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Energy Use and Related Data: Canadian Construction Industry 1990 to 2015

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Canadian Construction Association

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Sponsors of CIEEDAC: Environment and Climate Change Canada, Natural Resources Canada, Aluminium Association of Canada, Beer Canada, Canadian Construction Association, Canadian Foundry Association, Canadian Fuels Association, Canadian Gas Association, Canadian Lime Institute, Canadian Steel Producers Association, Cement Association of Canada, Chemistry Industry Association of Canada, Fertilizer Canada, Forest Products Association of Canada, Mining Association of Canada, Energy and Materials Research Group at SFU.

Executive Summary

This report was prepared for the Canadian Construction Association and the Canadian Industry Program for Energy Conservation, a program of the Office of Energy Efficiency at Natural Resources Canada, to document data availability on the construction industry in Canada, to present trends in energy and greenhouse gas emissions and to explain weaknesses in existing data.

Between 1990 and 2015, energy use increased by over 37% and CO_2 emissions over 42%. At the same time, gross domestic product (GDP) increased by 61%. Since Gross Output data are no longer available, energy and CO_2 intensity indicators were calculated using only GDP as a denominator. GDP-based energy intensity has fallen nearly 15% since 1990 while CO_2 intensity based on GDP declined by almost 12%. However, as these indicators are based on an economic measure of output they are open to influence by factors unrelated to energy and should be used with that in mind. Due to the diverse nature of the construction industry, no physical measures of output currently exist to enable more reliable intensity estimates.

There are several opportunities to improve the data and resulting analyses. In this report we examine three key issues:

- incomplete data, including a lack of electricity data and misallocation of refined petroleum product consumption;
- lack of aggregate physical measures of output in this industry; and
- energy use data is not sufficiently disaggregated.

We conclude by proposing a few actions to address these issues.

Acknowledgments

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Canada

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Energy Use and Related Data: Canadian Construction Industry, 1990 to 2015

1 Introduction

Like the rest of Canadian industry, the construction industry is increasingly aware of the need for accurate data on production, energy use, and greenhouse gas emissions. These data are required to:

(1) identify energy use and greenhouse gas (GHG) emission trends to assess the impacts of changing technology, processes, and attitudes about energy;
(2) compare Canadian industrial performance to other countries to ensure that we are remaining competitive; and
(3) monitor the environmental impacts of changes in energy use patterns.

To draw reliable conclusions about energy use and environmental impacts, data must represent actual conditions as closely as possible.

This report presents trends in energy use and production data for the Canadian construction industry from 1990 to 2015. We comment on several data issues, including quality, availability, and ways to improve the data.

Specifically, the objectives of this report are to:

- document the quantity and utility of energy and production data available on the Canadian construction industry for the period 1990 to 2015;
- identify energy use and CO_2 emissions trends for this period;
- identify weaknesses in energy and production data collection and their impact on accuracy and utility; and
- inform discussions between the construction industry and data collection agencies on data issues.

1.1 Background

The Canadian construction industry represents a major component of Canada's economy. Statistics Canada (STC) data indicated that the industry provided 1.4 million direct jobs in 2015 in almost 352,500 firms and contributed about $117 billion to Canada's GDP.[1] Two major organizations represent the industry. The Canadian Construction Association represents more than 17,000 firms, lobbies the federal government on behalf of the industry, develops industry standard practices and documents, and promotes the industry domestically and abroad. The Canadian Home Builders' Association represents more than 8,500 member firms across Canada.

[1] Data are from Statistics Canada: CANSIM Table 379-0031 (GDP in $2007), Table 383-0031 (labour statistics), and Innovation, Science and Economic Development Canada (establishments).

Recently, Canadian Construction Innovations (CCI) has been working with CCA, NRCan, STC, and CIEEDAC to improve the availability of construction energy and production data at a more detailed level. CCI works in close collaboration with CCA and is in contact with many of the industry's largest members.

The Canadian Industry Program for Energy Conservation (CIPEC), created in 1975 by industry and government leaders, provides an effective framework for energy conservation and a tool to increase industry's competitiveness in a global market. CIPEC helps industry to identify energy efficiency barriers and opportunities, forecast and set economically feasible energy efficiency targets, and develop and implement strategies to reach those targets.

