhicule chargé* »

"adjusted loaded vehicle weight" means the numerical average of the curb weight and the GVWR, and in the case of vehicles referred to in subsection 26(6) with an adjusted loaded vehicle weight of more than 6 350 kg (14,000 pounds), the value corresponding to the nearest 225 kg (500 pounds) increment.

"aftertreatment device"
« *dispositif de traitement postcombustion* »

"aftertreatment device" means a catalytic converter, particulate filter or any other system or component mounted downstream of the exhaust valve or exhaust port that is designed to decrease engine exhaust emissions before they are released into the environment.

"A to B testing"
« *essais A à B* »

"A to B testing" means testing performed in pairs to allow comparison of vehicle A to vehicle B or engine A to engine B, as the case may be.

"auxiliary emission control device"
« *dispositif antipollution auxiliaire* »

"auxiliary emission control device" means any element of design that senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying or deactivating the operation of any part of an emission control system.

"averaging set"
« *groupe de calcul de points* »

"averaging set" means, for the purpose of a company's participation in the CO_2 emission credit system set out in sections 34 to 47, any of the following groups of fleets of vehicles or engines:

(*a*) Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle";

(*b*) Class 2B, Class 3, Class 4 and Class 5 vocational vehicles and incomplete vocational vehicles;

(*c*) Class 6 and Class 7 heavy-duty vehicles and heavy-duty incomplete vehicles;

(*d*) Class 8 heavy-duty vehicles and heavy-duty incomplete vehicles;

(*e*) heavy-duty engines that are spark-ignition engines;

(*f*) light heavy-duty engines that are compression-ignition engines;

(*g*) medium heavy-duty engines that are compression-ignition engines; or

(*h*) heavy heavy-duty engines that are compression-ignition engines.

"basic vehicle frontal area"
« *surface frontale du véhicule de base* »

"basic vehicle frontal area" means the area enclosed by the geometric projection of the basic vehicle — including tires but not mirrors or air deflectors — along the longitudinal axis of the vehicle onto a plane perpendicular to that axis.

"cab-complete vehicle"
« *véhicule à cabine complète* »

"cab-complete vehicle" means a heavy-duty incomplete vehicle with either a completed occupant compartment that requires only the addition of a cargo-carrying surface, work-performing equipment or load-bearing component to perform its intended functions or with the back of the cab cut out for the intended installation of a structure that permits access from the driver's area to the back of the vehicle.

"calibration"
« *calibrages* »

"calibration" means the set of specifications and tolerances specific to a particular design, version or application of a component or assembly that describes its operation over its working range.

"CFR"
« *CFR* »

"CFR" means the *Code of Federal Regulations* of the United States, as amended from time to time.

"CH_4"
« *CH_4* »

"CH_4" means methane.

"Class 2B"
« *classe 2B* »

"Class 2B" means a class of heavy-duty vehicle that has a GVWR of more than 3 856 kg (8,500 pounds) but not more than 4 536 kg (10,000 pounds).

"Class 3"
« *classe 3* »

"Class 3" means a class of heavy-duty vehicle that has a GVWR of more than 4 536 kg (10,000 pounds) but not more than 6 350 kg (14,000 pounds).

"Class 4"
« *classe 4* »

"Class 4" means a class of heavy-duty vehicle that has a GVWR of more than 6 350 kg (14,000 pounds) but not more than 7 257 kg (16,000 pounds).

"Class 5"
« *classe 5* »

"Class 5" means a class of heavy-duty vehicle that has a GVWR of more than 7 257 kg (16,000 pounds) but not more than 8 845 kg (19,500 pounds).

"Class 6"
« *classe 6* »

"Class 6" means a class of heavy-duty vehicle that has a GVWR of more than 8 845 kg (19,500 pounds) but not more than 11 793 kg (26,000 pounds).

"Class 7"
« *classe 7* »

"Class 7" means a class of heavy-duty vehicle that has a GVWR of more than 11 793 kg (26,000 pounds) but not more than 14 969 kg (33,000 pounds).

"Class 8"
« *classe 8* »

"Class 8" means a class of heavy-duty vehicle that has a GVWR of more than 14 969 kg (33,000 pounds).

"compression-ignition engine"
« *moteur à allumage par compression* »

"compression-ignition engine" means an engine that operates as a reciprocating internal combustion engine, but does not include an engine that operates under characteristics significantly similar to the theoretical Otto combustion cycle or an engine that uses a spark plug or other sparking device.

"CO_2"
« *CO_2* »

"CO_2" means carbon dioxide.

"CO_2 family certification level"
« *niveau de certification de la famille applicable au CO_2* »

"CO_2 family certification level" means the maximum CO_2 emission level that is determined by a company for heavy-duty engines.

"curb weight"
« *masse en état de marche* »

"curb weight" means the actual or manufacturer's estimated weight of a heavy-duty vehicle in operational status with all standard equipment and includes the weight of fuel at nominal tank capacity and the weight of optional equipment.

"day cab"
« *cabine de jour* »

"day cab" means a tractor cab that is not a sleeper cab.

"deteriorated emission level"
« *niveau d'émissions détérioré* »

"deteriorated emission level" means the emission level that results from applying the applicable deterioration factor to the emission test results for a vehicle or engine.

"deterioration factor"
« *facteur de détérioration* »

"deterioration factor" means the relationship between the emission level measured at the end of useful life or at the point where it is the highest during the useful life and the undeteriorated emission level measured at the point corresponding to a maximum of 6 437 km (4,000 miles) of operation in relation to a vehicle that has stabilized emissions and a maximum of 125 hours of operation in relation to an engine that has stabilized emissions, determined in accordance with

(*a*) section 1823(m) of Title 40, chapter I, subchapter C, part 86, subpart S, of the CFR, and section 104(d)(5) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR, in the case of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle";

(*b*) section 241(c) of Title 40, chapter I, subchapter U, part 1037, subpart C, of the CFR, in the case of vocational vehicles, incomplete vocational vehicles, tractors and incomplete tractors; and

(*c*) section 150(g) of Title 40, chapter I, subchapter U, part 1036, subpart B, of the CFR, and section 241(c) of Title 40, chapter I, subchapter U, part 1036, subpart C, of the CFR, in the case of heavy-duty engines.

"electric vehicle"
« *véhicule électrique* »

"electric vehicle" means a heavy-duty vehicle that is not equipped with an internal combustion engine and is powered solely by an external source of electricity or solar power or a combination of both electricity and solar power.

"element of design"
« *élément de conception* »

"element of design" means, in respect of a vehicle or engine,

(*a*) any control system, including computer software, electronic control systems and computer logic;

(*b*) any control system calibrations;

(*c*) the results of systems interaction; or

(*d*) any hardware items.

"emission control system"
« *système antipollution* »

"emission control system" means any emission control device, auxiliary emission control device, engine modification and strategy, and other element of design used to reduce exhaust emissions from a vehicle or engine.

"engine configuration"
« *configuration de moteur* »

"engine configuration" means a unique combination of heavy-duty engine hardware and calibration that has an effect on measured emissions.

"engine family"
« *famille de moteurs* »

"engine family" means the classification unit of a company's product line of heavy-duty engines for the purposes of testing selection, determined in accordance with section 230 of Title 40, chapter I, subchapter U, part 1036, subpart C, of the CFR.

"EPA"
« *EPA* »

"EPA" means the United States Environmental Protection Agency.

"EPA certificate"
« *certificat de l'EPA* »

"EPA certificate" means a certificate of conformity with U.S. federal standards issued by the EPA.

"family emission limit"
« *limite d'émissions de la famille* »

"family emission limit" means, as the case may be,

(*a*) the value corresponding to the product of 1.03 multiplied by the CO_2 family certification level in the case of a heavy-duty engine's CO_2 emissions; or

(*b*) the maximum emission level determined by a company, in the case of

(i) a heavy-duty vehicle's CO_2 emissions, and,

(ii) a heavy-duty vehicle and heavy-duty engine's N_2O or CH_4 emissions.

"FTP-based city test"
« *essai en ville* »

"FTP-based city test" means the Federal Test Procedure set out in section 127 of Title 40, chapter I, subchapter C, part 86, subpart B, of the CFR, to comply with the FTP emission standards.

"GAWR"
« *PNBE* »

"GAWR" means the gross axle weight rating that is specified by a manufacturer as the load-carrying capacity of a single axle system, as measured at the tire-ground interface.

"GCWR"
« *PNBC* »

"GCWR" means the gross combination weight rating that is specified by a manufacturer as the maximum design loaded weight of a vehicle and trailer.

"GEM computer simulation model"
« *modèle de simulation informatique GEM* »

"GEM computer simulation model" means the EPA's GEM computer simulation model referred to in section 520 of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR.

"GVWR"
« *PNBV* »

"GVWR" means the gross vehicle weight rating that is specified by a manufacturer as the maximum design loaded weight of a vehicle.

"heavy-duty completed vehicle"
« *véhicule lourd complet* »

"heavy-duty completed vehicle" means a heavy-duty vehicle that has a cargo-carrying surface, work-performing equipment or primary load-carrying device or that is capable of pulling a trailer.

"heavy-duty engine"
« *moteur de véhicule lourd* »

"heavy-duty engine" means an engine that is designed to be used for motive power in a vocational vehicle or a tractor.

"heavy-duty incomplete vehicle"
« *véhicule lourd incomplet* »

"heavy-duty incomplete vehicle" means a heavy-duty vehicle that is manufactured by assembling components — none of which, taken separately, constitutes a heavy-duty incomplete vehicle — and that consists of, at a minimum, a chassis structure, a powertrain and wheels in the state in which all of those components are to be part of the heavy-duty completed vehicle, but that requires further manufacturing operations to become so.

"heavy-duty vehicle"
« *véhicule lourd* »

"heavy-duty vehicle" means an on-road vehicle that has a GVWR of more than 3 856 kg (8,500 pounds), a curb weight of more than 2 722 kg (6,000 pounds) or a basic vehicle frontal area in excess of 4.2 m^2 (45 square feet), but does not include a medium-duty passenger vehicle as defined in subsection 1(1) of the *On-Road Vehicle and Engine Emission Regulations* or a vehicle regulated under the *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*.

"heavy heavy-duty engine"
« *gros moteur de véhicule lourd* »

"heavy heavy-duty engine" means a heavy-duty engine that has cylinder liners designed for multiple rebuilds and is designed to be used in Class 8 heavy-duty vehicles.

"heavy heavy-duty vehicle"
« *gros véhicule lourd* »

"heavy heavy-duty vehicle" means a Class 8 heavy-duty vehicle.

"HFET-based highway test"
« *essai sur route* »

"HFET-based highway test" means the Highway Fuel Economy Test Procedure referred to in subpart B of Title 40, chapter I, subchapter Q, part 600, of the CFR.

"high-roof"
« *toit élevé* »

"high-roof", in relation to a tractor, means having a roof height of 376 cm (148 inches) or more.

"hybrid engine" or "hybrid powertrain"
« *moteur hybride* » *ou*
« *groupe motopropulseur hybride* »

"hybrid engine" or "hybrid powertrain" means an engine or a powertrain that is equipped with energy storage features — other than a conventional battery system or conventional flywheel — such as supplemental electric batteries and hydraulic accumulators.

"hybrid vehicle"
« *véhicule hybride* »

"hybrid vehicle" means a heavy-duty vehicle that is equipped with energy storage features — other than a conventional battery system or conventional flywheel — such as supplemental electric batteries and hydraulic accumulators, in addition to an internal combustion engine or other engine that uses fuel.

"incomplete tractor"
« *tracteur routier incomplet* »

"incomplete tractor" means a heavy-duty incomplete vehicle that is designed to become a tractor on completion of manufacturing operations.

"incomplete vocational vehicle"
« *véhicule spécialisé incomplet* »

"incomplete vocational vehicle" means a heavy-duty incomplete vehicle that is designed to become a vocational vehicle on completion of manufacturing operations.

"innovative technology"

« *technologie innovatrice* »

"innovative technology" means a greenhouse gas emission reduction technology for which the total emission reduction attributable to it cannot be measured by either GEM computer simulation modelling or the test procedures specified under these Regulations.

"light heavy-duty engine"
« *petit moteur de véhicule lourd* »

"light heavy-duty engine" means a heavy-duty engine that is designed to be used in Class 2B, Class 3, Class 4 or Class 5 heavy-duty vehicles.

"light heavy-duty vehicle"
« *petit véhicule lourd* »

"light heavy-duty vehicle" means a Class 2B, Class 3, Class 4 or Class 5 heavy-duty vehicle.

"low-roof"
« *toit bas* »

"low-roof", in relation to a tractor, means having a roof height of 305 cm (120 inches) or less.

"medium heavy-duty engine"
« *moteur moyen de véhicule lourd* »

"medium heavy-duty engine" means a heavy-duty engine that is designed to be used in Class 6 and Class 7 heavy-duty vehicles.

"medium heavy-duty vehicle"
« *véhicule mi-lourd* »

"medium heavy-duty vehicle" means a Class 6 or Class 7 heavy-duty vehicle.

"mid-roof"
« *toit moyen* »

"mid-roof", in relation to a tractor, means having a roof height of more than 305 cm (120 inches) but less than 376 cm (148 inches).

"model year"
« *année de modèle* »

"model year" means the year, determined in accordance with section 4, that is used by a manufacturer to designate a model of vehicle or engine.

"nominal tank capacity"
« *capacité nominale du réservoir à carburant* »

"nominal tank capacity" means the fuel tank's volume that is specified by a manufacturer to the nearest three eighths of a litre (one tenth of a U.S. gallon).

"N_2O"
« N_2O »

"N_2O" means nitrous oxide.

"on-road vehicle"
« *véhicule routier* »

"on-road vehicle" means a self-propelled vehicle that is designed for or capable of transporting persons, property, material or permanently or temporarily affixed apparatus on a highway, but does not mean a vehicle that

(*a*) cannot exceed a speed of 40 km/h (25 miles per hour) on a level paved surface;

(*b*) lacks features customarily associated with safe and practical highway use such as a reverse gear, a differential or safety features that are required by federal or provincial laws;

(*c*) exhibits features that render its use on a highway unsafe, impractical or highly unlikely, such as tracked road contact means or inordinate size; or

(*d*) is a military vehicle that is designed for use in combat or combat support.

"power take-off"
« *prise de mouvement* »

"power take-off" means a secondary engine shaft or other system of a vehicle that provides substantial auxiliary power for purposes unrelated to vehicle propulsion or the functioning of customary vehicle accessories such as air conditioning, power steering and basic accessories.

"sleeper cab"
« *cabine couchette* »

"sleeper cab" means a tractor cab that has a compartment located behind the driver's seat that is designed to be used as a sleeping accommodation and that is accessible either from the driver's compartment or from outside the vehicle.

"spark-ignition engine"
« *moteur à allumage commandé* »

"spark-ignition engine" means an engine that operates under characteristics significantly similar to the theoretical Otto combustion cycle and uses a spark plug or other sparking device.

"static loaded radius"
« *rayon sous charge statique* »

"static loaded radius" means the distance between the level surface where the vehicle is located and the axle centre measured at curb weight when the vehicle is stationary, with the wheels parallel to the vehicle's longitudinal centre line and the tires inflated to the manufacturer's recommended cold tire inflation pressure.

"steady state duty cycle"
« *cycle de service permanent* »

"steady state duty cycle" means the test cycle that is referred to in section 1362 of Title 40, chapter I, subchapter C, part 86, subpart N, of the CFR.

"test weight"
« *masse à l'essai* »

"test weight" means the vehicle weight that is used or represented during testing.

"tire rolling resistance level"
« *niveau de résistance au roulement du pneu* »

"tire rolling resistance level" means the rolling resistance of a tire configuration, expressed in kilograms per tonne.

"tractor"
« *tracteur routier* »

"tractor" means a Class 7 or Class 8 heavy-duty vehicle that is manufactured primarily for pulling a trailer but not for carrying cargo other than cargo in the trailer.

"transient duty cycle"
« *cycle de service transitoire* »

"transient duty cycle" means the test cycle that is referred to in section 1333 of Title 40, chapter I, subchapter C, part 86, subpart N, of the CFR.

"vehicle configuration"
« *configuration de véhicule* »

"vehicle configuration" means, in respect of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, a configuration as defined in section 104(d)(12)(i) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR.

"vehicle service class"
« *classe de service d'un véhicule* »

"vehicle service class" means any one of the following groups:

(*a*) light heavy-duty vehicles;

(*b*) medium heavy-duty vehicles; or

(*c*) heavy heavy-duty vehicles.

"vehicle subconfiguration"
« *sous-configuration de véhicule* »

"vehicle subconfiguration" means, within a vehicle configuration of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, a unique combination of equivalent test weight and road load horsepower, and any other operational characteristics or parameters that may significantly affect CO_2 emissions within the vehicle configuration.

"vocational tractor"
« *tracteur routier spécialisé* »

"vocational tractor" means any of the following tractors that are not designed primarily to operate at high and constant speeds such as on highways, or that would not benefit from efficiency improvements designed for line-haul tractors:

(*a*) a low-roof tractor that is designed for local pickup and delivery;

(*b*) a tractor that is designed for both on-road and off-road use, such as a tractor with a reinforced frame and increased ground clearance; or

(*c*) a tractor that has a GCWR of more than 54 431 kg (120,000 pounds).

"vocational vehicle"
« *véhicule spécialisé* »

"vocational vehicle" means any of the following:

(*a*) a Class 4, Class 5 or Class 6 heavy-duty vehicle;

(*b*) a Class 7 or Class 8 heavy-duty vehicle that is not a tractor;

(*c*) a vocational tractor;

(*d*) a heavy-duty incomplete vehicle that is not a cab-complete vehicle and is equipped with an engine conforming to the alternative standard referred to in section 25; or

(*e*) a Class 2B or Class 3 heavy-duty vehicle referred to in section 104(f) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR.

CFR

(2) Standards that are incorporated by reference in these Regulations from the CFR are those expressly set out in the CFR and must be read as excluding

(*a*) references to the EPA or the Administrator of the EPA exercising discretion in any way;

(*b*) references to the Secretary of Transportation exercising discretion in any way;

(*c*) alternative standards related to fleet averages, other averages, emission credits, small volume manufacturers or financial hardship; and

(*d*) standards or evidence of conformity of any authority other than the EPA.

Interpretation

(3) For the purposes of subsection (2), a reference in the CFR to "carbon-related exhaust emissions" and "CREE" must be read as "CO_2 emissions".

Rounding

(4) The calculations and measurements in these Regulations must be rounded in accordance with section 20(e) of Title 40, chapter I, subchapter U, part 1065, subpart A, of the CFR, unless otherwise provided in

(*a*) these Regulations;

(*b*) part 1037 of Title 40, chapter I, subchapter U, of the CFR, for the applicable standards and test procedures in the case of heavy-duty vehicles; or

(*c*) part 1036 of Title 40, chapter I, subchapter U, of the CFR, for the applicable standards and test procedures in the case of heavy-duty engines.

Useful life

(5) "Useful life", unless otherwise provided in these Regulations, refers to the period of time or use in respect of which an emission standard applies to, as the case may be,

(*a*) Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection (1) — namely, 11 years or 193 121 km (120,000 miles), whichever occurs first;

(*b*) Class 2B, Class 3, Class 4 and Class 5 vocational vehicles and incomplete vocational vehicles, heavy-duty engines that are sparkignition engines and light heavy-duty engines that are compression-ignition engines, namely, 10 years or 177 027 km (110,000 miles), whichever occurs first;

(*c*) Class 6 and Class 7 vocational vehicles and incomplete vocational vehicles, Class 7 tractors and incomplete tractors and medium heavy-duty engines that are compression-ignition engines, namely, 10 years or 297 728 km (185,000 miles), whichever occurs first;

(*d*) Class 8 vocational vehicles, incomplete vocational vehicles, tractors and incomplete tractors, namely, 10 years or 700 064 km (435,000 miles), whichever occurs first; or

(*e*) heavy heavy-duty engines that are compression-ignition engines, namely, as set out in section 2 of Title 40, chapter I, subchapter C, part 86, subpart A, of the CFR, for emissions of oxides of nitrogen (NO_X), hydrocarbon (HC), particulate matter (PM) and carbon monoxide (CO).

Roof height — tractors

(6) Subject to subsections (7) and (8), "roof height" refers to the maximum height of a tractor, rounded to the nearest inch, excluding small accessories such as exhaust pipes and antennas, but including large accessories such as roof fairings, and measured with tires inflated to the manufacturer's recommended cold tire inflation pressure and without occupants or cargo onboard.

Roof height measurement — tractors

(7) The roof height of a tractor must be measured with a static loaded radius equal to the arithmetic mean of the largest and smallest static loaded radius of the tires that are recommended for the tractor by the manufacturer.

Adjustable roof fairing — tractors

(8) In the case of a tractor equipped with an adjustable roof fairing, the roof height must be measured with the fairing in its lowest setting.

Family emission limit

(9) A family emission limit and a CO_2 family certification level must be expressed to the same number of decimal places as the emission standard they replace.

Spark-ignition engines

(10) For the purposes of these Regulations, a spark-ignition engine that is regulated as a "diesel engine" under part 86 of Title 40, chapter I, subchapter C, of the CFR, must conform to the standards, test procedures and calculation methods applicable to a compression-ignition engine.

Compression-ignition engines

(11) For the purposes of these Regulations, a compression-ignition engine that is regulated as an "Otto-cycle engine" under part 86 of Title 40, chapter I, subchapter C, of the CFR, must conform to the standards, test procedures and calculation methods applicable to a spark-ignition engine.

PURPOSE

Purpose

2. The purpose of these Regulations is to reduce greenhouse gas emissions from heavy-duty vehicles and engines by establishing emission standards and test procedures that are aligned with the federal requirements of the United States.

BACKGROUND

Background

3. These Regulations set out

(*a*) prescribed classes of vehicles and engines for the purposes of section 149 of the Act;

(*b*) requirements respecting the conformity of heavy-duty vehicles and heavy-duty engines with greenhouse gas emission standards for the purposes of section 153 of the Act;

(*c*) requirements respecting the conformity of fleets of heavy-duty vehicles and heavy-duty engines to greenhouse gas emission standards and other requirements for carrying out the purposes of Division 5 of Part 7 of the Act; and

(*d*) a credit system for the purposes of section 162 of the Act.

MODEL YEAR

Model year

4. (1) A year that is used by a manufacturer as a model year must,

(*a*) if the period of production of a model of heavy-duty vehicle or heavy-duty engine does not include January 1 of a calendar year, correspond to the calendar year during which the period of production falls; or

(*b*) if the period of production of a model of heavy-duty vehicle or heavy-duty engine includes January 1 of a calendar year, correspond to that calendar year.

Period of production

(2) The period of production of a model of heavy-duty vehicle or heavy-duty engine must include only one January 1.

PRESCRIBED CLASSES OF VEHICLES AND ENGINES

Heavy-duty vehicles

5. (1) The following classes of vehicles are prescribed for the purposes of the definition "vehicle" in section 149 of the Act:

(*a*) Class 2B and Class 3 heavy-duty vehicles;

(*b*) vocational vehicles;

(*c*) tractors; and

(*d*) heavy-duty incomplete vehicles.

Heavy-duty engines

(2) Heavy-duty engines are prescribed for the purposes of the definition "engine" in section 149 of the Act.

Exclusion

(3) The prescribed classes of vehicles and engines referred to in subsections (1) and (2) do not include heavy-duty vehicles or heavy-duty engines that are to be exported and that are accompanied by written evidence establishing that they will not be sold for use or used in Canada.

Transportation within Canada — heavy-duty vehicles

(4) For the purposes of section 152 of the Act, the prescribed vehicles are the vehicles referred to in subsection (1) for which the main assembly is completed in Canada, other than a vehicle that will be used in Canada solely for purposes of exhibition, demonstration, evaluation or testing.

Transportation within Canada — heavy-duty engines

(5) For the purposes of section 152 of the Act, the prescribed engines are the engines referred to in

subsection (2) that are manufactured in Canada, other than

(*a*) an engine that will be used in Canada solely for purposes of exhibition, demonstration, evaluation or testing;

(*b*) an engine that is to be installed in a heavy-duty vehicle before sale to the vehicle's first retail purchaser; and

(*c*) an engine that is to be installed as a replacement engine in a heavy-duty vehicle that has a national emissions mark applied to it, if the replacement engine is

(i) of the same model year as the original engine, and

(ii) identical to or better than the original engine with respect to emissions.

NATIONAL EMISSIONS MARK

Application

6. (1) A company that intends to apply a national emissions mark to a vehicle or engine for the purposes of these Regulations must apply to the Minister to obtain an authorization in accordance with paragraphs 7(2)(*a*) to (*c*) and (*e*) of the *On-Road Vehicle and Engine Emission Regulations* and the application must include the street address where the records referred to in section 59 of these Regulations will be maintained.

Exception

(2) Subsection (1) does not apply to a company that, on the day on which these Regulations come into force, is authorized to apply the national emissions mark to a vehicle or engine under the *On-Road Vehicle and Engine Emission Regulations*.

National emissions mark

7. A company that applies a national emissions mark to a vehicle or engine must comply with section 8 of the *On-Road Vehicle and Engine Emission Regulations*.

LABELLING

Non EPA-certified engines

8. (1) Heavy-duty engines and the engines referred to in section 25 that are imported or manufactured in Canada — other than EPA-certified engines — must bear a compliance label that sets out the following information:

(*a*) subject to subsection (2), the statement "THIS ENGINE CONFORMS TO ALL APPLICABLE STANDARDS PRESCRIBED BY THE CANADIAN HEAVY-DUTY VEHICLE AND ENGINE GREENHOUSE GAS EMISSION REGULATIONS IN EFFECT FOR MODEL YEAR [MODEL YEAR] / CE MOTEUR EST CONFORME À TOUTES LES NORMES QUI LUI SONT APPLICABLES EN VERTU DU RÈGLEMENT SUR LES ÉMISSIONS DE GAZ À EFFET DE SERRE DES VÉHICULES LOURDS ET DE LEURS MOTEURS DU CANADA EN VIGUEUR POUR L'ANNÉE DE MODÈLE [ANNÉE DE MODÈLE]";

(*b*) the name of the engine's manufacturer;

(*c*) the engine's model year if a national emissions mark is applied to the engine;

(*d*) subject to subsection (3), the engine's date of manufacture;

(*e*) subject to subsection (3), the engine's unique identification number;

(*f*) the model designations;

(*g*) the engine displacement;

(*h*) the identification of the emission control system;

(*i*) the engine family or the test group, as the case may be;

(*j*) the limits on the types of use for the engine to ensure that the emission standards set out in these Regulations are complied with;

(*k*) the engine specifications and adjustments recommended by the engine's manufacturer;

(*l*) in the case of a spark-ignition engine, the valve lash, idle speed, ignition timing and idle

air-fuel mixture setting procedure and value; and

(*m*) in the case of a compression-ignition engine, the engine power specified by the manufacturer and expressed in HP, the RPM at the specified horsepower, the fuel rate at the specified horsepower expressed in mm^3 per stroke, the valve lash, idle speed and initial injection timing.

National emissions mark

(2) Paragraph (1)(*a*) does not apply when a national emissions mark is applied to the engine.

Date of manufacture and unique identification number

(3) The engine's date of manufacture referred to in paragraph (1)(*d*) and unique identification number referred to in paragraph (1)(*e*) may, instead of being set out on the label, be permanently affixed, engraved or stamped on the engine.

Engines referred to in section 25

(4) In the case of spark-ignition engines referred to in section 25, the label referred to in subsection (1) must also set out one of the following statements, whichever applies:

(*a*) a statement in both official languages that the engine conforms to the alternative greenhouse gas emission standards for engines of Class 2B and Class 3 heavy-duty vehicles; or

(*b*) the statement referred to in section 150(m)(4) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR.

Engines referred to in subsection 31(1)

(5) In the case of compression-ignition engines referred to in subsection 31(1), the label referred to in subsection (1) must also set out one of the following statements, whichever applies:

(*a*) a statement in both official languages that the engine conforms to the alternative CO_2 emission standard based on model year 2011 compression-ignition engines; or

(*b*) the statement referred to in section 620(d) of Title 40, chapter I, subchapter U, part 1036, subpart G, of the CFR.

Non EPA-certified vehicles

9. (1) Heavy-duty vehicles that are imported or manufactured in Canada — other than EPA-certified heavy-duty vehicles — must bear a compliance label that sets out the following information:

(*a*) subject to subsection (2), the statement "THIS VEHICLE CONFORMS TO ALL APPLICABLE STANDARDS PRESCRIBED BY THE CANADIAN HEAVY-DUTY VEHICLE AND ENGINE GREENHOUSE GAS EMISSION REGULATIONS IN EFFECT FOR MODEL YEAR [MODEL YEAR] / CE VÉHICULE EST CONFORME À TOUTES LES NORMES QUI LUI SONT APPLICABLES EN VERTU DU RÈGLEMENT SUR LES ÉMISSIONS DE GAZ À EFFET DE SERRE DES VÉHICULES LOURDS ET DE LEURS MOTEURS DU CANADA EN VIGUEUR POUR L'ANNÉE DE MODÈLE [ANNÉE DE MODÈLE]";

(*b*) the name of the vehicle's manufacturer;

(*c*) the vehicle's model year if a national emissions mark is applied to the vehicle;

(*d*) subject to subsection (3), the vehicle's date of manufacture;

(*e*) the type of vehicle, in both official languages, referred to in subparagraphs 18(3)(*a*)(i) to (xiii);

(*f*) the vehicle family or the test group, as the case may be;

(*g*) the identification of the emission control system;

(*h*) in the case of a vocational vehicle referred to in subsection 26(3), a statement, in both official languages, that the vehicle is exempted under that subsection;

(*i*) in the case of a vocational tractor, a statement, in both official languages, that the vehicle is a vocational tractor;

(*j*) in the case of a vocational vehicle or a tractor that is exempted under section 17, a statement to that effect, in both official languages; and

(*k*) in the case of a Class 2B or Class 3 heavy-duty vehicle or cab-complete vehicle — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — the engine displacement and the CO_2 emission value determined by variable A in accordance with subsection 23(1) for that vehicle configuration and if applicable, the N_2O and CH_4 family emission limits.

National emissions mark

(2) Paragraph (1)(*a*) does not apply when a national emissions mark is applied to the vehicle or when the statement referred to in paragraph (1)(*h*) or (*j*) is set out on the label.

Date of manufacture

(3) The date of manufacture referred to in paragraph (1)(*d*) may, instead of being set out on the label, be permanently affixed, engraved or stamped on the vehicle.

Requirements

10. All the labels applied to a vehicle or engine, as the case may be, in accordance with sections 8 and 9, must

(*a*) be applied to a conspicuous and readily accessible location;

(*b*) be permanently attached to the vehicle and, in the case of an engine, be permanently attached to an engine part that is necessary for normal engine operation and does not normally require replacement during the engine's useful life;

(*c*) be resistant to or protected against any weather condition;

(*d*) have lettering that is

(i) clear and indelible,

(ii) indented, embossed or in a colour that contrasts with the background colour of the label, and

(iii) in block capitals and numerals that are not less than 2 mm in height; and

(*e*) have units that are identified by the appropriate name or symbol.

VEHICLES MANUFACTURED IN STAGES

Requirements

11. (1) If a company alters a heavy-duty vehicle or heavy-duty incomplete vehicle that was in conformity to these Regulations in such a manner that its stated type of vehicle referred to in subparagraphs 18(3)(*a*)(i) to (xiii) is no longer accurate, or if the company alters the emission control system, alters an engine configuration in a way that might affect emissions, or replaces any of the components of the vehicle that might alter the value of a parameter used in the GEM computer simulation model, the company must

(*a*) ensure that the U.S. emission control information label referred to in paragraph 53(*d*), the compliance label referred to in section 9 and the national emissions mark, as the case may be, remain applied to the altered vehicle;

(*b*) in respect of the work carried out by the company to alter the vehicle, ensure that the vehicle conforms to all applicable standards;

(*c*) subject to subsection (2), apply to the altered vehicle an additional label that sets out the following information:

(i) the words "THIS VEHICLE WAS ALTERED BY / CE VÉHICULE A ÉTÉ MODIFIÉ PAR", followed by the name of the company that altered the vehicle,

(ii) the month and year during which the alteration was made to the vehicle,

(iii) the national emissions mark referred to in section 6, and

(iv) the type of vehicle referred to in subparagraphs 18(3)(*a*)(i) to (xiii), if it differs from the type set out on the compliance label referred to in section 9 or if the regulatory subcategory that is set out on the U.S. emission control information label is changed, as the case may be; and

(*d*) obtain and produce the evidence of conformity referred to in section 54 for the altered vehicle in a form and manner that is satisfactory to the Minister before the vehicle leaves its possession or control.

National emissions mark

(2) The national emissions mark referred to in subparagraph (1)(*c*)(iii) may also be displayed on a label applied to the vehicle immediately beside the U.S. emission control information label or the compliance label referred to in section 9, as the case may be.

Non-participation in credit system

(3) A company that alters a vehicle in accordance with this section must not participate in the CO_2 emission credit system set out in sections 34 to 47 with respect to that altered vehicle.

GREENHOUSE GAS EMISSION STANDARDS

GENERAL

Heavy-duty Vehicles of the 2014 Model Year

January 1, 2014

12. (1) Subject to subsection (2), these Regulations apply to vehicles for which the main assembly is completed on or after January 1, 2014.

Election

(2) A company may elect to comply with these Regulations with respect to its heavy-duty vehicles of the 2014 model year for which the main assembly is completed before January 1, 2014 for the purpose of participation in the CO_2 emission credit system set out in sections 34 to 47.

Heavy-duty Vehicles and Engines Covered by an EPA Certificate

Conforming to EPA certificate

13. (1) Subject to subsections (4) and (8), a heavy-duty vehicle or heavy-duty engine of a given model year that is covered by an EPA certificate and that is sold concurrently in Canada and the United States must conform to the certification and in-use standards referred to in the EPA certificate instead of to the following standards, whichever apply:

(*a*) sections 14 to 16 and subsection 20(1) for Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle" in subsection 1(1);

(*b*) sections 14 and 15 and subsection 26(1) for vocational vehicles and incomplete vocational vehicles;

(*c*) sections 14 to 16 and subsection 27(1) for tractors and incomplete tractors; and

(*d*) sections 14 and 15 and subsection 29(1) and, as the case may be, section 30 or subsection 31(1) or (2) for heavy-duty engines.

Exceeding N_2O or CH_4 emission standard

(2) For greater certainty, a company that manufactures or imports a Class 2B or Class 3 heavy-duty vehicle or cab-complete vehicle — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — or a heavy-duty engine that is covered by an EPA certificate and that conforms to a N_2O or CH_4 family emission limit that exceeds the N_2O or CH_4 emission standard applicable to the model year of that vehicle or engine under these Regulations, must conform to subsections 20(3) to (6)

or 29(4) to (7), as the case may be.

Comply with CO_2 emission credit system

(3) Despite subsection (1), when a company participates in the CO_2 emission credit system set out in sections 34 to 47 for its heavy-duty vehicles or heavy-duty engines that are covered by an EPA certificate, it must comply with the CO_2 emission credit system provisions that relate to the emission standards referred to in subsection (1).

Fleets — vehicles

(4) A company that manufactures or imports a vocational vehicle, incomplete vocational vehicle, tractor or incomplete tractor that is covered by an EPA certificate and conforms to a CO_2 family emission limit that exceeds the CO_2 emission standard applicable to the model year of that vehicle under these Regulations, must participate in the CO_2 emission credit system set out in sections 34 to 47 and must, in accordance with section 18, group into fleets

(*a*) at least 50% of its vocational vehicles and incomplete vocational vehicles and at least 50% of its tractors and incomplete tractors of the 2015 model year if the number of heavy-duty vehicles it sold in Canada is greater than 500;

(*b*) at least 75% of its vocational vehicles and incomplete vocational vehicles and at least 75% of its tractors and incomplete tractors of the 2016 model year if the number of heavy-duty vehicles it sold in Canada is greater than 500; and

(*c*) all its 2017 and subsequent model year heavy-duty vehicles.

Credits — heavy-duty vehicles of 2015 and 2016 model years

(5) Unless a company elects to group all its vocational vehicles, incomplete vocational vehicles, tractors and incomplete tractors into fleets, credits obtained under paragraph (4)(*a*) or (*b*), as the case may be, for an averaging set of heavy-duty vehicles of the 2015 or 2016 model year may only be used to offset a deficit incurred for that averaging set of the same model year, after which the credits are no longer valid.

If all vehicles grouped into fleets

(6) For the purposes of subsection (4),

(*a*) credits obtained for the 2014 model year may be used to offset a deficit for an averaging set of the 2015 model year if the company groups into fleets all its vehicles of the 2014 and 2015 model years;

(*b*) credits obtained for the 2014 and 2015 model years may be used to offset a deficit for an averaging set of the 2016 model year if the company groups into fleets all its vehicles of the 2014, 2015 and 2016 model years; and

(*c*) credits obtained for the 2014, 2015 and 2016 model years may be used to offset a deficit for an averaging set of the 2017 or subsequent model year if the company groups into fleets all its vehicles of the 2014, 2015 and 2016 model years.

Early action credits

(7) For the purposes of subsection (4), for an averaging set of the 2014, 2015 or 2016 model year, a company may use early action credits obtained in accordance with section 47 if the company groups into fleets all its vocational vehicles, incomplete vocational vehicles, tractors and incomplete tractors of the averaging set for the model year in which the early action credits are used.

Fleets — engines

(8) A company that manufactures or imports an engine that is covered by an EPA certificate must group all its engines into fleets in accordance with section 18 and must participate in the CO_2 emission credit system set out in sections 34 to 47 if the following conditions are met:

(*a*) the engine conforms to a CO_2 family certification level that exceeds the CO_2 emission standard applicable to that engine's model year under these Regulations; and

(*b*) the number of engines referred to in paragraph (*a*) sold in Canada by the company

(i) is more than 1000 and exceeds the number of engines of the same engine family that it sold in the United States, or

(ii) is between 101 and 1000 and is more than twice the number of engines of the same engine family that it sold in the United States.

Subsection 153(3) of Act

(9) For the purposes of subsection 153(3) of the Act, the provisions of the CFR that apply to a vehicle or an engine referred to in subsection (1) under the EPA certificate correspond to the certification and in-use standards referred to in subsection (1).

EPA

(10) For the purposes of subsection 153(3) of the Act, the EPA is the prescribed agency.

Emission Control Systems

On-Road Vehicle and Engine Emission Regulations

14. (1) An emission control system that is installed in a heavy-duty vehicle or heavy-duty engine for the purpose of conforming to the standards set out in these Regulations must comply with subsection 11(1) of the *On-Road Vehicle and Engine Emission Regulations*.

Defeat device

(2) A heavy-duty vehicle or heavy-duty engine must not be equipped with a defeat device.

Test procedures

(3) Subsections 11(3) and (4) of the *On-Road Vehicle and Engine Emission Regulations* apply except that the test procedures in question are the ones set out in these Regulations.

Adjustable Parameters

Definition

15. (1) In this section, "adjustable parameter" means a device, system or element of design that is capable of being adjusted to affect the emissions or performance of a heavy-duty vehicle or heavy-duty engine during emission testing or normal in-use operation, but does not include a device, system or element of design that is permanently sealed by the vehicle or engine manufacturer or that is inaccessible using ordinary tools.

Standards

(2) A heavy-duty vehicle or heavy-duty engine that is equipped with adjustable parameters must comply with the applicable standards under these Regulations for any specification within the adjustable range.

Adjustable roof fairing

(3) The adjustable roof fairing of a tractor is not an adjustable parameter for the purposes of this section.

Air Conditioning Systems

Standards

16. A heavy-duty vehicle or heavy-duty incomplete vehicle — other than a vocational vehicle or incomplete vocational vehicle — that is equipped with an air conditioning system must conform to section 115(c) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR.