This report is a result of collaboration with these organizations, and is prepared by the Canadian Industrial Energy End-use Data and Analysis Centre. CIEEDAC collects, analyses and reports energy data relating to Canada's industrial sector. One of CIEEDAC's primary goals is to expand and improve knowledge of energy use in industry by promoting the regular and timely collection of reliable data.

1.2 SIC and NAICS codes for the Canadian Construction Industry

Until 1998, STC used the Canadian Standard Industrial Classification (SIC) system to classify the data that it collected. In 1998, STC switched to the North American Industry Classification System (NAICS). This six-digit code is a major revision that reorganizes the categories on a production / process basis compared to the production and market basis of the SIC. NAICS is a code system common to Canada, the US, and Mexico and it is compatible with the two-digit level of International Standard Industrial Classification (ISIC) system of the United Nations. Table 1.1 lists the NAICS codes for the construction industry under the 2007 Revision.

Table 1.1: NAICS Codes for the Construction Industry (NAICS 23)[2]

NAICS Code	Description
236	**Construction of Buildings**
2361	Residential Building Construction
2362	Non-Residential Building Construction
237	**Heavy and Civil Engineering Construction**
2371	Utility System Construction
2372	Land Subdivision
2373	Highway, Street, and Bridge Construction
2379	Other Heavy and Civil Engineering Construction
238	**Specialty Trade Contractors**
2381	Foundation, Structure, and Building Exterior Contractors
2382	Building Equipment Contractors
2383	Building Finishing Contractors
2389	Other Specialty Contractors

[2] See Appendix B for a complete list of the NAICS Construction Codes.

There are slight differences between the activities included in the SIC and the NAICS Construction categories, referred to as concordance issues. Portions of three non-construction SIC categories are now included in the NAICS construction codes and portions of two construction SIC categories have not been included.[3] The impact of this concordance issue on energy use and output data is considered negligible.

2 Method

This report and its underlying analysis rely upon energy use, production, and emissions data. The first two types of data are gathered from publicly-accessible sources; the third is derived by CIEEDAC. These data are assessed in terms of changes over time, and combined to form intensity indicators, measures of energy use and emissions as a ratio of production. While there are several issues with the data that weaken the analysis, the steps taken in our analysis are relatively straightforward.

2.1 Energy Use

This report uses energy use data published in STC's *Report on Energy Supply-Demand in Canada* (RESD).[4] This is the only source of publicly available data on energy use in the construction industry. STC collects the data through several energy disposition surveys sent to electricity, natural gas, and petroleum product producers. That is, data on energy use in the construction industry are gathered from the energy producers, not from the consumers, which may lead to some misallocation of energy use. These surveys are sent to all companies since there are only a few large respondents in each group.[5] The data are said to reflect energy use by all "establishments primarily engaged in the construction of buildings, highways, dams, and those providing services to the construction industry. Specialty Trade Contractors primarily engaged in construction work with expertise in plumbing, carpentry, and painting are included here. Sales of asphalt (in non-energy refined petroleum products) for paving purposes, regardless of the purchaser, are included here."[6]

Energy use data are available for all fossil fuels in both natural units (tonnes, cubic meters, or litres) and energy units (terajoules, TJ). Data are available by province for the calendar year but only at the two-digit NAICS level. Data on electricity use in the construction sector are not available because the construction sector is included in the "Commercial and Other Institutional" category in the electricity disposition survey. Also, one cannot split energy use data by fuel type into residential and non-residential construction. There are energy flow data which give an aggregate energy use picture for

[3] For specifics about the added and deleted activities, refer to STC's publication "North American Industry Classification System", Catalogue No. 12-501-XPE.
[4] Formerly the *Quarterly Report on Energy Supply-Demand in Canada,* it is now released once per year. RESD data were updated in 2011 for all years from 1995 to present. All references to RESD in this report will mean QRESD for years prior to 1995.
[5] STC, *Quarterly Report on Energy Supply-Demand in Canada*, Cat no. 57-003-XPB, 2001-II, page viii.
[6] Statistics Canada, *Report on Energy Supply-Demand in Canada*, Table 128-0016, footnote 21.

various groups of the construction industry (CANSIM Table 153-0113). CIEEDAC is working with STC, NRCan, CCA, and CCI to generate more detailed data that may offer additional insight into the industry. As a first step, work is being conducted to determine which industries are most amenable to collect detailed production and energy use data, and how best to go about it. This is especially important given the large variability in activities and fuel mix across the construction sector.