Small Volume Companies — Tractors and Vocational Vehicles

Exemption

17. (1) A company may elect, for a given model year, to not comply with the CO_2 emission standards set out in subsection 26(1) or 27(1), as the case may be, for its tractors and vocational vehicles and, in the case of tractors and vocational vehicles covered by an EPA certificate, the company may elect to not comply with subsection 13(4), if the following conditions are met:

(*a*) it manufactured or imported in 2011 for sale in Canada in total less than 200 tractors and vocational vehicles;

(*b*) its average number of tractors and vocational vehicles manufactured or imported for sale in Canada for the three most recent consecutive model years preceding the model year is less than 200; and

(*c*) it reports this election in its end of model year report in accordance with section 48.

CO_2 emission credit system

(2) A company that makes the election referred to in subsection (1) must not participate in the CO_2 emission credit system set out in sections 34 to 47 for the model year in question.

Merger

(3) If a company merges with one or more companies after the day on which these Regulations come into force, the company that results from the merger may make the election referred to in subsection (1) if the number of vocational vehicles and tractors manufactured or imported for sale in Canada by the merged companies under each of paragraphs (1)(*a*) and (*b*) is less than 200.

Acquisition

(4) If a company acquires one or more companies after the day on which these Regulations come into force, it must

(*a*) in the case where the company made the election referred to in subsection (1) before the acquisition, recalculate the number of vocational vehicles and tractors that it manufactured or imported for sale in Canada under each of paragraphs (1)(*a*) and (*b*) by adding to that number the number of tractors and vocational vehicles of each of the acquired companies and report it in its first end of model year report following the acquisition; or

(*b*) in the case where the company makes the election referred to in subsection (1) after the acquisition, calculate the number of vocational vehicles and tractors that it manufactured or imported for sale in Canada under each of paragraphs (1)(*a*) and (*b*) by adding to that number the number of tractors and vocational vehicles of each of the acquired companies.

Composition of Fleets

Definition of "fleet"

18. (1) In these Regulations, "fleet" refers to the heavy-duty vehicles and heavy-duty engines that a company imports or manufactures in Canada for the purpose of sale in Canada to the first retail purchaser, that are grouped in accordance with this section for the purpose of conforming to sections 21 to 23 or for the purpose of participation in the CO_2 emission credit system set out in sections 34 to 47.

Exclusions

(2) A company may elect to exclude from its fleets

(*a*) the heavy-duty vehicles and heavy-duty engines that it manufactures and that will be used in Canada solely for the purpose of exhibition, demonstration, evaluation or testing, if it reports that election in its end of model year report; and

(*b*) the heavy-duty vehicles and heavy-duty engines that it imports solely for the purpose of exhibition, demonstration, evaluation or testing, if it makes a declaration in accordance with

section 60 and it reports that election in its end of model year report.

Fleet composition

(3) A company may group heavy-duty vehicles and heavy-duty engines of the same model year into more than one fleet as follows:

(*a*) in the case of heavy-duty vehicles and subject to subsections (4) to (7), each fleet is composed solely of the vehicles referred to in one of the following subparagraphs:

(i) subject to section 25 and subsection 26(6), Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle" in subsection 1(1),

(ii) Class 2B, Class 3, Class 4 and Class 5 vocational vehicles and incomplete vocational vehicles,

(iii) Class 6 and Class 7 vocational vehicles and incomplete vocational vehicles,

(iv) Class 8 vocational vehicles and incomplete vocational vehicles,

(v) Class 7 low-roof tractors and incomplete tractors,

(vi) Class 7 mid-roof tractors and incomplete tractors,

(vii) Class 7 high-roof tractors and incomplete tractors,

(viii) Class 8 low-roof day cab tractors and incomplete tractors,

(ix) Class 8 low-roof sleeper cab tractors and incomplete tractors,

(x) Class 8 mid-roof day cab tractors and incomplete tractors,

(xi) Class 8 mid-roof sleeper cab tractors and incomplete tractors,

(xii) Class 8 high-roof day cab tractors and incomplete tractors, or

(xiii) Class 8 high-roof sleeper cab tractors and incomplete tractors; and

(*b*) in the case of heavy-duty engines and subject to subsections (8) and (9), each fleet is composed solely of the engines referred to in one of the following subparagraphs:

(i) spark-ignition engines,

(ii) light heavy-duty engines that are compression-ignition engines and that are designed to be used in vocational vehicles and incomplete vocational vehicles,

(iii) medium heavy-duty engines that are compression-ignition engines and that are designed to be used in vocational vehicles and incomplete vocational vehicles,

(iv) heavy heavy-duty engines that are compression-ignition engines and that are designed to be used in vocational vehicles and incomplete vocational vehicles,

(v) medium heavy-duty engines that are compression-ignition engines and that are designed to be used in tractors and incomplete tractors, or

(vi) heavy heavy-duty engines that are compression-ignition engines and that are designed to be used in tractors and incomplete tractors.

Class 2B and Class 3 heavy-duty vehicles

(4) For the purposes of subparagraph (3)(*a*)(i), all of the following heavy-duty vehicles must be grouped into one separate fleet of Class 2B and Class 3 heavy-duty vehicles:

(*a*) hybrid vehicles with regenerative braking;

(*b*) vehicles equipped with an engine that includes a Rankine-cycle or other bottoming cycle exhaust energy recovery system;

(*c*) electric vehicles;

(*d*) fuel cell vehicles; and

(*e*) vehicles that are manufactured with innovative technologies.

Grouping into subfleets

(5) For the purposes of subparagraph (3)(*a*)(i) and subsection 20(3), the vehicles in the fleet that

exceed the standards set out in subsection 20(1) and have more than one N_2O or CH_4 family emission limits, must be grouped into subfleets that include vehicles with identical N_2O or CH_4 family emission limits, as the case may be, and that are of the same test group, as described in section 1827 of Title 40, chapter I, subchapter C, part 86, subpart S, of the CFR.

Tractors and vocational vehicles

(6) For the purposes of subparagraphs (3)(*a*)(ii) to (xiii), all heavy-duty vehicles of a fleet must

(*a*) if applicable, be vocational tractors, hybrid vehicles with regenerative braking, vehicles equipped with an engine that includes a Rankine-cycle or other bottoming cycle exhaust energy recovery system, electric vehicles, fuel cell vehicles or vehicles manufactured with innovative technologies; and

(*b*) be grouped into subfleets that include vehicles with identical CO_2 family emission limits if the vehicles in the fleet have more than one family emission limit.

Roof heights, cab types and GVWR

(7) If a vocational vehicle, incomplete vocational vehicle, tractor or incomplete tractor model straddles a roof height, cab type or GVWR division, a company may elect to group all those vehicles into the same fleet if they conform to the most stringent standards applicable to a vehicle in the fleet.

Heavy-duty engines

(8) For the purposes of paragraph (3)(*b*), all heavy-duty engines of a fleet must be of the same engine family and have, taking into account section 205(e) of Title 40, chapter I, subchapter U, part 1036, subpart C, of the CFR,

(*a*) an identical CO_2 family certification level; and

(*b*) identical N_2O and CH_4 family emission limits.

Fleet of engines not sold in United States

(9) For the purposes of subsection (8), the CO_2 family certification level and the N_2O and CH_4 family emission limits for the model year in question are determined using the engine sales in Canada if none of the engines in the fleet are sold in the United States.

Grouping into Fleets

Election applicable to all vehicles and engines

19. If a company makes the election referred to in subsection 22(4), 26(7), 27(8) or 33(1) for a fleet of heavy-duty vehicles or heavy-duty engines that it manufactures or imports, that election applies to all the vehicles and engines of that fleet.

CLASS 2B AND CLASS 3 HEAVY-DUTY VEHICLES

N_2O and CH_4 Emissions

Standards

20. (1) Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles of the 2014 and subsequent model years — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — must have N_2O and CH_4 emission values that do not exceed 0.05 g/mile for N_2O or 0.05 g/mile for CH_4 for the applicable useful life of the vehicle.

Calculation

(2) The N_2O and CH_4 emission values must be calculated in accordance with section 24.

Fleet calculation

(3) A company that manufactures or imports vehicles referred to in subsection (1) that exceed any of

the standards set out in that subsection must group those vehicles of a given model year into a fleet and subfleets in accordance with section 18 and must calculate the N_2O and CH_4 emission deficits for that fleet, expressed in megagrams of CO_2 and rounded in accordance with subsection 35(2), by adding the deficits for all those subfleets, if applicable, using the formula

$$\frac{(A - B) \times C \times D \times E}{1\ 000\ 000}$$

where

A is 0.05 g/mile for N_2O and 0.05 g/mile for CH_4;

B is the N_2O or CH_4 family emission limit for the fleet or subfleet, as the case may be, and corresponds to the N_2O or CH_4 emission value calculated in accordance with section 24;

C is the number of vehicles in the fleet or subfleet, as the case may be;

D is the useful life for the vehicle, namely, 120,000 miles; and

E is the global warming potential and is equal to the following number of credits needed to offset a N_2O and CH_4 deficit:

(*a*) an emission credit of 298 Mg of CO_2 to offset a deficit of 1 Mg of N_2O; and

(*b*) an emission credit of 25 Mg of CO_2 to offset a deficit of 1 Mg of CH_4.

Family emission limit

(4) For the purposes of subsection (3), every vehicle within the fleet or subfleet, as the case may be, must conform to the N_2O or CH_4 family emission limit corresponding to the emission value determined for B in the formula set out in that subsection.

Offsetting deficit

(5) The deficit calculated under subsection (3) must be offset by using the CO_2 emission credits obtained in accordance with sections 34 to 47 for the averaging set in which the fleet is included.

No credits

(6) For greater certainty, the company must not obtain CO_2 emission credits with respect to N_2O and CH_4 emissions for the purpose of participation in the CO_2 emission credit system set out in sections 34 to 47.

CO_2 Emissions

Average standard

21. (1) A company must group all its Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles of the 2014 and subsequent model years — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — into a fleet based on model year in accordance with section 18 and must ensure that the fleet average CO_2 emission value calculated in accordance with section 23 for that fleet does not exceed the applicable fleet average CO_2 emission standard calculated in accordance with section 22 for that fleet for that model year.

Offsetting deficit

(2) When a company incurs a deficit based on the calculation referred to in subsection (1), it must offset the deficit by using the CO_2 emission credits obtained in accordance with sections 34 to 47 for the averaging set in which the fleet is included.

Calculation of average standard

22. (1) Subject to subsection (6), a company must determine the fleet average CO_2 emission

standard for a given model year, expressed in grams of CO_2 per mile and rounded to the nearest 0.1 gram of CO_2 per mile, for its fleet of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — using the formula

where

A is the CO_2 emission target value calculated for each vehicle subconfiguration in the fleet using the applicable formula set out in subsection (2) and rounded to the nearest 0.1 gram of CO_2 per mile;

B is the number of vehicles of that vehicle subconfiguration in the fleet; and

C is the number of vehicles in the fleet.

Vehicle subconfiguration

(2) Subject to subsection (4), the CO_2 emission target value for each vehicle subconfiguration in a fleet must be calculated using the formula set out in one of the following paragraphs, whichever applies:

(*a*) for vehicles equipped with a spark-ignition engine,

$$(0.0440 \times WF) + 339$$

where

WF is the work factor for each vehicle subconfiguration, calculated using the formula set out in subsection (3) and rounded to the nearest pound; or

(*b*) for vehicles equipped with a compression-ignition engine and vehicles that operate without an internal combustion engine,

$$(0.0416 \times WF) + 320$$

where

WF

is the work factor for each vehicle subconfiguration, calculated using the formula set out in

subsection (3) and rounded to the nearest pound.

Work factor

(3) The work factor for each vehicle subconfiguration is calculated using the formula

$$0.75 \times (GVWR - \text{curb weight} + xwd) + 0.25 \times (GCWR - GVWR)$$

where

GVWR

is the GVWR as defined in subsection 1(1), expressed in pounds;

curb weight

is the curb weight as defined in subsection 1(1), expressed in pounds;

xwd

is 500 pounds if the vehicle has four-wheel drive or all-wheel drive and is 0 pounds for all other vehicles; and

GCWR

is the GCWR as defined in subsection 1(1), expressed in pounds.

Alternative target value calculation for 2014 to 2018 model years

(4) A company may elect to use the CO_2 emission target values set out in the table of paragraph (*a*) or (*b*), as the case may be, instead of the emission target value calculated in accordance with subsection (2):

(*a*) for the 2014 to 2017 model years,

Item	Column 1 Model Year	Column 2 Engine Cycle	Column 3 Alternate CO_2 Emission Target (grams/mile)
1.	2014	Spark-ignition engine	(0.0482 × WF) + 371
		Compression-ignition engine	(0.0478 × WF) + 368
2.	2015	Spark-ignition engine	(0.0479 × WF) + 369
		Compression-ignition engine	(0.0474 × WF) + 366
3.	2016	Spark-ignition engine	(0.0469 × WF) + 362
		Compression-ignition engine	(0.0460 × WF) + 354
4.	2017	Spark-ignition engine	(0.0460 × WF) + 354
		Compression-ignition engine	(0.0445 × WF) + 343

(*b*) for the 2014 to 2018 model years,

Item	Column 1 Model Year	Column 2 Engine Cycle	Column 3 Alternate CO_2 Emission Target (grams/mile)
1.	2014	Spark-ignition engine	(0.0482 × WF) + 371

		Compression-ignition engine	(0.0478 × WF) + 368
2.	2015	Spark-ignition engine	(0.0479 × WF) + 369
		Compression-ignition engine	(0.0474 × WF) + 366
3.	2016 to 2018	Spark-ignition engine	(0.0456 × WF) + 352
		Compression-ignition engine	(0.0440 × WF) + 339

Election

(5) If a company elects to use the CO_2 emission target values set out in paragraph (4)(*a*) or (*b*), the applicable targets continue to apply for all the model years referred to in that paragraph, unless it elects to comply with subsection (2) for the remaining model years.

Grouping subconfigurations into configurations

(6) A company may group vehicle subconfigurations of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — within a vehicle configuration for the purpose of calculating the fleet average CO_2 emission standard if

(*a*) the vehicles of each subconfiguration have the same test weight, GVWR and GCWR, and the work factor and target value are calculated assuming a curb weight equal to two times the test weight minus the GVWR; or

(*b*) the lowest target value of a vehicle subconfiguration is used for all vehicle subconfigurations.

Calculation of average values

23. (1) A company must calculate the fleet average CO_2 emission value for a given model year, expressed in grams of CO_2 per mile for its fleet of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — by using the formula

where

A is the CO_2 emission value for each vehicle configuration calculated in accordance with section 24 and taking into account subsection (2);

B is the number of vehicles of that vehicle configuration in the fleet; and

C is the number of vehicles in the fleet used for the purposes of subsection (2).

Representative data

(2) When a company calculates the fleet average CO_2 emission value in accordance with this section, it must use the data and values from one or more vehicle configurations that represent at least 90% of its number of vehicles for the fleet.

Test Methods and Calculations

General

24. (1) The N_2O, CH_4 and CO_2 emission values for Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) and the vehicles referred to in subsection (2) — must be determined in accordance with subsection (3) or (4), as the case may be, and

(*a*) using

(i) the test procedures, fuels and calculation methods set out for the FTP-based city test and the HFET-based highway test, and

(ii) the adjusted loaded vehicle weight and the deterioration factors determined using the durability procedures and method prescribed in section 1823(m) of Title 40, chapter I, subchapter C, part 86, subpart S, of the CFR; and

(*b*) taking into account

(i) sections 104(d)(5) and 150(e) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR, and

(ii) the altitude testing conditions set out in section 1865(h)(3) of Title 40,

chapter I, subchapter C, part 86, subpart S, of the CFR.

Electric vehicles and fuel cell vehicles

(2) In the case of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — that are electric vehicles or fuel cell vehicles, the N_2O, CH_4 and CO_2 emission values are considered to be 0 grams per mile.

Multi-fuel, dual fuel or flexible fuel

(3) In the case of Class 2B or Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — that are designed to operate on two or more different fuel types, either separately or simultaneously, the N_2O, CH_4 and CO_2 emission values for a given vehicle or vehicle configuration, as the case may be, must be determined using

(*a*) in the case of N_2O and CH_4 emissions, the highest of the following averages:

(i) the arithmetic average of the FTP-based city test and HFET-based highway test emission values, determined in accordance with this section, for that vehicle configuration, weighted 0.55 and 0.45 respectively, tested on gasoline or diesel fuel, and

(ii) the arithmetic average of the FTP-based city test and HFET-based highway test emission values, determined in accordance with this section, for that vehicle configuration, weighted 0.55 and 0.45 respectively, tested on the alternative fuel; and

(*b*) in the case of CO_2 emissions, the formula

$$(F \times A) + ((1 - F) \times B)$$

where

F is 0.00 unless the company provides the Minister with evidence demonstrating that an alternative value determined for F is more representative for that vehicle configuration,

A is the arithmetic average of the FTP-based city test and HFET-based highway test emission values, determined in accordance with this section, for that vehicle configuration, weighted 0.55 and 0.45 respectively, tested on the alternative fuel, and

B is the arithmetic average of the FTP-based city test and HFET-based highway test emission values, determined in accordance with this section, for that vehicle configuration, weighted 0.55 and 0.45 respectively, tested on gasoline or diesel fuel.

Other cases

(4) In the case of other Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — the N_2O, CH_4 and CO_2 emission values must be determined as follows:

(*a*) in the case of N_2O and CH_4 emissions, by calculating the arithmetic average of the FTP-based city test and HFET-based highway test emission values, weighted 0.55 and 0.45 respectively; and

(*b*) in the case of CO_2 emissions,

(i) by making the calculation set out in paragraph (*a*), or

(ii) by calculating the CO_2 emission rate in accordance with section 104(g) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR.

Alternative Standards

Spark-ignition engines

25. A company may elect to include heavy-duty engines that are spark-ignition engines in a fleet of

Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — if the following conditions are met:

(*a*) the fleet is composed of vehicles equipped with engines of the same model year, design and hardware;

(*b*) the engines are installed in heavy-duty incomplete vehicles that are not cab-complete vehicles, or are sold without being installed in a vehicle;

(*c*) the number of engines referred to in paragraph (*b*) represent not more than 10% of the number of engines — whether they are installed in vehicles or not — that are of the same model year, design and hardware in the fleet;

(*d*) instead of conforming to sections 29 and 30, the engines referred to in paragraph (*b*) must conform to

(i) the N_2O and CH_4 emission standards and the calculations of the emission values referred to in section 20, and

(ii) the CO_2 emission target value and test result determined in accordance with section 150(m)(6) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR; and

(*e*) the company reports its election in its end of model year report.

VOCATIONAL VEHICLES

CO_2 emission standards

26. (1) Subject to subsections (3) and (5) to (7), every vocational vehicle and incomplete vocational vehicle of the 2014 and subsequent model years must have a CO_2 emission rate that does not exceed the applicable CO_2 emission standard set out in the following table for the model year in question for its applicable useful life:

Item	Column 1	Column 2	Column 3
	Class of Vocational Vehicle	CO_2 Emission Standard (grams of CO_2 per tonne-mile) for the 2014 to 2016 Model Years	CO_2 Emission Standard (grams of CO_2 per tonne-mile) for the 2017 and Subsequent Model Years
1.	Classes 2B, 3, 4 and 5	388	373
2.	Classes 6 and 7	234	225
3.	Class 8	226	222

Modelling CO_2 emissions to demonstrate compliance

(2) The CO_2 emission rate must be determined using the GEM computer simulation model with the following parameters:

(*a*) the "regulatory subcategory" referred to in the GEM computer simulation model corresponds to a type of vocational vehicle referred to in subparagraphs 18(3)(*a*)(ii) to (iv), whichever applies to the class of vocational vehicle being modelled; and

(*b*) the steer tire rolling resistance level and the drive tire rolling resistance level measured for each tire configuration in accordance with section 520(c) of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR.

Exemption for certain vocational vehicles

(3) The vocational vehicles and incomplete vocational vehicles referred to in subsection (1) do not include vehicles that either

(*a*) have tires with a maximum speed rating at or below 88 km/h (55 miles per hour); or

(*b*) are designed to perform work in an off-road environment or to operate at low speeds that are unsuitable for normal highway operation and meet one of the following criteria:

(i) have an axle that has a GAWR of 13 154 kg (29,000 pounds) or more,

(ii) attain a speed of 53 km/h (33 miles per hour) or less over 3.2 km (2 miles), or

(iii) attain a speed of 72 km/h (45 miles per hour) or less over 3.2 km (2 miles), have an unloaded vehicle weight that is not less than 95% of its GVWR, and have no capacity to carry occupants other than the driver and operating crew.

Non-eligible vehicles

(4) The vehicles referred to in subsection (3) are not eligible for participation in the CO_2 emission credit system set out in sections 34 to 47.

Option to conform to higher vehicle service class

(5) For any given vehicle referred to in subsection (1), a company may elect to conform to the emission standards and useful life applicable to a higher vehicle service class, in which case the company must not obtain credits for those vehicles when participating in the CO_2 emission credit system set out in sections 34 to 47.

Alternative standards

(6) In the case of a vocational vehicle or a cab-complete vocational vehicle equipped with a spark-ignition engine, a company may elect to comply with the standards referred to in sections 20 to 23 applicable to Class 2B and Class 3 heavy-duty vehicles, taking into account section 150(l) of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR, instead of complying with subsection (1) and sections 29 and 30 if the following conditions are met:

(*a*) all vehicles are grouped into the fleet referred to in subparagraph 18(3)(*a*)(i);

(*b*) the company participates in the CO_2 emission credit system set out in sections 34 to 47; and

(*c*) the company reports its election in its end of model year report.

Calculation using fleets and subfleets

(7) A company may elect to comply with subsection (1) by grouping all its vocational vehicles and incomplete vocational vehicles of a given model year into fleets or subfleets, as the case may be, in accordance with section 18 and participating in the CO_2 emission credit system set out in sections 34 to 47.

Family emission limit

(8) For the purposes of subsection (7), every vocational vehicle and incomplete vocational vehicle within a fleet or subfleet, as the case may be, must conform to the CO_2 family emission limit determined by the company for the fleet or subfleet of the vehicle, as the case may be, and corresponding to the value determined for B in the formula set out in paragraph 35(1)(*b*).

Engines meeting requirements

(9) Every vocational vehicle and incomplete vocational vehicle of the 2014 and subsequent model years must be equipped with a heavy-duty engine that meets the requirements of these Regulations.

TRACTORS

CO_2 emission standard

27. (1) Subject to subsections (7) and (8), every tractor and incomplete tractor of the 2014 and subsequent model years must have a CO_2 emission rate that does not exceed the applicable CO_2 emission standard set out in the following table for the model year in question for the applicable useful life of the tractor:

Item	Column 1 Class of Tractor	Column 2 Characteristics	Column 3 CO_2 Emission Standard (grams of CO_2 per tonne-mile) for the 2014 to 2016 Model Years	Column 4 CO_2 Emission Standard (grams of CO_2 per tonne-mile) for the 2017 and Subsequent Model Years
1.	Class 7	Low-roof (all cab styles)	107	104
2.	Class 7	Mid-roof (all cab styles)	119	115
3.	Class 7	High-roof (all cab styles)	124	120
4.	Class 8	Low-roof day cab	81	80
5.	Class 8	Low-roof sleeper cab	68	66
6.	Class 8	Mid-roof day cab	88	86
7.	Class 8	Mid-roof sleeper cab	76	73
8.	Class 8	High-roof day cab	92	89
9.	Class 8	High-roof sleeper cab	75	72

Modelling CO_2 emissions to demonstrate compliance

(2) The CO_2 emission rate must be determined using the GEM computer simulation model with the following parameters:

(*a*) the "regulatory subcategory" referred to in the GEM computer simulation model corresponds to a type of tractor referred to in any of subparagraphs 18(3)(*a*)(v) to (xiii), whichever applies to the tractor being modelled;

(*b*) the coefficient of aerodynamic drag determined in accordance with subsection (4);

(*c*) the steer tire rolling resistance level and the drive tire rolling resistance level measured for each tire configuration in accordance with section 520(c) of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR;

(*d*) in the case of a tractor equipped with a vehicle speed limiter, the maximum speed, expressed in miles per hour and rounded to the nearest 0.1 mile per hour, to which the tractor is limited, determined in accordance with section 640 of Title 40, chapter I, subchapter U, part 1037, subpart G, of the CFR;

(*e*) the weight reduction value, calculated by adding the applicable values set out in the tables in the following subparagraphs:

(i) in the case of tires and wheels, the weight reduction value corresponds to the

sum of the applicable weight reduction values set out in column 3 for each of the tractor's wheels that are set out in the following table:

Item	Column 1 Tire Type	Column 2 Wheel Type	Column 3 Weight Reduction Value (pounds per wheel)
1.	Single-wide drive tire	Steel wheel	84
2.	Single-wide drive tire	Aluminum wheel	139
3.	Single-wide drive tire	Light-weight aluminum wheel (weighs at least 9.5 kg (21 pounds) less than a similar steel wheel)	147
4.	Steer tire or dual-wide drive tire	High-strength steel wheel (steel with tensile strength of 350 MPa or more)	8
5.	Steer tire or dual-wide drive tire	Aluminum wheel	21
6.	Steer tire or dual-wide drive tire	Light-weight aluminum wheel (weighs at least 9.5 kg (21 pounds) less than a similar steel wheel)	30

(ii) in the case of the following components, the weight reduction value corresponds to the sum of the applicable weight reduction values for each of the tractor's components that are set out in the following table:

Item	Column 1 Component	Column 2 Aluminum Weight Reduction Value (pounds)	Column 3 High-strength Steel (steel with tensile strength of 350 MPa or more) Weight Reduction Value (pounds)
1.	Door	20	6
2.	Roof	60	18
3.	Cab rear wall	49	16
4.	Cab floor	56	18
5.	Hood support structure system	15	3

6.	Fairing support structure system	35	6
7.	Instrument panel support structure	5	1
8.	Brake drums – drive (4 units)	140	11
9.	Brake drums – non-drive (2 units)	60	8
10.	Frame rails	440	87
11.	Crossmember – cab	15	5
12.	Crossmember – suspension	25	6
13.	Crossmember – non-suspension (3 units)	15	5
14.	Fifth wheel	100	25
15.	Radiator support	20	6
16.	Fuel tank support structure	40	12
17.	Steps	35	6
18.	Bumper	33	10
19.	Shackles	10	3
20.	Front axle	60	15
21.	Suspension brackets and hangers	100	30
22.	Transmission case	50	12
23.	Clutch housing	40	10
24.	Drive axle hubs (8 units)	160	4
25.	Non-drive front hubs (2 units)	40	5

26.	Driveshaft	20	5
27.	Transmission and clutch shift levers	20	4

(*f*) in the case of a Class 8 sleeper cab, if the tractor is equipped with idle reduction technology that conforms to section 660 of Title 40, chapter I, subchapter U, part 1037, subpart G, of the CFR, and that automatically shuts off the main engine after 300 seconds or less, the corresponding value is 5 grams of CO_2 per tonne-mile or if applicable, is calculated in accordance with section 660(c) of Title 40, chapter I, subchapter U, part 1037, subpart G, of the CFR.

Weight reduction technologies

(3) For greater certainty, CO_2 emission credits for weight reduction technologies that are not referred to in paragraph (2)(*e*) may be obtained under section 41.

Calculation of coefficient of aerodynamic drag

(4) Subject to subsections (5) and (6), the coefficient of aerodynamic drag (C_D) is determined by

(*a*) measuring the drag area (C_DA) in accordance with the coastdown testing referred to in subpart F of Title 40, chapter I, subchapter U, part 1037, of the CFR, rounded to two decimal places and taking into account the following criteria:

(i) high-roof tractors must be tested with the standard trailer referred to in section 501(g) of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR, and low-roof and mid-roof tractors must be tested without a trailer, unless they are tested with a trailer to evaluate innovative technologies, and

(ii) the tractors and standard trailers referred to in section 501(g) of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR must be equipped with tires that are mounted on steel rims in accordance with section 521(b)(2) of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR; and

(*b*) determining, in accordance with section 520(b) of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR, the tractor's coefficient of aerodynamic drag (C_D) and bin level that correspond to the tractor's drag area (C_DA) calculated in paragraph (*a*).

Alternative bin level

(5) For low-roof and mid-roof tractors, the bin level may be determined using the bin level of an equivalent high-roof tractor as follows:

(*a*) if the equivalent high-roof tractor is in Bin I or Bin II, the low-roof and mid-roof tractors must be in Bin I; or

(*b*) if the equivalent high-roof tractor is in Bin III, Bin IV or Bin V, the low-roof and mid-roof tractors must be in Bin II.

Alternative method for measuring drag area

(6) Instead of the method referred to in paragraph (4)(*a*), a company may elect to measure the tractor's drag area (C_DA) in accordance with any other method described in subpart F of Title 40, chapter I, subchapter U, part 1037, of the CFR, if,

(*a*) in the case of a tractor that is covered by an EPA certificate, the election has been approved by the EPA for that tractor, under section 521(c) of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR, and the company provides the Minister with evidence of the EPA approval; and

(*b*) in the case of a tractor that is not covered by an EPA certificate, the company provides

the Minister with evidence demonstrating that the alternative method for measuring the tractor's drag area referred to in this subsection is more representative of that tractor's drag area.

Option to conform to higher vehicle service class

(7) For any given vehicle referred to in subsection (1), a company may elect to conform to the emission standards and useful life applicable to a higher vehicle service class in which case the company must not obtain credits for those vehicles when participating in the CO_2 emission credit system set out in sections 34 to 47.

Calculation using fleets and subfleets

(8) A company may elect to comply with subsection (1) by grouping all its tractors and incomplete tractors of a given model year into fleets or subfleets, as the case may be, in accordance with section 18 and participating in the CO_2 emission credit system set out in sections 34 to 47.

Family emission limit

(9) For the purposes of subsection (8), every tractor and incomplete tractor within a fleet or subfleet, as the case may be, must conform to the CO_2 family emission limit determined by the company for the fleet or subfleet of the vehicle, as the case may be, and corresponding to the value determined for B in the formula set out in paragraph 35(1)(*c*).

Engines meeting requirements

(10) Every tractor and incomplete tractor of the 2014 and subsequent model years must be equipped with a heavy-duty engine that meets the requirements of these Regulations.

VOCATIONAL TRACTORS

Alternative standards

28. A company that manufactures or imports vocational tractors for sale in Canada may elect to conform to the emission standards applicable to vocational vehicles instead of tractors for a maximum of 5 250 Class 7 and Class 8 vocational tractors that it manufactures or imports in any period of three consecutive model years and must report this election in its end of model year report.

HEAVY-DUTY ENGINES

N_2O and CH_4 Emissions

Standards

29. (1) Every heavy-duty engine that is a compression-ignition engine of the 2014 and subsequent model years and heavy-duty engine that is a spark-ignition engine of the 2016 and subsequent model years must have N_2O and CH_4 emission values that do not exceed an emission standard of 0.10 g/BHP-hr for N_2O and 0.10 g/BHP-hr for CH_4 for the applicable useful life of the engine.

Values

(2) The N_2O and CH_4 emission values for the engines referred to in subsection (1) correspond to the emission values of the tested engine configuration referred to in section 235(a) of Title 40, chapter I, subchapter U, part 1036, subpart C, of the CFR, for the engine family, measured in accordance with the transient duty cycle, taking into account sections 108(d) to (f) and 150(g) of subpart B, sections 235(b) and 241(c) and (d) of subpart C and subparts E and F of part 1036, Title 40, chapter I, subchapter U, of the CFR.

Engine configuration

(3) For the purposes of subsection (2), the tested engine configuration for the model year in question is determined using the engine sales in Canada if none of the engines of the engine family are sold in the United States.

Fleet calculation

(4) A company that manufactures or imports engines referred to in subsection (1) that exceed any of the standards set out in that subsection must group those engines of a given model year into fleets in accordance with section 18 and must calculate the N_2O and CH_4 emission deficits for each fleet, expressed in megagrams of CO_2 and rounded in accordance with subsection 35(2), using the formula

$$\frac{(A - B) \times C \times D \times E \times F}{1\ 000\ 000}$$

where

A is 0.10 g/BHP-hr for N_2O and 0.10 g/BHP-hr for CH_4;

B is the N_2O or CH_4 family emission limit for the fleet and corresponds to the N_2O or CH_4 deteriorated emission level value, calculated using the applicable emission value determined in accordance with subsection (2);

C is the number of engines in the fleet;

D is the transient cycle conversion factor calculated in accordance with the applicable variable "CF" in section 705(b) of Title 40, chapter I, subchapter U, part 1036, subpart H, of the CFR;

E is the useful life for the engine, as follows:

(*a*) 110,000 miles for a spark-ignition engine; and

(*b*) the following number of miles for a compression-ignition engine:

(i) 110,000 miles for a light heavy-duty engine,

(ii) 185,000 miles for a medium heavy-duty engine, and

(iii) 435,000 miles for a heavy heavy-duty engine; and

F is the global warming potential and is equal to the following number of credits needed to offset a N_2O and CH_4 deficit:

(*a*) an emission credit of 298 Mg of CO_2 to offset a deficit of 1 Mg of N_2O; and

(*b*) an emission credit of 25 Mg of CO_2 to offset a deficit of 1 Mg of CH_4.

Family emission limit

(5) For the purposes of subsection (4), every heavy-duty engine within a fleet must conform to the N_2O or CH_4 family emission limit determined by the company for the fleet that corresponds to the deteriorated emission level value determined for B in subsection (4).

Offsetting fleet emission deficit

(6) The deficit calculated under subsection (4) must be offset by using the CO_2 emission credits obtained in accordance with sections 34 to 47 for the averaging set in which the fleet is included.

No credits

(7) For greater certainty, and subject to subsection (8), the company must not obtain CO_2 emission credits with respect to N_2O and CH_4 emissions for the purpose of participation in the CO_2 emission credit system set out in sections 34 to 47.

Credits for low N_2O emissions

(8) If a company's heavy-duty engines from a fleet of the 2014, 2015 or 2016 model year conform to an N_2O family emission limit that is less than 0.04 g/BHP-hr, the company may obtain CO_2 emission credits for the purpose of participation in the CO_2 emission credit system set out in sections 34 to 47, using the following formula for each fleet, expressed in megagrams of CO_2 and rounded in accordance

with subsection 35(2):

$$\frac{(A - B) \times C \times D \times E \times F}{1\ 000\ 000}$$

where

A is 0.04 g/BHP-hr for N_2O;

B is the N_2O family emission limit for the fleet and corresponds to the N_2O deteriorated emission level value, calculated using the applicable emission value determined in accordance with subsection (2);

C is the number of engines in the fleet;

D is the transient cycle conversion factor calculated in accordance with the applicable variable "CF" in section 705(b) of Title 40, chapter I, subchapter U, part 1036, subpart H, of the CFR;

E is the useful life for the engine, as follows:

(*a*) 110,000 miles for a spark-ignition engine; and

(*b*) the following number of miles for a compression-ignition engine:

(i) 110,000 miles for a light heavy-duty engine,

(ii) 185,000 miles for a medium heavy-duty engine, and

(iii) 435,000 miles for a heavy heavy-duty engine; and

F is the global warming potential and is equal to 298 Mg of CO_2.

CO_2 Emissions

Standard

30. Subject to sections 31 and 33, every heavy-duty engine must have a CO_2 emission value that does not exceed the following emission standard for the applicable useful life of the engine:

(*a*) for a spark-ignition engine of the 2016 and subsequent model years, a CO_2 emission standard of 627 g/BHP-hr; and

(*b*) for any other engine of the 2014 and subsequent model years, the applicable CO_2 emission standard set out in the following table:

Item	Column 1 Model Year	Column 2 Light Heavy-duty Engines (g/BHP-hr)	Column 3 Medium Heavy-duty Engines Designed To Be Used in Vocational Vehicles (g/BHP-hr)	Column 4 Heavy Heavy-duty Engines Designed To Be Used in Vocational Vehicles (g/BHP-hr)	Column 5 Medium Heavy-duty Engines Designed To Be Used in Tractors (g/BHP-hr)	Column 6 Heavy Heavy-duty Engines Designed To Be Used in Tractors (g/BHP-hr)
1.	2014 to 2016	600	600	567	502	475
2.	2017 and subsequent model years	576	576	555	487	460

Alternative emission standard — model years 2014 to 2016

31. (1) Heavy-duty engines that are compression-ignition engines of the 2014 to 2016 model years may conform to the CO_2 emission standard referred to in section 620 of Title 40, chapter I, subchapter U, part 1036, subpart G, of the CFR, instead of the standard set out in paragraph 30(*b*) if there are no remaining credits that can be used under sections 42 to 46 for the averaging set of those engines for the model years in question.

Alternative emission standard — model years 2013 to 2016

(2) Heavy-duty engines that are compression-ignition engines of the 2013 to 2016 model years may conform to the CO_2 emission standard referred to in section 150(e) of Title 40, chapter I, subchapter U, part 1036, subpart B, of the CFR, instead of the standard set out in paragraph 30(*b*) or in subsection (1).

No early action credits

(3) The engines referred to in subsection (2) are not eligible for early action credits in accordance with section 47.

Election to comply with subsection (2)

(4) A company that elects to conform to the alternative CO_2 emission standard referred to in subsection (2) must continue to comply with that subsection for the other model years referred to in that subsection.

Value

32. (1) The CO_2 emission value for the following heavy-duty engines corresponds to the emission value of the tested engine configuration referred to in section 235(a) of Title 40, chapter I, subchapter U, part 1036, subpart C, of the CFR, for the engine family, measured in accordance with the following duty cycles, taking into account sections 108(d) to (f) and 150(g) of subpart B, sections 235(b) and 241(c) and (d) of subpart C and subparts E and F of part 1036, Title 40, chapter I, subchapter U, of the CFR:

(*a*) for medium heavy-duty engines and heavy heavy-duty engines that are compression-ignition engines designed to be used in tractors or incomplete tractors, the steady state duty cycle;

(*b*) for medium heavy-duty engines and heavy heavy-duty engines that are compression-ignition engines designed to be used in both vocational vehicles or incomplete vocational vehicles and tractors or incomplete tractors, the steady state duty cycle and transient duty cycle; and

(*c*) for engines other than those referred to in paragraphs (*a*) and (*b*), the transient duty cycle.

Engine configuration

(2) For the purposes of subsection (1), the tested engine configuration for the model year in question is determined using the engine sales in Canada if none of the engines of the engine family are sold in the United States.

Calculation using fleets and subfleets

33. (1) A company may elect to comply with section 30 or subsection 31(2) by grouping all its heavy-duty engines of a given model year into fleets in accordance with section 18 and participating in the CO_2 emission credit system set out in sections 34 to 47.

CO_2 family certification level

(2) For the purposes of subsection (1), every heavy-duty engine within a fleet must conform to the CO_2 family certification level for the fleet that corresponds to the deteriorated emission level value determined for B in the formula set out in paragraph 35(1)(*d*).

Calculation of Credits and Deficits

Credits

34. (1) For the purposes of subparagraph 162(1)(*b*)(i) of the Act, a company obtains CO_2 emission credits if the CO_2 emissions for a fleet or subfleet, as the case may be, of heavy-duty vehicles or heavy-duty engines of a given model year are lower than the CO_2 emission standard applicable to that fleet or subfleet, as the case may be, and for that model year, and the company reports the credits in its end of model year report in accordance with section 48.

Deficits

(2) A company incurs deficits if the CO_2 emissions for a fleet or subfleet, as the case may be, of heavy-duty vehicles or heavy-duty engines of a given model year are higher than the CO_2 emission standard applicable to that fleet or subfleet, as the case may be, and for that model year, and the company reports the deficits in its end of model year report in accordance with section 48.