STC has re-evaluated the allocation of refined petroleum products among the various sectors and this has significantly affected energy consumption levels in the industry in general and has altered energy use by province as well.

In the past, we have contacted four other organizations regarding data on energy use they may collect for the construction sector: the Canadian Home Builders' Association, the Canadian Mortgage and Housing Corporation, NRCan's Office of Energy Efficiency, and Industry Canada. As far as we know, none of these collect data of this nature.

2.2 Production

Production data are necessary to assess energy and emission intensity trends in the industry. Production data can be expressed in either physical terms (i.e., number of houses or miles of roadway) or economic terms (i.e., dollars).

STC collects physical production data on some portions of the construction industry, such as on the number of houses and the amount of commercial and institutional floor space built per year, but it does not collect physical production data for industrial components of the construction industry. This latter portion produces diverse products, such as roads, dams, irrigation systems, and electricity transmission systems, and includes repair work on these and similar structures. Thus far, there is no measure of physical output that combines these products into a single measure.

STC collects economic production data for both the residential and non-residential construction industries. It also collects economic data for the industry as a whole, quoted as gross domestic product (GDP) or gross output (GO) in constant $2007. GDP is the value added by the construction industry when it transforms inputs purchased from other industries into outputs. Gross output is the total value of goods and services produced by an industry, including the value of purchased inputs. GO data from STC are released three years after the year being reviewed and are not useful in this analysis.

2.3 Greenhouse Gas Emissions

Data on greenhouse gas (GHG) emissions in the construction sector are not collected directly but are derived from energy use data. The construction industry emits GHGs from the on-site combustion of fossil fuels. These emissions are considered *direct emissions*. Direct CO_2 emissions are calculated by multiplying the level of consumption of each fuel by the fuel's CO_2 emission factor obtained from Environment and Climate

Change Canada.[7] Emissions of other GHGs from fossil fuel combustion are marginal in quantity; estimates of these can be found in Appendix D.

CO_2 is also emitted from the generation of electricity used by the construction industry. These emissions are called *indirect emissions* because they occur at the generator, not on-site. Indirect emissions were not included in this study because STC does not provide data on electricity consumption in the construction industry.

All conversion coefficients are provided in Appendix A and are obtained from Environment and Climate Change Canada's *National Inventory Report, 1990 – 2014* (ECCC 2016).

2.4 Intensity Indicators

Indicators of performance are important yardsticks for measuring improvements in energy efficiency and environmental performance of industry. The two indicators calculated in this study are energy intensity and CO_2 intensity, based on either energy used or CO_2 emitted per unit of output. Energy and CO_2 intensities are expressed in either physical (e.g., joules/tonne of product; tonnes of CO_2/tonne of product) or economic terms (e.g., joules/$GDP; tonnes of CO_2/$GDP).

In general, physical measures of energy and CO_2 intensity are more informative than economic measures because it is the relationship between physical outputs and energy use that is being examined. Changes in physical energy and CO_2 intensity mark real changes in how energy is used and emissions are generated in production; changes in economic intensity are confounded by several factors (e.g., costs of labour and materials, or the selling price of the final product) and are, as a result, less accurate measures.[8] Examining energy and emission intensity using solely economic measures may lead to faulty conclusions.

Industries that produce one product, such as the steel industry, are easily amenable to physical intensity measures because their outputs can be added across firms. However, a physical unit for the construction industry, with its diverse products, remains undefined. With the current push towards the development of a physical unit protocol among all industry groups that don't yet have one, organizations such as the Canadian Construction Association should give the development of such a parameter serious thought, making recommendations to STC with respect to collecting data on such a parameter in the future.[8]

[7] See *Greenhouse Gas Intensity Indicators for Canadian Industry 1990-2015* (CIEEDAC 2017).
[8] See *An Assessment of Data on Output for Industrial Sub-Sectors* (CIEEDAC 1993) for more information on the issues of physical versus monetary units for calculating intensity indicators and on CIEEDAC's recommendations of appropriate units.

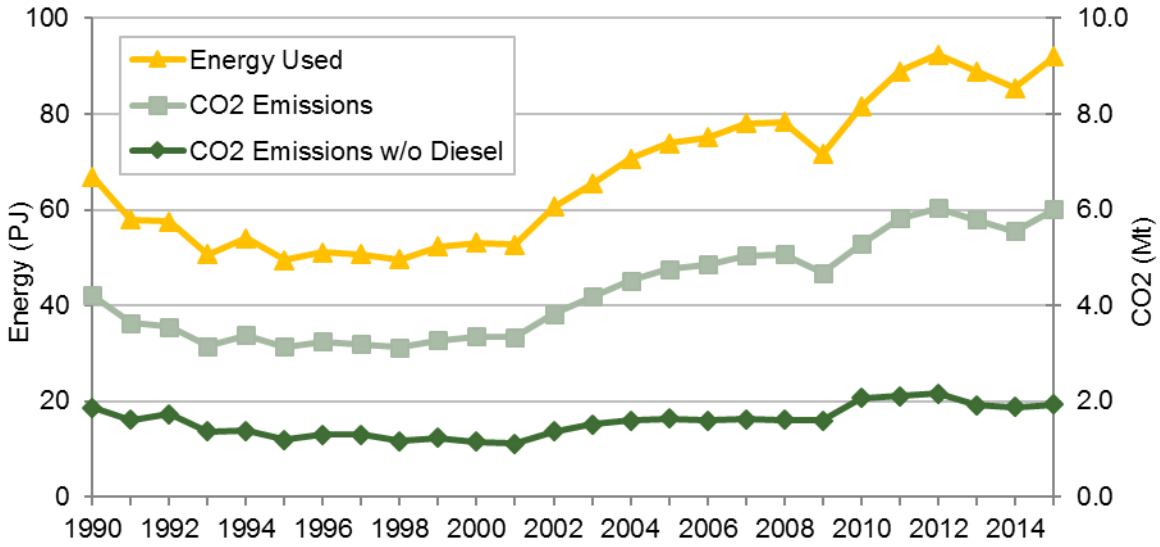
3 Trends in Construction, 1990-2015

3.1 Energy and Emissions

Between 1990 and 2015, energy use and emissions closely tracked one another (Fig. 3.1). Energy use fell in 2009 to 71.6 PJ, but increased 28% (more than 20 PJ) to 92 PJ by 2015, 37% higher than 1990 levels. Note that this significant change is due in part to STC's reallocation of various refined petroleum products (RPPs) from the commercial (resale) sector to other sectors of the economy.

Fuel mix has changed since 1990; part of this is due to the RPP reallocation issue described above. Natural gas, at 19% in 2015, has been as high as 35% over the study period. Natural gas liquids declined from 11% in 1990 to 4% in 2015, and light fuel oil declined from 7% to 2%. Gasoline use has risen from near 0% (i.e., it was not initially allocated to this sector) to an estimated 10% due to the reallocation of RPPs; gasoline data are estimated because they are considered confidential in RESD. Diesel consumption has taken up some of this negative change as well, increasing from 51% to 63% over the period. Since all the major fuels are carbon based, the trend in CO_2 emissions generally mirrors energy use trends, increasing by about 42% over the study period. As diesel is the dominant fuel, it also generates the most CO_2 emissions, about 68% of the total.