Calculation

35. (1) A company must calculate the credits or deficits for each of its fleets or subfleets, as the case may be, using the equation set out in one of the following paragraphs, whichever applies:

(*a*) for Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle" in subsection 1(1),

$$ECD = \frac{(A - B) \times C \times D}{1\,000\,000}$$

where

ECD is the number of credits, if the result is positive, or the number of deficits, if the result is negative, expressed in megagrams of CO_2 and rounded in accordance with subsection 35(2),

A is the fleet average CO_2 emission standard calculated in accordance with section 22, expressed in grams of CO_2 per mile,

B is the fleet average CO_2 emission value calculated in accordance with section 23, expressed in grams of CO_2 per mile,

C is the number of vehicles in the fleet, and

D is the useful life for the vehicle, namely, 120,000 miles;

(*b*) for vocational vehicles and incomplete vocational vehicles and subject to subsection 38(2) and clause 41(1)(*b*)(ii)(A),

$$ECD = \frac{(A - B) \times C \times D \times E}{1\,000\,000}$$

where

ECD is the number of credits, if the result is positive, or the number of deficits, if the result is negative, expressed in megagrams of CO_2 and rounded in accordance with subsection 35(2),

A is the CO_2 emission standard under subsection 26(1) that applies to the vehicles of the subfleet, expressed in grams of CO_2 per tonne-mile,

B is the CO_2 family emission limit and corresponds to the CO_2 emission rate for the subfleet of vehicles, expressed in grams of CO_2 per tonne-mile, determined in accordance with subsection 26(2),

C is the payload for the class of vehicles, as follows:

(i) 2.85 tonnes for Class 2B, Class 3, Class 4 and Class 5,

(ii) 5.6 tonnes for Class 6 and Class 7, and

(iii) 7.5 tonnes for Class 8,

D is the number of vehicles in the subfleet, and

E is the useful life for the class of vehicles, as follows:

(i) 110,000 miles for Class 2B, Class 3, Class 4 and Class 5,

(ii) 185,000 miles for Class 6 and Class 7, and

(iii) 435,000 miles for Class 8;

(*c*) for tractors and incomplete tractors and subject to subsection 38(2) and clause 41(1)(*b*)(ii)(B),

$$ECD = \frac{(A - B) \times C \times D \times E}{1\,000\,000}$$

where

ECD is the number of credits, if the result is positive, or the number of deficits, if the result is negative, expressed in megagrams of CO_2 and rounded in accordance with subsection 35(2),

A is the CO_2 emission standard under subsection 27(1) that applies to the tractors and incomplete tractors of the subfleet, expressed in grams of CO_2 per tonne-mile,

B is the CO_2 family emission limit and corresponds to the CO_2 emission rate for the subfleet of tractors and incomplete tractors, expressed in grams of CO_2 per tonne-mile, determined in accordance with subsection 27(2),

C is the payload for the class of tractors and incomplete tractors, as follows:

(i) 12.5 tonnes for Class 7, and

(ii) 19 tonnes for Class 8,

D is the number of tractors and incomplete tractors in the subfleet, and

E is the useful life for the class of tractors or incomplete tractors, as the case may be, as follows:

(i) 185,000 miles for Class 7, and

(ii) 435,000 miles for Class 8; and

(*d*) for heavy-duty engines and subject to subparagraph 41(1)(*c*)(iii),

$$ECD = \frac{(A - B) \times C \times D \times E}{1\,000\,000}$$

where

ECD is the number of credits, if the result is positive, or the number of deficits, if the result is negative, expressed in megagrams of CO_2 and rounded in accordance with subsection 35(2),

A is the CO_2 emission standard that applies to the fleet of heavy-duty engines under section 30 or subsection 31(2), as the case may be, expressed in grams per BHP-hr,

B is the CO_2 family certification level for the fleet and corresponds to the CO_2 deteriorated emission level value, using the applicable emission value calculated in accordance with section 32 and subject to subsection (3), expressed in grams of CO_2 per BHP-hr,

C is the transient cycle conversion factor calculated in accordance with the applicable variable "CF" in section 705(b) of Title 40, chapter I, subchapter U, part 1036, subpart H, of the CFR,

D is the number of engines in the fleet, and

E is the useful life for the engine, as follows:

(i) 110,000 miles for spark-ignition engines, and

(ii) for the following compression-ignition engines:

(A) 110,000 miles for light heavy-duty engines,

(B) 185,000 miles for medium heavy-duty engines, and

(C) 435,000 miles for heavy heavy-duty engines.

Fleets

(2) The credits or deficits for each averaging set of heavy-duty vehicles and heavy-duty engines are determined by adding the credits and deficits for all fleets and subfleets, if applicable. The credits and deficits must be added together before rounding and the result must be rounded to the nearest megagram of CO_2.

Duty cycle

(3) In the case of medium heavy-duty engines and heavy heavy-duty engines that are designed to be used in both vocational vehicles or incomplete vocational vehicles and in tractors or incomplete tractors, a company must select the duty cycle set out in paragraph 32(1)(*b*) that corresponds to the vehicle in which the engine is installed for the purpose of calculating the value determined for B in the

formula set out in paragraph (1)(*d*).

Additional Credits

Limitation

36. A company must not obtain additional credits in accordance with sections 37 to 41 more than once for a vehicle or an engine with regard to the same type of greenhouse gas emission reduction technology.

Credit multiplier — Class 2B and Class 3 vehicles

37. A company that obtains credits under paragraph 35(1)(*a*) for Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles that are electric vehicles, fuel cell vehicles, hybrid vehicles or are equipped with an engine that includes a Rankine-cycle or other bottoming cycle exhaust energy recovery system, may multiply the number of credits obtained for those vehicles by 1.5.

Equivalent conventional vehicle and footprint

38. (1) For the purpose of the calculation in subsection (2),

(*a*) "equivalent conventional vehicle" means a vocational vehicle, incomplete vocational vehicle, tractor or incomplete tractor that is being compared with a vocational vehicle, incomplete vocational vehicle, tractor or incomplete tractor that is an electric vehicle, a fuel cell vehicle, a hybrid vehicle, or that is equipped with an engine that includes a Rankine-cycle or other bottoming cycle exhaust energy recovery system that has, as a minimum, the same footprint, class, coefficient of aerodynamic drag, tires and wheels, and has the same number of power take-off circuits and the equivalent take-off power as the vehicle in question; and

(*b*) "footprint" means the result of the product of the average width, measured in inches and rounded to the nearest tenth of an inch, of the lateral distance between the centrelines of the front and rear base tires at ground level, multiplied by the longitudinal distance between the front and rear wheel centrelines, measured in inches and rounded to the nearest tenth of an inch, divided by 144 and rounded to the nearest tenth of a square foot.

Calculation — tractors and vocational vehicles

(2) In the case of vocational vehicles, incomplete vocational vehicles, tractors or incomplete tractors that are electric vehicles, fuel cell vehicles, hybrid vehicles or that are equipped with an engine that includes a Rankine-cycle or other bottoming cycle exhaust energy recovery system, a company may obtain additional credits by replacing the value determined for (A – B) in the equation set out in paragraph 35(1)(*b*) or (*c*), as the case may be, with the following benefit to emission credits, expressed in grams of CO_2 per tonne-mile and determined by the equation

(A − B) = improvement factor x modelling result B

where

improvement factor is the value determined by the formula

$$\frac{\text{emission rate A} - \text{emission rate B}}{\text{emission rate A}}$$

where

emission rate A is the emission test result, expressed in grams of CO_2 per tonne-mile, obtained by an equivalent conventional vehicle when tested using the duty cycle test set out in section 510 of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR, taking into account section 501 of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR; and

emission rate B is the emission test result, expressed in grams of CO_2 per tonne-mile, obtained by the vehicle in question, as follows:

(*a*) for an electric vehicle, the result corresponds to 0 grams of CO_2 per tonne-mile, and

(*b*) for any other vehicle, subject to subsection (3), the result obtained using the duty cycle test set out in section 510 of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR, taking into account sections 501 and 525 of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR; and

modelling result B is the CO_2 emission rate obtained for the vocational vehicle, incomplete vocational vehicle, tractor or incomplete tractor that is an electric vehicle, a fuel cell vehicle, a hybrid vehicle, or that is equipped with an engine that includes a Rankinecycle or other bottoming cycle exhaust energy recovery system, when modelled in accordance with subsection 26(2) or subsection 27(2), as the case may be.

Emission rate B

(3) In the case of fuel cell vehicles, the company may use the alternative procedure referred to in section 615 of Title 40, chapter I, subchapter U, part 1037, subpart G, of the CFR to calculate emission rate B in the equation set out in subsection (2).

Credit multiplier — tractors and vocational vehicles

(4) The additional credits calculated in subsection (2) may be multiplied by 1.5 if the company does not use the early action credit multiplier referred to in subsection 47(6) for the same vehicles.

Definitions

39. (1) The following definitions apply in this section:

"post-transmission hybrid system"
« *système hybride post-transmission* »

"post-transmission hybrid system" means a powertrain that includes features that recover and store energy from braking but that cannot function as a hybrid system without the transmission.

"pre-transmission hybrid system"
« *système hybride pré-transmission* »

"pre-transmission hybrid system" means an engine system that includes features that recover and store energy during engine motoring operation but not from the vehicle wheels.

Calculation — post-transmission and pre-transmission hybrid systems

(2) In the case of vocational vehicles, incomplete vocational vehicles, tractors and incomplete tractors that are equipped with post-transmission hybrid systems or pre-transmission hybrid systems, a company may obtain additional credits, expressed in megagrams of CO_2, using the following formula:

$$\frac{A \times B \times C \times D}{1\ 000\ 000}$$

where

A is the grams of CO_2 per tonne-mile benefit from A to B testing determined in accordance with,

(*a*) in the case of a post-transmission hybrid system, section 550 of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR, and taking into account section 525 of Title 40, chapter I, subchapter U, part 1036, subpart F, of the CFR, and

(*b*) in the case of a pre-transmission hybrid system, part 1065 of Title 40, chapter I, subchapter U, of the CFR, or section 550 of Title 40, chapter I, subchapter U, part 1037, subpart F, of the CFR, and taking into account section 525 of Title 40, chapter I, subchapter U, part 1036, subpart F, of the CFR;

B is the payload for the class of vocational vehicles, incomplete vocational vehicles, tractors or incomplete tractors, as the case may be, as follows:

(*a*) 2.85 tonnes for Class 2B, Class 3, Class 4 and Class 5 vocational vehicles and incomplete

vocational vehicles,

(*b*) 5.6 tonnes for Class 6 and Class 7 vocational vehicles and incomplete vocational vehicles,

(*c*) 7.5 tonnes for Class 8 vocational vehicles and incomplete vocational vehicles,

(*d*) 12.5 tonnes for Class 7 tractors and incomplete tractors, and

(*e*) 19 tonnes for Class 8 tractors and incomplete tractors;

C is the number of vehicles in the fleet or subfleet, as the case may be; and

D is the useful life for the class of vehicles, as follows:

(*a*) 110,000 miles for Class 2B, Class 3, Class 4 and Class 5,

(*b*) 185,000 miles for Class 6 and Class 7, and

(*c*) 435,000 miles for Class 8.

Credit multiplier

(3) The additional credits calculated in subsection (2) may be multiplied by 1.5 if the company does not use the early action credit multiplier referred to in subsection 47(6) for the same vehicles.

Calculation — Rankine-cycle engines

40. (1) In the case of heavy-duty engines that include a Rankine-cycle or other bottoming cycle exhaust energy recovery system, a company may obtain additional credits, expressed in megagrams of CO_2, using the following formula:

$$\frac{A \times B \times C \times D}{1\ 000\ 000}$$

where

A is the benefit obtained from A to B testing, expressed in grams of CO_2 per BHP-hr, determined in accordance with subpart F of Title 40, chapter I, subchapter U, part 1037, of the CFR, or using an alternative procedure if,

(*a*) in the case of an engine that is covered by an EPA certificate, the alternative procedure has been approved by the EPA for that technology and the company provides the Minister with evidence of the EPA approval, or

(*b*) in the case of an engine that is not covered by an EPA certificate, the company provides the Minister with evidence demonstrating that the alternative procedure provides a more representative benefit than A to B testing for that technology;

B is the transient cycle conversion factor calculated in accordance with the applicable variable "CF" in section 705(b) of Title 40, chapter I, subchapter U, part 1036, subpart H, of the CFR;

C is the number of engines in the fleet; and

D is the useful life for the engine, as follows:

(*a*) 110,000 miles for spark-ignition engines, and

(*b*) for compression-ignition engines,

(i) 110,000 miles for light heavy-duty engines,

(ii) 185,000 miles for medium heavy-duty engines, and

(iii) 435,000 miles for heavy heavy-duty engines.

Credit multiplier

(2) The additional credits calculated in subsection (1) may be multiplied by 1.5 if the company does not use the early action credit multiplier referred to in subsection 47(6) for the same engines.

Innovative technologies

41. (1) A company may obtain additional credits, expressed in megagrams of CO_2, for its fleet or

subfleet, as the case may be, of heavy-duty vehicles or heavy-duty engines for the use of innovative technologies by

(*a*) in the case of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle" in subsection 1(1), using the following formula:

$$\frac{A \times B \times C}{1\ 000\ 000}$$

where

A is the five-cycle credit value determined in accordance with section 1869(c) of Title 40, chapter I, subchapter C, part 86, subpart S, of the CFR, and expressed in grams of CO_2 per mile,

B is the number of vehicles manufactured with the innovative technology in question in the fleet, and

C is the useful life for the vehicle, namely, 120,000 miles;

(*b*) in the case of vocational vehicles and incomplete vocational vehicles, or tractors and incomplete tractors, either

(i) by using the following formula:

$$\frac{(A - B) \times C \times D \times E}{1\ 000\ 000}$$

where

(A − B) is the difference between the in-use emission rate of the vehicle manufactured without the innovative technology and the in-use emission rate of the vehicle manufactured with the innovative technology and determined in accordance with section 610(c) of Title 40, chapter I, subchapter U, part 1037, subpart G, of the CFR, expressed in grams of CO_2 per tonne-mile,

C is the number of vehicles manufactured with the innovative technology in question in the subfleet,

D is the payload for the class of vehicles, as follows:

(A) 2.85 tonnes for Class 2B, Class 3, Class 4 and Class 5 vocational vehicles and incomplete vocational vehicles,

(B) 5.6 tonnes for Class 6 and Class 7 vocational vehicles and incomplete vocational vehicles,

(C) 7.5 tonnes for Class 8 vocational vehicles and incomplete vocational vehicles,

(D) 12.5 tonnes for Class 7 tractors and incomplete tractors, and

(E) 19 tonnes for Class 8 tractors and incomplete tractors, and

E is the useful life for the class of vehicles, as follows:

(A) 110,000 miles for Class 2B, Class 3, Class 4 and Class 5,

(B) 185,000 miles for Class 6 and Class 7, and

(C) 435,000 miles for Class 8, or

(ii) by substituting the result obtained in accordance with paragraph 35(1)(*b*) or (*c*), as the case may be, with the result obtained in accordance with one of the following formulas, whichever applies:

(A) for vocational vehicles and incomplete vocational vehicles:

$$\frac{[(A - B) + (B \times C)] \times D \times E \times F}{1\ 000\ 000}$$

where

A is the CO_2 emission standard under subsection 26(1) that applies to

the vocational vehicles and incomplete vocational vehicles of the subfleet, expressed in grams of CO_2 per tonne-mile,

B is the CO_2 family emission limit and corresponds to the CO_2 emission rate for the subfleet of vocational vehicles and incomplete vocational vehicles, expressed in grams of CO_2 per tonne-mile, determined in accordance with subsection 26(2),

C is the improvement factor determined in accordance with sections 610(b)(1) and (c) of Title 40, chapter I, subchapter U, part 1037, subpart G, of the CFR, for the subfleet of vocational vehicles and incomplete vocational vehicles,

D is the payload for the class of vocational vehicles and incomplete vocational vehicles, as follows:

(I) 2.85 tonnes for Class 2B, Class 3, Class 4 and Class 5,

(II) 5.6 tonnes for Class 6 and Class 7, and

(III) 7.5 tonnes for Class 8,

E is the number of vocational vehicles and incomplete vocational vehicles manufactured with the innovative technology in question in the subfleet, and

F is the useful life for the class of vocational vehicles and incomplete vocational vehicles, as follows:

(I) 110,000 miles for Class 2B, Class 3, Class 4 and Class 5,

(II) 185,000 miles for Class 6 and Class 7, and

(III) 435,000 miles for Class 8, or

(B) for tractors and incomplete tractors:

$$\frac{[(A - B) + (B \times C)] \times D \times E \times F}{1\ 000\ 000}$$

where

A is the CO_2 emission standard under subsection 27(1) that applies to the tractors and incomplete tractors of the subfleet, expressed in grams of CO_2 per tonne-mile,

B is the CO_2 family emission limit and corresponds to the CO_2 emission rate for the subfleet of tractors and incomplete tractors, expressed in grams of CO_2 per tonne-mile, determined in accordance with subsection 27(2),

C is the improvement factor determined in accordance with sections 610(b)(1) and (c) of Title 40, chapter I, subchapter U, part 1037, subpart G, of the CFR, for the subfleet of tractors and incomplete tractors,

D is the payload for the class of tractors or incomplete tractors, as the case may be, as follows:

(I) 12.5 tonnes for Class 7, and

(II) 19 tonnes for Class 8,

E is the number of tractors and incomplete tractors manufactured with the innovative technology in question in the subfleet, and

F is the useful life for the class of tractors or incomplete tractors, as the case may be, as follows:

(I) 185,000 miles for Class 7, and

(II) 435,000 miles for Class 8; or

(*c*) in the case of heavy-duty engines,

(i) by using the following formula for engines tested on a chassis:

$$\frac{(A - B) \times C \times D \times E}{1\ 000\ 000}$$

where

(A – B) is the difference between the in-use emission rate of the engine manufactured without the innovative technology and the in-use emission rate of the engine manufactured with the innovative technology, determined in accordance with chassis A to B testing or in-use A to B testing of pairs of vehicles equipped with the engines differing only with respect to the innovative technology in question, and expressed in grams of CO_2 per tonne-mile,

C is the number of vocational vehicles, incomplete vocational vehicles, tractors or incomplete tractors with engines manufactured with the innovative technology in the fleet,

D is the payload, if applicable, for the class of vehicles, as follows:

(A) 2.85 tonnes for Class 2B, Class 3, Class 4 and Class 5 vocational vehicles and incomplete vocational vehicles,

(B) 5.6 tonnes for Class 6 and Class 7 vocational vehicles and incomplete vocational vehicles,

(C) 7.5 tonnes for Class 8 vocational vehicles and incomplete vocational vehicles,

(D) 12.5 tonnes for Class 7 tractors and incomplete tractors, and

(E) 19 tonnes for Class 8 tractors and incomplete tractors, and

E is the useful life for the class of vehicles, as follows:

(A) 110,000 miles for Class 2B, Class 3, Class 4 and Class 5,

(B) 185,000 miles for Class 6 and Class 7, and

(C) 435,000 miles for Class 8,

(ii) by using the following formula for engines tested on an engine dynamometer:

$$\frac{(A - B) \times C \times D \times E}{1\ 000\ 000}$$

where

(A – B) is the difference between the in-use emission rate of the engine manufactured without the innovative technology and the in-use emission rate of the engine manufactured with the innovative technology, determined in accordance with engine dynamometer A to B testing of pairs of engines differing only with respect to the innovative technology in question, and expressed in grams of CO_2 per BHP-hr,

C is the transient cycle conversion factor calculated in accordance with the applicable variable "CF" in section 705(b) of Title 40, chapter I, subchapter U, part 1036, subpart H, of the CFR,

D is the number of engines manufactured with the innovative technology in the fleet,

E is the useful life for the engine, as follows:

(A) 110,000 miles for spark-ignition engines, and

(B) for the following compressionignition engines:

(I) 110,000 miles for light heavy-duty engines,

(II) 185,000 miles for medium heavy-duty engines, and

(III) 435,000 miles for heavy heavy-duty engines, or

(iii) by substituting the result obtained in accordance with paragraph 35(1)(*d*) with the result determined in accordance with the following formula:

$$\frac{[(A - B) + (B \times C)] \times D \times E \times F}{1\ 000\ 000}$$

where

A is the CO_2 emission standard that applies to the fleet of heavy-duty engines under section 30 or subsection 31(2), as the case may be, expressed in grams of CO_2 per BHP-hr,

B is the CO_2 family certification level for the fleet and corresponds to the COdeteriorated emission level value, using the applicable emission value calculated in accordance with section 32 and subject to subsection 35(3), expressed in grams of CO_2 per BHP-hr,

C is the improvement factor determined in accordance with section 610(b)(1) of Title 40, chapter I, subchapter U, part 1036, subpart G, of the CFR, based on results of A to B testing, chassis A to B testing or in-use A to B testing of pairs of engines using an engine dynamometer or of pairs of vehicles equipped with the engines in question, as the case may be, differing only with respect to the innovative technology in question,

D is the transient cycle conversion factor calculated in accordance with the applicable variable "CF" in section 705(b) of Title 40, chapter I, subchapter U, part 1036, subpart H, of the CFR,

E is the number of engines manufactured with the innovative technology in the fleet, and

F is the useful life for the engine, as follows:

(A) 110,000 miles for spark-ignition engines, and

(B) for the following compressionignition engines:

(I) 110,000 miles for light heavy-duty engines,

(II) 185,000 miles for medium heavy-duty engines, and

(III) 435,000 miles for heavy heavy-duty engines.

Calculation — alternative procedure

(2) If the five-cycle credit value referred to in the description of A in the formula set out in paragraph (1)(*a*) cannot adequately measure the emission reduction attributable to an innovative technology, the company may calculate that five-cycle credit value using the alternative procedure set out in section 1869(d) of Title 40, chapter I, subchapter C, part 86, of the CFR, if

(*a*) in the case of a vehicle that is covered by an EPA certificate, the alternative procedure has been approved by the EPA for that technology and the company provides the Minister with evidence of the EPA approval; or

(*b*) in the case of a vehicle that is not covered by an EPA certificate, the company provides the Minister with evidence demonstrating that the alternative procedure provides a more representative benefit for that technology.

Averaging Sets

Calculation

42. The credits or deficits for each averaging set of heavy-duty vehicles or heavy-duty engines are determined by adding the credits obtained and deficits incurred for all fleets of that averaging set.

Date of credits or deficits

43. A company obtains credits or incurs deficits for an averaging set of heavy-duty vehicles or heavy-duty engines on the day on which the company submits the end of model year report for that model year.

Use of credits — time limit

44. Credits obtained for an averaging set of heavy-duty vehicles or heavy-duty engines of a given model year may be used for that averaging set up to five model years after the model year for which the credits were obtained, after which the credits are no longer valid.

Deficits

45. (1) Subject to subsections (4) and (6), a company must use the credits obtained for an averaging set of heavy-duty vehicles or heavy-duty engines of a given model year to offset any outstanding deficits incurred for that averaging set.

Remaining credits

(2) A company may bank any remaining credits to offset a future deficit for that averaging set or it may transfer the remaining credits to another company.

Offsetting

(3) Subject to subsection (4), a company may offset a deficit that it incurs for an averaging set of heavy-duty vehicles or heavy-duty engines with an equivalent number of credits obtained in accordance with section 35 or transferred from another company for that averaging set.

Transfer of credits

(4) A company that obtains credits in accordance with sections 37 to 40 for an averaging set may transfer them to one of its other averaging sets to offset a deficit incurred in accordance with any of paragraphs 35(1)(*a*) to (*d*) if the following conditions are met:

(*a*) if the company obtained credits in accordance with section 37, they are used to offset any deficits for other vehicles in that averaging set before transferring any remaining credits to other averaging sets; and

(*b*) not more than 6 000 Mg of CO_2 emission credits per model year are transferred between any of the following groups of averaging sets:

(i) averaging sets of spark-ignition engines, light heavy-duty engines that are compression-ignition engines and light heavy-duty vehicles,

(ii) averaging sets of medium heavy-duty engines that are compression-ignition engines and medium heavy-duty vehicles, or

(iii) averaging sets of heavy heavy-duty engines that are compression-ignition engines and heavy heavy-duty vehicles.

Exception

(5) The credit transfer limit between the groups set out in paragraph (4)(*b*) does not apply when the credits are used between the averaging sets of the engines and vehicles referred to in each of the subparagraphs of that paragraph.

Offsetting deficits — time limit

(6) A company must offset a deficit incurred for an averaging set of heavy-duty vehicles or heavy-duty engines of a given model year no later than the day on which the company submits the end of model year report in accordance with section 48 for vehicles or engines of the third model year after the model year for which the company incurred the deficit.

Acquisition or merger

46. (1) A company that acquires another company or that results from a merger of companies must offset any outstanding deficit of the purchased or merged companies.

Ceasing activities

(2) If a company ceases to manufacture, import or sell heavy-duty vehicles or heavy-duty engines, it must offset all outstanding deficits for its averaging sets before submitting its last end of model year report.

Early Action Credits

Eligibility

47. (1) A company may obtain early action credits for an averaging set of heavy-duty vehicles or heavy-duty engines that are compression-ignition engines of the 2013 model year or for an averaging set of heavy-duty engines that are spark-ignition engines of the 2015 model year, if the number of credits calculated for that averaging set is greater than the number of deficits incurred for that model year and the company reports the credits

(*a*) in its 2014 end of model year report, in the case of heavy-duty vehicles and heavy-duty engines that are compression-ignition engines; or

(*b*) in its 2016 end of model year report, in the case of heavy-duty engines that are spark-ignition engines.

Electric vehicles

(2) A company may obtain early action credits by grouping its fleets of electric vehicles of the 2011 to 2013 model years into the applicable averaging sets and if the company reports the credits in its 2014 end of model year report.

What to include

(3) For the purpose of obtaining early action credits, a company must group

(*a*) into the applicable fleet, all its vocational vehicles, tractors, Class 2B and Class 3 heavy-duty vehicles equipped with a spark-ignition engine or Class 2B and Class 3 heavy-duty vehicles equipped with a compression-ignition engine, except in the case of electric vehicles; and

(*b*) into the applicable averaging set, all its heavy-duty engines.

Date

(4) A company obtains early action credits on the day on which its 2014 end of model year report is submitted in the case of heavy-duty vehicles and heavy-duty engines that are compression-ignition engines, and on the day on which its 2016 end of model year report is submitted in the case of heavy-duty engines that are spark-ignition engines.

Calculation

(5) Early action credits obtained or deficits incurred within each averaging set for the following fleets must be calculated in accordance with sections 35 to 41, as applicable, using the following standards:

(*a*) in the case of heavy-duty vehicles and heavy-duty engines that are compression-ignition engines of the 2013 model year, the emission standards applicable to the 2014 model year;

(*b*) in the case of electric vehicles of the 2011 to 2013 model years, the emission standards applicable to the 2014 model year; and

(*c*) in the case of heavy-duty engines that are spark-ignition engines of the 2015 model year, the emission standards applicable to the 2016 model year.

Credit multiplier

(6) Early action credits obtained for vocational vehicles, tractors or heavy-duty engines may be multiplied by 1.5 if the company does not use the additional credit multiplier referred to in subsection 38(4), 39(3) or 40(2) for the same vehicles.

Time limit

(7) Early action credits may be used as follows:

(*a*) credits obtained for heavy-duty vehicles or heavy-duty engines that are compression-ignition engines of the 2013 model year may be used for the 2014 to 2018 model years;

(*b*) credits obtained for electric vehicles of the 2011 to 2013 model years may be used for the 2014 to 2018 model years; and

(*c*) credits obtained for heavy-duty engines that are spark-ignition engines of the 2015 model year may be used for the 2016 to 2020 model years.

Use

(8) The rules set out in sections 45 and 46 with respect to credits also apply to early action credits.

REPORTS

END OF MODEL YEAR REPORT

Deadline

48. (1) A company must submit to the Minister an end of model year report, signed by a person who is authorized to act on behalf of the company, for all heavy-duty vehicles and heavy-duty engines of the 2014 and subsequent model years that it imported or manufactured in Canada, no later than June 30 of the calendar year following the calendar year that corresponds to the model year in question.

Statement

(2) The end of model year report must indicate the model year for which the report is made and must include any of the following statements by the company for its vehicles and engines, whichever applies:

(*a*) in the case of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle" in subsection 1(1),

(i) in respect of the fleet average CO_2 emission standard, that all its vehicles are grouped into one or more fleets in accordance with section 18, and

(ii) in respect of the N_2O and CH_4 emission standards, that its vehicles

(A) conform to the applicable N_2O and CH_4 emission standards,

(B) are covered by an EPA certificate, sold concurrently in Canada and the United States and conform either to the emission standards referred to in the EPA certificate or to a N_2O or CH_4 family emission limit, as the case may be, that is lower than the N_2O or CH_4 emission standard applicable to the model year of the vehicles under these Regulations, or

(C) are grouped into one or more fleets in accordance with section 18 for the purpose of offsetting a deficit in accordance with subsection 20(5);

(*b*) in the case of tractors and vocational vehicles, that its vehicles

(i) conform to the applicable CO_2 emission standard,

(ii) are covered by an EPA certificate, sold concurrently in Canada and the United States and conform either to the emission standard referred to in the EPA certificate or to a CO_2 family emission limit that is lower than the CO_2 emission standard applicable to the model year of the vehicles under these Regulations,

(iii) are covered by an EPA certificate, sold concurrently in Canada and the United States, conform to a CO_2 family emission limit that exceeds the CO_2 emission standard applicable to the model year of the vehicles under these Regulations and are not grouped into one or more fleets pursuant to subsection 13(4),

(iv) are grouped into one or more fleets in accordance with section 18 for the purpose of participation in the CO_2 emission credit system,

(v) are exempted under section 17, or

(vi) in the case of vocational tractors, conform to the emission standards applicable to vocational vehicles in accordance with section 28; and

(*c*) in the case of heavy-duty engines,

(i) in respect of the CO_2 emission standard, that its engines

(A) conform to the applicable CO_2 emission standard,

(B) are covered by an EPA certificate, sold concurrently in Canada and the United States and conform either to the emission standard referred to in the EPA certificate or to a CO_2 family certification level that is lower than the CO_2 emission standard applicable to the model year of the engines under these Regulations,

(C) are covered by an EPA certificate, sold concurrently in Canada and the United States, conform to a CO_2 family certification level that exceeds the CO_2 emission standard applicable to the model year of the engines under these Regulations and are not grouped into one or more fleets pursuant to subsection 13(8), or

(D) are grouped into one or more fleets in accordance with section 18 for the purpose of participation in the CO_2 emission credit system, and

(ii) in respect of the N_2O and CH_4 emission standards, that its engines

(A) conform to the applicable N_2O and CH_4 emission standards,

(B) are covered by an EPA certificate, sold concurrently in Canada and the United States and conform either to the emission standards referred to in the EPA certificate or to a N_2O or CH_4 family emission limit, as the case may be, that is lower than the N_2O or CH_4 emission standard applicable to the model year of the engines under these Regulations, or

(C) are grouped into one or more fleets in accordance with section 18 for the purpose of offsetting a deficit in accordance with subsection 29(6).

Statement when conforming to standards

(3) If an end of model year report contains any statement referred to in clause (2)(*a*)(ii)(A), subparagraph (2)(*b*)(i) and clauses (2)(*c*)(i)(A) and (ii)(A) for a given model year, it must contain the number of heavy-duty vehicles or heavy-duty engines for each type referred to in subparagraphs 18(3)(*a*)(i) to (xiii) or (*b*)(i) to (vi).

Statement when covered by EPA certificate and sold concurrently

(4) If an end of model year report contains any statement referred to in clause (2)(*a*)(ii)(B), subparagraphs (2)(*b*)(ii) and (iii), clauses (2)(*c*)(i)(B) and (C) and (ii)(B) for a given model year, it must contain the following information for each type of heavy-duty vehicle or heavy-duty engine:

(*a*) the number of vehicles or engines for each type referred to in subparagraphs 18(3)(*a*)(i) to (xiii) or (*b*)(i) to (vi);

(*b*) in the case of vehicles, the CO_2 family emission limit and, in the case of engines, the CO_2 family certification level;

(*c*) the number of vehicles or engines for each CO_2 family emission limit or CO_2 family certification level, as the case may be;

(*d*) if applicable, the N_2O or CH_4 family emission limit;

(*e*) if applicable, the number of vehicles or engines for each N_2O or CH_4 family emission limit; and

(*f*) if an end of model year report contains the statement referred to in clause (2)(*c*)(i)(C), the number of heavy-duty engines sold in the United States that are grouped into the same engine family.

Statement for exempted tractors and vocational vehicles

(5) If an end of model year report contains the statement referred to in subparagraph (2)(*b*)(v) for a given model year, the report must contain the following information:

(*a*) the number of tractors and vocational vehicles that the company manufactured or imported in 2011 for sale in Canada;

(*b*) the average number of tractors and vocational vehicles that the company manufactured or imported for sale in Canada for the three most recent consecutive model years preceding that model year; and

(*c*) the number of tractors and vocational vehicles that the company manufactured or imported for sale in Canada for that model year.

Alternative standards for engines — section 25

(6) If the company includes in a fleet, in accordance with section 25, spark-ignition engines that are not installed in vehicles or that are installed in heavy-duty incomplete vehicles that are not cab-complete vehicles, it must provide the number of those engines, along with the total number of engines in that vehicle fleet — whether they are installed in vehicles or not — that are of the same model year, design and hardware.

Contents

(7) If an end of model year report contains any statement referred to in subparagraph (2)(*a*)(i), clause (2)(*a*)(ii)(C), subparagraph (2)(*b*)(iv) and clauses (2)(*c*)(i)(D) and (ii)(C) for a given model year, the report must contain the following information for each averaging set:

(*a*) if applicable, a statement that the company has elected to exclude from its fleets heavy-duty vehicles or heavy-duty engines in accordance with subsection 18(2);

(*b*) if applicable, a statement that the company has elected to comply with the alternative standards for vocational vehicles equipped with sparkignition engines referred to in subsection 26(6);

(*c*) an identification of all fleets and subfleets referred to in section 18 within the averaging set;

(*d*) in relation to CO_2 emission standards and, if applicable, the N_2O and CH_4 emission standards:

(i) for Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle" in subsection 1(1),

(A) the N_2O and CH_4 emission standards applicable to each fleet,

(B) the fleet average CO_2 emission standard, determined for A in the formula set out in paragraph 35(1)(*a*),

(C) the CO_2 emission target value for each vehicle subconfiguration of each fleet, determined for A in the formula set out in subsection 22(1),

(D) the work factor for each vehicle subconfiguration calculated in accordance with subsection 22(3), and

(E) the GVWR, curb weight, GCWR, type of transmission, gear ratio, axle ratio and type of engine for each vehicle configuration,

(ii) for vocational vehicles and incomplete vocational vehicles, the CO_2 emission standard that applies to the vehicles of each subfleet, determined for A in the formula set out in paragraph 35(1)(*b*),

(iii) for tractors and incomplete tractors, the CO_2 emission standard that applies to the vehicles of each subfleet, determined for A in the formula set out in paragraph 35(1)(*c*), and

(iv) for heavy-duty engines, the CO_2 emission standard and N_2O and CH_4 emission standards that apply to the engines of each fleet;

(*e*) in relation to CO_2 emissions, and if applicable, to N_2O and CH_4 emissions,

(i) for each fleet of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — the following values:

(A) the fleet average CO_2 emission value, determined for B in the formula set out in paragraph 35(1)(*a*),

(B) the CO_2 emission value for each vehicle configuration, determined for A in the formula set out in subsection 23(1) and taking into account subsection 23(2), and

(C) if applicable, the N_2O or CH_4 family emission limit, determined for B in the formula set out in subsection 20(3),

(ii) for each fleet of vocational vehicles and incomplete vocational vehicles, the CO_2 family emission limit for each subfleet, determined for B in the formula set out in paragraph 35(1)(*b*),

(iii) for each fleet of tractors and incomplete tractors, the CO_2 family emission limit for each subfleet, determined for B in the formula set out in paragraph 35(1)(*c*), and

(iv) for each fleet of heavy-duty engines,

(A) the CO_2 family certification level, determined for B in the formula set out in paragraph 35(1)(*d*), and

(B) if applicable, the N_2O and CH_4 family emission limits, determined for B in the formula set out in subsection 29(4);

(*f*) the number of heavy-duty vehicles or heavy-duty engines in each averaging set, fleet, subfleet, vehicle configuration, engine configuration and the number of vehicles in each vehicle subconfiguration;

(*g*) if applicable, the evidence of the variable F referred to in the formula set out in paragraph 24(3)(*b*);

(*h*) if applicable, the evidence of the EPA approval referred to in paragraph 27(6)(*a*);

(*i*) if applicable, the evidence referred to in paragraph 27(6)(*b*);

(*j*) if applicable, evidence of the EPA approval referred to in paragraph (*a*) of the description of A in the formula set out in subsection 40(1);

(*k*) if applicable, the evidence referred to in paragraph (*b*) of the description of A in the formula set out in subsection 40(1);

(*l*) if applicable, the evidence of the EPA approval referred to in paragraph 41(2)(*a*);

(*m*) if applicable, the evidence referred to in paragraph 41(2)(*b*);

(*n*) if applicable, the number of CO_2 emission credits calculated in accordance with subsection 29(8) for an N_2O family emission limit that is less than 0.04 g/BHP-hr;

(*o*) the number of credits and deficits, calculated in accordance with section 35 for each fleet and subfleet, and the value of each variable — along with its description — used in calculating them;

(*p*) the number of additional credits, calculated in accordance with section 38 for each fleet, including the following values:

(i) the improvement factor,

(ii) the emission rate A,

(iii) the emission rate B,

(iv) the modelling result B, along with the value and description of each parameter used in determining that result, and

(v) the values determined for C, D and E;

(*q*) the number of additional credits, calculated in accordance with section 39 for each fleet and subfleet, and the value of each variable used in calculating them;

(*r*) the number of additional credits, calculated in accordance with section 40, for each fleet and subfleet, and the value of each variable used in calculating them;

(*s*) the number of additional credits, calculated in accordance with section 41, for each fleet and subfleet, and the value of each variable used in calculating them;

(*t*) an identification of every instance in each fleet or subfleet, as the case may be, when the 1.5 credit multiplier referred to in section 37 and subsections 38(4), 39(3) and 40(2) was used;

(*u*) the number of CO_2 emission credits and early action credits, if any, that are used to offset a deficit incurred for the model year or an outstanding deficit, and the averaging set and the model year for which the credits were obtained;

(*v*) an accounting of the CO_2 emission credits, early action credits and deficits; and

(*w*) for the purposes of paragraphs 13(4)(*a*) and (*b*), in the company's end of model year reports for the 2015 and 2016 model years, the percentage of its vocational vehicles and incomplete vocational vehicles and the percentage of its tractors and incomplete tractors that are grouped into one or more fleets in accordance with section 18 for the purpose of participation in the CO_2 emission credit system.

Statement — subparagraph (2)(*b*)(vi)

(8) If an end of model year report contains the statement referred to in subparagraph (2)(*b*)(vi) for a given model year, the company must provide in its end of model year report the number of Class 7 and Class 8 vocational tractors that conform to the emission standards applicable to vocational vehicles in accordance with section 28 and that it manufactures or imports for that model year and for the two previous model years.

Additional information — emission credit transfers

(9) The end of model year report must also contain the following information for each CO_2 emission credit transfer and early action credit transfer to or from the company since the submission of the previous end of model year report:

(*a*) the name, street address and, if different, the mailing address of the company that transferred the credits and the model year for which that company obtained those credits;

(*b*) the name, street address and, if different, the mailing address of the company that received the credits;

(*c*) the date of the transfer; and

(*d*) the number of credits transferred, expressed in megagrams of CO_2.

EARLY ACTION CREDITS

Contents

49. (1) To obtain early action credits under section 47, a company must include in its 2014 or 2016 end of model year report, as the case may be, the following information for each averaging set of the 2011 to 2013 model years or of the 2015 model year, as the case may be:

(*a*) for each fleet of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle" in subsection 1(1),

(i) the number of credits or deficits calculated in accordance with paragraph 35(1)(*a*),

(ii) the N_2O and CH_4 emission standards applicable to each fleet,

(iii) the fleet average CO_2 emission standard, determined for A in the formula set out in paragraph 35(1)(*a*),

(iv) the CO_2 emission target value for each vehicle subconfiguration of each fleet, determined for A in the formula set out in subsection 22(1),

(v) the work factor for each vehicle subconfiguration calculated in accordance with subsection 22(3),

(vi) the GVWR, curb weight, GCWR, type of transmission, gear ratio, axle ratio and type of engine for each vehicle configuration,

(vii) the fleet average CO_2 emission value, determined for B in the formula set out in paragraph 35(1)(*a*),

(viii) the CO_2 emission value for each vehicle configuration, determined for A in the formula set out in subsection 23(1) and taking into account subsection 23(2),

(ix) if applicable, the N_2O or CH_4 family emission limit, determined for B in the formula set out in subsection 20(3),

(x) the number of vehicles of each vehicle configuration and subconfiguration,

(xi) the number of vehicles in each fleet, and

(xii) the number of vehicles in the averaging set;

(*b*) for each fleet of vocational vehicles and incomplete vocational vehicles,

(i) the number of credits or deficits for each fleet and subfleet, calculated in accordance with paragraph 35(1)(*b*),

(ii) the CO_2 emission standard that applies to the vehicles of each fleet or subfleet, as the case may be, determined for A in the formula set out in paragraph 35(1)(*b*),

(iii) the CO_2 family emission limit for each fleet or subfleet, as the case may be, determined for B in the formula set out in paragraph 35(1)(*b*), and

(iv) the number of those vehicles in each averaging set, fleet and subfleet;

(*c*) for each fleet of tractors and incomplete tractors,

(i) the number of credits or deficits for each fleet and subfleet, calculated in accordance with paragraph 35(1)(*c*),

(ii) the CO_2 emission standard that applies to the vehicles of each fleet or subfleet, as the case may be, determined for A in the formula set out in paragraph 35(1)(*c*),

(iii) the CO_2 family emission limit for each fleet or subfleet, as the case may be, determined for B in the formula set out in paragraph 35(1)(*c*), and

(iv) the number of tractors and incomplete tractors in each averaging set, fleet and subfleet;

(*d*) for each fleet of heavy-duty engines,

(i) the number of credits or deficits for each fleet, calculated in accordance with paragraph 35(1)(*d*),

(ii) the N_2O and CH_4 emission standards that apply to the engines of each fleet,

(iii) the CO_2 emission standard that applies to the engines of each fleet, determined for A in the formula set out in paragraph 35(1)(*d*),

(iv) the CO_2 deteriorated emission level value for each fleet, determined for B in the formula set out in paragraph 35(1)(*d*), and

(v) the number of engines in each averaging set, fleet and engine configuration; and

(*e*) an identification of every instance in each fleet or subfleet, as the case may be, when the 1.5 credit multiplier was used in accordance with subsection 47(6).

Additional credits

(2) To obtain additional early action credits under section 47, a company must include in its 2014 or 2016 end of model year report, as the case may be, the values referred to in paragraphs 48(7)(*q*) to (*t*).

FORMAT OF REPORTS

Submission

50. Any report to be submitted under these Regulations must be submitted electronically in the format provided by the Minister, but the report must be submitted in writing if

(*a*) no such format is provided; or

(*b*) it is, owing to circumstances beyond the control of the person required to submit the report, impracticable to submit the report electronically in the format provided.

INSTRUCTIONS

Engine installation

51. (1) A company that manufactures or imports a heavy-duty engine must ensure that every engine that is installed in a vehicle in Canada is accompanied with written instructions for installing the engine and emission control system or with the address of the place or the website where those instructions may be obtained.

Contents

(2) The instructions must contain the following information:

(*a*) detailed installation procedures for the exhaust system, emission control system, aftertreatment devices and their components;

(*b*) all necessary steps for installing any diagnostic system required under part 86 of Title 40, chapter I, subchapter C, of the CFR; and

(*c*) the limits on the types of use for the engine to ensure that the emission standards set out in these Regulations are complied with.

Language

(3) The instructions must be provided in English, French or both official languages, as requested by the installer.

Tire maintenance

52. (1) In the case of tractors and vocational vehicles, a company must ensure that the written instructions respecting tire maintenance and replacement are provided to the first retail purchaser of every vehicle.

Language

(2) The instructions must be provided in English, French or both official languages, as requested by that purchaser.

RECORDS

EVIDENCE OF CONFORMITY

Sold concurrently in Canada and United States

53. For a heavy-duty vehicle or heavy-duty engine that is covered by an EPA certificate and that is sold concurrently in Canada and the United States, evidence of conformity in respect of a company for the purposes of paragraph 153(1)(*b*) of the Act consists of

(*a*) a copy of the EPA certificate covering the vehicle or the engine and, if applicable, a copy of the evidence of the EPA approval concerning the vehicle or engine as referred to in paragraph 27(6)(*a*), in paragraph (*a*) of A in the formula set out in subsection 40(1) or in paragraph 41(2)(*a*), as the case may be;

(*b*) a document demonstrating that the vehicle or engine that is covered by the EPA certificate is sold concurrently in Canada and the United States;

(*c*) a copy of the records submitted to the EPA in support of the application or amended application for the EPA certificate in respect of the vehicle or engine; and

(*d*) a U.S. emission control information label or, in the case of a heavy-duty engine, a U.S. engine information label that is permanently affixed to the vehicle or engine in the form and location set out in

(i) section 35 of Title 40, chapter I, subchapter C, part 86, subpart A, of the CFR, and section 135 of Title 40, chapter I, subchapter U, part 1037, subpart B, of the CFR, for the applicable model year of the heavy-duty vehicle, and

(ii) section 35 of Title 40, chapter I, subchapter C, part 86, subpart A, of the CFR, and section 135 of Title 40, chapter I, subchapter U, part 1036, subpart B, of the CFR, for the applicable model year of the heavy-duty engine.

Paragraph 153(1)(*b*) of Act

54. (1) For the purposes of paragraph 153(1)(*b*) of the Act, a company must obtain and produce evidence of conformity for a heavy-duty vehicle or heavy-duty engine — other than one referred to in section 53 — in a form and manner satisfactory to the Minister instead of as specified in that section.

Time of submission

(2) For greater certainty, a company must submit the evidence of conformity to the Minister before importing a heavy-duty vehicle or heavy-duty engine or applying a national emissions mark to it.

Subsection 153(2) of Act

55. For greater certainty, a company that imports a heavy-duty vehicle or heavy-duty engine or applies a national emissions mark to it under subsection 153(2) of the Act is not required to provide the Minister with the evidence of conformity referred to in subsection 54(1) before importing it or applying a national emissions mark to it, but must provide that evidence in accordance with subsection 153(2) of the Act before the vehicle or engine leaves the possession or control of the company and before the vehicle is presented for registration under the laws of a province or of an Aboriginal government.

FLEET AVERAGE EMISSIONS

Contents

56. (1) A company that participates in the CO_2 emission credit system must maintain records containing the following information for each of its fleets:

(*a*) for each fleet of Class 2B and Class 3 heavy-duty vehicles and cab-complete vehicles, excluding those referred to in the definition "vocational vehicle" in subsection 1(1),

(i) the model year,

(ii) the fleet average CO_2 emission standard,

(iii) the fleet average CO_2 emission value and, if applicable, the N_2O and CH_4 emission values,

(iv) the values and data used in calculating the fleet average CO_2 emission standard and the fleet average CO_2 emission value and, if applicable, in calculating the N O and CH emission values,

(v) the values and data used in calculating the number of CO_2 emission credits and, if applicable, the number of early action credits,

(vi) the number of CO_2 emission credits used to offset a N_2O or CH_4 emission deficit, if applicable, and

(vii) the GVWR, curb weight, GCWR, type of transmission, gear ratio, axle ratio and type of engine for each vehicle configuration;

(*b*) for each fleet of vocational vehicles and incomplete vocational vehicles,

(i) the model year,

(ii) the CO_2 emission standard that applies to the vehicles of each subfleet,

(iii) the CO_2 emission rate for each subfleet,

(iv) the values and data, including the GEM computer simulation model inputs and results, used in calculating the CO_2 emission rate for each subfleet, and

(v) the values and data used in calculating the number of CO_2 emission credits and, if applicable, the number of early action credits, for each fleet and subfleet;

(*c*) for each fleet of tractors and incomplete tractors,

(i) the model year,

(ii) the CO_2 emission standard that applies to the vehicles of each subfleet,

(iii) the CO_2 emission rate for each subfleet,

(iv) the values and data, including the GEM computer simulation model inputs and results, used in calculating the CO_2 emission rate for each subfleet, and

(v) the values and data used in calculating the number of CO_2 emission credits and, if applicable, the number of early action credits, for each fleet and subfleet; and

(*d*) for each fleet of heavy-duty engines,

(i) the model year,

(ii) the CO_2 emission standard that applies to the engines of each fleet,

(iii) the CO_2 deteriorated emission level value for each fleet, and

(iv) the values and data used in calculating the number of CO_2 emission credits and, if applicable, the number of early action credits.

Contents — heavy-duty vehicles

(2) A company must maintain records containing the following information for each heavy-duty vehicle in the fleets referred to in paragraphs (1)(*a*) to (*c*):

(*a*) the model year and vehicle configuration or subfleet of the vehicle, as the case may be;

(*b*) the CO_2 emission standard that applies to the vehicles of each subfleet and the fleet average CO_2 emission standard;

(*c*) for a vehicle covered by an EPA certificate, the vehicle family described in section 230 of subpart C of Title 40, chapter I, subchapter U, part 1037, of the CFR, or the applicable test group described in section 1827 of subpart S of Title 40, chapter I, subchapter C, part 86, of the CFR;

(*d*) the name and street address of the plant where the vehicle was assembled;

(*e*) the vehicle identification number;

(*f*) the CO_2 emission value that applies to the fleet of the vehicle or the CO_2 emission rate that applies to the subfleet of the vehicle, as the case may be, and the values and data used in calculating that value or rate; and

(*g*) the name and the street or mailing address of the first retail purchaser of the vehicle in Canada.

Contents — engines

(3) A company must maintain records containing the following information for each heavy-duty engine in the fleets referred to in paragraph (1)(*d*):

(*a*) the model year, the engine configuration and the fleet of the engine;

(*b*) the date of manufacture;

(*c*) the gross power;

(*d*) the identification of the emission control system;

(*e*) the CO_2 emission standard that applies to the engines of the fleet;

(*f*) the applicable engine family;

(*g*) the name of the engine manufacturer;

(*h*) the unique identification number of the engine;

(*i*) the deterioration factor and whether it constitutes a multiplicative deterioration factor or an additive deterioration factor, and the values and data used in calculating that factor; and

(*j*) the name and the street or mailing address of the first retail purchaser of the engine in Canada.

ENGINES SOLD CONCURRENTLY

Evidence of number of engines sold

57. For the purposes of subsection 13(8), in the case of a heavy-duty engine covered by an EPA certificate and sold concurrently in Canada and the United States that conforms to a CO_2 family certification level exceeding the CO_2 emission standard applicable to the model year under these Regulations, the company must maintain records demonstrating the number of heavy-duty engines sold in the United States that are of the same engine family.

VOCATIONAL TRACTORS

Meets definition "vocational tractor"

58. For the purposes of section 28, in the case of a tractor that conforms to the emission standards applicable to vocational vehicles instead of tractors, the company must maintain records demonstrating that the tractor meets the definition "vocational tractor" in subsection 1(1).

MAINTENANCE AND SUBMISSION OF RECORDS

Maintenance of records

59. (1) For heavy-duty vehicles and heavy-duty engines, a company must maintain in writing or in a readily readable electronic or optical form for each model year

(*a*) a copy of the reports referred to in sections 48 and 49 for a period of at least eight years after the end of the calendar year that corresponds to the model year;

(*b*) the evidence of conformity and records referred to in sections 53 and 54 for a period of at least eight years after the day on which the main assembly of the vehicle or manufacture of the engine was completed;

(*c*) the records referred to in sections 56 and 57 for a period of at least eight years after the end of the calendar year that corresponds to the model year; and

(*d*) the records referred to in section 58 for a period of at least three years after the end of the calendar year that corresponds to the model year in question.

Records maintained on behalf of company

(2) If the copy of the reports, the evidence of conformity and the records referred to in subsection

(1) are maintained on behalf of a company, the company must keep a record of the name, street address and, if different, the mailing address of the person who maintains those records.

Time limits

(3) If the Minister makes a written request for the evidence of conformity or the records referred to in subsections (1) and (2), or a summary of any of them, the company must provide the Minister with the requested information, in either official language, within

(*a*) 40 days after the day on which the request is delivered to the company; or

(*b*) if the evidence of conformity or records referred to in section 53 or 54 must be translated from a language other than French or English, 60 days after the day on which the request is delivered to the company.

IMPORTATION DOCUMENT

Importation for exhibition, demonstration, evaluation or testing

60. The declaration referred to in paragraph 155(1)(*a*) of the Act must be made in accordance with section 41 of the *On-Road Vehicle and Engine Emission Regulations*.

RENTAL RATE

Rental rate

61. The annual rental rate to be paid to a company by the Minister under subsection 159(1) of the Act, prorated on a daily basis for each day that a vehicle or engine is made available, is the rate prescribed in section 43 of the *On-Road Vehicle and Engine Emission Regulations*.

APPLICATION FOR EXEMPTION

Application

62. A company applying under section 156 of the Act for an exemption from conformity to any standard specified under these Regulations must submit in writing to the Minister the information set out in section 44 of the *On-Road Vehicle and Engine Emission Regulations*.

DEFECT INFORMATION

Notice of defect

63. (1) The notice of defect referred to in subsections 157(1) and (4) of the Act must be given in writing and must contain the information set out in subsection 45(1) of the *On-Road Vehicle and Engine Emission Regulations*.

Reports

(2) In respect of a notice of defect issued under these Regulations, a company must comply with subsections 45(2) and (3) of the *On-Road Vehicle and Engine Emission Regulations*.

Applicable standard

(3) For the application of section 157 of the Act, the CO_2 emission standard that applies

(*a*) to a Class 2B and Class 3 heavy-duty vehicle and cab-complete vehicle — excluding those referred to in the definition "vocational vehicle" in subsection 1(1) — or to a spark-ignition engine that conforms to the alternative CO_2 emission standard referred to in section 25, is the product of 1.1 multiplied by the CO_2 emission value for that vehicle configuration, rounded to the nearest 0.1 gram per mile;

(*b*) to a vocational vehicle is the result of the GEM computer simulation model using the parameters specified in subsection 26(2);

(*c*) to a tractor — other than a low-roof or mid-roof tractor referred to in subsection 27(5) —

is the result of the GEM computer simulation model using the parameters specified in subsection 27(2), except that the coefficient of aerodynamic drag may originate from a bin for which the coefficient of aerodynamic drag is higher than that of the bin of the subject vehicle;

(*d*) to a low-roof or mid-roof tractor referred to in subsection 27(5), is the result of the GEM computer simulation model using the parameters specified in subsection 27(2);

(*e*) to a heavy-duty engine — other than an engine referred to in paragraphs (*f*) and (*g*) — is the product of 1.03 multiplied by the applicable standard set out in section 30 for that engine, or in the case of an engine that is grouped into a fleet referred to in section 18, the product of 1.03 multiplied by the deteriorated emission level applicable to the fleet;

(*f*) to a heavy-duty engine of the 2014 to 2016 model years that conforms to the alternative CO_2 emission standard referred to in subsection 31(1), is the product of 1.03 multiplied by the alternative CO_2 emission standard; and

(*g*) to a heavy-duty engine of the 2013 to 2016 model years that conforms to the alternative CO_2 emission standard referred to in subsection 31(2), is the product of 1.03 multiplied by the alternative CO_2 emission standard.

COMING INTO FORCE

Registration

64. These Regulations come into force on the day on which they are registered.

REGULATORY IMPACT ANALYSIS STATEMENT

(*This statement is not part of the Regulations*.)

1. Executive summary

Issue: As a result of human activities, predominantly the combustion of fossil fuels, the atmospheric concentrations of greenhouse gases (GHGs) have increased substantially since the onset of the Industrial Revolution. In view of the historical emissions of GHGs from anthropogenic sources, and the quantity of emissions expected in the near future, GHGs, as significant air pollutants, are expected to remain a key contributor to climate change.

The transportation sector is a significant source of GHG emissions in Canada, accounting for 28% of total emissions in 2010. Within this sector, heavy-duty vehicles account for nearly 24% of GHG emissions, or approximately 7% of total emissions in Canada. (see footnote 1) Heavy-duty vehicle emissions rose by nearly 3 megatonnes (Mt) of carbon dioxide equivalent (CO_2e) from 2005 to 2010.

Description: The objective of the *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations* (the Regulations) is to reduce GHG emissions by establishing mandatory GHG emission standards for new on-road heavy-duty vehicles and engines that are aligned with U.S. national standards. The development of common North American standards will provide a level playing field that will lead North American manufacturers to produce more advanced vehicles, which enhances their competitiveness.

The Regulations will apply to companies manufacturing and importing new on-road heavy-duty vehicles and engines of the 2014 and later model years for the purpose of sale in Canada including the whole range of on-road heavy-duty full-size pickup trucks, vans, tractors and buses, as well as a wide variety of vocational vehicles such as freight, delivery, service, cement, and dump trucks. The Regulations will also include provisions that establish compliance flexibilities which include a system for generating, banking and trading emission credits. The Regulations will include additional credits for hybrid vehicles and electric vehicles, as well as for innovative technologies to reduce GHG emissions. The Regulations will include further flexibilities for companies to use a phased-in approach for model year 2014 through 2016 tractors and vocational vehicles. Companies will also be

required to submit annual reports and maintain records relating to the GHG emission performance of their vehicles and fleets.

Cost-benefit statement: The Regulations are estimated to result in a reduction of approximately 19.1 Mt of CO_2e in GHG emissions over the lifetime operation of vehicles produced in the model years 2014–2018 (MY2014–2018) cohort.

The present value of the total costs of the Regulations is estimated at $0.8 billion, largely due to the additional vehicle technology costs required by the Regulations. The total benefits are estimated at $5.3 billion, including GHG reductions valued at $0.5 billion and fuel savings of $4.8 billion. Over the lifetime of vehicles produced in MY2014–2018, the present value of the net benefit of the Regulations is estimated at $4.5 billion.

"One-for-One" Rule: In 2012, the Government of Canada implemented a "One-for-One" Rule to control the administrative burden that regulations place on business. Environment Canada has reviewed the administrative burden estimated to result from the proposed Regulations published in the *Canada Gazette*, Part I, to identify a means of minimizing this burden, while achieving compliance. As a result of this exercise and based on comments received during the consultation period, changes were made to the proposed Regulations to limit the increase in overall administrative burden. Notable changes include reduced administrative requirements for vehicles manufactured in stages and simplified reporting requirements.

Business and consumer impacts: Although owners and operators of heavy-duty vehicles will not be subject to the Regulations, they are expected to face higher purchase prices for new heavy-duty vehicles. The technologies embedded in the vehicles in order to comply with the Regulations will bring fuel savings that will outweigh the costs of these technologies. These available technologies were carefully selected to ensure broad industry support through the increased use of safe, existing technologies (see footnote 2) to achieve significant GHG emissions and fuel consumption reductions. For all three heavy-duty vehicle regulatory classes, the payback period is less than one year. The increased fuel efficiencies of the vehicles are also expected to make the trucking industry more competitive with other modes of shipping. Despite their benefits, and while there will likely be some vehicle technology improvement, it is not expected that those technologies would be introduced to the same extent in the market place in the absence of the Regulations.

Domestic and international coordination and cooperation: Consultations were conducted with industry, provincial and territorial governments, other federal government departments and environmental non-governmental organizations (ENGOs). Environment Canada and Transport Canada co-hosted four consultation group meetings that included representatives from the above-mentioned stakeholders.

Environment Canada also released two consultation documents. (see footnote 3) Comments received during consultation, both before and after the publication of the proposed Regulations in the *Canada Gazette*, Part I, served to inform the development of the Regulations. In addition, Environment Canada has conducted joint testing and research with the United States Environmental Protection Agency (U.S. EPA) to support the development of common standards.

2. Background

2.1. Background on policy development

2.1.1. National context

In 2009, the Government of Canada committed in the Copenhagen Accord and the Cancun Agreements to reducing, by 2020, total GHG emissions by 17% from 2005 levels, a target that is aligned with that of the United States. An important step toward meeting that goal included the 2010 publication in the *Canada Gazette*, Part II, of the *Passenger Automobile and Light Truck Greenhouse*

Gas Emission Regulations that are aligned with those of the United States.

On May 21, 2010, the Government of Canada and the Government of the United States each announced the development of new regulations to limit GHG emissions from new on-road heavy-duty vehicles. Canada announced that the Regulations would be made under CEPA 1999 and in alignment with those of the United States. On October 25, 2010, the Government of Canada released an initial consultation document describing the key elements being considered in the development of Canadian regulations to seek stakeholder views early in the process.

On August 9, 2011, Environment Canada published a second and more detailed consultation document to provide an additional opportunity for stakeholders to provide comments and to participate in the regulatory development process.

On April 14, 2012, Environment Canada published the proposed *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations* in the *Canada Gazette*, Part I. This began a formal 60-day comment period. Environment Canada considered all comments received during the comment period in developing the Regulations.

2.1.2. Canada's collaboration with the U.S. EPA

Environment Canada, in partnership with Canada's National Research Council, has conducted joint aerodynamic testing and research with the U.S. EPA as well as heavy-duty vehicle emissions testing at Environment Canada facilities to support regulatory development. This collaboration is taking place under the Canada-U.S. Air Quality Committee and builds on the joint work with the United States on the development and implementation of GHG emission standards for vehicles. This collaboration served to inform the development of the Regulations in Canada.

2.1.3. Actions in other Canadian jurisdictions

Provinces and territories have not indicated any intention to regulate GHG emissions from new on-road heavy-duty vehicles. Furthermore, provincial environment ministries have communicated strong support for federal Canadian regulations aligned with those of the United States.

The provincial and territorial governments set requirements for in-use vehicles including tractor-trailer weights and trailer dimensions. All provinces will continue to be consulted to ensure a consistent pan-Canadian approach to regulating on-road heavy-duty vehicle emissions.

2.1.4. Actions in international jurisdictions

2.1.4.1. United States

On November 30, 2010, the National Highway Traffic Safety Administration (NHTSA) and the U.S. EPA jointly published a Proposed Rule describing a set of complementary new proposed regulations for heavy-duty vehicles and engines for model years 2014 and later. On September 15, 2011, the Final Rule was published in the U.S. *Federal Register*. The U.S. rules establish coordinated federal regulations to address the closely intertwined issues of energy efficiency and climate change under a joint Heavy-Duty National Program. In this joint rulemaking, the NHTSA implements fuel economy standards under the *Energy Independence and Security Act of 2007*, while the U.S. EPA regulations under the *Clean Air Act* implement the GHG emission standards for heavy-duty vehicles.

The U.S. National Program is based on a common set of principles, which includes, as stated in the Final Rule, (see footnote 4) "increased use of existing technologies to achieve significant GHG emissions and fuel consumption reductions; a program that starts in 2014 and is fully phased in by 2018; a program that works towards harmonization of methods for determining a vehicle's GHG and fuel efficiency, recognizing the global nature of the issues and the industry; standards that recognize the commercial needs of the trucking industry; and incentives leading to the early introduction of advanced technologies."

In 2004, the U.S. EPA launched SmartWay, a voluntary program that encourages the trucking sector to identify strategies and technologies for reducing fuel consumption and CO_2e emissions and allows

companies to be SmartWay certified.

The SmartWay program has allowed the U.S. EPA to work closely with heavy-duty vehicle manufacturers and fleet operators in evaluating numerous technologies and developing test procedures that achieve fuel and CO_2e reductions. The experience and knowledge acquired with SmartWay served in developing the Heavy-Duty National Program of the GHG regulations of the United States.

2.1.4.2. California

The California Air Resources Board adopted a GHG emission regulation for heavy-duty vehicles in 2008. This regulation is to reduce GHG by improving the fuel efficiency of heavy-duty vehicles through aerodynamic enhancement of vehicles and the use of low rolling resistance tires. This regulation covers tractors that pull a 53-foot or longer box-type semi-trailer, and covers the trailers themselves, and applies to the users of these tractor-trailer vehicles.

Since January 1, 2010, 2011 and later model year sleeper-cab heavy-duty tractors pulling a 53-foot or longer box-type trailer operating on a highway within California must be U.S. EPA Certified SmartWay, which requires certified aerodynamic equipment and low rolling resistance tires. As for day-cab tractors, the regulation requires that they be equipped with SmartWay verified low rolling resistance tires. The California regulation also requires that existing tractors, mainly all 2010 model year and older sleeper-cab and day-cab tractors, be equipped with SmartWay verified low rolling resistance tires starting in January 2012. The regulation also includes similar requirements for 53-foot or longer box-type trailers.

2.1.4.3. Other international regulatory actions to reduce GHGs/fuel consumption of vehicles

Other international jurisdictions have established or are developing regulatory regimes that directly or indirectly serve to reduce GHG emissions from new heavy-duty vehicles.

Japan has implemented the Top-Runner Program, which identifies and designates as the “top-runner” the most fuel-efficient vehicle in each weight range. The program has the objective to improve the fleet average fuel-efficiency of all vehicles in a particular weight range to match that of its top-runner. In the case of heavy-duty vehicles, the most fuel-efficient vehicle of model year 2002 (excluding hybrids) was set as the baseline, and regulation will start with model year 2015.

The European Commission is currently developing a new certification procedure and a strategy targeting fuel consumption and CO_2e emissions from heavy-duty vehicles. Simulation modelling is being considered. A draft regulation is expected to be completed by the end of 2012. (see footnote 5) It is expected that mandatory reporting would be effective in 2013–2014 and that possible regulation would be in a 2018–2020 timeframe.

2.2. Sector profile

2.2.1. Heavy-duty vehicle manufacturing and importing

The Regulations have divided these vehicles into three different categories:

1. Class 2B and Class 3 heavy-duty vehicles (full-size pick-up trucks and vans);
2. Vocational vehicles; and
3. Tractors.

Heavy-duty vehicles have a gross vehicle weight rating (GVWR) greater than 3 856 kg (8 500 lb) and span several GVWR classes:

1. Tractors (often called combination tractors) are contained mainly within classes 7 and 8; and
2. Vocational vehicles, which span from Class 2B through Class 8, including various types of buses.

There are currently only two Canadian manufacturers of heavy-duty trucks, Hino and Paccar, which produce approximately 6 400 vehicles annually that are primarily exported to the United States. There is little to no manufacturing of heavy-duty engines in Canada although there are some Canadian body manufacturers that produce finished vocational vehicles. Canadian bus manufacturers hold an important

share of the North American market, notably MCI in Manitoba and Prevost in Quebec, which produce intercity buses; New Flyer and Nova Bus, which produce transit buses; and Girardin Minibus, which produces school buses and smaller buses. All of these manufacturers sell in both American and Canadian markets.

2.2.2. Statistics of manufacturing and trade

The Canadian industry, classified in national statistics as Heavy-Duty Truck Manufacturing in the North American Industry Classification System (NAICS 33612), includes producers of complete heavy-duty vehicles and chassis, which are either tractors or vocational vehicles under the Regulations. Output of the industry has fallen sharply since the recent recession: from 11 321 vehicles in 2009 to 5 630 in 2010. (see footnote 6) Most of the vehicles produced in Canada are exported to the United States: over 90% in 2009, and about 80% in 2010. The decline in output reflects a reduction in total vehicles purchased in the United States in consequence of reduced economic activity. The industry defined as Motor Vehicle Body Manufacturing (NAICS 336211) included 197 Canadian establishments producing vocational vehicles in 2009.

Manufacturing revenues for Heavy-Duty Truck Manufacturing decreased from $3.6 billion in 2001 to $1.9 billion in 2010, or at an average compound annual rate of 7.1% per year. Between 2009 and 2010, manufacturing revenues decreased by 14.9%. (see footnote 7) The total number of employees in the sector decreased from 6 961 workers in 2001 to 4 985 workers in 2010, an average annual decrease of 3.6% over this time span. There was an increase of 4.5% in employment between 2009 and 2010. (see footnote 8)

Exports of heavy-duty truck manufacturing declined 60% from $3.1 billion in 2007 to $1.2 billion in 2011, largely the result of reduced exports to the United States, where approximately 97% of exports are destined, falling from $3 billion in 2007 to $1.2 billion in 2011. Imports of heavy-duty truck manufacturing grew 23% from $4.3 billion in 2007 to $5.2 billion in 2011, largely originating in countries other than the United States, the origin of 88% of our imports in 2007 and 78% of our imports in 2011.

2.2.3. Truck carriers

In 2009, there were some 750 000 heavy-duty trucks of GVWR over 4 536 kg in operation in Canada (Canadian Vehicle Survey, 2009). There were approximately 435 000 medium heavy-duty trucks below 14 970 kg GVWR and 314 000 heavier heavy-duty trucks. The medium heavy-duty truck usage was 8.2 billion vehicle-kilometres, an average of 18 900 km per truck, while the heavy heavy-duty truck usage totalled 21.2 billion vehicle-kilometres, an average of 67 500 km per vehicle, as shown below in Table 1:

Table 1: Heavy-duty truck distance travelled in 2009, by weight class

Vehicle Type	**Weight**	**Number in Operation**	**Average Distance Travelled** (Kilometres)	**Combined Distance Travelled** (Billions of kilometres)
Medium heavy-duty trucks	< 14 970 kg	435 000	18 900	8.2
Heavy heavy-duty trucks		314 000	67 500	21.2
Sum, all heavy-duty trucks	> 4 536 kg	750 000		29.4

Source: Canadian Vehicle Survey, 2009, Statistics Canada

There were 194 000 trucks described as "for-hire," only 26% of the total fleet, but responsible for 46% of total vehicle-kilometres. A further 128 000 trucks were owned by owner-operators, responsible for 21% of total vehicle-kilometres. Such trucks are usually contracted to a larger carrier or company. Some 319 000 vehicles were used in "private trucking," the term used to describe trucks that are not for hire, but are used to carry the owners' goods, including trucks owned by major manufacturers and retailers to transport the goods they own, and also trucks owned by farmers or tradesmen, for example. Such trucks were 43% of the fleet, but were used for only 23% of total vehicle-kilometres, at an average of only 21 000 km per vehicle.

Table 2: Heavy-duty truck distance travelled, 2009, by ownership/use

Ownership/ Use	**Vehicles** (thousands)				**Kilometres Driven** (per vehicle)			**Vehicle-kilometres** (billions)			
	Medium	Heavy	Total	%	Medium	Heavy	Total	Medium	Heavy	Total	%
For-hire	51.8	142.5	194.3	26%	22 236	88 421	70 510	1.1	12.6	13.7	46.4%
Owner-operator	63.3	64.2	127.6	17%	28 436	70 093	49 373	1.8	4.5	6.3	22.1%
Private	240.0	79.0	319.0	43%	19 250	34 177	21 003	3.9	2.7	6.7	22.7%
Other	79.5	28.5	108.0	14%	17 610	49 123	25 926	1.4	1.4	2.8	9.5%
Total/ Average	434.6	314.2	748.8	100%	18 868	67 473	39 391	8.2	21.2	29.5	100%

Source: Canadian Vehicle Survey, 2009, Statistics Canada

2.2.4. Trade by transport mode

Table 3 shows preliminary 2010 values of Canada's merchandise trade with the United States and Mexico, combining imports and exports. Trucking is responsible for the largest proportion of North American merchandise trade by value — 57% in 2010.

Table 3: Total North American merchandise trade by transport mode

Mode	**Trade 2010** (millions of U.S. dollars)	**Percentage**
Road	298,832	58.1%
Rail	87,151	16.9%
Pipeline and other	71,652	13.9%
Air	29,267	5.7%
	27,305	5.3%

Marine		
Total	514,208	100%

Source: North American Transportation Statistics Database

In 2008, employment in the for-hire trucking industry in Canada was estimated at 415 000. It included 182 000 full- and part-time employees of the medium and large for-hire carriers with annual operating revenues of $1 million or more; 26 000 employees of small for-hire carriers with annual operating revenues between $30,000 and $1 million; 104 000 owner-operators with annual operating revenues of $30,000 or more; and 103 000 delivery drivers. Of this total for-hire trucking employment, 36% were in Ontario, 20% in Quebec and 27% in the Prairie provinces, with smaller proportions in the other provinces and territories.

2.2.5. Bus carriers

Bus carrier companies operate in several sub-markets or sub-industries. A total of 1 371 companies earned service revenues of $6.4 billion, and received an additional $7.2 billion in government contributions, primarily for urban transit services. Urban transit services earned 53% of total industry revenues excluding those contributions, and school bus services earned another 23%. Scheduled intercity, charter and shuttle services together earned 16% of total revenues.

3. Issue

As a result of human activities, predominantly the combustion of fossil fuels, the atmospheric concentrations of GHGs have increased substantially since the onset of the Industrial Revolution. In view of the historical emissions of GHGs from anthropogenic sources, and the quantity of emissions expected in the near future, GHGs are expected to remain a key contributor to climate change.

Across Canada we are witnessing the negative impacts of a changing climate first-hand. For example, a warming climate has been linked to the melting of permafrost in the North that has destabilized the foundations of homes and schools. While the specific impacts vary by region, all of Canada's provinces and territories are experiencing the effects of a changing climate. (see footnote 9)

While Canada accounts for just 2% of global GHG emissions, its per capita emissions are among the highest in the world and continue to increase. In 2010, GHG emissions in Canada totalled 692 megatonnes (Mt) of CO_2e as shown in Table 4 below:

Table 4: Canada's GHG emissions

Source (Mt)	**2005**	**2010**
Total	731	692
Transportation	193	195
Heavy-duty vehicles	44	47

Source: National Inventory Report: 1990–2010

As Table 4 indicates, the transportation sector (air, marine, rail, road and other modes) is a significant source of GHG emissions in Canada, accounting for 28% of total emissions in 2010. Within this sector, heavy-duty vehicles account for nearly 24% of GHG emissions, or approximately 7% of total emissions in Canada. (see footnote 10) Heavy-duty vehicle GHG emissions rose by nearly 3 Mt of CO_2e from 2005 to 2010.

Accordingly, taking action to reduce GHG emissions from new on-road heavy-duty vehicles and their engines is an essential element of the Government of Canada's strategy to reduce GHG emissions to protect the environment and the health of Canadians. COis the predominant GHG emitted by motor vehicles and is directly related to the amount of fuel that is consumed by vehicles. Vehicles also emit other GHGs, including tailpipe emissions of methane (CH_4), and the leakage of air-conditioning system refrigerant, gases which all have higher global warming potential than CO_2. Reductions of those emissions are not related to or do not significantly contribute to fuel savings.

4. Objectives

4.1. GHG reductions

The Government of Canada is committed to reducing Canada's total GHG emissions to 17% below its 2005 levels by 2020 (i.e. from 731Mt to 607 Mt) — a target that is identified in the Copenhagen Accord and the Cancun Agreements. By establishing mandatory GHG emission standards for new on-road heavy-duty vehicles and engines beginning in 2014, Canada will move closer to its Copenhagen 2020 target.

The implementation of a comprehensive set of national standards reflecting a common North American approach for regulating GHG emissions from new on-road heavy-duty vehicles and engines will lead to environmental improvements for Canadians and provide regulatory certainty for Canadian manufacturers. Aligning Canadian standards with new U.S. regulations will also set a North American level playing field in the transportation sector.

The Regulations will require manufacturers selling heavy-duty vehicles and engines in Canada to deploy emission reduction technologies, which will benefit both the environment and Canadians.

4.2. Regulatory burden

The Regulations are designed to achieve the above objectives while minimizing the regulatory compliance burden of regulated Canadian industries through the alignment of heavy-duty vehicle regulations in Canada and in the United States. The reporting requirements were designed to assess the performance of the Regulations against the targets established in the Performance Measurement and Evaluation Plan (see section 14) while minimizing the reporting burden of industry. The Regulations will also allow regulatees to use the same GHG emissions model (GEM) as regulatees in the United States will use. This GEM is an accurate and cost-effective tool to assess compliance in either country (see section 5.4).

Implementation of a common Canada-U.S. approach to regulating GHG emissions from model year 2014 and later heavy-duty vehicles benefits not only the environment, but also consumers and the competitiveness of the North American auto industry. Aligning North American regulations not only provides manufacturers and importers with regulatory certainty, but also ensures common standards in both countries, which minimizes the administrative burden on Canadian companies. Common Canada-U.S. standards are important to preserve the competitiveness of the Canadian heavy duty vehicle sector, due to the high level of integration within the industry.

5. Description

5.1. Key elements of the Regulations

The Regulations introduce progressively more stringent GHG emission standards for new on-road heavy-duty vehicles and engines of the 2014 to 2018 model years in alignment with the national GHG emission standards and test procedures of the U.S. EPA. The Regulations apply to companies manufacturing and importing new on-road heavy-duty vehicles and engines for the purpose of sale in Canada.

5.2. Prescribed regulatory classes

The Regulations aim at reducing GHG emissions from the whole range of new on-road heavy-duty vehicles, comprising full-size pickup trucks and vans, tractors, and a wide variety of vocational vehicles, such as school, transit and intercity buses and freight, delivery, service, cement, garbage and dump

trucks.

The Regulations are aimed at all on-road vehicles with a GVWR of more than 3 856 kg (8 500 lb), except medium-duty passenger vehicles and those vehicles that are subject to the *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*. Trailers are not subject to the Regulations.

The Regulations recognize the utility of vehicles and introduce GHG emission standards that apply to three prescribed regulatory classes of heavy-duty vehicles. Under the Regulations, the full-size pickup trucks and vans would be regulated as "Class 2B and Class 3 heavy-duty vehicles," and combination tractors as "tractors." All other heavy-duty vehicles not covered by the two previously mentioned prescribed regulatory classes are regulated as "vocational vehicles," which include buses. Furthermore, the Regulations establish a prescribed regulatory class for heavy-duty engines designed to be used in a vocational vehicle or a tractor.

5.3. Emission standards for CO_2, N_2O and CH_4

The standards in the Regulations address emissions of CO_2, N_2O and CH_4 from heavy-duty vehicles and engines. The Regulations also include measures to require reductions in leakage of the refrigerant used in cabin air-conditioning systems of tractors and class 2B and 3 vehicles.

For Class 2B and Class 3 heavy-duty vehicles, the Regulations include emission standards for CO_2, N_2O and CH_4. In regard to CO_2 emissions, the standard is a fleet average CO_2 emission standard for all vehicles of a company's fleet and is determined based on a work factor, which is defined as a weighting of payload capacity, towing capacity and four-wheel drive capability. The standard is different for gasoline- and diesel-powered vehicles.

In regard to vocational vehicles and tractors, the Regulations include heavy-duty engine standards for CO_2, N_2O and CH_4, and also separate vehicle standards for CO_2. The vehicle emission standards are set according to the class of the vehicle, its characteristics, and the model year.

The standards are structured so as not to constrain the size and power of heavy-duty vehicles, recognizing that these vehicles are designed to perform work. The standards are expressed in grams per unit of work, therefore allowing a more powerful vehicle to proportionally emit more GHGs than a less powerful vehicle.

5.4. Compliance assessment and computer simulation model

For standards applicable to Class 2B and Class 3 heavy-duty vehicles, regulatees must measure the vehicle performance using prescribed test cycles on a chassis dynamometer, similarly to existing procedures for light-duty vehicles under the current *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*.

The performance of engines installed on vocational vehicles and tractors is measured using prescribed test cycles on an engine dynamometer, i.e. the same ones used to measure criteria air contaminants under the *On-Road Vehicle and Engine Emission Regulations*.