Figure 3.1: Canadian Construction Sector Energy Use and CO_2 Emissions

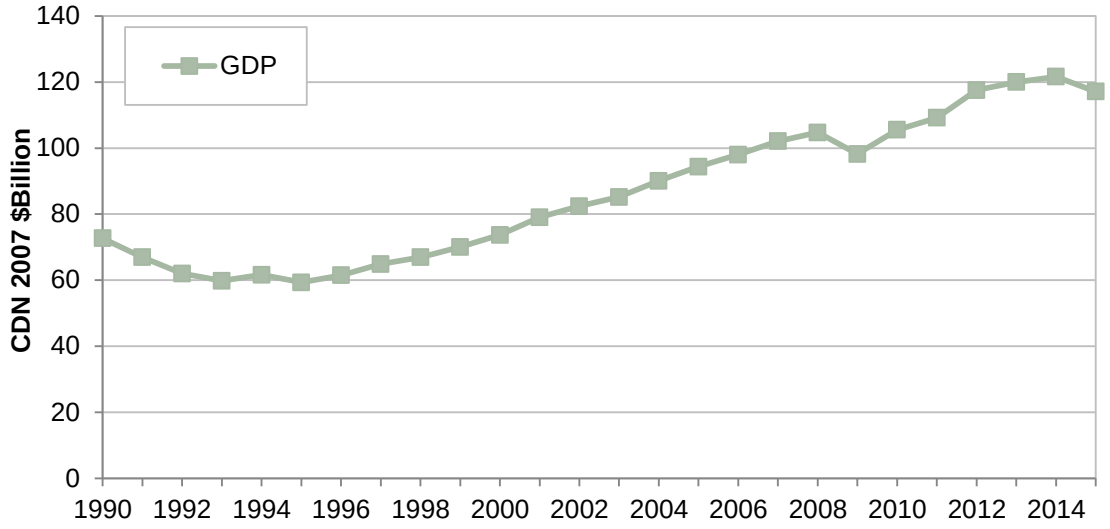


Source: STC RESD. Emissions calculated using Environment and Climate Change Canada's coefficients found in the NIR (ECCC, 2016)

3.2 Production

Figure 3.2 shows annual GDP (in constant $2007) for the construction industry from 1990 to 2015. Constant dollar values are used to remove the effect of inflation. From 1990 to 2015, GDP increased by 61%, down slightly (3.7%) from 2014.

Figure 3.2: Canadian Construction Industry Production

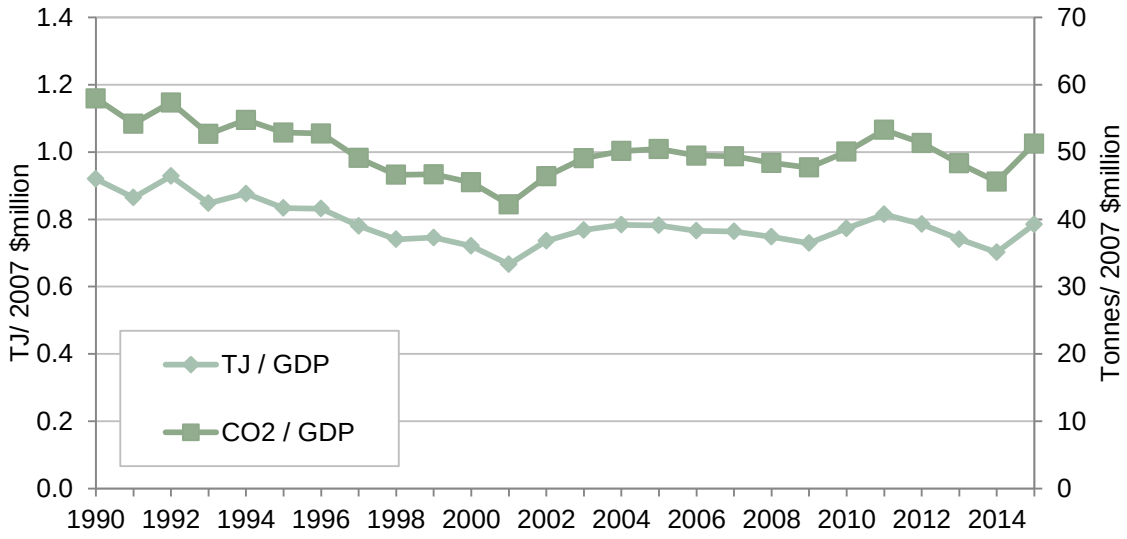


Source: STC CANSIM Table 379-0031

3.3 Energy and CO_2 Intensity

Between 1990 and 2001, energy intensity showed a clear downward trend. However, influenced by the reallocation of RPPs (especially gasoline) to this sector, intensity indicators have fluctuated since that time. Energy intensity is currently 14.5% below the 1990 level.

Figure 3.3: Energy Intensity of Canadian Construction Industry



Source: Calculated from STC: GDP and RESD data

A strong relationship is evident between fossil fuel consumption and CO_2 emissions (Fig. 3.3 above). While CO_2/GDP intensity increased after 2009 like energy intensity, it has decreased overall to a level 11.5% below that of 1990.

As noted earlier, such a strong relationship exists due to a relatively stable fuel mix over time (Table 3.1). While changes in some fuels were significant – such as natural gas liquids (NGLs), which declined in usage by 66% – their overall contributions to emissions were small. Note also the rise in gasoline as a contributor, again the result of STC reallocation of RPPs.