Compliance with the vehicle standards for vocational vehicles and tractors is assessed using the GEM computer simulation model. This model is readily available at no charge and assesses the emission reductions of a vehicle equipped with one or more non-engine-related technologies, such as aerodynamic fairings, low rolling resistance tires, a speed limiter, weight reduction technologies, and idle reduction technology. The simulation model also assigns to vehicles a pre-determined payload and engine size. As a result, Canadian manufacturers will not be disadvantaged compared to U.S. manufacturers due to the higher average payloads in Canada.

5.5. CO_2 emission credit system

The Regulations include a system of emission credits to help meet overall environmental objectives in a manner that provides the regulated industry with compliance flexibility. The system allows companies to generate, bank and trade emission credits. Under this system, companies are allowed to

manufacture or import vehicles and engines with CO_2 emission levels worse than the applicable emission standard, and others performing better than the standard, provided that their average fleet emission level does not exceed the applicable emission standard.

In order to participate in the CO_2 emission credit system, a company must group into fleets its vehicles and engines and calculate its credits and deficits, expressed in units of megagrams of CO_2. Credits may be obtained by companies whose average fleet emission levels fall below the applicable standard, while deficits are incurred by companies whose fleet emissions exceed the applicable standard. A deficit must be compensated within three model years. Credits may be banked to offset a future deficit for up to five model years after the year in which the credits were obtained. Credits may also be transferred to another company.

5.6. Transitional measures and enhanced flexibilities for vehicles and engines covered by a U.S. EPA certificate

To provide additional flexibilities, companies will be exempt from the requirements the CO_2 emission credits system for all its 2014 model year vocational vehicles and tractors that are covered by a U.S. EPA certificate. In addition, companies will also be permitted to exempt up to 50% of these vehicles of the 2015 model year and up to 25% of these vehicles of the 2016 model year from these requirements. This exemption is not available for the 2017 and beyond model years. Some restrictions apply to the use of early action credits and credits obtained during the 2014–2016 model years if a company chooses to take advantage of the transitional measures.

The Regulations also provide additional flexibilities that exempt companies from having to participate in the CO_2 credit system if they import and manufacture engines that are covered by a U.S. EPA certificate with emission levels worse than the applicable standard. Whether companies can be exempted depends on the number of engines sold in Canada and on a ratio of the number of engines sold in Canada and in the United States.

Environment Canada's analysis indicates that these additional flexibilities will not significantly impact the final positive outcome of the Regulations, as discussed in greater detail in section 7.1.2. There is an inherent purchaser demand for fuel efficient vehicles and companies would only be expected to use the flexibilities if required to respond to unexpected market demand or to allow additional lead time to set up effective trading systems.

5.7. Additional emission credits

The Regulations allow companies that incorporate certain technologies that provide improvements in reducing CO_2 emissions to be eligible for additional emission credits when participating in the credit system.

Companies that manufacture or import, prior to the coming into force of the applicable standards, heavy-duty vehicles or engines that have emissions that are below the required emissions standards also have the possibility to generate early action credits.

The methods to calculate the additional credits are aligned with those of the United States. A company is not allowed to obtain additional credits more than once for the same type of GHG emission reduction technology.

5.8. Small volume companies

Companies that manufactured or imported, in Canada, fewer than 200 vocational vehicles and tractors in 2011 and fewer than 200 vocational vehicles and tractors on average over the three most recent consecutive model years have the option to exempt their vocational vehicles and tractors of a given model year from complying with the CO_2 emissions standards.

5.9. Annual reporting requirements

Beginning with the 2014 model year, companies are required to submit to the Minister an annual end of model year report for all their heavy-duty vehicles and engines.

The report includes, for each type of vehicle or engine of a prescribed regulatory class, the number of heavy-duty vehicles and heavy-duty engines and all necessary information for the calculation of the company's credits or deficits when the company participates in the CO_2 emission credit system. This includes, among other information, the applicable emission standards, emission values or rates, and family emission limits.

5.10. Vehicles manufactured in stages

The Regulations introduce requirements for heavy-duty vehicles manufactured in stages so that when a company alters a heavy-duty vehicle that is in conformity with the Regulations in a way that may affect emissions, it must, in respect of the work carried out to alter the vehicle, ensure that the vehicle still conforms to all applicable standards.

5.11. Other administrative provisions

Several administrative provisions are aligned with those under existing related regulations under the *Canadian Environmental Protection Act, 1999* (CEPA 1999), including provisions respecting the national emissions mark, maintenance and submission of records, the cost for test vehicles, application for exemptions and notices of defect.

In 2012, the Government of Canada implemented a "One-for-One" Rule to control the administrative burden that regulations place on business. Environment Canada (EC) has reviewed the administrative burden as it was proposed in the *Canada Gazette*, Part I, in an attempt to identify areas in which the increase in burden could be reasonably minimized.

As a result of this exercise and based on comments received during the consultation period, several changes were made to the proposed Regulations to limit the increase in overall administrative burden. Companies are no longer required to submit annual preliminary reports given that they were not intended to establish company compliance with the Regulations, but rather to orient regulators as to the initial actions of the regulated companies during a model year. Also, as a result of comments received from industry stakeholders, the deadline for submitting end of model year reports was postponed by several weeks. This will allow companies sufficient time to cull and submit the necessary information. Finally, administrative requirements for vehicles manufactured in stages were reduced, given the low impact secondary manufacturers have on the emission performance of vehicles and given the relative small size of businesses involved in this sector.

Also, it should be noted that the Regulations incorporate all of the same test methods and procedures as used in the United States. This provides clear direction to regulated companies and allows test data produced to demonstrate compliance under U.S. regulations to be used to demonstrate compliance in Canada.

6. Regulatory and non-regulatory options considered

6.1. Status quo approach

Currently, there is no federal requirement in Canada to reduce GHG emissions from new on-road heavy-duty vehicles. Heavy-duty vehicles are an important contributor to overall emissions and reducing GHGs from these vehicles is a key element in meeting the Government's climate change goals. Maintaining the status quo would make it more difficult for Canada to achieve this goal, while preventing Canadians from benefiting from the associated environmental improvements and economic benefits. Therefore, for the Government of Canada, maintaining the status quo is not an appropriate option for reducing GHG emissions from new heavy-duty vehicles in Canada.

6.2. Voluntary approach

New regulations in the United States will require manufacturers to adopt more GHG-reducing technologies in new heavy-duty vehicles sold in the United States beginning in 2014. However, because of the highly customized nature of the heavy-duty vehicle industry, manufacturers may choose not to install those technologies in vehicles sold in Canada. Therefore, while a voluntary program could result in some emission reductions, it would not necessarily result in the same level of emission reductions as

a Canadian regulatory regime will.

6.3. Regulatory approach

Given the importance of addressing climate change, most industrialized countries are moving to establish regulated requirements for the control of fuel consumption and/or GHG emissions from new vehicles. The implementation of a comprehensive set of national standards reflecting a common North American approach for regulating GHG emissions from new on-road heavy-duty vehicles and engines will lead to environmental improvements for Canadians, and provide regulatory certainty for Canadian manufacturers. Aligning Canadian standards with U.S. standards would also set a level North American playing field in the transportation sector.

6.3.1. Regulations under the *Motor Vehicle Fuel Consumption Standards Act*

The Government of Canada has previously considered reducing GHG emissions through the adoption of vehicle fuel consumption standards under the *Motor Vehicle Fuel Consumption Standards Act* (MVFCSA). When the *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations* were developed in 2010, it was determined that significant amendments were required to the MVFCSA in order to be able to put in place regulations that would align with the U.S. fuel economy standards. Therefore, the approach of proceeding with Canadian fuel consumption regulations under the MVFCSA was then excluded in favour of regulating under CEPA 1999.

6.3.2. Regulations under CEPA 1999

CEPA 1999 enables the implementation of innovative compliance flexibilities, such as a system for the banking and trading of emission credits to help meet overall environmental objectives in a manner that provides the regulated industry with maximum compliance flexibility.

This approach is also consistent with the existing use of CEPA 1999 to establish standards limiting smog-forming air pollutant emissions from new vehicles and engines, as well as to regulate GHG emissions from light-duty vehicles under the *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*.

The Government of Canada has determined that establishing regulated heavy-duty vehicle GHG emission standards under CEPA 1999 represents the best option to introduce these Regulations and to align Canada's requirements with the national regulated standards of the United States.

7. Benefits and costs

The Regulations are estimated to result in a reduction of approximately 19.1 Mt of CO_2e in GHG emissions over the lifetime operation of new on-road heavy-duty vehicles sold between 2014 and 2018 (MY2014–2018), the period during which the Regulations first come into force (2014) and then are gradually phased into full effect (from 2015 to 2018). The Regulations are also expected to reduce fuel consumption by 7.2 billion litres over the lifetime of the MY2014–2018 fleet.

Over the lifetime of MY2014–2018 vehicles, the present value of the cost of the Regulations is estimated at $0.8 billion, largely due to the additional vehicle technology costs required by the Regulations. The total benefits are estimated at $5.3 billion, due to the value of GHG reductions ($0.5 billion) and fuel savings ($4.8 billion). Over the lifetime of MY2014–2018 vehicles, the present value of the net benefit of the Regulations is estimated at $4.5 billion. The detailed analysis of benefits and costs is presented below.

7.0. Regulatory updates from *Canada Gazette*, Part I

The proposed Regulations underwent a number of changes following publication in *Canada Gazette*, Part I, to address formal comments received during the 60-day comment period (see section 10). Those changes include a phased-in approach to provide transitional measures over the 2014–2016 model years; reductions in the administrative requirements for vehicles manufactured in stages; added flexibilities for small-volume companies; delayed deadlines for submitting end of model year reports; and additional flexibilities for tractors that are not designed to operate mainly on highways ("vocational

tractors"). All of these changes are designed to provide greater flexibility, particularly in the first year of implementation.

Environment Canada's analysis has indicated that these changes will not significantly affect the impacts of the Regulations. Both technology costs borne by industry, and GHG emission reductions are expected to be slightly reduced, while costs and benefits are both likely to fall at the same ratio. As a result, the benefit to cost ratio of the Regulations remain essentially unchanged. The consistency of the benefit to cost ratio, the small magnitude of these changes and the uncertainty inherent in forecasting emissions, costs and benefits into the future have led EC to deem it neither necessary nor cost-effective to quantify these minor changes in the analysis.

7.1. Analytical framework

The approach to the cost-benefit analysis identifies, quantifies and monetizes, to the extent possible, the incremental costs and benefits of the Regulations. The cost-benefit analysis framework applied to this study incorporates the following elements:

Incremental impacts: Impacts due to the Regulations are analyzed in terms of changes to vehicle technologies, emissions, and associated costs and benefits in the regulatory scenario compared to the business-as-usual (BAU) scenario. The two scenarios are presented in detail below. The incremental impacts are the differences between the estimated levels of technologies and emissions in the two scenarios, and the differences between the associated costs and benefits in the two scenarios. These differences (incremental impacts) are fully attributed to the Regulations (see section 7.2.3 on key assumptions).

Timeframe: The analysis considers new heavy-duty vehicles sold between 2014 and 2018 (MY2014–2018), the period during which the Regulations first come into force (2014) and then are gradually phased into full effect (2015 to 2018). The analysis assumes that new vehicles survive for up to 30 years. This timeframe is consistent with other analyses, and with Canadian data that shows that few vehicles survive beyond 30 years. Thus, the overall timeframe for the analysis is 35 years (2014 to 2048), the total lifespan of the MY2014–2018 new vehicle fleet. The impact of vehicles sold after 2018 is not considered in this analysis, but is expected to be similar to the impact for MY2018.

Benefits and costs have been estimated in monetary terms, to the extent possible and are expressed in 2011 Canadian dollars. Whenever this was not possible, due either to lack of appropriate data or difficulties in valuing certain components, incremental impacts were evaluated in qualitative terms. A social discount rate of 3% is used in the analysis for estimating the present value (2012 base year) of the costs and benefits under the central analysis. This level is within the range prescribed by the Treasury Board Secretariat's cost-benefit analysis (CBA) guidelines. This is consistent with discount rates used for other GHG related measures in Canada, as well as those used by the U.S. EPA. Table 5 summarizes the benefits and costs which were evaluated quantitatively, monetized and discounted.

Table 5: Monetized benefits and costs

Benefits	**Costs**
Pre-tax fuel savings Avoided GHG damages	Technology costs and related administrative burden Noise, accidents, congestion Government administration

7.2. Analytical scenarios

This analysis considers two scenarios: a business-as-usual (BAU) scenario, which assumes the Regulations are not implemented, and a regulatory scenario, which assumes the Regulations are implemented. These two scenarios are based on the same volume of forecasted vehicle sales between 2014 and 2018. The differences between the scenarios are considered in terms of the estimated changes in vehicle technology choices in the regulatory scenario compared to the BAU, and the associated incremental changes in vehicle costs, GHG emissions, fuel consumption and related impacts.

7.2.1. Business-as-usual scenario

The business-as-usual (BAU) scenario assumes that the Regulations are not implemented and that vehicle technologies which affect GHG emissions will remain unchanged over the sales period of the analysis. This assumption may underestimate any "natural" technology changes that could occur throughout the North American market due to normal technological development in the absence of any regulations, or "complementary" technology changes that might occur in Canada either in response to similar regulations in the United States or in anticipation of the Regulations in Canada. These alternate rates of technology change are difficult to estimate, but are considered in a sensitivity analysis.

7.2.2. Regulatory scenario

The regulatory scenario assumes that certain GHG emission-reducing technologies will be chosen to comply with the Regulations. These are assumed to be existing technologies, and thus manufacturers can readily increase their usage in new vehicles in order to comply with the Regulations. It is also assumed that the costs of these technologies will be fully passed onto vehicle purchasers, and that vehicle sales will not be affected by technology changes. The analysis considers the same BAU projected vehicle sales for 2014 to 2018, and estimates the incremental impacts of the technical modifications to these vehicles in terms of changes in vehicle costs, GHG emissions, fuel consumption and related impacts.

7.2.3. Key assumptions

Under the business-as-usual scenario, technology choices for MY2014–2018 remain the same as for MY2010. This assumption is further discussed in section 7.2.1 and in the "Rationale" section, and is evaluated in "Sensitivity analysis" (section 7.8).

Under the regulatory scenario, all technology manufacturing costs will be passed onto vehicle purchasers, who will recoup these costs through fuel savings achieved by the technologies adopted to meet the Regulations. This assumption is evaluated in the payback analysis section.

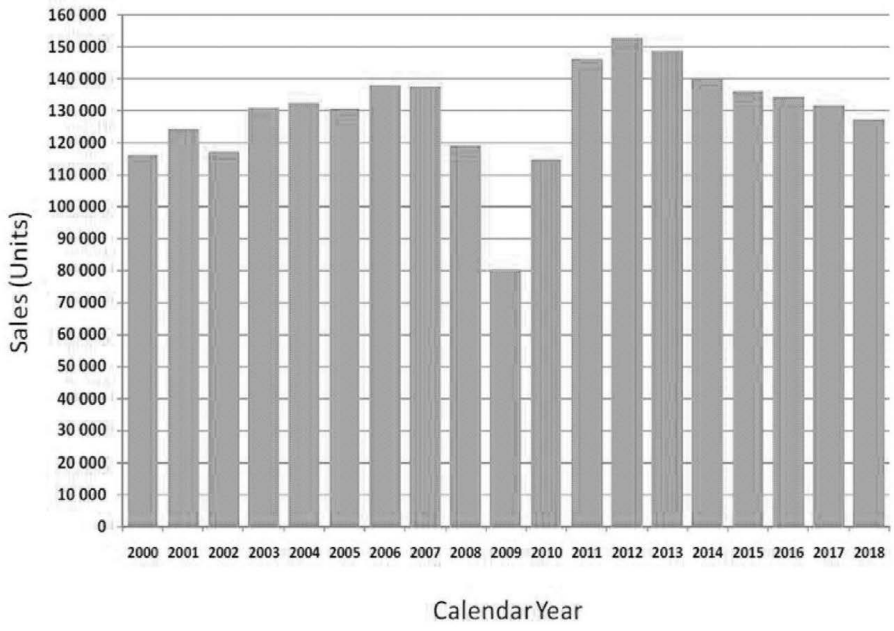
7.3. Key modelling and data

To assess the impact of the Regulations, it was necessary to obtain Canadian estimates of future vehicle sales, fuel prices and monetary values for GHG reductions; to identify the technologies that manufacturers would likely adopt and the costs they would incur in order to comply with the Regulations; and then to model future vehicle emissions, fuel consumption and distance travelled, with and without the Regulations. These key sources of data and information are described below.

7.3.1. Canadian sales forecast

For years 2011 through 2018, a vehicle sales forecast from DesRosiers Automotive Consultants (DAC) was used in the analysis. For the purpose of this study, all historical (calendar year 2005 through year-to-date June 2010) medium- and heavy-duty vehicle data was provided by R. L. Polk (Polk). Using the Polk data file, DAC developed aggregate medium- and heavy-duty historical registration data and forecast data using proprietary DAC forecasting methodologies and input from industry representatives. This study required an in-depth review of core Canadian economic variables. A database containing historical and forecast economic factors from calendar year 2000 through 2018 was provided by Environment Canada's Energy-Economy-Environment Model for Canada (E3MC) in March of 2011. DAC also considered provincial economic forecast data from Informetrica Limited (March 14, 2011), BMO Capital Markets Economics (March 14, 2011) and TD Economics (March 2011). The overall results of the DAC sales report are displayed below, with historical trends shown from 2000 to 2010, and projected trends shown from 2011 to 2018, based on DAC analysis and forecasts:

Figure 1: Sales forecast for Canadian medium and heavy-duty vehicles



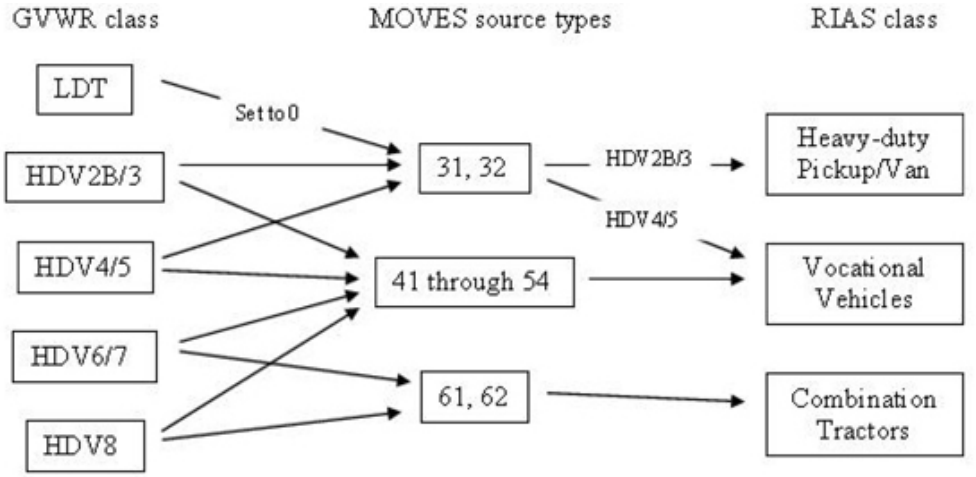
Source: R.L. Polk & Co. (data years 2000 – June 2010 new truck registration file), DesRosiers Automotive Consultants Inc. (2010–2018 Forecast Data)

The analysis of the Regulations incorporates the same detailed DAC sales estimates, for each vehicle regulatory class, into the modelling of vehicle population growth from 2010 to 2018 for both the BAU and policy scenarios. DAC estimated total sales per calendar year, which are used as a proxy for model year sales in this analysis.

7.3.2. Canadian vehicle emissions modelling

Estimates of Canadian vehicle emissions were developed using methods aligned with those initially developed by the U.S. EPA, together with key Canadian data to reflect the impact of the Regulations. The emissions selected were those linked to climate change, air quality and human health, such as GHGs and criteria air contaminants (CACs). The primary modelling tool used to calculate vehicle emissions was the Motor Vehicle Emissions Simulator (MOVES), which is the U.S. EPA's official mobile source emission inventory model for heavy-duty vehicles. Key data for Canadian heavy-duty vehicle populations and distance travelled were then incorporated into the most current version of MOVES (MOVES2010a) available in order to produce an analysis for Canada of the impacts of the Regulations. Vehicle data collected by gross vehicle weight rating (GVWR) was mapped into MOVES2010a and then categorized according to the vehicle classifications in the Regulations, as described in this RIAS and as shown in figure 2.

Figure 2: GVWR, MOVES and RIAS classes for this analysis



Canadian vehicle populations were estimated for all calendar years 2005 through 2050. For the purposes of this analysis, data purchased from Polk and Co. on the heavy-duty fleet in Canada for calendar years 2005 through 2010, were used by Environment Canada to develop vehicle population and age estimates for those years. After 2010, future vehicle populations are forecasted based on new vehicle sales and the number, age and estimated survival rates of existing vehicles. For years 2011 through to 2018, the DesRosiers sales forecast were used, as discussed above. For years 2019 and beyond, the default MOVES sales rates were used in the absence of Canada specific sales rates beyond 2018. Comprehensive validated survival estimates for Canadian heavy-duty vehicles were not available for this analysis. Instead, MOVES default vehicle survival rate estimates were generally used. These MOVES survival rate estimates appear similar to available Canadian data for vehicles less than 30 years old, but appear to underestimate survival for Canadian vehicles aged 30 years or more. Therefore, an adjustment was made in MOVES for the survival rate of vehicles aged 30 years or more, to make this rate more consistent with available Canadian data.

Along with vehicle populations, vehicle distance travelled is also important in overall emissions estimation for Canada. Estimates of Canadian vehicle kilometres travelled (VKT) and kilometre accumulation rates (KAR) were developed for all calendar years from 2005 through 2050. KAR is the product of VKT divided by the number of vehicles (the population). In 2010, Environment Canada contracted Stewart-Brown Associates (SBA) to generate KARs from inspection and maintenance (I/M) program data in Canada. Specifically, this was the Drive Clean program in Ontario, and the AirCare program in British Columbia. KARs generated in this manner from Ontario and British Columbia were then applied to Canada as a whole. This baseline Canadian KAR data was used to generate Canadian VKT estimates for each vehicle type and age, for all calendar years 2005 through 2010. Then the default MOVES growth rates were used to estimate VKT for the Canadian fleet for the calendar years 2011 to 2050.

7.3.3. The social cost of carbon (SCC)

The SCC is used in the modelling of the cost-benefit analysis of environmental regulations in a RIAS to quantify the benefits of reducing GHG emissions. It represents an estimate of the economic value of avoided climate change damages at the global level for current and future generations as a result of reducing GHG emissions. The calculations of SCC are independent of the method used to reduce emissions. The SCC is also used by the United States in their cost-benefit analysis of regulations. The values used by Environment Canada are based on the extensive work of the U.S. Interagency Working Group on the Social Cost of Carbon.

The estimated value of avoided damages from GHG reductions is based on the climate change damages avoided at the global level. These damages are usually referred to as the social cost of carbon

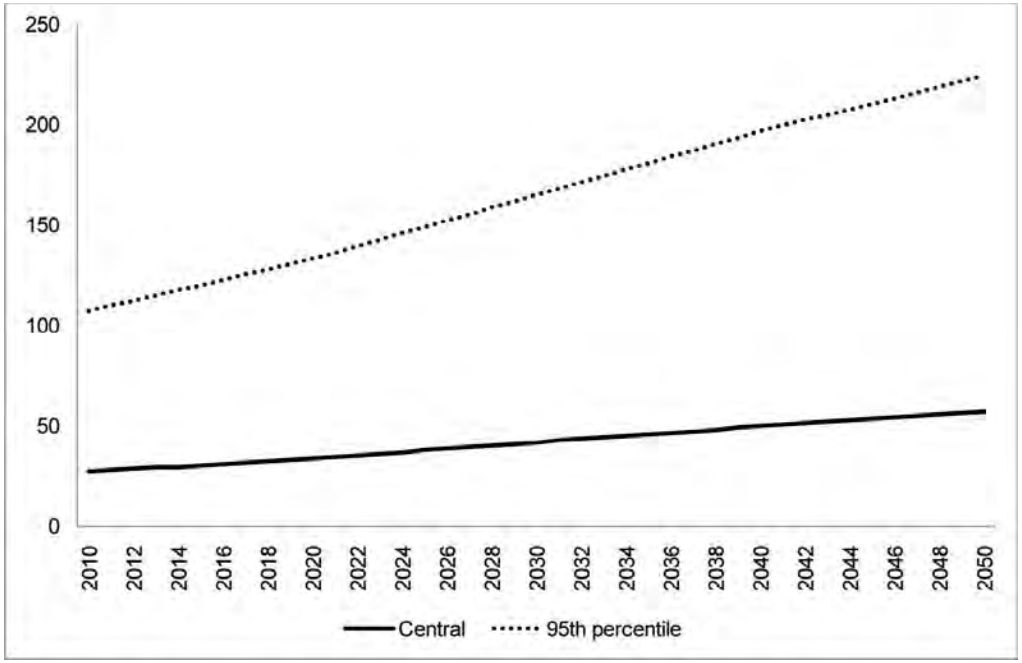
(SCC). Estimates of the SCC between and within countries vary widely due to challenges in predicting future emissions, climate change, damages and determining the appropriate weight to place on future costs relative to near-term costs (discount rate).

SCC values used in this assessment draw on ongoing work being undertaken by Environment Canada (see footnote 11) in collaboration with a federal interdepartmental working group, and in consultation with a number of external academic experts. This work involves reviewing existing literature and other countries' approaches to valuing GHG emissions. Preliminary recommendations, based on current literature and, in line with the approach adopted by the U.S. Interagency Working Group on the Social Cost of Carbon, (see footnote 12) are that it is reasonable to estimate SCC values at $28.44/tonne of CO_2 in 2012, increasing at a given percentage each year associated with the expected growth in damages. (see footnote 13) Environment Canada's review also concludes that a value of $112.37/tonne in 2012 should be considered, reflecting arguments raised by Weitzman (2011) (see footnote 14) and Pindyck (2011) (see footnote 15) regarding the treatment of right-skewed probability distributions of the SCC in cost-benefit analyses. (see footnote 16) Their argument calls for full consideration of low probability, high-cost climate damage scenarios in cost-benefit analyses to more accurately reflect risk. A value of $112.37 per tonne does not, however, reflect the extreme end of SCC estimates, as some studies have produced values exceeding $1,000 per tonne of carbon emitted.

As shown in Figure 3 below, the social cost of carbon values increase over time to reflect the increasing marginal damages of climate change as projected GHG concentrations increase. The time-varying schedule of SCC estimates for Canada has been derived from the work of the U.S. Interagency Working Group.

The federal interdepartmental working group on SCC also concluded that it is necessary to continually review the above estimates in order to incorporate advances in physical sciences, economic literature, and modelling to ensure the SCC estimates remain current. Environment Canada will continue to collaborate with the federal interdepartmental working group and outside experts to review and incorporate as appropriate new research on SCC into the future.

Figure 3: SCC estimates (2011 Canadian dollars/tonne)

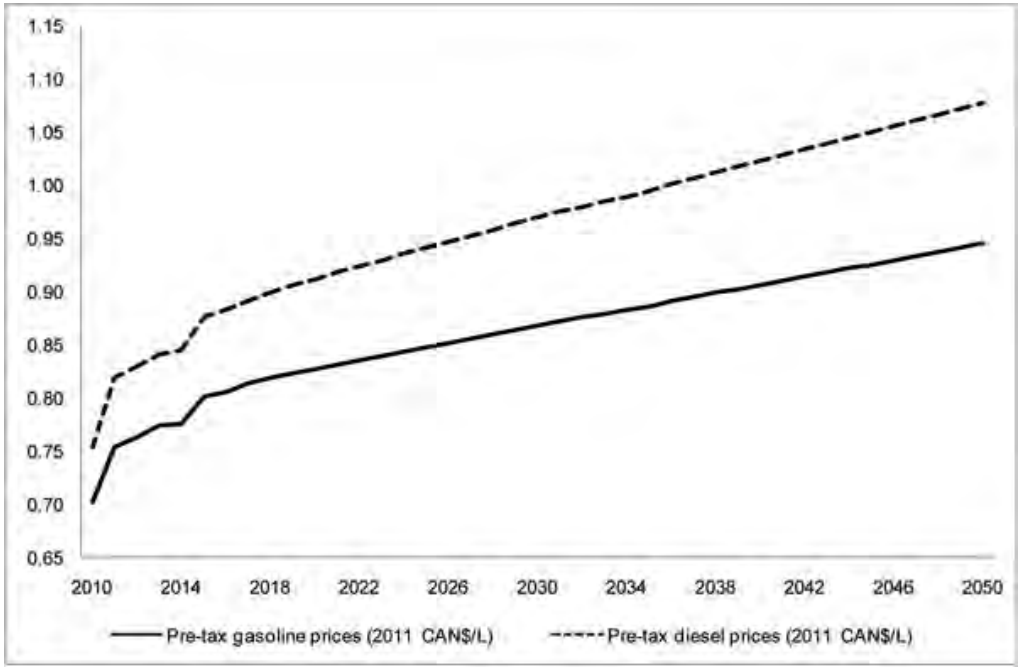


7.3.4. Fuel prices

Fuel price forecasts for both gasoline and diesel were adopted from Environment Canada's E3MC model for the period of 2011 to 2035. The E3MC model is an end-use model that incorporates the National Energy Board's (NEB) forecast for West Texas Intermediate crude oil price as reported in the NEB's *Energy Supply and Demand Projections to 2035 — Market Energy Assessment*. (see footnote 17) The E3MC model uses this data to generate fuel price forecasts which are primarily based on consumer-choice modelling and historical relationships between macroeconomic and fuel price variables. Fuel prices beyond 2035 were projected based on the E3MC model average growth rate of fuel prices for the years 2020 to 2035. Uncertainty regarding these future fuel price forecasts was also considered in a sensitivity analysis.

Pre-tax fuel prices were used in the analysis as taxes are not generally considered in cost-benefit analyses given that they are a transfer rather than an economic cost. Post-tax gasoline and diesel price forecasts were used in a separate payback analysis. Due to regional variations in fuel taxes, post-tax fuel prices were calculated by weighting fuel sales by regional populations and then adding regional taxes accordingly.

Figure 4: Gasoline and diesel prices (2011 Canadian dollars/L)



7.3.5. Vehicle technologies that reduce GHG emissions

Information on vehicle technologies, costs and adoption rates was obtained from the U.S. EPA's regulatory impact analysis of its *Final Rulemaking to Establish Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles*. (see footnote 18)

The technologies considered in this analysis are those most likely to be adopted during the period of the analysis (MY2014–2018) in response to the Regulations, having been developed and being available to some extent already, and already shown by the U.S. EPA to be cost-effective. Table 6 below presents a list of technologies that manufacturers are likely to choose in order to comply with the Regulations.

Table 6: Potential key technologies

Combination trucks	Engine improvements, more use of low rolling resistance tires, mass reduction, improved aerodynamics, increased use of auxiliary power units, reduced air conditioning leakage
Vocational vehicles	Engine improvements, more use of low rolling resistance tires
Heavy-duty pick-up trucks and vans	Engine improvements, more use of low rolling resistance tires, mass reduction, improved transmissions, reduced accessory loads

7.4. Benefits

7.4.1. GHG emission reductions

The MOVES emissions model was used to estimate the impact of the Regulations in terms of reductions in vehicle GHG emissions, as presented in Table 7 below (in Mt of CO_2e). The Regulations are estimated to result in a lifetime model-year reduction of 2.9 Mt beginning in MY2014 and increasing each year to 5.3 Mt for MY2018. Thus, as the Regulations come into full effect over the MY2014–2018 period, they will result in a cumulative lifetime GHG emission reduction of 19.1 Mt arising from new vehicles entering the market in these five years.

For MY2019 and subsequent model years, the Regulations will remain in full effect, and thus the lifetime reductions that would be observed under a regulatory scenario will likely be similar to the MY2018 level of 5.3 Mt for each subsequent MY, assuming similar sales and other modelling parameters. However, looking beyond MY2018, it also becomes more likely that some of these GHG emission reductions would have occurred even in the absence of the Regulations and could not therefore be fully attributed to the Regulations.

The estimated value of avoided damages from GHG reductions is based on the climate change damages avoided at the global level. Based on an estimated SCC (see footnote 19) of $28.44/tonne, the present value of incremental GHG emission reductions under the Regulations is estimated to be approximately $0.5 billion over the lifespan of the MY2014–2018 new vehicle fleet. Under the $112.37/tonne SCC estimate, the present value of incremental GHG emission reductions would be estimated at over $1.9 billion for the 2014–2018 model year vehicles.

Table 7: Summary of GHG benefits, by model year, in millions of 2011 Canadian dollars

	MY2014	MY2015	MY2016	MY2017	MY2018	Combined MYs 2014–18
Reduction in GHG emissions — undiscounted (Mt CO_2e)	2.9	3.0	3.2	4.7	5.3	19.1
Present value of the reduction in GHG emissions (SCC at $28/tonne)	77	78	84	120	135	493

Present value of the reduction in GHG emissions (SCC at $112/tonne)	304	310	333	476	537	1,961

MY = lifetime (30 years) impacts for each year of vehicle sales. Due to rounding, some of the totals may not match. Present value in 2011 Canadian dollars, using a 3% discount rate.

7.4.2. Fuel savings benefits

Manufacturers are expected to meet the requirements of the Regulations by adopting vehicle technologies that reduce GHG emissions. Most of these technologies (e.g. low rolling resistance tires and improved aerodynamics) will achieve these GHG emission reductions by improving vehicle energy efficiency. MOVES was used to estimate vehicle energy efficiency improvements due to vehicle technology improvements, and then these energy savings were converted to fuel savings using standard metrics. Thus, these technologies are expected to reduce fuel consumption by 7.2 billion litres (undiscounted) over the lifetime of the MY2014–2018 fleet, as presented in Table 8 below.

Based on projected fuel prices, the benefits to vehicle owners arising from these fuel reductions are estimated to be nearly $4.8 billion in fuel savings, and these cumulative savings are estimated to outweigh the technology costs ($0.7 billion) by a ratio of more than 6:1 over the lifetime of the MY2014–2018 fleet. Fuel prices are calculated pre-tax, so vehicle owners could expect higher savings than those resulting from this analysis. A post-tax payback analysis for vehicle owners is also presented in section 7.9.

Fuel savings are also expected to reduce the frequency of refuelling, which is a time-saving benefit for vehicle operators. The analysis used refuelling fill rates to calculate the total time saved due to reduced fuel consumption. The value of these time savings was calculated using an estimated mean wage rate for a typical truck driver ($23.75 per hour in 2011 Canadian dollars). (see footnote 20) Using these values, the benefits of refuelling time savings due to the Regulations are expected to be $36 million over the lifetime of the MY2014–2018 fleet, as presented in Table 8.

Table 8: Summary of fuel-related benefits, by model year, in millions of 2011 Canadian dollars

	MY2014	**MY2015**	**MY2016**	**MY2017**	**MY2018**	**Combine MYs 2014–18**
Fuel savings — undiscounted (million litres)	1,080	1,111	1,215	1,758	2,015	7,179
Present value of fuel savings	760	767	817	1,156	1,291	4,791
Present value of reduced refuelling time	5	5	6	9	11	36

Present value of the sum of fuel benefits	**765**	**772**	**823**	**1,165**	**1,302**	**4,826**

MY = lifetime (30 years) impacts for each year of vehicle sales. Due to rounding, some of the totals may not match. Fuel savings are pre-tax. Present value in 2011 Canadian dollars, using a 3% discount rate.

7.5. Costs

7.5.1. Vehicle technology and related administrative burden

The Regulations align with the national GHG emission standards of the U.S. EPA for the 2014 and later model years, in order to provide manufacturers with a common set of vehicle GHG emission standards. Therefore, the analysis of the Canadian Regulations assumes that manufacturers will likely adopt similar technologies to meet these common emission standards.

The U.S. EPA selected likely technology choices from existing technologies based on engineering analyses, estimated increased adoption rates for these technologies in order to comply with the U.S. EPA standards, and then estimated the redesign and application costs per vehicle for those technology packages. The U.S. EPA assessment of technologies that would be available for each of the engine classes and sub-categories of vehicles, the estimates of their effectiveness and costs were guided by published research and independent summary assessments. They first estimated the baseline emission and fuel consumption rates for each of the regulated subcategories of engines and vehicles. It was assumed that these rates would remain unchanged in the absence of the standards, then for each subcategory of engine, the U.S. EPA identified technologies which could be applied practically and cost-effectively. Effectiveness and costs of each technology were estimated and applied independently, then applied in combination. The availability and increase in penetration rates of technologies were assessed together with effectiveness and costs for each model year from 2014 to 2018. The technology costs reported by model year are incremental to the BAU costs. Under the regulatory scenario, technologies and compliance options are applied to vehicles in order for companies to meet their regulated standards. The estimated incremental cost per vehicle is calculated on this basis.

The Regulations will also include a CO_2 emission credit system to help meet overall environmental objectives in a manner that provides the regulated industry with compliance flexibility. As use of these credits is difficult to predict with any precision, the analysis did not model the benefits of these compliance flexibilities. It is therefore reasonable to conclude that the costs of vehicle technology may be somewhat overestimated.

There are also one-time costs largely associated with learning about new regulatory obligations and ongoing costs, largely associated with required record-keeping and reporting on technology compliance and use of regulatory flexibility options. These costs are collectively referred to as administrative costs, which are estimated to be highest in the first year of the Regulations (due to initial learning costs) and then constant in subsequent years (due to ongoing record-keeping and reporting costs, and an assumed rate of the use of compliance flexibilities). The present value of these administrative costs is shown in Table 9 below.

Given the integration of the North American vehicle manufacturing sector and the alignment of the Canadian Regulations with the U.S. EPA standards, the same U.S. EPA-estimated vehicle technology choices and adoption rates were used in our analysis. This leads to the same proportional costs per vehicle, adjusted for exchange rates, as those that were used in the U.S. EPA analysis. The resulting estimates of the present value of the costs of the technologies and the associated Canadian administrative requirements necessary to meet the Regulations are presented in Table 9.

Table 9: Summary of technology-related costs, by model year, in millions of 2011 Canadian dollars

						Combined

	MY2014	MY2015	MY2016	MY2017	MY2018	MYs 2014–2018
Present value of technology costs	142	136	139	141	154	712
Present value of administrative costs	0.2	0.1	0.1	0.1	0.1	0.5
Present value of total technology-related costs	**142**	**136**	**139**	**141**	**154**	**713**

MY = lifetime (30 years) impacts for each year of vehicle sales. Present value in 2011 Canadian dollars, using a 3% discount rate.

The analysis of the Regulations assumes that manufacturers will pass the GHG emission-reducing vehicle technology costs on to their purchasers. Because these technologies are estimated to also generate substantial fuel savings for vehicle owners and operators, the Regulations are assumed not to impact the volume of new heavy-duty vehicle sales. No other potential operating cost impacts of new technologies (e.g. maintenance and repairs) were considered in the analysis, as any such incremental costs are expected to be quite small in relation to expected fuel savings.

7.5.2. Government costs

Costs of the Regulations to the Government of Canada fall into three principal categories: compliance promotion costs, enforcement costs, and regulatory program costs. The estimates of these are described below:

Compliance promotion: The overall present value of costs over the 2014–2018 period is estimated at approximately $94 000. Compliance promotion activities include information sessions for manufacturers and importers on the main requirements of the Regulations, in particular new emission standards and report submission. In subsequent years, the annual costs will be approximately $20 000 (undiscounted) per year, and the compliance promotion activities will be adjusted according to the regulated community compliance level and to the compliance strategy.

Enforcement: The present value of overall costs over the 2014–2018 period is estimated at approximately $574 000 and will be used for inspections (which includes operation and maintenance costs, transportation and sampling costs), investigations, measures to deal with alleged violations (including warnings, environmental protection compliance orders and injunctions) and prosecutions.

Regulatory administration: The present value of overall costs over the 2014–2018 period is estimated at approximately $8.6 million. These costs include regulatory administration and verification testing, and also include salaries, operation and maintenance. Regulatory administration will be used to develop and maintain a reporting system to compile data submitted by companies related to their fleet emissions and related credits or deficits for each model year fleet. The costs for verification testing will be used to deliver and administer the testing and emissions verification program, including associated laboratory costs and vehicle and engine acquisition. These costs also include an upgrade to the testing facilities and associated equipment to accommodate heavy-duty vehicle and engine testing.

The present value of the costs related to these three categories is estimated to total $9.2 million over the 2014–2018 period in this analysis, and is presented in Table 10.

Table 10: Incremental cost to Government, 2014–2018, in millions of 2011 Canadian dollars

	2014	2015	2016	2017	2018	5-Year Total
Present value of compliance promotion costs	0.024	0.018	0.018	0.017	0.017	0.094
Present value of enforcement costs	0.122	0.118	0.115	0.111	0.108	0.574
Present value of regulatory program costs	1.767	1.709	1.728	1.699	1.650	8.554
Total Government costs	**1.913**	**1.845**	**1.860**	**1.828**	**1.775**	**9.221**

Due to rounding, some of the totals may not match. Present value in 2011 Canadian dollars, using a 3% discount rate.

7.5.3. Accidents, congestion and noise

As fuel savings lower vehicle operating costs, it is assumed that there will be some increase in vehicle distance travelled. The increase in vehicle distance travelled in response to lower vehicle operating costs is referred to as the "rebound" effect, and is measured here in vehicle-kilometres travelled (VKT). This rebound effect is expected to lead to more accidents, congestion and noise.

For heavy-duty vehicles, the U.S. EPA estimated the net rebound rate to be small overall and to vary by vehicle type: an approximate 0.5% to 1.5% increase in annual VKT per vehicle in response to total vehicle operating cost savings due to fuel savings. The Canadian analysis used the same rebound rates as the U.S. EPA, and applied them to annual Canadian fleet estimates of baseline VKT from MOVES in order to estimate the increase in VKT attributable to the rebound effect.

There are no identified Canadian estimates of heavy-duty vehicle costs per kilometre for accidents, congestion and noise. For Class 2B and Class 3 heavy-duty vehicles, this analysis used Canadian estimates for light-duty pickup trucks and vans. This is the same approach used by the U.S. EPA. The Canadian estimates for these vehicles are 46% lower than the U.S. EPA's estimates. This analysis applied the U.S. EPA's estimates per kilometre for heavy-duty vocational vehicles and tractors, assuming that Canadian estimates would also be 46% lower than the U.S. EPA's estimates for the same heavy-duty vehicle classes. These per-kilometre cost estimates for accidents, congestion and noise were then applied to the Canadian VKT rebound estimates in order to obtain estimates of the overall value of accidents, congestion and noise for each vehicle class in this analysis. The results are presented below.

Table 11: Summary of costs of additional noise, accidents, and congestion, by model year, in millions of 2011 Canadian dollars

	MY2014	MY2015	MY2016	MY2017	MY2018	Combined MYs 2014–18
Present						

value of accidents, congestion, and noise	27	26	26	25	24	126

MY = lifetime (30 years) impacts for each year of vehicle sales. Present value in 2011 Canadian dollars, using a 3% discount rate.

7.6. Non-quantified impacts

7.6.1. Fuel savings impacts on upstream petroleum sector

Canada has a small, open economy and is a price-taker in the world petroleum market. The estimated reduction in domestic fuel consumption resulting from the Regulations will therefore not be expected to impact on the price of petroleum. Reduced domestic fuel consumption from any fuel savings resulting from the Regulations will therefore be expected to be redirected from domestic consumption to increased exports, with no incremental impact on the upstream petroleum sector.

7.6.2. Criteria air contaminant impacts

The Regulations are also expected to impact on criteria air contaminants (CACs) such as carbon monoxide (CO), nitrogen oxide (NO_x), particulate matter ($PM_{2.5}$, SO_x) and volatile organic compounds (VOCs). Overall it is expected that vehicle emissions of most CACs will decrease slightly in response to the Regulations, primarily due to anticipated fuel savings. Conversely, it is anticipated that emissions of $PM_{2.5}$ will rise slightly, primarily due to the expected increased use of diesel-powered auxiliary power units as a fuel saving measure for extended idling in tractors. The net impact of these changes in emissions of CACs on air quality, and the resulting impacts on human health are expected to be very minor. Given the small scale of the expected CAC emissions and the challenges in estimating their value, these impacts have not been quantified.

7.6.3. Regulatory certainty and reduced compliance costs for manufacturers

The Regulations are designed to align with similar regulations being introduced in the United States in 2014. The heavy-duty vehicle manufacturing sectors in Canada and the United States are highly integrated, so there are several benefits to regulatory alignment between the two countries. First, responding to new U.S. regulations with regulations in Canada provides a degree of regulatory certainty for Canadian manufacturers, which should facilitate their investment decision-making.

Second, by aligning regulations, as opposed to establishing regulatory requirements different than in the United States, the Regulations will further benefit Canadian companies subject to these regulations. Canadian companies manufacturing and/or importing into Canada vehicles that are concurrently sold in the United States, can use U.S. information and data, such as emission tests results, to demonstrate compliance with the standards. This significantly reduces the companies' compliance assessment and administrative costs. Aligned regulations will also set a North American level playing field in the transportation sector by preventing any manufacturer from producing less expensive and higher emitting vehicles, and therefore putting other manufacturers in a competitive disadvantage. These benefits have been assessed qualitatively, as there are no available quantified estimates of the benefits of regulatory alignment.

7.7. Summary of costs and benefits

Over the lifetime operation of MY2014–2018 vehicles, the present value of the cost of the Regulations is estimated at $0.8 billion, largely due to the additional vehicle technology costs required by the Regulations. The total benefits for MY2014–2018 are estimated at $5.3 billion, due to the value of GHG reductions ($0.5 billion) and fuel savings ($4.8 billion). Over the lifetime operation of MY2014–2018 vehicles, the present value of the net benefits of the Regulations is estimated at $4.5 billion. The results of the cost-benefit analysis of the Regulations are presented in Table 12.

Table 12: Summary of main results, by model year, in millions of 2011 Canadian dollars

Incremental benefits and costs	MY2014	MY2015	MY2016	MY2017	MY2018	Combined MYs 2014–2018
Monetized benefits						
A. Sector benefits						
Pre-tax fuel savings	760	767	817	1,156	1,291	4,791
Reduced refuelling time	5	5	6	9	11	36
B. Societal benefits						
Reduced GHG emissions (SCC at $28/tonne)	77	78	84	120	135	493
Total benefits	**842**	**850**	**907**	**1,284**	**1,437**	**5,320**
Monetized costs						
A. Sector costs						
Technology-related costs	142	136	139	141	154	713
B. Societal costs						
Accidents, congestion, and noise	27	26	26	25	24	126
Government administration	2	2	2	2	2	9
Total costs	**171**	**164**	**166**	**168**	**180**	**848**
NET BENEFIT — with SCC at $28/tonne	**671**	**686**	**741**	**1,117**	**1,257**	**4,472**
NET BENEFIT — with						

alternate SCC at $112/tonne	899	918	990	1,473	1,659	5,939
Qualitative and non-monetized impacts	Positive regulatory alignment impacts					
	No net criteria air contaminants impacts					
	No net upstream fuel impacts					

MY = lifetime (30 years) impacts for each year of vehicle sales. Present value in 2011 Canadian dollars, using a 3% discount rate. Due to rounding, some of the totals may not match.

The analysis indicates that in the first years of the Regulations (MY2014–16), the total lifetime costs will range from $164 to $171 million, the lifetime benefits will range from $842 to $907 million, and the lifetime net benefits will range from $671 to $741 million. These values reflect the impacts of the initial levels of compliance standards in the Regulations, and the level of vehicles sales over this period. For MY2017–18, the Regulations introduce higher compliance standards, resulting in higher costs ($168 to $180 million), higher benefits ($1,284 to $1,437 million) and higher net benefits ($1,117 to $1,257 million).

For MY2019 and subsequent model years, the Regulations maintain the MY2018 compliance standards, and, all else being equal, results would be expected to be similar to those for MY2018, given similar volumes of annual vehicle sales.

Table 13: Summary metrics

	MY2014	**MY2015**	**MY2016**	**MY2017**	**MY2018**	**Combined MYs 2014–2018**
Benefit to cost ratio — discounted at 3% (SCC at $28/tonne)	4.9	5.2	5.5	7.7	8.0	6.3
Fuel savings — undiscounted (billion litres)	1.1	1.1	1.2	1.8	2.0	7.2
Reduction in GHG emissions — undiscounted ($Mt CO_2e$)	2.9	3.0	3.2	4.7	5.3	19.1
Present value of CO_2e damages avoided ($Mt CO_2e$)						17.2
Present value of the socio-economic costs which equal total costs minus non-GHG benefits (in millions of 2011 CAN$)						–3,978

Present value of the socio-economic cost per tonne of CO_2e damages avoided ($/tonne)	–232

MY = lifetime (30 years) impacts for each year of vehicle sales. CO_2e damages are grown at 2% per year to reflect the growth in climate change damages over time as emissions cumulate in the atmosphere. Present value uses a 3% discount rate. Due to rounding, some of the totals may not match.

For the Regulations, the benefit to cost ratio is estimated to be 6.3 to 1 for the overall MY2014–2018 fleet of new heavy-duty vehicles. The benefit to cost ratio also increases from 4.9 to 1 for MY2014 to 8.0 to 1 for MY2018. This trend reflects the positive impact of fully implementing the Regulations.

Over the lifetime of the MY2014–2018 fleet, the Regulations are expected to reduce fuel consumption by 7.2 billion litres, and reduce GHG emissions (CO_2e) by 19.1 Mt.

In order to allow a comparison of social cost-effectiveness with other government climate change measures, we present the socio-economic cost per tonne of CO_2e emissions avoided. This ratio is calculated by subtracting the present value of the sum of all non-GHG benefits from the present value of the costs of the Regulations, and then dividing by the present value of the tonnes of CO_2e emissions avoided. This ratio measures the lifetime socioeconomic costs of reducing GHG emissions if the Regulations are implemented over the MY2014–2018 analysis period, on a per tonne basis. For the Regulations, the ratio of –$232/tonne is negative, indicating that the carbon emission reduction under the Regulations will result in a net benefit rather than net cost.

7.8. Sensitivity analysis

A sensitivity analysis was done to consider the impact of uncertainty in key variables (i.e. changes in estimated sales, technology costs, fuel prices and discount rates). The sensitivity analysis shows that the results are robust in terms of demonstrating positive net benefits for the Regulations across a broad range of plausible values for variables and assumptions.

Table 14: Results of sensitivity analysis

	Net Benefit		
Sensitivity variables	**Lower**	**Central**	**Higher**
1. Sensitivity to sales forecasts: (–30%, central, +30%)	3,130	4,472	5,813
2. Sensitivity to technology costs: (+30%, central, –30%)	4,258	4,472	4,685
3. Sensitivity to fuel prices: (–30%, central, +30%)	3,034	4,472	5,909
4. Sensitivity to discount rates: (7%, 3%, undiscounted)	2,943	4,472	6,394

All values are in millions of 2011 Canadian dollars, using a 3% discount rate except where otherwise indicated.

A sensitivity analysis was also done to consider the impact of the assumption in the business-as-usual (BAU) scenario regarding the rate of technology change in the absence of the Regulations. Throughout

the regulatory analysis, it is assumed that this rate is zero. This sensitivity analysis shows, however, that by assuming instead that some technology change would occur even in the absence of the Regulations, costs and benefits attributable to the Regulations would be reduced proportionately.

Table 15: BAU sensitivity analysis

BAU rate of technology adoption	0%	25%	50%
Costs	848	636	424
Benefits	5,320	3,990	2,660
Net benefit	4,472	3,354	2,236
Rate of technology adoption attributable to the Regulations	100%	75%	50%

All figures are in millions of 2011 Canadian dollars, using a 3% discount rate.

The regulatory analysis provides information to the public and stakeholders about the costs they can expect to bear and the benefits they can expect to receive over the lifetime of new heavy-duty vehicles sold with more GHG emission reducing technologies. It is unclear whether some or many of the technologies would be adopted in the absence of the Regulations. To the extent that they would, the costs and the benefits attributed to the Regulations would be overstated. The sensitivity analysis shows that even if the BAU rate of technology adoption was as high as 50%, the Regulations would still result in a positive net benefit.

7.9. Distributional impacts

The automotive manufacturing sector is concentrated within Ontario and Quebec, with other plants in Manitoba, Saskatchewan, Alberta, and British Columbia. (see footnote 21) The compliance costs of the Regulations are estimated to increase the production cost of vehicles for manufacturers by more than $136 million per year. These costs are expected to be distributed according to the future purchases and use of these regulated heavy-duty vehicles, and it is not expected that there will be significantly disproportionate impacts on any region within Canada.

The Regulations will require manufacturers to comply by adopting more GHG emission-reducing technologies in new vehicles. The analysis of the Regulations assumes that manufacturers will generally be able to pass on all GHG emission-reducing technology costs to vehicle purchasers, because these purchase costs can be shown to be quickly recouped through fuel savings. All new heavy-duty vehicle purchasers are assumed to be businesses, not consumers, given that heavy-duty vehicles are generally designed for commercial use. Businesses are expected to evaluate costs and benefits in terms of the expected payback on investment costs.

A simple payback analysis of MY2018 vehicle costs (Table 16) shows that average first-year fuel savings (including taxes) for owners and operators are expected to be greater than the manufacturer's average costs for adding new technologies. For all three heavy-duty vehicle regulatory classes, the payback period is less than one year.

Table 16: Average technology costs per new vehicle and fuel savings, in 2011 Canadian dollars

MY2018	HD Pick-up Trucks and Vans	Vocation Vehicles	Combination Tractors
Technology costs per			

new vehicle	1,082	410	5,837
First-year fuel savings per new vehicle	1,212	1,041	8,006
Net first-year savings	**129**	**631**	**2,169**

Fuel prices are post-tax, by MY2018 vehicle class. All figures are in 2011 Canadian dollars. Technology costs are a weighted average cost for vehicles in their respective RIAS class.

8. "One-for–One" Rule

The "One-for-One" Rule was implemented to control new administrative burden imposed on businesses as a result of regulations. In summary, the rule requires that departments

- restrict the growth of administrative burden by ensuring that new administrative burden on business introduced by a regulatory change (IN) is offset by an equal decrease in administrative burden on business from the existing stock of regulations (OUT); and
- control the number of regulations by repealing at least one existing regulation every time a new one imposing administrative burden on business is introduced.

Given that this is a new regulatory initiative, the changes that will be implemented through the Regulations will result in a net increase in administrative burden; therefore, the regulatory initiative is considered an "IN" under the rule. Increases in burden on the on-road heavy-duty sector will mainly take the form of reporting and record keeping requirements. The Regulations introduce a new administrative burden of $92,000 (in 2012 Canadian dollars) in annualized costs to the sector. These new costs will require equal and off-setting administrative cost reduction to existing regulations, and as this is a new regulation, Environment Canada will also be required to repeal at least one existing regulation.

Based on calculations carried out using the standard cost model methodology, these Regulations have been estimated to result in an annualized increase in total administrative costs to all businesses subject to the Regulations of approximately $92,000 (in 2012 Canadian dollars). The expected average annualized administrative costs per business subject to the Regulations is approximately $249 (in 2012 Canadian dollars).

9. Small business lens

The regulated community comprises manufacturers and importers of new on-road heavy-duty vehicles and engines sold in Canada. It excludes companies or individuals that

(*a*) purchase vehicles or engines outside of Canada and import them into Canada for use or for a purpose other than sale;

(*b*) sell used vehicles or engines; or

(*c*) sell vehicles or engines that do not meet the definitions of "heavy-duty vehicle" or "heavy-duty engine," as prescribed in the Regulations.

Most of the companies to which the Regulations apply are Canadian subsidiaries or branches of multinational manufacturers, and are not considered to be "small businesses."

That said, there are small independent importers that import small numbers of vehicles and engines for the purpose of sale into Canada. There are also a number of small and specialized secondary manufacturers that import incomplete vehicles into Canada for the purpose of completing and then selling those vehicles to the end user. Collectively, these companies are responsible for a small fraction of all Canadian sales of heavy-duty vehicles.

Nevertheless, the Regulations recognize the unique challenges of companies that import or manufacture small volumes of new on-road heavy-duty vehicles and engines for sale in Canada. First, under the Regulations, the majority of these small businesses would have very limited requirements

given the exemption for companies importing or manufacturing fewer than 200 vehicles of any given model year. Also, requirements for a company that alters heavy-duty vehicles or heavy-duty incomplete vehicles — even those that are not exempted — are limited compared to original equipment manufacturers.

10. Consultation

10.1. Consultations before the publication of the proposed Regulations in the *Canada Gazette*, Part I

The Government of Canada first announced its commitment to take regulatory action to reduce GHG emissions from 2014 and later model year heavy-duty vehicles and engines on May 21, 2010. The announcement indicated the Regulations would be aligned with the U.S. EPA, while considering unique Canadian circumstances where appropriate. In October 2010, Canada released a consultation document detailing the main elements of Canada's proposed Regulations to address GHG emissions from heavy-duty vehicles and engines. Canada subsequently released a second, more detailed consultation document in August 2011. Interested parties were invited to submit comments after the announcement and the release of the two consultation documents.

Environment Canada also held extensive consultation sessions with industry and other concerned stakeholders before the publication of the proposed Regulations. These included several meetings with manufacturers, vehicle owners, carriers, operators, ENGOs, provinces and territories. Environment Canada also co-hosted with Transport Canada three stakeholder working group meetings comprised of the above mentioned stakeholders, as well as other federal departments, such as Natural Resources Canada and Industry Canada.

The views of stakeholders provided during the above early consultations were taken into account in developing the proposed *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations* prior to publication in the *Canada Gazette*, Part I.

10.2. Consultations after the publication of the proposed Regulations in the *Canada Gazette*, Part I

Publication of the proposed *Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations* in the *Canada Gazette*, Part I, on April 14, 2012, initiated a 60-day comment period where interested parties were invited to submit their written views on the proposed Regulations. The proposed Regulations were posted on Environment Canada's CEPA Environmental Registry Web site (see footnote 22) to make them broadly available to interested parties. Environment Canada distributed an email to a broad range of interested parties to inform them of the formal consultation process. During the consultation period, Environment Canada held meetings with representatives of the provinces and territories, vehicle industry associations and ENGOs to provide an overview of the proposed Regulations, and answer questions to better inform possible written submissions. During the formal consultation period, Environment Canada also presented the proposed Regulations at the Heavy Duty Vehicle GHG Emissions & Fuel Efficiency in Canada Conference hosted by the University of Manitoba in Winnipeg, Manitoba. Environment Canada received comments at the event, and also invited participants to submit written comments during the consultation period.

Environment Canada received 19 written submissions from a range of commenters, including provinces, Canadian and U.S.- based original equipment manufacturers, dealers, truck owners and operators, and ENGOs. Environment Canada took these views into account when developing the final Regulations. The following paragraphs summarize the major issues raised by interested parties on the proposed Regulations and Environment Canada's analysis leading to the development of the final Regulations.

10.2.1. Alignment with the U.S. EPA's *Greenhouse Gas Emissions Standards for Medium- and Heavy-Duty Engines and Vehicles*

The vast majority of commenters generally expressed support for emission standards under the *Heavy-Duty Vehicle and Engine Greenhouse Gas Emission Regulations* aligned with the U.S. EPA's *Greenhouse Gas Emissions Standards for Medium- and Heavy-Duty Engines and Vehicles* final rule. Alignment of test procedures, vehicle classes, flexibilities and administration were also specifically

highlighted as important by many commenters. Some U.S.-based manufacturers, however, stated that alignment could possibly establish a more stringent approach in Canada, because

1. Canadian regulatees (mostly importers) have smaller and less diverse fleets which do not allow them to certify vehicles across a broader range of emission performance standards, as compared to their U.S. counterparts who generally have larger and more diverse fleets;
2. the current penetration of GHG-reducing technologies is reportedly lower in Canada than in the United States, which would require greater improvements to meet the standards in Canada compared to the United States; and
3. the lead time for complying with the Regulations is significantly shorter in Canada.

Response: Environment Canada has a long-standing policy of aligning transportation emissions standards with those of the U.S. EPA, as this provides significant environmental and economic benefits to Canada while minimizing compliance costs for industry and consumers. Alignment provides identical emission standards and test procedures to those of the U.S. EPA, which were found in the *Canada Gazette*, Part I, publication.

The vast majority of vehicles are imported into Canada by large corporations with sufficient volume and diversity so as to not make the standards more stringent in Canada than in the U.S. Also, the Regulations' credit system allows Canadian companies to transfer credits amongst themselves, which effectively increases the pool of vehicles used for averaging and produces a similar fleet mix to the larger U.S. companies.

The data submitted by industry stakeholders suggest some differences in baseline vehicle performance between the United States and Canada, including a proportionally greater number of "vocational tractors" (see section 10.2.8 on vocational tractors for additional details on this issue).

In recognition of the transition to aligned standards, and to address industry concerns with a shorter lead time than that of the United States, Environment Canada is taking a phased-in approach by providing transitional measures over the 2014–2016 model years for vocational vehicles and tractors, as outlined in the regulatory description. Some restrictions apply to the use of early action credits and credits obtained during the phase-in period to ensure companies do not overly take advantage of the transitional measures (see section 5.6 for details). To address concerns specifically with regard to vocational tractors, Environment Canada has increased the threshold for vocational tractors (as described in section 10.2.8 below).

10.2.2. Low rolling resistance tires

There were many comments related to the safety, performance, availability and usage of low rolling resistance tires in Canada. Some U.S.-based manufacturers raised concerns that weather conditions such as mud, snow and ice were more severe or frequent in Canada than in the United States. They also noted that on average, Canadian heavy-duty vehicles are purchased with tires that have a higher rolling resistance than in the United States. Some vehicle operators stated that in the limited testing of low rolling resistance tires they had already conducted, they had seen no evidence of safety concerns and had so far obtained positive cost-benefit results. In general, there was a desire by commenters to see more data on the safety and performance of low-rolling resistance tires. Some commenters also stated a desire to see a standardized way of communicating tire rolling resistance information to vehicle and replacement tire purchasers.

Response: In addition to the testing results and comments provided by industry, the Government has conducted additional testing on low rolling resistance tires. Transport Canada conducted a broad study comparing the performance of tires with different rolling resistance in winter conditions. The results of these studies demonstrate that low rolling resistance tires can offer a similar level of snow traction performance as conventional tires, while reducing fuel consumption and emissions. In developing its final rule, the U.S. EPA conducted independent tire testing in both conventional and winter weather conditions. The results from that testing indicated that current low-rolling resistance targets can be met by a wide variety of tires currently on the market. The U.S. EPA studies also indicated no statistical relationship between rolling resistance and snow traction. Given the currently available data, standards anticipating the same penetration level of low-rolling resistance tire technology in

both Canada and the United States are appropriate.

10.2.3. Fuels

Some commenters felt that the proposed Regulations should aim to increase the penetration of various alternative fuels, particularly liquefied natural gas and biofuels. One commenter also stated that before any new fuel requirements are introduced, the compatibility of these fuels with existing emission control technologies should be assured.

Response: Environment Canada is maintaining the standards of the proposed Regulations, which are fuel-neutral and do not provide regulatory incentives or obstacles to any particular fuel including biofuel and liquefied natural gas. It should be noted that Environment Canada has separate renewable fuel standards in the *Renewable Fuels Regulations.*

10.2.4. Vehicles manufactured in stages

Many manufacturers and industry associations expressed concern that the administrative burden and documentation requirements for multistage manufacturers were unnecessary and overly onerous. The commenters stressed that the great majority of these companies did not alter components which would affect a vehicle's emissions value, principally the tires, engine and after-treatment system. They felt that for this reason, the reporting burden should be eliminated or substantially reduced. Some commenters advocated aligning multistage manufacturing requirements with those of the U.S. EPA.

Response: Environment Canada has reduced the administrative requirements for vehicles manufactured in stages, while maintaining the objectives of the Regulations. Environment Canada has modified the requirements of the proposed Regulations so that only manufacturers who alter components which will affect a vehicle's emission performance will be required to ensure that the vehicle conforms to all applicable standards in the new configuration. Those multistage manufacturers who do not affect a vehicle's conformity to the Regulations will not be subject to any data or documentation submission requirements.

10.2.5. Small volume companies

Some associations and companies stated that the threshold for companies to be considered for the provisions applying to small volume manufacturers and importers should be raised from 100, and some commenters also submitted data supporting this claim. Several other commenters also stated that the small volume provisions could lead to a proliferation of small volume companies in an effort to circumvent the standards, and one commenter stated that the provisions should be eliminated completely.

Response: Based on the data received, Environment Canada has increased the threshold for the small volume provisions to companies who manufactured or imported 200 or fewer vocational vehicles and tractors in 2011 and on average over the three most recent consecutive model years. Additionally, to address concerns that the exemption could lead to the proliferation of small-volume companies, Environment Canada has clarified in the regulatory text that a company must have been involved in the import or manufacture of fewer than 200 heavy-duty vehicles in 2011 (reference year) in order to be eligible for the small volume provisions. Finally, in response to the recommendation that the small-volume exemption be eliminated, Environment Canada is not eliminating this provision given its broad support from most commenters and in consideration of the unnecessary compliance burden for small businesses manufacturing and importing heavy-duty vehicles in Canada.

10.2.6. Reporting

Environment Canada received a number of comments related to several aspects of the reporting provisions contained in the proposed Regulations. Several commenters stated that the timing of the end of model year report should be later in the year, to allow Canadian subsidiaries to compile and prepare data from their American parent corporations.

Several large U.S.-based manufacturers were critical of the information requirements for vehicle importers, stating that the importers were unlikely to possess the information necessary to comply with

the proposed Regulations. They noted that given the current market structure involving numerous and generally small companies importing various brands and products, Environment Canada would likely subsequently receive many reports, often with duplicate vehicle information. An association and several U.S.-based manufacturers advocated for the option of allowing large entities to report on behalf numerous small importers. One U.S.-based manufacturer stated that reporting in this manner was not a suitable long-term solution to the issue of a high reporting burden.

Response: The deadlines for end of model year report submissions have been revised to June 30 of each year, to allow more time for Canadian regulatees to acquire information from their U.S. parent companies where necessary. Also, in order to further limit administrative burden and to streamline reporting requirements, the provisions contained in the proposed Regulations that required submitting an annual preliminary report for Class 2B and Class 3 heavy-duty vehicles were removed.

Under CEPA 1999 and the Regulations, companies are responsible for compliance including fulfilling all the regulatory reporting obligations. Regulatees may seek to establish an agreement with a third-party, such as the original equipment manufacturer, which has the expertise to submit the requisite regulatory reports on its behalf. Environment Canada recognizes that such an approach can limit the regulatory reporting burden, and in certain cases, such as submitting defect information, facilitate the dissemination of information.

10.2.7. Compliance flexibilities

Manufacturers, associations and ENGOs all commented on the compliance flexibilities contained in the proposed Regulations, in particular the CO_2 emission credit system. In general, U.S.-based manufacturers noted that Canadian regulatees (mostly importers) have smaller and less diverse fleets which do not allow them to certify vehicles across a broader range of emission performance standards, as compared to their U.S. counterparts, who generally have larger and more diverse fleets. Because of this, they said, the CO_2 emission credit system provides less flexibility for Canadian regulatees compared to U.S. regulatees.

Some U.S.-based manufacturers further commented that the proposed Regulations should not require companies to participate in the credit system if they import vehicles and engines covered by a U.S. EPA certificate, even if one or more of those vehicles and engines have emission levels worse than the standard. In the case of engines, these manufacturers also advocated this approach even if sales in Canada of one engine exceed sales in the U.S. of that same engine as stipulated in the proposed Regulations. Commenters further expressed concerns that, because of differences between the Canadian and U.S. engine markets, a small number of engines sold into a niche market segment could trigger a requirement for a company's entire engine line-up to be included in the CO_2 emission credit system.

On the other hand, several ENGOs emphasized the importance of a well-monitored CO_2 emission credit system to ensure that Canada does not become a pollution haven for high-emitting vehicles, and to ensure that the Government can verify the changes in technology and fuel efficiency at the fleet level.

Response: Participation in the CO_2 emission credit system is a compliance flexibility, and is not required unless one or more vehicles, including those covered by a U.S. EPA certificate, have emission levels worse than the applicable standard. The credit system cannot completely exclude U.S. EPA-certified vehicles and engines from its scope as this would reduce the Government's ability to ensure GHG emission reductions and properly evaluate the performance of the Regulations.

The requirement to participate in the CO_2 emission credit system for engines covered by a U.S. EPA certificate and with GHG emissions above the applicable standards is based on the number of engines sold in Canada and on a ratio of the number of engines sold in Canada and in the United States. The requirement for companies to track Canadian sales of heavy-duty engines is to ensure there are no significant differences between Canada and the United Sales in sales of low-volume engines. Environment Canada has modified the Canada/U.S. sales threshold for lower volumes of engines, to ensure that the requirement to participate in the CO_2 emission credit system for engines is only

triggered when there are significant Canadian sales of high-emitting engines.

10.2.8. Vocational tractors

The proposed Regulations contained provisions for vocational tractors, which are tractors that are not designed to operate mainly on highways, or that would not benefit from some of the technologies expected to be deployed for line-haul tractors. The proposed Regulations included an option for companies manufacturing or importing vocational tractors to comply with the CO_2 emissions standards applicable for vocational vehicles instead of those applicable for tractors, with a limit of no more than 2 100 vocational tractors, in any consecutive three model-year period.

Several U.S.-based manufacturers commented that Canada has a higher proportion of vehicles which would be considered vocational tractors than in the United States. The majority of these tractors have a gross combined weight rating (GCWR) of 120 000 lb or greater, and are also known as heavy-haulers. Commenters also stated that there is a greater need in Canada for vocational tractors due to the relatively higher percentage of Canada's economy dedicated to resource extraction. Commenters proposed to raise the limit on the number of tractors a manufacturer or importer could declare as vocational tractors. Commenters suggested to raise the thresholds to between 4 500 and 12 000 vehicles per three-year period, instead of 2 100 vocational tractors as proposed in the proposed Regulations.

Response: Based on confidential market data received from U.S.-based manufacturers, Environment Canada has raised the limit on vocational tractors to 5 250 per three-year period, from 2 100 for the same period.

10.2.9. Labelling

Some commenters recommended requiring manufacturers and importers to label tractors and vocational vehicles with the emissions values used for the U.S. certification, as an indicator to purchaser of emission performance. These commenters felt that this information would allow purchasers to make more informed purchases, and would also allow the Government of Canada to track the penetration of GHG-reducing technologies. Other commenters felt that these certification values were confidential business information, and should not be shared with the general public.

Response: Placing GHG emissions values on tractors, vocational vehicles and engines would require additional Canada- specific labels and is not in alignment with the requirements of the U.S. EPA. Environment Canada is not requiring GHG emissions certification values on labels under the Regulations.

11. Regulatory cooperation

The Joint Action Plan for the Canada-United States Regulatory Cooperation Council indicated that "in addressing climate change, both Canada and the U.S. have implemented aggressive emissions targets in the transportation sector. Continuing progressive and aligned action to reduce GHGs from vehicles is a priority for both countries. There is an opportunity for regulators to work more closely with the aim of better synchronizing implementation of regulations and leveraging existing expertise."

Throughout the regulatory development process in both Canada and the United States, Environment Canada and the U.S. EPA worked to support each other. Environment Canada's contributions included emissions and aerodynamic testing, conducted at facilities run by both Environment Canada and the National Research Council Canada. Canada's contributions were explicitly mentioned by the U.S. EPA in their rulemaking documents, including the following excerpt: "We expect the technical collaboration with Environment Canada to continue as we implement testing and compliance verification procedures for this rulemaking. We may also begin to develop a knowledge base enabling improvement upon this regulatory framework for model years beyond 2018 (for example, improvements to the means of demonstrating compliance). We also expect to continue our collaboration with Environment Canada on compliance issues."

Environment Canada expects collaboration with the U.S. EPA to continue and expand as both countries work to address GHG emissions from heavy-duty vehicles, especially in the areas of joint testing,

knowledge sharing and the implementation of the Regulations.

12. Rationale

The Regulations will achieve the Government of Canada's objective to continue to reduce GHG emissions from heavy-duty vehicles and engines for model years 2014 and beyond. The Regulations align with the national GHG emission standards of the U.S. EPA for model years 2014 and later, providing long-term regulatory certainty to the heavy-duty vehicle and engine industry and common requirements in both jurisdictions, to allow for companies to take advantage of economies of scale. The implementation of these national GHG emission standards will require significant technological improvements to new heavy-duty vehicles and engines, which will lead to significant GHG emission reductions and improved fuel efficiency. The present value to vehicle purchasers of benefits from reduced fuel consumption alone is estimated to be $4.8 billion over the lifetime operation of model year 2014 to 2018 heavy-duty vehicles and engines.

In perfect markets, such fuel savings would be enough to motivate reductions in GHG emissions even in the absence of the Regulations. Accordingly, it may be reasonably asked why the Regulations are necessary in order to achieve these cost-effective results. To try to understand this issue, the U.S. EPA surveyed published literature and held discussions with numerous truck market participants. From these sources, five categories of possible explanations were derived.

First, comprehensive and reliable information on the effectiveness and efficiency of new technologies is not always available. Thus, buyers may understandably be reluctant to spend additional money to purchase vehicles equipped with these new technologies.

Second, although it seems reasonable to assume that people are willing to pay more for better vehicles, new or used, it is not clear whether buyers of used vehicles can tell which are the better vehicles. As a result, the purchasers of original equipment may expect the resale market to provide inadequate compensation for the new technologies, even when those technologies would reduce costs for resale buyers.

Third, if for some reason a truck purchaser will not be directly responsible for future fuel costs, or the individual who will be responsible for fuel costs does not decide which truck characteristics to purchase, then those price signals (higher vehicle prices offset by lower fuel costs) may not be transmitted effectively, and incentives can be described as "split."

Fourth, there may be uncertainty about future fuel prices. When purchasers have less than perfect foresight about future operating expenses, they may implicitly apply much higher discount rates to future potential fuel savings, due to their uncertainty.

Fifth, transaction costs of changing to new technologies may slow or prevent their adoption. If a conservative approach to new technologies leads truck buyers to adopt new technologies slowly, then successful new technologies are likely to be adopted over time without market intervention, but with potentially significant delays in achieving fuel savings and environmental benefits.

It is unclear whether some or many of the technologies would be adopted in the absence of the Regulations. There is, however, highly imperfect information in the original and resale markets, split incentives, uncertainty about future fuel prices, and adjustment and transaction costs. These market failures would limit the adoption of these technologies in the absence of the Regulations. Therefore, regulations that force the adoption of these technologies can bring net benefits to Canadians, as demonstrated in the summary cost-benefit table for the Regulations (Table 12).

13. Implementation and enforcement

13.1. Implementation

Environment Canada currently administers a comprehensive program to verify compliance with the *On-Road Vehicle and Engine Emission Regulations* under CEPA 1999, which establish federal emission standards for smog-forming emissions. The Regulations will be implemented and enforced in a similar manner. Manufacturers and importers will be responsible for ensuring that their products comply with the Regulations and will be required to produce and maintain evidence of such conformity. The program

will include

- authorizing and monitoring the use of the national emissions mark;
- reviewing company evidence of conformity;
- monitoring data submission for compliance with the applicable GHG emission standards for heavy-duty vehicles and engines and the banking or trading of emission credits;
- registering company notices of defects affecting emission controls;
- inspections of test vehicles and engines and their emission-related components;
- laboratory emissions tests on a sample of new vehicles and engines that are representative of products offered for sale in Canada; and
- laboratory emissions tests on a sample of typical in-use vehicles.

Environment Canada plans to coordinate monitoring efforts with the U.S. EPA by sharing information to increase program efficiency and effectiveness.

In administering the Regulations, Environment Canada will respond to submissions and inquiries from the regulated community in a timely manner taking into account the complexity and completeness of the request.

13.2. Enforcement

Since the Regulations will be made under CEPA 1999, enforcement officers will, when verifying compliance with the Regulations, apply the Compliance and Enforcement Policy implemented under the Act. The Policy sets out the range of possible responses to violations, including warnings, directions, environmental protection compliance orders, ticketing, ministerial orders, injunctions, prosecution, and environmental protection alternative measures (which are an alternative to a court trial after the laying of charges for a CEPA 1999 violation). In addition, the Policy explains when Environment Canada will resort to civil suits by the Crown for costs recovery.

When, following an inspection or an investigation, an enforcement officer discovers an alleged violation, the officer will choose the appropriate enforcement action based on the following factors:

- Nature of the alleged violation: This includes consideration of the damage, the intent of the alleged violator, whether it is a repeat violation, and whether an attempt has been made to conceal information or otherwise subvert the objectives and requirements of the Act.
- Effectiveness in achieving the desired result with the alleged violator: The desired result is compliance within the shortest possible time and with no further repetition of the violation. Factors to be considered include the violator's history of compliance with the Act, willingness to cooperate with enforcement officers, and evidence of corrective action already taken.
- Consistency: Enforcement officers will consider how similar situations have been handled in determining the measures to be taken to enforce the Act.

Environment Canada will monitor the GHG emission performance of heavy-duty vehicles and engines and their fleets and compliance with the Regulations. In the situation where a vehicle or engine is found to exceed applicable standards or exceed the family emission limit specified by the company, the normal course of events will be to perform sufficient engineering assessment to determine if a notice of defect should be issued by the company to the owners of the particular model of vehicle. This may result in a product recall to fix the defect. In the case of the emission credit system, companies will have three years to offset a deficit. In the situation where a company fails to meet this requirement, the issue will be referred to the Enforcement Division to consider actions in accordance with its Compliance and Enforcement Policy for CEPA 1999.

13.3. Service standards

For the Regulations, Environment Canada, in its administration of the regulatory program, will provide these services in a timely manner:

- Reviewing applications and preparing authorizations to use the national emissions mark; and
- Assessing requests for exemptions from the Regulations.

In addition, Environment Canada will audit evidence of conformity for engines and vehicles and

provide to manufacturers an acknowledgement of its receipt and whether it is presented "in a form and manner that is satisfactory" based on a set of criteria established by Environment Canada. Environment Canada intends to develop a technical guidance document describing the required evidence of conformity and the procedures to be followed when submitting required documentation.

14. Performance measurement and evaluation

The Performance Measurement and Evaluation Plan (PMEP) describes the desired outcomes of the Regulations and establishes indicators to assess the performance of the Regulations in achieving these outcomes. The PMEP package is composed of three documents:

- The PMEP, which details the regulatory evaluation process;
- The logic model, which provides a simplified visual walkthrough of the regulatory evaluation process; and
- The table of indicators, which lists clear performance indicators and associated targets, where applicable, in order to track the progress of each outcome of the Regulations.

The three documents complement each other and allow the reader to gain a clear understanding of the outcomes of the Regulations, the performance indicators, as well as the evaluation process.

14.1. Outcomes

The PMEP details the suite of outcomes for each unit as they comply with the Regulations. These outcomes include the following:

- Upon publication of the Regulations, the regulated community will become aware of the Regulations, start importing or manufacturing vehicles and engines that comply with the standards and meet the reporting requirements, when applicable (immediate outcome).
- Then, as fuel-saving technologies enter the market, owners and operators of heavy-duty vehicles will experience fuel savings (intermediate outcome), which directly translates into GHG emission reductions and economic benefits (final outcome).

As a key feature of the Regulations, companies will be subject to progressively more stringent standards during the 2014 to 2018 model year period. Also, the Regulations only target new vehicles. Existing vehicles are not subject to the Regulations. As a result, the outcomes, such as anticipated reductions in GHG emissions, will take place progressively and accumulate over time as the Canadian vehicle fleet turns over.