Table 3.1: Fuel Shares (%) in Construction

Fuel	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Natural Gas	29	25	25	26	25	24	24	20	23	19	19	20	21	19
Liquid Gas NGL	11	8	5	3	3	4	4	4	4	4	5	4	4	4
Gasoline	*0*	*2*	*3*	*4*	*4*	*4*	*4*	*8*	*10*	*11*	*11*	*11*	*10*	*11*
Kerosene	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Diesel	51	57	59	60	62	62	62	61	56	59	60	62	61	63
Light Fuel Oil	7	7	5	4	4	4	4	4	4	3	2	2	2	2
Heavy Fuel Oil	2	1	1	2	1	1	1	3	3	3	3	1	1	1

Note: Gasoline data are confidential in RESD. The quantity used, and thus the market share, is estimated.

4 Provincial Analysis

This section presents construction sector data by province for 2015, demonstrating regional allocations in construction sector energy use, CO_2 emissions, and economic activity. Ontario and Québec account for nearly half of all energy used in this sector (Table 4.1). Québec's and Ontario's shares decreased by about 1% and 0.5%, respectively, with Alberta and the Atlantic provinces increasing by slightly more than that amount. There are regional variations in fuel preference. The proportion of LPGs and gas plant NGLs is highest in Ontario and Alberta. Light fuel oils are more commonly used in eastern Canada (Atlantic, Quebec, and Ontario). STC's re-evaluation of RPPs among the various sectors, as described in Section 2 has affected provincial allocations.

Table 4.1: Construction Sector Energy Use by Province for 2015, TJ

Fuel Type	Atl.	QC	ON	MB	SK	AB	BC	Terr.	Total
Natural Gas	12	5,605	3,724	2,090	795	4,034	1,294		**17,555**
LPGs, NGLs	20	348	1,307	27	60	1,484	74	11	**3,326**
Total RPPs	6,891	10,131	20,027	4,481	9,558	11,019	6,834	154	**71,092**
Gasoline	*644*	*616*	*2,400*	*1,120*	*1,929*	*2,560*	*887*	*8*	***9,831***
Kerosene	-	43	289	-	1	3	9	2	**344**
Diesel	6,138	8,551	18,369	3,335	7,549	8,269	5,905	136	**57,971**
Light Fuel Oil	644	320	969	-	4	7	12	8	**2,033**
Heavy Fuel Oil	18	601	-	26	75	180	21	-	**913**
Total	**7,444**	**16,084**	**27,058**	**6,598**	**10,413**	**16,537**	**8,202**	**165**	**91,973**
Percent of Total	7.5%	17.5%	29.4%	7.2%	11.3%	18.0%	8.9%	0.2%	100%

Source: STC RESD CANSIM 128-0016.
Note: Gasoline data are confidential in RESD and have been estimated.

Table 4.2 shows construction sector energy demand, CO_2 emissions and industry GDP by province/region in 2015. Reviewing the numbers side-by-side reveals some interesting details; for example, British Columbia consumes 9% of energy but is responsible for 15% of the GDP, while Saskatchewan consumes 11% of the energy, but contributes only 4% of the GDP from construction in Canada.

Table 4.2: Construction Sector Energy, CO_2 Emissions and Production Data by Province, 2015

Province	Energy Demand		CO_2 Emissions		Construction GDP	
	TJ	% of Total	Tonnes	% of Total	2007 $Million	% of Total
Atlantic	6,923	7.5	522,526	8.7	5,442	4.6
Québec	16,084	17.5	1,002,549	16.7	18,917	16.2
Ontario	27,058	29.4	1,795,053	29.9	36,326	31.0
Manitoba	6,598	7.2	412,618	6.9	4,204	3.6
Saskatchewan	10,413	11.3	705,677	11.8	4,571	3.9
Alberta	16,537	18.0	1,047,483	17.5	29,649	25.3
British Columbia	8,202	8.9	543,244	9.1	17,269	14.7
Territories	165	0.2	11,425	0.2	743	0.6
Total	**91,980**		**6,040,575**		**117,121**	

Sources: STC RESD, CANSIM Table 379-0031.
Note: Provincial GDP is adjusted; the value differs from Total presented in Section 3 due to differing methods of calculation of sources by STC.

These trends are more clearly expressed as provincial/regional energy and emission intensities (Table 4.3). Saskatchewan and Manitoba have the most energy and emission intense construction industries, while the Territories have the most energy and emission efficient industry.