14.2. Performance indicators and evaluation

Clear, quantitative indicators and targets, where applicable, were defined for each outcome — immediate, intermediate, and final — and will be tracked on a yearly basis or every five years, depending on the indicator and outcome. Examples of performance indicators include the annual percentage of regulatees who took advantage of compliance flexibilities, the annual percentage of total vehicles that are in compliance with the standards and the number of enforcement actions taken annually.

In addition, a compilation assessment will be conducted every five years starting in 2020 to gauge the performance of every indicator against the identified targets. This regular review process will allow Environment Canada to clearly detail the impact of the Regulations on the on-road heavy-duty vehicle sector as more and more low GHG-emitting vehicles enter the market, and to evaluate the performance of the Regulations in reaching the intended targets.

These performance indicators are available in the PMEP table of indicators, and make direct references to the outcomes listed in the logic model.

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Footnote a
S.C. 2004, c. 15, s. 31

Footnote b
S.C. 1999, c. 33

Footnote c
S.C. 1999, c. 33

Footnote 1
Canada's Greenhouse Gas Inventory, 2009, 2010, www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=8BAF9C6D-1.

Footnote 2
Federal Register, Vol. 76, No. 179, p. 57108, September 15, 2011, www.epa.gov/otaq/climate/regulations.htm#1-2.

Footnote 3
These consultation documents are available at www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=A7A02DDF-1.

Footnote 4
Federal Register, Vol. 76, No. 179, p. 57108, September 15, 2011, www.epa.gov/otaq/climate/regulations.htm#1-2.

Footnote 5
The European Commission is due to adopt a strategy on HDV GHG emissions in 2013. For details, visit http://ec.europa.eu/clima/events/0054/index_en.htm.

Footnote 6
Industry Canada, www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic33612tabe.html.

Footnote 7
Source: www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic33612prde.html.

Footnote 8
Source: www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic33612empe.html.

Footnote 9
Canada's Action on Climate Change, www.climatechange.gc.ca/default.asp? lang=En&n=036D9756-1.

Footnote 10
Canada's Greenhouse Gas Inventory, 2010, www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=8BAF9C6D-1.

Footnote 11
Contact Environment Canada's Economic Analysis Directorate for any questions regarding methodology, rationale, or policy.

Footnote 12
U.S. Interagency Working Group paper on SCC: IWGSCC, 2010, "Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866," U.S. Government.

Footnote 13
The value of $28.44/tonne of CO_2 in 2012 (in 2011 Canadian dollars) and its growth rate have been estimated using an arithmetic average of the three models PAGE, FUND, and DICE.

Footnote 14
"Fat-Tailed Uncertainty in the Economics of Climate Change," Review of Environmental Economic Policy, 5(2), pp. 275–292 (summer 2011).

Footnote 15
"Fat Tails, Thin Tails, and Climate Change Policy," Review of Environmental Economics and Policy, summer 2011.

Footnote 16
The value of $112.37/tonne of CO_2 in 2012 (in 2011 Canadian dollars) and its growth rate have been estimated using an arithmetic average of the two models PAGE and DICE. The FUND model has been excluded in this estimate because it does not include low probability, high-cost climate damage.

Footnote 17
www.neb.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgyftr/2011/nrgsppldmndprjctn2035-eng.html#s2_1

Footnote 18
www.epa.gov/otaq/climate/documents/420r11901.pdf

Footnote 19
See section 7.3.3.

Footnote 20
www.tc.gc.ca/media/documents/policy/report-final.pdf

Footnote 21
Canadian Industry Statistics, Industry Canada.

Footnote 22
www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=D44ED61E-1

Date modified: 2013-04-11

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.5; Page No.: 48

PREAMBLE: Figure 13.8 illustrates the reduction of thermal generated GHG emissions outside Manitoba.

QUESTION:

Explain the declining effect in Figure 13.8 of the hydro development plans on reduction of GHG emissions in export markets over time, making reference to relevant legislation in these markets and any targets for GHG emissions reduction at the municipal, state, regional and federal levels or within certain industries or corporations producing electricity within these markets.

RESPONSE:

The decline in GHG emission reductions over time in Figure 13.8 of ***Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis*****,** is a result of a reduction in the volume of electricity exports. As electrical load within Manitoba increases across the time horizon shown in the figure, the amount of exported electricity decreases across all development plans.

This figure assumes a constant GHG displacement factor of 0.75 kg CO_2e/kWh was applied to the Manitoba Hydro exports (and imports) associated with the selected development plans.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.5; Page No.: 55

PREAMBLE: The text notes that "The economic measure of the cost of any residual impact on environmental resources and attributes is the compensation required by those people who would be adversely affected to willingly accept the impacts and risks." This suggests that the affected environment has no inherent value outside of its potential to provide resources to local harvesters.

QUESTION:

Describe the environmental services provide currently (and at no cost) by the environments to be affected by the preferred development plan, and estimate the cost of providing those services.

RESPONSE:

The economic measure of value is not restricted to resource or other use. It in principle includes the value people place on environmental attributes for the ecological or other services they provide. The benefit-cost issue is what trade-off people would be willing to make to preserve or avoid adverse impacts on those attributes should such exist. A summary of the nature of the environmental impacts was provided in Chapter 13 where it was concluded that the assessments did not indicate there would be major residual effects or trade-offs given the extensive monitoring, mitigation and other measures planned, but that this will be addressed in detail in the environmental hearings the projects require (see p. 67, Chapter 13).

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.5; Page No.: 55

PREAMBLE: The text notes that "Preliminary assessments indicate, however, that the impacts of the Conawapa Project would be similar in nature to the Keeyask Project, except the flooding and related aquatic impacts would be much less." Both the Keeyask and Conawapa projects appear to rely on flow regimes resulting from the creation of upstream reservoirs and would be less economic or even uneconomic without these previously constructed hydroelectric projects.

QUESTION:

Describe the nature and scope of the ongoing environmental effects of the reservoirs and operating regimes established by the development of upstream hydroelectric projects on which Keeyask and Conawapa would depend for flow regulation.

RESPONSE:

The PUB ruled in Order No. 119/13 that Manitoba Hydro need not answer MMF/MH I-0062 as phrased, but it is to provide a high-level description of the ongoing environmental effects of upstream projects for purposes of establishing a baseline in respect of the Board's assessment of macro environmental impacts.

The Keeyask and Conawapa Projects would be located in a region that has been altered over the past 55 years by the development of Lake Winnipeg Regulation (LWR) and the Churchill River Diversion (CRD) and five generating stations. Large rapids have been replaced with dams, stretches of river have been changed into reservoirs, flows from the Churchill River have been directed into the Nelson River, and seasonal flow patterns have been reversed with higher flows in winter and reduced flows in spring and summer. Roads and transmission lines now cross the region. Other agents of change include mining, commercial forestry and commercial fishing.

Manitoba Hydro has produced matrices and text comparing the environmental effects of Keeyask, Conawapa, gas turbines and wind generation, as well as DSM and transmission projects (please see CAC/MH-231(a)). This analysis focuses on several important environmental components: water quality, wetland function, sturgeon, birds and caribou.

Through the environmental review process (CEC Rd 1 – CEC-0020), the Keeyask Partnership previously provided historical and current context for these environmental components. As such, this information is subject to review in the environmental review process. This response and Section 6.2.3.4.6 of the Response to EIS Guidelines form the basis of the following high-level description of on-going environmental effects to address Order 119/13 regarding an environmental baseline.

Water Quality

- Water along the Nelson River is moderately nutrient rich, well oxygenated, moderately soft to hard, has a slightly alkaline pH, and alkalinity is moderate.
- Water quality has been generally stable along the mainstem over the last several decades and conditions have been stable in north arm of Stephens Lake since the 1980s.
- The Keeyask Cree Nations (KCNs) have noted a decline in water quality, stating that water is more murky, dirty, muddy and undrinkable throughout the system before and more intensely after the Kettle GS was completed. The overall decline in water quality was attributed, at least in part, to the Churchill River Diversion (CRD), Lake Winnipeg Regulation (LWR) and construction of the individual generating stations.
- Water quality in Stephens Lake was affected in the initial years following construction of the Kettle GS, with increased concentrations of nutrients and total suspended solids and periodic dissolved oxygen depletion, but improved over time.

Lake Sturgeon

- Commercial fishing of Lake Sturgeon on the Nelson River began in 1907 and severely depleted populations before the fishery was permanently closed in 1992.
- Changes to the aquatic environment began with construction of the first hydroelectric generating station at Kelsey Rapids in the late 1950s. The CRD and LWR, completed in the mid-1970s, altered the aquatic environment of the entire Nelson River.
- The KCNs state that hydroelectric development caused a decline in sturgeon. Technical studies found that sturgeon numbers declined where habitat for specific life-history requirements such as spawning was lost. However, healthy populations persist in areas affected by hydroelectric development where habitat to support all life history stages is available.
- Sturgeon populations in the Keeyask study area consist of three groups inhabiting: Split Lake and its tributaries; Clark Lake to Gull Rapids; and Stephens Lake. Although habitat in the Clark Lake to Gull Rapids reach (where the Keeyask Project would be located) currently supports all life history stages, numbers are low and the long-term sustainability (if there is no mitigation[11]) is uncertain. Numbers may be increasing in the Split Lake area, suggesting this population may persist. The extremely small number of spawning sturgeon at Gull Rapids make it unlikely the Stephens Lake population is presently self sustaining without mitigation.

Wetland Function

- Hydroelectric and public infrastructure development has reduced total wetland area, as well as the amounts of some wetland types. Wetland composition was also altered by those roads and other infrastructure that changed hydrology. All of the natural Nelson River shoreline wetlands in the Keeyask Regional Study Area were either lost to flooding are have been altered by modified water and ice regimes. Off-system wetlands with hydrological connections to the Nelson River may also have been affected.
- Natural climate warming that began about 150 years ago has already dramatically altered some peatland types, primarily through permafrost melting and fire regime

[11] For more information about the history, current status, and management plans for the sturgeon population, see Appendix 2.1

changes. Analysis of historical air photos from the regional study area indicated that permafrost melting in a recent 44 year period eliminated approximately 20% of the total area of peat plateau bogs, the most pronounced permafrost wetland type in the regional study area. Throughout much of the boreal forest, ongoing past climate change has also altered the fire regime which is thought to have shifted habitat composition toward younger vegetation types with high proportions of plant species that regenerate quickly after fire and reduced proportions of the permafrost-affected wetlands types.

Birds

- Approximately 185 bird species potentially breed within or migrate through the Keeyask regional study area. Of these, 150 overwinter in southern areas.
- Surveys occurred between 2001 and 2011 revealed the presence of 140 different bird species.
- The birds that were observed during field studies are as follows:
    - Waterbirds: 14 species observed (of 17 species that potentially occur in the region).
    - Waterfowl: 22 waterfowl species observed (which includes 19 ducks, 2 geese and one species of swan; of a possible 27 waterfowl species that may occur in the region) – Canada geese and mallards are particularly valued by the local Cree nations.
    - Raptors (hawks, eagles, falcons and owls): 15 (of a potential 19 species) were observed in the region – the bald eagle was the most commonly observed species during bird surveys and has cultural importance to the Cree nations.
    - Rails and cranes: 2 (of potentially 4) species were observed: sora rail and sandhill crane. The breeding range of yellow rail and American coot extends to the regional study area, but they were not observed during the bird surveys.
    - Shorebirds: 6 (of potentially 21) species were observed in the region.
    - Kingfishers: belted kingfisher is the only species observed and expected to occur in the Keeyask GS region.

- Songbirds: 69 (of a possible 83 songbirds) were observed.
- Woodpeckers: 6 (of potentially 7 species) were observed in the study area.
- Nighthawks: the common nighthawk is the only species observed and expected to occur in the Keeyask GS region.
- Upland game birds: 4 species, all of which are harvested by local hunters, were observed and represent the only species expected to occur in the region.

The ruby-throated hummingbird is the only hummingbird species potentially occurring in the region, but none were observed during studies.

Species at risk are those birds listed as endangered, threatened or of special concern by the Manitoba Endangered Species Act (MESA), the Species at Risk Act (SARA) and/or the Committee on the Status of Endangered Species in Canada (COSWEIC). Five of the eight with the potential to occur within the bird regional study area were observed in the regional study area (olive-sided flycatcher, rusty blackbird, short-eared owl, horned grebe and common nighthawk). No nationally, regionally, or locally important migratory bird habitat, as designated by the Canadian Wildlife Service and/or Bird Studies Canada, occurs within the regional study area.

Caribou

- Caribou populations are typically influenced by effects such as amount of important habitat areas (primarily calving sites), fragmentation or intactness, natural predation by wolves, and harvesting by hunters.
- Effects since hydroelectric development began on caribou have included habitat loss and alternation, changes in habitat fragmentation, and changes in herd size, migration routes and river crossings. Islands in lake and peatland complexes have also changed. Although the number of islands in lakes has increased above historical levels, the quality and quantity of habitat change is uncertain. Calving in the regional study area was noted since the return of caribou in the 1990s.

- Field studies from 2001 to 2011 indicate that large numbers of caribou occur infrequently in the local study area, but are more common in the regional study area.
- Signs of caribou activity were very common in the local study area in summer and usually sparse in winter.
- Extreme annual variability in the number of animals was observed in winter, along with the use of winter habitat due to differences in migration routes and the timing of movements.
- Calving habitat, including islands in lakes and peatland habitat, is important today.
- Summer resident caribou habitat intactness estimates in the regional study area are above the 65% Environment Canada benchmark.
- Gray wolf density in the region is low (1.4 wolves / 1000 km2).

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.5; Page No.: 55-56

PREAMBLE: Manitoba Hydro indicates that "Detailed environmental assessments have not been undertaken for the other projects in the preferred and alternative plans…Manitoba Hydro is of the view that preliminary project designs and cost estimates for Conawapa G.S. and the related upgrades provide for sufficient mitigation to minimize residual adverse effects to acceptable levels. It is also expected that some form of local agreements would be entered into to ensure whatever residual biophysical impacts or risks remain, they would be addressed…The same general conclusion applies to other projects in the different plans." (Section 13.3.5, p.55) Manitoba Hydro concludes that there will be "no major external cost" with little to no foundation for this conclusion. Manitoba Hydro is reliant on yet to be completed "detailed environmental reviews and arrangements with directly affected individuals" (Section 13.3.5, p. 56). The Manitoba Metis Federation (MMF) has not yet completed their Metis-specific Traditional Land Use and Knowledge Study, socio-economic impact assessment and historical narrative for the Keeyask region (Section 2.1.3.1, p.16). Furthermore, it is still up to CEAA to determine if the Keeyask project will cause a significant adverse effect (Section 15.4.2.2, p.22).

QUESTION:

If the environmental impact is not well understood at this time, please explain how Manitoba Hydro concludes that "economic decisions adequately reflect environmental effects", as indicated in the Sustainable Development Act – 1997.

RESPONSE:

Please see "Integration of Environmental and Economic Decisions" on page 2-4 in Appendix 14.1.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.5; Page No.: 55-56

PREAMBLE: Manitoba Hydro indicates that "Detailed environmental assessments have not been undertaken for the other projects in the preferred and alternative plans…Manitoba Hydro is of the view that preliminary project designs and cost estimates for Conawapa G.S. and the related upgrades provide for sufficient mitigation to minimize residual adverse effects to acceptable levels. It is also expected that some form of local agreements would be entered into to ensure whatever residual biophysical impacts or risks remain, they would be addressed…The same general conclusion applies to other projects in the different plans." (Section 13.3.5, p. 55) Manitoba Hydro concludes that there will be "no major external cost" with little to no foundation for this conclusion. Manitoba Hydro is reliant on yet to be completed "detailed environmental reviews and arrangements with directly affected individuals" (Section 13.3.5, p. 56). The Manitoba Metis Federation (MMF) has not yet completed their Metis-specific Traditional Land Use and Knowledge Study, socio-economic impact assessment and historical narrative for the Keeyask region (Section 2.1.3.1, p.16). Furthermore, it is still up to CEAA to determine if the Keeyask project will cause a significant adverse effect (Section 15.4.2.2, p.22).

QUESTION:

Given that the environmental impact of the Keeyask project on the Manitoba Metis community is not well understood at this time, provide evidence that "arrangements with directly affected individuals", in this case the MMF, are well underway and likely to address any remaining residual biophysical impacts.

RESPONSE:

The NFAT submission has drawn information from existing sources, which include Manitoba Hydro's experience with past projects and plans for future projects, including the Keeyask environmental impact statement (see chapter 2 of the NFAT submission). The MMF posed questions in the first round of the CEC IRs relevant to MMF/MH I-063b. The response to MMF-0024 in the first round of CEC IRs stated:

> Based on existing studies of the project area and the experience and expertise of the Keeyask Cree Nations, the Keeyask Hydropower Limited Partnership does not currently have any knowledge of how the Métis, as a distinct group of people within the study area, would be affected any differently by the Keeyask Project than the general population.
>
> Manitoba Hydro (acting on behalf of the Partnership) and the MMF have reach an agreement on a workplan and budget to undertake a Metis-specific Traditional Land Use and Knowledge Study, Socio-economic Impact Assessment and historical narrative for the Keeyask region. It is anticipated that these studies will assist in furthering *our* understanding of the Métis community in the Keeyask region and any potential effects that may be experienced as a result of the Project.

The response to MMF-0039a in the first round of CEC IRs concludes:

> The Partnership has committed to consider any information that is provided by these studies.

In response to regulatory requirements of the environmental reviews, the Keeyask Partnership reviewed existing sources of information regarding Métis resource use. The following was noted in MMF-0038c from the first round of CEC IRs:

> …the Partnership has provided a document entitled "Manitoba Métis: A review of available information on the current use of lands and resources for traditional purposes in the Keeyask resource use regional study area and potential effects of the Keeyask Generation Project on those uses". The MMF had the opportunity to review this document and notes that it disagrees with its conclusions.

The response to MMF-0023 in the first round of CEC IRs also noted:

To the extent that there are Métis or other Aboriginal citizens in the Local Study Area, these individuals are included in the assessments of effects of the Project on people in the Local Study Area, and are also captured in the total and Aboriginal populations (where available) identified for each Local Study Area community (please also refer to the responses to CEC Rd 1 MMF-0024g and MMF-0024h).

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.6; Page No.: 57

PREAMBLE: The text indicates that the JKDA "would generate significant benefits for the four Cree Nations (KCNs) that would partner with Manitoba Hydro in the development of the project."

QUESTION:

Describe the criteria, including criteria developed by the Project partners (if any), used to determine the significance of the benefits under the JKDA and how the nature and scope of those benefits exceeds the threshold of significance.

RESPONSE:

As noted in section 13.3.6, the determination is based on the investment, employment, direct contracts and other provisions of the JKDA.

The term “significant” as used in the NFAT submission is synonymous with words such as important, major, noteworthy and substantial. Professional judgment is applied regarding whether to describe an effect as significant.

Of note: For a discussion about the methodology to determine “significant” in the environmental reviews, please see Manitoba Hydro’s response to MMF/MH I-053a.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: Section 13.3.6; Page No.: 57, 59

PREAMBLE: The text states that "A detailed socioeconomic impact assessment has been undertaken for the Keeyask Project, but not for the other projects in the preferred and alternative plans" (Chapter 13, Section 13.3.6, p.59). (The MMF has previously articulated the position that the detailed socioeconomic assessment for the Keeyask Project fails to identify, assess, and mitigate the socioeconomic impacts as these might be experienced by Metis in the vicinity of the Project.) Despite this lack of assessment, in the analysis of the Social Account, the Business Case Submission states that the project developments in both the PDP and alternative plans would have a wide range of social and economic effects for project partners, local and regional communities, and Manitobans as a whole, (Chapter 13, Section 13.3.6, p.57).

QUESTION:

Explain how the social and economic effects were identified and assessed, and evaluated for each of the options, despite the lack of a detailed socioeconomic assessment for the other projects in the preferred and alternative plans.

RESPONSE:

The social impacts on communities presented in Chapter 13 are based on the extensive social impact assessments in Chapter 6 of the Keeyask EIS as well as preliminary assessment and project description information for the other projects in the different plans (see Chapter 2 of the NFAT submission).

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.6; Page No.: 57, 61

PREAMBLE: In the analysis of the Social Account, Manitoba Hydro states that there would be expected returns and other benefits for the KCNs (project partners), and that while there would be employment and business impacts for affected communities, there would also be potential impacts on population, housing, infrastructure and services, transportation, family and community well-being, health and safety, and culture and heritage resources (Chapter 13, Section 13.3.6, p.57). Manitoba Hydro further states that while there would be some adverse effects, the KCNs support and participation in the project "...suggest that local adverse effects would be offset by the positive impacts and expected benefits" (Chapter 13, Section 13.3.6, p.61).

Given that the Metis (and other non-KCN members) in the vicinity of the project are not partners, and thus lack both the benefits and offsetting programs of the Adverse Effects Agreements, it is anticipated that they will experience, to some degree, the adverse potential impacts, described above, of the preferred or alternative projects.

QUESTION:

Confirm whether, and to what extent, it is anticipated that the Metis, as residents in the communities in the vicinity of the preferred and alternative projects, are anticipated to experience the potential impacts described in the preamble.

RESPONSE:

The NFAT submission has drawn information from existing sources, which include Manitoba Hydro's experience with past projects and plans for future projects, including the Keeyask environmental impact statement (see chapter 2 of the NFAT submission). The MMF posed a number of questions in the first round of the CEC IRs relevant to MMF/MH I-066a.

The response to MMF-0023 in the first round of CEC IRs noted:

To the extent that there are Metis or other Aboriginal citizens in the Local Study Area, these individuals are included in the assessments of effects of the Project on people in the Local Study Area, and are also captured in the total and Aboriginal populations (where available) identified for each Local Study Area community.

For more discussion on this topic, please see Manitoba Hydro's response to MMF/MH I-001b.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.6; Page No.: 57, 61

PREAMBLE: In the analysis of the Social Account, Manitoba Hydro states that there would be expected returns and other benefits for the KCNs (project partners), and that while there would be employment and business impacts for affected communities, there would also be potential impacts on population, housing, infrastructure and services, transportation, family and community well-being, health and safety, and culture and heritage resources (Chapter 13, Section 13.3.6, p.57). Manitoba Hydro further states that while there would be some adverse effects, the KCNs support and participation in the project "...suggest that local adverse effects would be offset by the positive impacts and expected benefits" (Chapter 13, Section 13.3.6, p.61).

Given that the Métis (and other non-KCN members) in the vicinity of the project are not partners, and thus lack both the benefits and offsetting programs of the Adverse Effects Agreements, it is anticipated that they will experience, to some degree, the adverse potential impacts, described above, of the preferred or alternative projects.

QUESTION:

Identify what measures could be taken by Manitoba Hydro to avoid or reduce the potential impacts, particularly as these might be experienced by the Métis in the vicinity of the preferred or alternative projects.

RESPONSE:

Please see Manitoba Hydro's response to CAC/MH I-231a. Concerns about effects on the Métis have been raised during the environmental review process. The response to MMF-0023 in the first round of CEC IRs noted:

> To the extent that there are Métis or other Aboriginal citizens in the Local Study Area, these individuals are included in the assessments of effects of the Project on people in the Local Study Area, and are also captured in the total and Aboriginal populations (where available) identified for each Local Study Area community.

For more information on this topic, including information about an MMF-lead study, please see Manitoba Hydro's response to MMF/MH I-001b.

In addition, Manitoba Hydro has undertaken to provide matrices of macro environmental and socio-economic issues comparing Keeyask, Conawapa, gas turbines and wind generation. The matrices summarize the various components of the PUB's definitions of macro environmental and socio-economic as defined in PUB Order 92/13. PUB Order 119/13 added DSM to the resource options to be considered in the matrices, and Manitoba Hydro has chosen to also include transmission projects.

Please refer to CAC/MH I-231a for the matrices.

REFERENCE: Chapter 13: Integrated Comparisons of Development Plans - Multiple Account Analysis; Section: 13.3.6; Page No.: 62

PREAMBLE: The text notes that: "One aspect of the plans, however, that may be more broadly significant and that may not have been fully recognized in the other accounts, is what one could describe as a bequest value – the value of the assets that will benefit future generations of Manitobans over the very long term." Equally, the NFAT has not considered the potential that interconnected electricity growth will not occur as projected by Manitoba Hydro and the resources will be no longer required before the end of their design life.

QUESTION:

Describe and quantify the residual costs to Manitobans relating to the decommissioning of the assets composing each of the development plans in the event that they are no longer required prior to the end of their design life.

RESPONSE:

Decommissioning in advance of design life is not expected and decommissioning costs were not included in estimation of expenditures over the planning period.

REFERENCE: Chapter 14: Conclusions; Section: 14.1; Page No.: 4

PREAMBLE: The business case indicates that the PDP is the best option and also indicates that the plan is flexible (Executive Summary, Section 14.1). For example, Manitoba Hydro states that "other resources not specified as being included may well be added (e.g. customer self-generation, wind, biomass, solar and additional enhancement of existing Manitoba Hydro generation.)" (Section 14.1, p.4)

QUESTION:

Explain how the environmental impacts would be considered in any decision to shift to alternative options in the future.

RESPONSE:

Environmental impacts are inherently considered as one of the criteria in the Manitoba Hydro development plan decisions. Decisions in the future on including other resources in the development plan will be subject to the ongoing Manitoba Hydro planning process and development plan decision process and thus include the environmental impacts as well as other criteria. Major new developments such as hydroelectric, gas turbine or wind generation projects, are also subject to review under *The Environment Act* (Manitoba)

REFERENCE: Appendix F Economic Outlook 2012 – 2033; Page No.: 5

PREAMBLE: Appendix F indicates that "For the purpose of the 2012 Economic Outlook, the forecasting sources include IHS Global Insight, the Conference Board of Canada, Informetrica, Spatial Economics, BMO Nesbitt Burns, CIBC, Desjardins, Laurentian, Royal Bank of Canada, Scotiabank, National Bank of Canada, and TD Bank."

QUESTION:

Indicate which of these forecasters provided real GDP data for Manitoba and provide this data separately for each forecaster.

RESPONSE:

The following table depicts the sources used to derive the forecast of Manitoba Real GDP for 2011/12 – 2032/33, as shown in Table A-1 of the 2012 Economic Outlook, filed as Appendix F.

Copies of the source forecasts are attached.

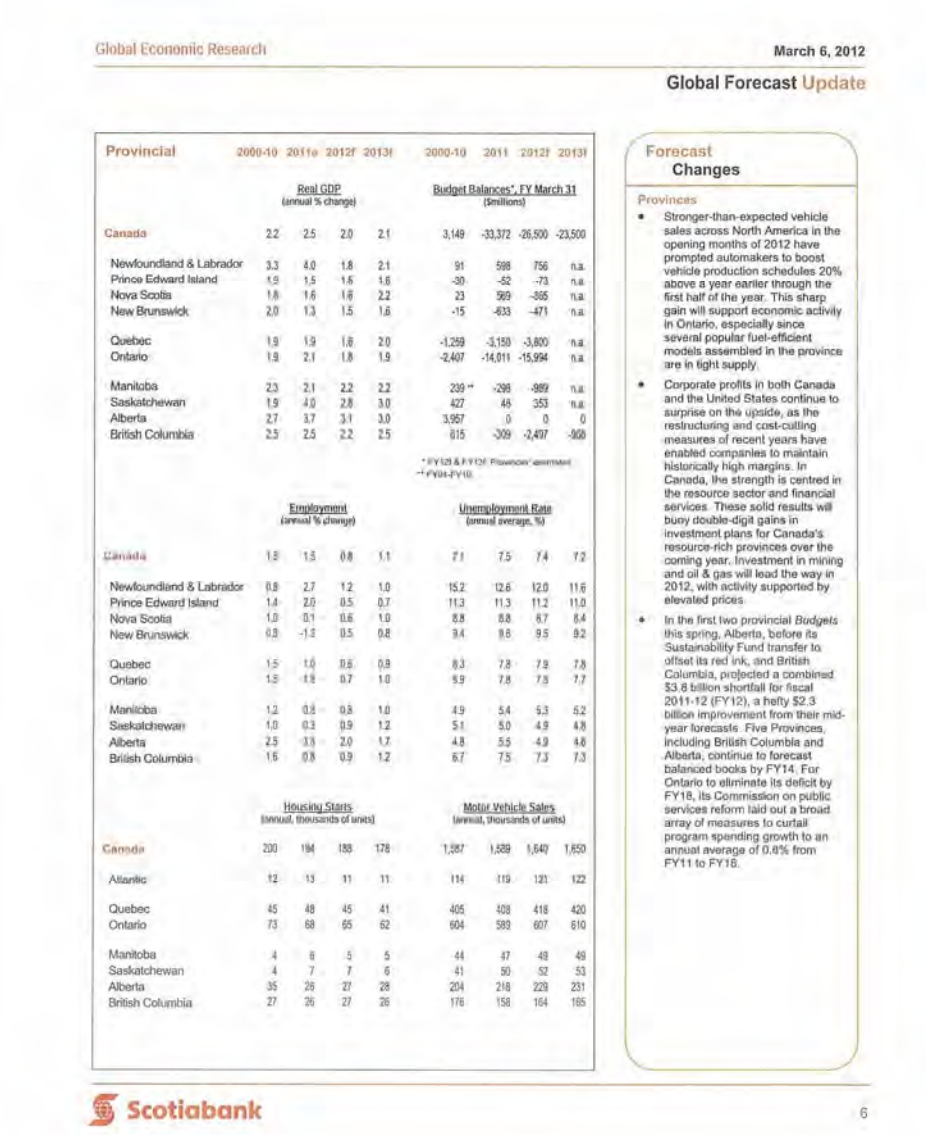
Economic Outlook 2012 (Fall update)

Table 1 – Manitoba RGDP – % change

	Fcst Date	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
CIBC	5-Mar-12	2.2	2.2	2.3																				
National Bank	Jan-12	2.2	2.5																					
BMO Nesbitt Burns	2-Mar-12	2.2	2.3	2.5																				
Royal Bank	Mar-12	2.2	3.4	3.0																				
Scotia Bank	6-Mar-12	2.2	2.2	2.2																				
TD Bank	4-Jan-12	2.2	1.7	2.2																				
Spatial Economics	Jan-12	2.2	2.3	2.6	2.1	2.8	2.5	2.4	1.7	1.4	1.0	0.9	0.9	1.1	1.2	1.7	1.8	1.9	2.0	1.9	1.7	1.5	1.3	1.2
Conference Board	Dec-11	2.2	2.6	3.0	2.6	2.9	2.4	2.2	1.9	2.1	1.9	1.9	1.8	2.0	2.0	1.9	1.9	2.0	2.0	2.1	2.1	2.0	2.1	2.0
IHS Global Insight	16-Nov-11	2.2	1.9	2.1	2.9	2.7	2.7																	
Informetrica	27-Feb-12	2.2	2.7	2.6	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3
EO2012 - Calendar		2.2	2.4	2.5	2.4	2.6	2.4	2.2	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33
EO2012 - Fiscal	2.2	2.4	2.5	2.4	2.5	2.3	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

Note:
1. 2011 is actual data
2. Long-term Manitoba RGDP rate was previously forecasted at 1.7% per Economic Outlook 2012-2033. The forecast has been updated to include correct source data from Informetrica.



Global Economic Research

March 6, 2012

Global Forecast Update

Provincial	2000-10	2011e	2012f	2013f	2000-10	2011	2012f	2013f
	Real GDP (annual % change)				Budget Balances*, FY March 31 ($millions)			
Canada	2.2	2.5	2.0	2.1	3,149	-33,372	-26,500	-23,500
Newfoundland & Labrador	3.3	4.0	1.8	2.1	91	598	756	n.a.
Prince Edward Island	1.9	1.5	1.6	1.6	-30	-52	-73	n.a.
Nova Scotia	1.8	1.6	1.6	2.2	23	569	-365	n.a.
New Brunswick	2.0	1.3	1.5	1.6	-15	-633	-471	n.a.
Quebec	1.9	1.9	1.8	2.0	-1,259	-3,150	-3,800	n.a.
Ontario	1.9	2.1	1.8	1.9	-2,407	-14,011	-15,994	n.a.
Manitoba	2.3	2.1	2.2	2.2	239 **	-298	-989	n.a.
Saskatchewan	1.9	4.0	2.8	3.0	427	46	353	n.a.
Alberta	2.7	3.7	3.1	3.0	3,957	0	0	0
British Columbia	2.5	2.5	2.2	2.5	615	-309	-2,497	-908
	Employment (annual % change)				Unemployment Rate (annual average, %)			
Canada	1.8	1.5	0.8	1.1	7.1	7.5	7.4	7.2
Newfoundland & Labrador	0.8	2.7	1.2	1.0	15.2	12.6	12.0	11.6
Prince Edward Island	1.4	2.0	0.5	0.7	11.3	11.3	11.2	11.0
Nova Scotia	1.0	0.1	0.6	1.0	8.8	8.8	8.7	8.4
New Brunswick	0.8	-1.0	0.5	0.8	9.4	9.6	9.5	9.2
Quebec	1.5	1.0	0.6	0.9	8.3	7.8	7.9	7.8
Ontario	1.5	1.8	0.7	1.0	8.9	7.8	7.8	7.7
Manitoba	1.2	0.8	0.8	1.0	4.9	5.4	5.3	5.2
Saskatchewan	1.0	0.3	0.9	1.2	5.1	5.0	4.9	4.8
Alberta	2.5	3.8	2.0	1.7	4.8	5.5	4.9	4.8
British Columbia	1.6	0.8	0.9	1.2	6.7	7.5	7.3	7.3
	Housing Starts (annual, thousands of units)				Motor Vehicle Sales (annual, thousands of units)			
Canada	200	194	188	178	1,587	1,589	1,640	1,650
Atlantic	12	13	11	11	114	119	121	122
Quebec	45	48	45	41	405	408	418	420
Ontario	73	68	65	62	604	589	607	610
Manitoba	4	6	5	5	44	47	49	49
Saskatchewan	4	7	7	6	41	50	52	53
Alberta	35	26	27	28	204	218	229	231
British Columbia	27	26	27	26	176	158	164	165

* FY12f & FY13f: Provinces' estimates
** FY01-FY10

Forecast Changes

Provinces

- Stronger-than-expected vehicle sales across North America in the opening months of 2012 have prompted automakers to boost vehicle production schedules 20% above a year earlier through the first half of the year. This sharp gain will support economic activity in Ontario, especially since several popular fuel-efficient models assembled in the province are in tight supply.
- Corporate profits in both Canada and the United States continue to surprise on the upside, as the restructuring and cost-cutting measures of recent years have enabled companies to maintain historically high margins. In Canada, the strength is centred in the resource sector and financial services. These solid results will buoy double-digit gains in investment plans for Canada's resource-rich provinces over the coming year. Investment in mining and oil & gas will lead the way in 2012, with activity supported by elevated prices.
- In the first two provincial *Budgets* this spring, Alberta, before its Sustainability Fund transfer to offset its red ink, and British Columbia, projected a combined $3.8 billion shortfall for fiscal 2011-12 (FY12), a hefty $2.3 billion improvement from their mid-year forecasts. Five Provinces, including British Columbia and Alberta, continue to forecast balanced books by FY14. For Ontario to eliminate its deficit by FY18, its Commission on public services reform laid out a broad array of measures to curtail program spending growth to an annual average of 0.8% from FY11 to FY18.

Scotiabank

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TD Economics | www.td.com/economics

PROVINCIAL ECONOMIC FORECASTS

REAL GROSS DOMESTIC PRODUCT (GDP)
Annual average per cent change

	95-09	2009	2010E	2011F	2012F	2013F
CANADA	2.6	-2.8	3.2	2.4	1.7	2.2
N. & L.	2.9	-9.0	6.1	3.4	2.1	2.1
P.E.I.	2.4	0.2	2.6	2.4	2.1	1.7
N.S.	2.2	0.0	1.9	1.4	1.6	2.6
N.B.	2.2	-0.4	3.1	1.5	1.3	1.9
Québec	2.3	-0.7	2.5	2.1	1.4	2.0
Ontario	2.6	-3.2	3.0	2.5	1.7	2.3
Manitoba	2.3	-0.3	2.4	2.2	1.7	2.2
Sask.	1.9	-3.8	4.0	3.0	2.4	2.7
Alberta	3.1	-4.5	3.3	3.1	2.6	2.9
B.C.	2.5	-2.1	3.0	1.9	1.7	2.0

E, F: Estimate, Forecast by TD Economics as at December 2011
Source: Statistics Canada / Haver Analytics

NOMINAL GROSS DOMESTIC PRODUCT (GDP)
Annual average per cent change

	95-09	2009	2010E	2011F	2012F	2013F
CANADA	4.7	-4.6	6.3	5.4	2.9	3.9
N. & L.	6.6	-19.6	13.9	7.4	3.6	4.1
P.E.I.	4.3	1.9	4.9	5.2	3.4	3.3
N.S.	4.2	0.7	4.5	4.5	4.9	4.1
N.B.	4.0	1.5	5.5	5.1	2.5	2.9
Québec	3.9	0.1	4.8	4.7	2.1	3.3
Ontario	4.2	-0.9	5.3	5.3	2.7	3.7
Manitoba	4.6	-0.1	5.3	5.2	3.3	4.2
Sask.	6.1	-11.7	9.6	6.8	4.0	5.2
Alberta	7.5	-16.6	9.5	6.2	4.5	5.4
B.C.	4.4	-3.8	5.9	5.3	2.7	3.5

E, F: Estimate, Forecast by TD Economics as at December 2011
Source: Statistics Canada / Haver Analytics

EMPLOYMENT
Annual average per cent change

	2008	2009	2010	2011F	2012F	2013F
CANADA	1.7	-1.6	1.4	1.8	0.8	1.4
N. & L.	1.0	-2.9	3.5	2.9	0.6	1.2
P.E.I.	1.2	-1.4	3.1	1.4	0.8	1.1
N.S.	0.9	-0.1	0.2	-0.3	1.4	1.7
N.B.	0.6	0.1	-0.9	-1.3	1.2	1.7
Québec	1.2	-0.8	1.8	1.2	0.6	1.3
Ontario	1.5	-2.4	1.6	1.9	0.7	1.4
Manitoba	1.7	0.0	1.9	0.7	0.7	1.3
Sask.	1.7	1.3	0.9	0.2	0.9	1.6
Alberta	3.1	-1.3	-0.4	3.7	1.5	1.8
B.C.	2.0	-2.1	1.8	0.8	0.6	1.5

F: Forecast by TD Economics as at December 2011
Source: Statistics Canada / Haver Analytics

UNEMPLOYMENT RATE
Annual, per cent

	2008	2009	2010	2011F	2012F	2013F
CANADA	6.1	8.3	8.0	7.4	7.6	7.4
N. & L.	13.3	15.6	14.3	12.5	12.3	12.1
P.E.I.	10.7	12.0	11.3	11.5	11.3	11.1
N.S.	7.6	9.1	9.3	9.2	8.9	8.4
N.B.	8.5	8.7	9.3	9.6	9.2	8.6
Québec	7.3	8.5	7.9	7.6	8.0	7.8
Ontario	6.5	9.0	8.6	7.8	7.9	7.8
Manitoba	4.2	5.3	5.4	5.4	5.6	5.5
Sask.	4.1	4.8	5.2	5.0	5.1	5.0
Alberta	3.6	6.6	6.5	5.4	5.0	4.8
B.C.	4.6	7.7	7.6	7.5	7.8	7.7

F: Forecast by TD Economics as at December 2011
Source: Statistics Canada / Haver Analytics

CONSUMER PRICE INDEX (CPI)
Annual average per cent change

	92-10	2009	2010	2011F	2012F	2013F
CANADA	1.8	0.3	1.8	2.9	1.7	1.8
N. & L.	1.8	0.3	2.5	3.2	1.6	2.1
P.E.I.	1.9	-0.1	2.0	3.2	1.8	2.1
N.S.	1.9	-0.1	2.2	3.7	1.6	1.9
N.B.	1.7	0.3	2.3	3.2	1.5	1.9
Québec	1.8	0.6	1.4	2.8	1.9	1.9
Ontario	1.8	0.4	2.4	3.2	1.5	1.7
Manitoba	1.9	0.6	0.9	2.9	1.7	1.7
Sask.	2.1	1.1	1.3	2.9	1.9	2.1
Alberta	2.3	-0.1	1.2	2.4	2.1	2.0
B.C.	1.7	0.0	1.3	2.4	1.2	1.5

F: Forecast by TD Economics as at December 2011
Source: Statistics Canada / Haver Analytics

RETAIL TRADE
Annual average per cent change

	91-09	2009	2010	2011F	2012F	2013F
CANADA	4.6	-2.9	5.1	3.3	2.8	3.5
N. & L.	4.1	1.6	3.7	5.0	3.5	3.9
P.E.I.	4.6	-1.3	4.9	5.2	3.0	3.3
N.S.	3.9	0.1	5.0	2.0	3.6	3.2
N.B.	4.3	0.7	4.1	4.0	2.6	2.9
Québec	4.2	-1.1	5.6	1.4	2.7	3.3
Ontario	4.3	-2.5	5.0	3.4	2.6	3.5
Manitoba	5.0	-0.4	5.5	3.8	3.1	3.6
Sask.	5.8	-0.5	2.7	8.0	3.8	4.1
Alberta	6.5	-8.3	5.7	8.7	3.6	4.4
B.C.	4.6	-4.4	4.8	1.4	2.1	2.9

F: Forecast by TD Economics as at December 2011
Source: Statistics Canada / Haver Analytics

January 4, 2012 7

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CIBC

ECONOMICS
http://research.cibcwm.com/res/Eco/EcoResearch.html

Provincial Forecast Update

March 5, 2012

Warren Lovely (416) 594-8041

	Real GDP Yr/Yr % Chg			Employment Yr/Yr % Chg			Unemployment Rate %			Housing Starts 000s Units			Consumer Price Index Yr/Yr % Chg		
	2011E	2012F	2013F	2011A	2012F	2013F	2011A	2012F	2013F	2011A	2012F	2013F	2011A	2012F	2013F
BC	2.6	2.2	2.5	0.8	1.3	1.5	7.5	7.0	6.6	26.4	26.0	22.5	2.3	1.8	1.7
Alta	4.0	3.3	3.0	3.8	2.5	2.0	5.4	5.0	4.7	25.5	27.0	28.0	2.4	2.6	2.4
Sask	4.0	3.1	3.0	0.3	1.3	1.7	5.0	5.0	4.8	7.2	7.5	7.5	2.8	2.3	2.3
Man	2.4	2.2	2.3	0.8	0.9	1.3	5.4	5.4	5.2	5.9	6.2	6.0	2.9	1.9	2.0
Ont	2.2	1.9	1.9	1.8	0.8	1.3	7.8	8.0	7.8	67.7	67.0	63.5	3.1	1.9	2.0
Qué	2.0	1.7	1.8	1.0	-0.2	1.2	7.8	8.2	7.9	48.2	44.0	42.5	3.0	2.3	1.9
NB	1.4	1.5	1.6	-1.1	1.0	0.9	9.5	9.5	9.3	3.2	3.4	3.3	3.5	2.1	2.0
NS	1.6	1.8	2.6	0.1	0.9	1.6	8.8	8.5	8.1	4.7	4.4	4.5	3.8	2.0	2.1
PEI	1.8	1.6	1.9	1.9	1.1	0.9	11.4	11.7	11.5	1.0	0.9	0.8	2.9	1.9	2.0
N&L	5.0	1.5	2.3	2.7	1.2	1.5	12.7	12.8	12.2	3.5	3.7	3.5	3.4	2.3	2.3
Cda	**2.5**	**2.1**	**2.1**	**1.6**	**0.9**	**1.4**	**7.5**	**7.5**	**7.2**	**193**	**190**	**182**	**2.9**	**1.9**	**2.0**

Sources: CIBC, Statistics Canada, CMHC

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NATIONAL BANK

Economic Outlook

Annex

Main economic indicators - Provinces

	2007	2008	2009	2010e	2011f	2012f
Real GDP (% growth)						
Newfoundland & Labrador	9.2	-0.4	-9.0	6.1	4.9	0.7
Prince Edward Island	1.8	0.7	0.2	2.6	2.0	1.7
Nova Scotia	1.6	2.7	0.0	1.9	1.5	1.7
New Brunswick	1.1	0.6	-0.4	3.1	1.2	1.5
Quebec	2.1	1.3	-0.7	2.5	1.6	1.5
Ontario	2.0	-0.6	-3.2	3.0	2.3	1.5
Manitoba	2.7	3.8	-0.3	2.4	2.2	2.5
Saskatchewan	3.6	4.6	-3.8	4.0	3.6	3.1
Alberta	1.7	0.9	-4.5	3.3	3.4	3.6
British Columbia	3.0	0.7	-2.1	3.0	2.3	2.1
Canada	2.2	0.7	-2.8	3.2	2.4	2.0
Employment (% growth)						
Newfoundland & Labrador	0.7	1.0	-2.9	3.5	2.7	0.4
Prince Edward Island	0.8	1.2	-1.4	3.1	1.6	1.2
Nova Scotia	1.6	0.9	-0.1	0.2	-0.1	0.8
New Brunswick	1.9	0.6	0.1	-0.9	-1.3	0.8
Quebec	2.4	1.2	-0.8	1.8	1.1	0.6
Ontario	1.8	1.5	-2.4	1.6	1.8	0.7
Manitoba	1.7	1.7	0.0	1.9	0.7	1.0
Saskatchewan	2.4	1.7	1.3	0.9	0.2	0.9
Alberta	3.8	3.1	-1.3	-0.4	3.8	2.0
British Columbia	3.5	2.0	-2.1	1.8	0.8	1.0
Canada	2.4	1.7	-1.6	1.4	1.5	0.9
Unemployment rate (%)						
Newfoundland & Labrador	13.5	13.3	15.6	14.3	12.6	12.2
Prince Edward Island	10.3	10.7	12.0	11.3	11.4	11.0
Nova Scotia	8.0	7.6	9.1	9.3	9.1	8.4
New Brunswick	7.6	8.5	8.7	9.3	9.6	9.1
Quebec	7.2	7.3	8.5	7.9	7.6	7.7
Ontario	6.4	6.5	9.0	8.6	7.9	8.0
Manitoba	4.5	4.2	5.3	5.4	5.4	5.6
Saskatchewan	4.2	4.1	4.8	5.2	5.0	4.9
Alberta	3.5	3.6	6.6	6.5	5.5	5.4
British Columbia	4.3	4.6	7.7	7.6	7.5	7.4
Canada	6.0	6.1	8.3	8.0	7.4	7.2
Housing starts (000)						
Newfoundland & Labrador	2.8	3.3	3.1	3.6	3.5	2.9
Prince Edward Island	0.8	0.7	0.9	0.8	0.9	0.6
Nova Scotia	4.8	4.0	3.4	4.3	4.2	3.8
New Brunswick	4.2	4.3	3.5	4.1	3.2	2.8
Quebec	48.6	47.9	43.4	51.4	47.5	40.0
Ontario	68.1	75.1	50.4	60.4	66.7	62.0
Manitoba	5.7	5.5	4.2	5.9	5.9	5.5
Saskatchewan	6.0	6.8	3.9	5.9	7.3	5.7
Alberta	48.3	29.2	20.3	27.1	25.3	26.1
British Columbia	39.2	34.3	16.1	26.5	26.7	26.0
Canada	228.3	211.1	149.1	189.9	191.1	175.4
Consumer Price Index (% growth)						
Newfoundland & Labrador	1.4	2.9	0.3	2.4	3.3	1.9
Prince Edward Island	1.8	3.4	-0.1	1.8	2.9	1.8
Nova Scotia	1.9	3.0	-0.1	2.2	3.9	1.9
New Brunswick	1.9	1.7	0.3	2.1	3.4	1.8
Quebec	1.6	2.1	0.6	1.3	3.1	2.3
Ontario	1.8	2.3	0.4	2.4	3.2	2.1
Manitoba	2.1	2.2	0.6	0.8	3.0	1.7
Saskatchewan	2.9	3.2	1.1	1.3	2.8	1.8
Alberta	4.9	3.2	-0.1	1.0	2.3	2.0
British Columbia	1.7	2.1	0.0	1.4	2.4	1.9
Canada	2.1	2.4	0.3	1.8	3.0	2.2

f: forecast National Bank, Economy and Strategy Group

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Provincial Economic Outlook

BMO Capital Markets Economics
March 2, 2012

	Cda	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
Real GDP Growth (% change, chain-weighted)											
2009	-2.8	-2.1	-4.5	-3.8	-0.3	-3.2	-0.7	-0.4	0.0	0.2	-9.0
2010	3.2	3.0	3.3	4.0	2.4	3.0	2.5	3.1	1.9	2.6	6.1
2011 f	2.5	2.6	3.9	3.3	2.2	2.1	1.9	1.4	1.6	1.7	3.8
2012 f	2.0	2.3	3.2	2.9	2.3	2.0	1.6	1.5	1.8	1.4	2.2
2013 f	2.5	2.7	3.3	3.1	2.5	2.2	2.0	1.9	2.5	1.5	1.8
Employment Growth (% change)											
2009	-1.6	-2.1	-1.3	1.3	0.0	-2.4	-0.8	0.1	-0.1	-1.4	-2.9
2010	1.4	1.8	-0.4	0.9	1.9	1.6	1.8	-0.9	0.2	3.1	3.5
2011	1.5	0.8	3.8	0.3	0.7	1.8	1.0	-1.2	0.0	1.7	2.9
2012 f	0.7	1.1	2.7	1.0	0.8	0.5	-0.3	0.5	0.6	1.2	0.2
2013 f	1.2	1.4	1.8	1.4	1.0	1.1	1.0	0.6	1.6	0.2	0.6
Unemployment Rate (percent)											
2009	8.3	7.7	6.6	4.8	5.3	9.0	8.5	8.7	9.1	12.0	15.6
2010	8.0	7.6	6.5	5.2	5.4	8.6	7.9	9.3	9.3	11.3	14.3
2011	7.5	7.5	5.5	5.0	5.4	7.8	7.7	9.5	8.9	11.4	12.6
2012 f	7.5	7.0	5.0	4.9	5.3	7.9	8.2	9.5	8.4	11.5	12.7
2013 f	7.2	6.6	4.8	4.9	5.2	7.6	7.9	9.3	8.2	11.5	12.5
Housing Starts (thousands)											
2009	148	16.0	20.0	3.8	4.0	49.8	43.9	3.5	3.4	0.9	3.0
2010	191	26.7	26.9	6.1	6.1	60.8	51.0	4.5	4.4	0.8	4.1
2011	193	26.4	25.5	7.2	5.9	67.7	48.2	3.2	4.7	1.0	3.5
2012 f	187	25.0	26.0	7.0	5.4	67.4	44.5	3.2	4.6	0.7	3.3
2013 f	185	23.0	29.0	7.2	5.2	64.5	43.5	3.5	5.0	0.7	3.4
Consumer Price Index (% change)											
2009	0.3	0.0	-0.1	1.1	0.6	0.4	0.6	0.3	-0.1	-0.1	0.3
2010	1.8	1.4	1.0	1.3	0.8	2.4	1.3	2.1	2.2	1.8	2.4
2011	2.9	2.4	2.4	2.8	3.0	3.1	3.0	3.5	3.8	2.0	3.4
2012 f	2.4	2.1	2.6	2.5	2.2	2.2	2.6	2.3	2.1	2.0	2.3
2013 f	2.1	1.4	2.4	2.3	2.0	2.2	1.9	1.7	2.2	1.5	2.0

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PROVINCIAL OUTLOOK | MARCH 2012

Tables

Forecast detail

Average annual % change unless otherwise indicated

	Real GDP				Employment				Unemployment rate %				Housing starts Thousands				Retail sales				CPI			
	10	11F	12F	13F	10	11	12F	13F	10	11	12F	13F	10	11	12F	13F	10	11	12F	13F	10	11	12F	13F
N.& L.	6.1	4.6	2.8	3.0	3.4	2.7	1.4	1.9	14.4	12.7	12.1	11.1	3.6	3.5	3.4	3.5	4.6	4.9	4.0	4.7	2.4	3.4	2.1	2.1
P.E.I	2.6	2.2	1.8	1.9	3.0	1.9	1.7	1.2	11.1	11.4	11.1	10.4	0.8	1.0	1.0	0.8	5.2	6.4	4.1	3.9	1.8	2.9	1.9	2.1
N.S.	1.9	1.4	1.6	3.2	0.2	0.1	1.1	1.9	9.3	8.8	8.5	8.0	4.3	4.7	4.5	4.6	4.6	3.4	3.5	4.0	2.2	3.8	2.0	2.2
N.B.	3.1	0.7	1.6	2.1	-1.0	-1.1	0.7	1.0	9.3	9.5	9.4	8.9	4.1	3.2	3.1	3.2	4.9	4.9	3.2	3.7	2.1	3.5	2.0	2.1
QUE.	2.5	1.6	1.6	1.9	1.7	1.0	0.2	1.3	8.0	7.8	8.0	7.8	51.4	48.2	45.0	42.0	6.3	1.9	3.4	3.8	1.3	3.0	1.8	2.0
ONT.	3.0	1.9	2.5	2.3	1.7	1.8	1.0	1.4	8.7	7.8	7.8	7.5	60.4	67.7	62.3	59.0	5.4	3.0	3.7	3.9	2.4	3.1	1.8	1.9
MAN.	2.4	2.6	3.4	3.0	1.9	0.8	0.9	1.3	5.4	5.4	5.2	5.0	5.9	5.9	6.1	5.8	5.6	4.6	5.0	4.7	0.8	2.9	1.9	2.1
SASK.	4.0	4.3	4.6	4.7	0.9	0.3	1.7	1.9	5.2	5.0	4.8	4.6	5.9	7.2	7.6	7.9	3.1	8.5	5.9	6.5	1.3	2.8	2.4	2.6
ALTA.	3.3	4.2	3.9	3.9	-0.4	3.8	3.1	2.5	6.5	5.5	4.8	4.5	27.1	25.5	30.0	32.5	6.0	7.0	6.5	6.3	1.0	2.4	2.0	1.8
B.C.	3.0	2.4	2.6	2.9	1.7	0.8	1.4	1.5	7.6	7.5	6.7	6.6	26.5	26.4	26.8	27.0	5.3	2.3	4.2	4.4	1.4	2.3	1.6	1.3
CANADA	**3.2**	**2.5**	**2.6**	**2.6**	**1.4**	**1.6**	**1.1**	**1.6**	**8.0**	**7.5**	**7.3**	**7.0**	**190**	**194**	**190**	**186**	**5.5**	**3.6**	**4.2**	**4.4**	**1.8**	**2.9**	**1.8**	**1.9**

Key provincial comparisons

2010 unless otherwise indicated

	N. & L.	P.E.I.	N.S.	N.B.	QUE	ONT	MAN	SASK	ALTA	B.C.
Population (000s) (2011)	511	146	945	755	7,980	13,373	1,251	1,058	3,779	4,573
Gross domestic product ($ billions)	28.2	5.0	36.4	29.4	319.3	612.5	54.3	63.6	263.5	203.1
Real GDP ($2002 billions)	19.0	4.3	30.0	24.2	273.9	527.8	43.7	41.5	183.3	167.1
Share of Canada real GDP (%)	1.4	0.3	2.3	1.8	20.7	39.8	3.3	3.1	13.8	12.6
Real GDP growth (CAR, 2005-10, %)	1.6	1.8	1.3	1.4	1.4	0.7	2.4	1.3	1.4	1.7
Real GDP per capita ($ 2002)	37,214	29,966	31,701	32,166	34,640	39,902	35,435	39,769	49,249	36,899
Real GDP growth rate per capita (CAR, 2005-10, %)	1.7	1.1	1.2	1.2	0.5	-0.4	1.4	0.3	-0.9	0.2
Personal disposable income per capita ($)	27,402	24,645	27,308	27,091	26,642	29,893	27,645	30,593	37,885	29,175
Employment growth (CAR, 2006-11, %)	1.0	1.1	0.5	0.1	1.1	0.9	1.2	1.3	1.8	1.2
Employment rate (Feb. 2012, %)	53.4	60.1	58.9	56.8	59.2	61.2	65.2	65.7	70.1	60.5
Discomfort index (inflation + unemp. rate, Jan. 2012)	16.4	15.1	11.1	12.7	11.2	10.5	7.4	7.3	7.8	8.6
Manufacturing industry output (% of real GDP)	4.1	9.5	9.1	11.5	16.3	15.1	11.3	7.0	8.0	8.6
Personal expenditures on goods & services (% of real GDP)	60.5	72.3	73.1	69.4	65.6	63.0	65.3	60.9	55.3	71.3
International exports (% of real GDP)	34.9	26.0	22.4	40.0	29.6	38.6	30.4	35.3	35.8	24.9

ECONOMICS | **RESEARCH**

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IHS Global Insight - November 16, 2011

Manitoba

	2011	2012	2013	2014	2015	2016
Source Population (Thousands)	953	966	976	987	997	1,007
Participation Rate (%)	69.0	68.7	68.9	69.2	69.3	69.3
Labour Force (Thousands)	657	664	672	682	691	698
Employment (Thousands)	624	632	642	650	658	665
Unemployment (Thousands)	33	32	31	32	32	33
Unemployment Rate (%)	5.0	4.8	4.6	4.7	4.7	4.8
Average Wage $s per Year	42,838	44,586	46,360	48,158	49,405	50,473
Wages, Salaries, Supplementary Labour Income (Millions of dollars)	28,163	29,587	31,174	32,866	34,119	35,224
Other Personal Income (Millions of dollars)	15,963	16,543	16,928	17,677	18,765	19,890
Personal Income (Millions of dollars)	44,126	46,130	48,102	50,543	52,884	55,113
Federal Personal Income Taxes Paid (Millions of dollars)	3,415	3,715	4,075	4,646	5,271	5,837
Provincial Personal Income Taxes Paid (Millions of dollars)	2,627	2,919	3,098	3,338	3,595	3,841
Contributions to Social Insurance Programs, Etc. (Millions of dollars)	3,057	3,186	3,309	3,454	3,576	3,686
Disposable Personal Income (Millions of dollars)	35,028	36,310	37,619	39,105	40,443	41,750
Retail Sales (Millions of dollars)	16,221	16,731	17,161	17,642	18,269	18,913
CPI 2002 = 100 (Index)	118.2	120.2	122.4	125.0	127.5	130.3
Total Motor Vehicle Sales (Units)	47,232	47,221	48,619	52,140	52,752	51,592
GDP at Market Prices (Millions of dollars)	57,198	59,791	62,366	65,446	68,524	71,657
GDP Price 2002 = 1.00 (Index)	1.281	1.314	1.342	1.369	1.395	1.421
GDP at Market Prices (Millions of chained 2002 dollars)	44,665	45,518	46,483	47,809	49,107	50,411
Real GDP % chge	2.1	1.9	2.1	2.9	2.7	2.7
Housing Starts (Units)	5,988	5,480	4,417	4,396	4,223	4,570
Investment in Residential Construction (Millions of dollars)	3,414	3,170	2,943	3,067	3,170	3,621
Investment in Residential Construction Price 2002 = 1.00 (Index)	1.558	1.599	1.638	1.677	1.718	1.760
2002 Dollar Investment in Residential Construction (Millions of chained 2002 dollars)	2,191	1,983	1,797	1,829	1,845	2,057
Investment in Non-Residential Construction (Millions of dollars)	4,051	4,382	4,412	4,880	5,274	5,416
Investment in Non-Residential Construction Price 2002 = 1.00 (Index)	1.456	1.497	1.541	1.586	1.632	1.679
2002 Dollar Investment in Non-Residential Construction (Millions of chained 2002 dollars)	2,782	2,927	2,863	3,076	3,231	3,225
Population (Thousands)	1,251	1,266	1,281	1,295	1,309	1,324

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SPATIAL ECONOMICS

Key Economic Indicators: Manitoba January 2012 Provincial Forecast	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Real GDP ($Millions)	44830	45665	45868	47851	48203	50436	51649	52546	52857	53793	54270	54757	55376	56032	56988	57995	59091	60243	61383	62443	63370	64198	64943
% Change	2	2.3	2.6	2.1	2.8	2.5	2.4	1.7	1.4	1	0.9	0.9	1.1	1.2	1.7	1.8	1.9	2	1.9	1.7	1.5	1.3	1.2
GDP Deflator (Reference Year=1)	1.277	1.291	1.308	1.39	1.394	1.359	1.374	1.397	1.423	1.449	1.476	1.503	1.529	1.554	1.578	1.605	1.634	1.664	1.696	1.734	1.773	1.812	1.852
% Change	2.9	1.1	1.1	1.1	1	1.3	1.6	1.7	1.9	1.9	1.8	1.8	1.7	1.6	1.6	1.7	1.8	1.8	1.9	2.2	2.2	2.3	2.2
Nominal GDP ($Millions)	56973	58959	61203	69174	65634	68171	70951	73385	75764	77958	80121	82312	84694	87058	90001	93109	96648	100232	104110	108276	112328	116380	120337
% Change	5	3.5	3.8	3.2	3.9	3.8	4.1	3.4	3.2	2.9	2.8	2.7	2.9	2.8	3.4	3.5	3.7	3.8	3.9	4	3.7	3.6	3.4
Consumer Price Index (2002=100)	1.182	1.195	1.213	1.232	1.25	1.27	1.293	1.317	1.343	1.37	1.397	1.424	1.451	1.477	1.504	1.531	1.558	1.587	1.617	1.652	1.688	1.727	1.767
% Change	2.8	1.1	1.5	1.5	1.5	1.6	1.8	1.9	2	2	2	2	1.9	1.8	1.8	1.8	1.8	1.8	1.9	2.2	2.2	2.3	2.3
Hourly Labour Income ($)	26.6	26.9	27.4	27.8	28.4	29	29.8	30.6	31.5	32.3	33.1	33.9	34.7	35.5	36.3	37.2	38.3	39.5	40.7	42	43.3	44.5	45.7
% Change	2.7	1.4	1.6	1.6	2	2.3	2.7	2.7	2.8	2.6	2.5	2.4	2.3	2.2	2.3	2.6	2.9	3	3.1	3.2	3.1	2.9	2.8
Employment (000s)	624	628	638	648	662	674	685	691	695	698	699	697	699	702	708	716	724	733	742	750	757	762	767
% Change	0.7	0.8	1.4	1.6	2.1	1.8	1.7	1	0.6	0	0	0.1	0.4	0.4	0.9	1.1	1.2	1.2	1.2	1.1	0.9	0.8	0.7
Unemployment Rate (%)	5.4	5.7	5.7	5.7	5.3	5	4.7	4.8	4.9	5.1	5.3	5.4	5.5	5.6	5.3	5	4.7	4.5	4.5	4.6	4.8	5.2	5.5
Participation Rate (%)	68.2	68	68	68.1	68.3	68.3	68.2	68.0	68.0	68.2	67.9	67.7	67.5	67.3	67.2	67.1	67	66.9	66.8	66.6	66.5	66.5	66.5
Real Hourly Labour Productivity ($)	42.32	42.94	43.35	43.8	43.87	44.15	44.49	44.9	45.34	45.87	46.33	46.74	47.08	47.45	47.76	48.03	48.3	48.61	48.94	49.29	49.62	49.94	50.24
% Change	1.3	1.5	1	0.9	0.6	0.6	0.8	0.9	1	1.2	1	0.9	0.7	0.8	0.7	0.6	0.6	0.6	0.7	0.7	0.7	0.6	0.6
Population (000s)	1321	1349	1386	1396	1426	1448	1471	1493	1511	1525	1535	1544	1553	1564	1575	1586	1598	1610	1624	1635	1644	1653	1661
% Change	1.3	1.4	1.5	1.5	1.5	1.7	1.7	1.5	1.2	1	0.7	0.6	0.6	0.7	0.7	0.8	0.9	1.1	1.3	1.2	1.2	1.1	0.9

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CONFERENCE BOARD - DECEMBER 2011

Table 8
Key Economic Indicators: Manitoba

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
GDP at market prices (current $)	56,823	59,563	62,671	65,437	68,524	71,299	73,966	76,735	79,593	82,421	85,268	88,245	91,424	94,790	98,289	101,881	105,670	109,644	113,868	118,333	122,841	127,582	132,492
	6.2	4.8	5.2	4.4	4.7	4.1	3.7	3.7	3.7	3.6	3.5	3.5	3.6	3.7	3.7	3.7	3.7	3.8	3.9	3.9	3.8	3.9	3.8
GDP at basic prices (current $)	53,040	55,521	58,395	60,945	63,817	66,378	68,834	71,394	74,037	76,644	79,263	82,008	84,948	88,063	91,302	94,624	98,130	101,809	105,725	109,867	114,038	118,425	122,967
	6.2	4.7	5.2	4.4	4.7	4.0	3.7	3.7	3.7	3.5	3.4	3.5	3.6	3.7	3.7	3.6	3.7	3.7	3.8	3.9	3.8	3.8	3.8
GDP at basic prices (constant 2002 $)	40,424	41,483	42,708	43,834	45,124	46,217	47,242	48,162	49,159	50,104	51,034	51,949	52,964	53,999	55,049	56,098	57,193	58,354	59,554	60,796	62,010	63,288	64,578
	2.1	2.6	3.0	2.6	2.9	2.4	2.2	1.9	2.1	1.9	1.9	1.8	2.0	2.0	1.9	1.9	2.0	2.0	2.1	2.1	2.0	2.1	2.0
Consumer Price Index (2002=1.0)	1.164	1.204	1.231	1.259	1.285	1.312	1.342	1.373	1.404	1.436	1.469	1.502	1.535	1.569	1.603	1.637	1.672	1.708	1.745	1.782	1.820	1.858	1.898
	2.9	1.7	2.3	2.2	2.0	2.1	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Implicit price deflator—	1.312	1.338	1.367	1.390	1.414	1.436	1.457	1.482	1.506	1.530	1.553	1.579	1.604	1.631	1.659	1.687	1.716	1.745	1.775	1.807	1.839	1.871	1.904
GDP at basic prices (2002=1.0)	4.0	2.0	2.2	1.7	1.7	1.6	1.4	1.7	1.8	1.8	1.5	1.8	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8
Average weekly wages (level $)	744	762	782	803	826	848	871	894	917	941	965	990	1016	1042	1067	1092	1118	1145	1172	1199	1228	1256	1286
(industrial composite)	4.5	2.5	2.6	2.7	2.8	2.8	2.7	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3
Personal income (current $)	43,514	45,040	47,036	49,052	51,088	53,160	55,226	57,324	59,537	61,833	64,207	66,685	69,255	71,904	74,602	77,402	80,326	83,358	86,488	89,706	93,043	96,476	100,016
	4.3	3.5	4.4	4.3	4.2	4.1	3.9	3.8	3.9	3.9	3.8	3.9	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.7	3.7	3.7	3.7
Personal disposable income (current $)	34,758	35,776	37,212	38,671	40,180	41,718	43,250	44,801	46,446	48,152	49,915	51,754	53,661	55,617	57,699	59,936	61,799	64,010	66,299	68,624	71,036	73,606	76,242
	3.7	2.9	4.0	3.9	3.9	3.8	3.7	3.6	3.7	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.6	3.5	3.5	3.5	3.5
Personal savings rate	1.2	0.2	-0.3	-0.6	-0.7	-0.7	-0.8	-1.0	-1.2	-1.4	-1.5	-1.5	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.5	-1.5	-1.5	-1.5	-1.6
Population (000s)	1,248	1,267	1,286	1,305	1,325	1,345	1,365	1,385	1,405	1,426	1,446	1,466	1,487	1,507	1,528	1,548	1,569	1,590	1,611	1,631	1,652	1,673	1,693
	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2
Labour force (000s)	660	671	684	695	704	713	721	729	737	744	751	759	767	776	784	793	802	811	821	831	841	852	863
	0.8	1.6	2.0	1.6	1.4	1.2	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3
Employment (000s)	625	636	649	660	669	678	686	693	700	708	715	722	730	738	746	754	763	772	782	791	801	811	821
	0.8	1.8	2.1	1.6	1.4	1.3	1.2	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3
Unemployment rate (percentage)	5.3	5.2	5.1	5.0	5.0	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Retail sales (current $)	16,363	16,978	17,632	18,263	18,865	19,439	20,044	20,658	21,302	21,950	22,586	23,225	23,859	24,488	25,111	25,731	26,362	26,994	27,628	28,256	28,887	29,517	30,158
	3.9	3.8	3.8	3.6	3.3	3.0	3.1	3.1	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.5	2.5	2.4	2.3	2.3	2.2	2.2	2.2
Housing starts (units)	5,698	6,144	6,823	7,655	8,345	8,473	8,498	8,473	8,476	8,487	8,511	8,532	8,565	8,586	8,626	8,722	8,831	8,872	8,892	9,008	9,043	9,112	9,178
	-3.2	7.8	11.1	12.2	9.0	1.5	0.3	-0.3	0.0	0.1	0.3	0.2	0.4	0.2	0.5	1.1	1.2	0.5	0.2	1.3	0.4	0.8	0.7

Shaded area represents forecast data.
All data are in millions of dollars, seasonally adjustrates, unless otherwise specified.
For each indicator, the first line is the level and the s the percentage change from the previous period.

Sources: The Conference Board of Canada; Statist:CMHC Housing Time Series Database.

INFORMETRICA

Ontario
Basic indicators

IL Reference February 27, 2012	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Population (000s)																								
Population	1251	1285.5	1280.6	1298.5	1312.9	1329.8	1346.9	1364.2	1381.6	1399.2	1416.8	1434.5	1452.2	1469.8	1487.4	1504.9	1522.3	1539.5	1556.8	1573.8	1590.7	1607.5	1624.1	1640.7
Source Population	946.9	957.6	968.7	980	991.5	1003	1014.5	1026.1	1038	1049.9	1062.1	1074.7	1087.6	1100.7	1113.9	1127.2	1140.7	1154.2	1167.8	1181.5	1195.2	1208.9	1222.5	1236.1
Households	478.4	485	491.7	498.8	506.3	513.9	521.4	528.8	536.4	543.8	551.1	558.3	565.3	572.3	579.3	586.2	593	599.9	606.8	613.8	620.7	627.7	634.7	641.9
Family	322.9	330.5	334.2	338.2	342.5	346.9	351.1	355.2	359.3	363.3	367.2	371	374.6	378.2	381.8	385.3	388.8	392.3	395.9	399.5	403.4	407.4	411.5	415.7
Non-family	151.5	154.5	157.5	160.6	163.8	167.1	170.3	173.7	177.1	180.5	183.9	187.3	190.7	194.1	197.5	200.9	204.2	207.6	211	214.2	217.3	220.3	223.2	226.1
Labour Markets (000s)		689.5	700.4	708.5	716.9	724.2	732.5	739.8	747.4	754.9	762.6	769.5	776.5	783.7	790.9	798.1	805.3	813.7	821.0	828.2	835.4	842.6	849.6	856.6
Labour Force	672.8	689.5	700.1	708.7	716.5	724.2	732.3	740.1	747.8	755.1	762.2	769.3	776.4	783.6	790.9	798.4	805.9	813.2	820.6	827.8	834.9	842.2	849.5	856.7
Participation Rate (%)	71.1	72	72.5	72.3	72.3	72.2	72.2	72.1	72	71.9	71.8	71.6	71.4	71.2	71	70.8	70.6	70.5	70.3	70.1	69.9	69.7	69.5	69.3
Employment	629.9	636.7	644.4	650.3	656	662.2	668.6	675.7	682.5	690	697.8	705.8	713.9	722.2	730.4	738.7	747.2	755.7	764.6	773.4	782.3	791.3	800.5	809.8
Unemployment Rate (%)	6.4	7.7	8	8.2	8.4	8.6	8.7	8.7	8.7	8.6	8.5	8.3	8	7.8	7.6	7.5	7.3	7.1	6.8	6.6	6.3	6	5.8	5.5
Gross Domestic Product ($97 Mns)	2.8	2.7	2.6	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Total	38509	39356	40395	41158	41942	42767	43639	44574	45554	46538	47544	48609	49741	50871	52072	53289	54547	55825	57119	58445	59798	61159	62564	63998
Goods	10116	10361	10639	10898	11152	11416	11668	11955	12220	12498	12735	12988	13277	13573	13913	14247	14568	14857	15167	15490	15785	16066	16368	16684
Energy (1)	1209	1179	1175	1171	1171	1178	1181	1184	1182	1182	1180	1177	1177	1179	1181	1182	1181	1179	1176	1173	1170	1166	1163	1161
Non-energy, Energy-intensive (2)	1333	1373	1409	1439	1483	1493	1528	1561	1587	1626	1661	1699	1742	1796	1860	1921	1977	2026	2087	2151	2208	2261	2314	2368
Other	7574	7810	8055	8289	8519	8745	8959	9211	9451	9690	9894	10112	10358	10599	10872	11144	11408	11651	11905	12166	12407	12639	12881	13155
Services	28193	28995	29756	30259	30789	31351	31970	32618	33334	34040	34809	35622	36464	37297	38159	39042	39981	40988	41951	42956	44013	45093	46196	47314
Transportation & Warehousing	2591	2671	2742	2784	2816	2848	2885	2935	2983	3030	3077	3128	3183	3234	3288	3340	3391	3449	3494	3547	3598	3646	3693	3741
Public Administration & Social Services	7349	7489	7614	7707	7816	7921	8031	8150	8273	8404	8545	8699	8858	9020	9187	9359	9539	9726	9917	10110	10310	10520	10731	10945
Other Services	18254	18834	19400	19769	20155	20582	21051	21533	22079	22606	23187	23795	24423	25043	25684	26342	27051	27800	28540	29298	30105	30927	31772	32628
Output per Employee ($1997 000s)	60.6	61.8	62.7	63.3	63.9	64.6	65.3	66	66.7	67.4	68.1	68.9	69.7	70.4	71.3	72.1	73	73.9	74.7	75.6	76.4	77.3	78.2	79

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REFERENCE: Appendix F Economic Outlook 2012 – 2033; Page No.: 8

PREAMBLE: As shown in the tables and charts in this Appendix, Manitoba has seen fluctuations in population growth rates since 1960 and has had two previous periods where growth rates reached more than 1% per year for more than 3 years or so, only to return to growth rates of 0.5% per year for extended periods of twenty years or more.

QUESTION:

Provide the rationale (including the social, economic, policy and other factors) for the rise in Provincial population growth rates in the early 1980s to an average of 1.0% per year and the return to below 0.5% per year by the mid 1980s for the next two decades.

RESPONSE:

Historically, Manitoba witnessed modest population growth in the late 1980's, no population growth in the 1990's and renewed population growth since the late 1990's. The primary reason for this resumed growth is the significant increase in immigration and a combination of less people leaving than coming to Manitoba. In particular, the primary factor is the introduction in 1998 and subsequent continuance of the Provincial Nominee Program.

REFERENCE: Appendix F Economic Outlook 2012 – 2033; Page No.: 8

PREAMBLE: As shown in the tables and charts in this Appendix, Manitoba has seen fluctuations in population growth rates since 1960 and has had two previous periods where growth rates reached more than 1% per year for more than 3 years or so, only to return to growth rates of 0.5% per year for extended periods of twenty years or more.

QUESTION:

Describe the social, economic, policy and other factors contributing to the recent increase in population growth in the Province and provide the complete rationale as to how these and other factors will contribute to sustained population growth rates higher than those that have ever been sustained previously in the Province.

RESPONSE:

Please see the response to MMF/MH I-070.

REFERENCE: Appendix F Economic Outlook 2012 – 2033; Page No.: A-1

PREAMBLE: Table A-1 illustrates forecasts for real GDP for Manitoba to 2032/33.

QUESTION:

Indicate which of these forecasts real GDP data contributed to the data contained in Table A-1.

RESPONSE:

Please see the response to MMF/MH I-069.

REFERENCE: Appendix 7.1 Emerging Energy Technology Review; Page No.: 14

PREAMBLE: The text indicates that: "Manitoba Hydro has a Non Utility Generation (NUG) policy which sets the price for power purchases of less than 200 kW in size to the maximum Standard Residential Run-off Rate."

QUESTION:

Provide the current Standard Residential Run-off Rate and the historic trend in this rate over the past 10 years

RESPONSE:

Please see Manitoba Hydro's response to CAC/MH I-139. The rates presented in that response are applicable to both Standard Residential customers, as well as those who heat with electricity.

REFERENCE: Appendix 7.1 Emerging Energy Technology Review; Section: 4.4.2; Page No.: 44

PREAMBLE: Figure 10 illustrates solar photovoltaic installed cost price trends to 2020 and beyond. At $1.12 per installed watt (presumably in 2013 dollars), a typical rooftop 4 kW system would have an installed cost of about $4,500.

QUESTION:

Using a solar resource of 1300 kWh/kW on a 4 kW rooftop system, a solar decay of 1.5% per year, determine the price per kWh that residents in Manitoba would have to receive (or the value of the energy they would need to displace in the case of net-metering), to achieve a 6% return on investment over a 20-year investment.

RESPONSE:

The following tables provide the price per kWh for a residential PV system requested in this information request. Key assumptions used in the calculations are as follows:

- To achieve a 6% return, it is assumed that the initial capital cost is paid outright in cash at the onset of project and not financed.
- A 15% Capacity Factor is based on panels installed with tilt equal to latitude and is representative of a residential PV installation.
- Distribution and integration costs for grid connection are not included.
- The costs in Figure 10 are in USD assumed on par with $2012 CDN.
- Residential Solar - 20 years with 1.5% annual degradation (solar decay)

Criteria	Fixed Tilt
Plant Size	< 100 kW
Plant Life	20 years
Discount Rate	6%
Capacity Factor	15%
Installed Cost (2012$/MW)	$1,120,000/MW
Operation & Maintenance	$19,700/MW/Year
Real Escalation	0%
Levelized Cost Of Electricity (2012$/MW.h)	$103.70 MW.h

Figure 10 referenced in this information request illustrates a trend to $1.12 per Watt installed cost for residential systems by 2020. This projected decline in installed cost is based on a number of assumptions related to continuing technological improvements, reduced component costs, mass production increases and installation advancements. Please see Manitoba Hydro's response to CAC_GAC/MH I-020a) for additional context related to the ability to achieve projected price declines for solar PV technologies.

REFERENCE: Appendix 7.1 Emerging Energy Technology Review; Section: 4.4.2; Page No.: 44

PREAMBLE: Figure 10 illustrates solar photovoltaic installed cost price trends to 2020 and beyond. At $1.12 per installed watt (presumably in 2013 dollars), a typical rooftop 4 kW system would have an installed cost of about $4,500.

QUESTION:

Compare the findings in part a) with current residential and domestic service electricity rates in the Province.

RESPONSE:

The current (October 2013) residential electrical energy charge in Manitoba is 7.183 ¢/kWh for firm power. As provided in MMF/MH 1-074a), the levelized cost of energy (LCOE) from a 4 kW solar PV in Winnipeg installed in 2020 is 10.37¢/kWh (in 2012$ CDN) assuming a 6% return on investment over a 20-year period. The LCOE in 2013$ CDN is 10.55¢/kWh.

Intermittent power requires some form of grid back-up or energy storage service to augment its output. It is recognized that the current rate setting strategies in most North American Electric Utilities, including Manitoba Hydro, do not have appropriate net metering pricing mechanisms to cover solar integration costs (cost of dealing with the intermittency). This issue is currently being addressed in regions such as California where the amount of residential solar PV is significant enough to affect the utilities' economic and financial performance.

Figure 10 referenced in this information request illustrates a trend to $1.12 per Watt installed cost for residential systems by 2020. This projected decline in installed cost is based on a number of assumptions related to continuing technological improvements, reduced component costs, mass production increases and installation advancements. Please see Manitoba Hydro's

response to CAC_GAC/MH I-020a) for additional context related to the ability to achieve projected price declines for solar PV technologies.