Table 4.3: Energy and Emission Intensities of Provinces and Regions, 2015

Province	Energy Intensity	CO_2 Emission Intensity
	TJ/$GDP	T CO_2/$GDP
Atlantic	1.27	96.02
Québec	0.85	53.00
Ontario	0.74	49.42
Manitoba	1.57	98.14
Saskatchewan	2.28	154.40
Alberta	0.56	35.33
British Columbia	0.47	31.46
Territories	0.22	15.37

Sources: CIEEDAC calculations based on STC RESD CANSIM Table 379-0031.

5 Opportunities for Data Improvement

A few opportunities exist to monitor changes in energy and CO_2 intensity more accurately in the Canadian construction industry. We noted earlier that STC has re-evaluated how refined petroleum products are allocated among the sectors; this analysis has already impacted the final energy picture of the Construction Industry. The following is a summary of other opportunities and proposed actions.

5.1 Energy Data

There are opportunities for improvement in energy use data (see #1, #3 below). The issue related to the allocation of RPPs is described in #2 below.

1. The *Electricity Supply and Disposition Quarterly* survey does not separately list the consumption of electricity in the construction industry. This has a significant impact on the ability to assess energy use. Electricity used by the construction industry is allocated to a residual category "Commercial and Other Institutional (all industries not previously specified)".[9]
2. STC data on the consumption of refined petroleum products in the construction industry originate from the *Refined Petroleum Product End-Use Survey*. In contrast to other surveys, survey respondents (petroleum refineries) allocate the fuel they sell to the industrial sectors that consume the product. This is only problematic because a significant proportion of refined petroleum products are sold to shippers or other intermediaries (such as wholesalers), and thus the final consumers of the product are not known to survey respondents. Such sales are reported under the "Commercial and Other Institutional" category.[10] As we've noted throughout this document, this has changed the energy use picture for the industry.
3. Energy use data published by STC are not disaggregated sufficiently to properly estimate changes in energy and CO_2 intensity in the various sub-sectors of the industry. The industry produces a diverse set of products, however STC data are only available for the industry as a whole (i.e., at the 2-digit NAICS level). More disaggregation would allow more accurate monitoring of changes in energy and CO_2 intensity.[11]

5.2 Production Data

The construction industry could improve the value of its energy and CO_2 intensity indicators by collecting physical production data for its various sub-sectors. The lack of physical production data has significant implications for these indicators. Intensity indicators based on physical output (e.g., number of houses, commercial floor space) rather than economic (monetary) output provide a much better reflection of real energy intensity changes.[11]

Considering the lack of physical output data, we calculated energy and CO_2 intensity indicators using GDP as a denominator. With gross output data (GO) no longer available in time, this is now the only production indicator available for analysis.

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[9] Elaine DuWors, Statistics Canada, Personal Communication, October 2002. This may also be part of the re-evaluation in the RESD.

[10] John Svab, Statistics Canada, Personal Communication, October 2002. This is the primary area of concern under the RESD re-evaluation.

[11] Work is currently on-going between CCA, CCI, NRCan, STC, and CIEEDAC to determine which sub-sectors could provide greater detail on production and energy use data.

5.3 Proposed Actions

We propose the industry undertake two courses of action to address current data deficiencies. First, we propose that the industry work with STC to determine the optimum level of disaggregation for construction sector energy use data. More disaggregation could increase the utility of the data for energy and CO_2 intensity analysis provided corresponding production data can be obtained. It would provide a better indication of where one might wish to focus programs and policies. CIEEDAC is already acting on behalf of the industry to address this issue.

Second, we propose the industry develop a physical production indicator. We propose that the CCA investigate which physical production data for each of its sub-sectors would be most representative of that sector, i.e., what units could most appropriately measure the bulk of production in each component of the industry (floor space, number of houses/buildings, labour hours, input raw materials such as tonnes of cement or steel or cubic meters of wood, etc.). Then, in conjunction with STC, a method could be devised for obtaining these data on a regular basis. These physical production data should be aligned with energy use data to permit the development of useful intensity indicators. As mentioned above, this would allow the construction industry to focus its energy efficiency program by identifying energy intensive activities and provide a means to monitor results of its initiatives, providing useful feedback to its members. As mentioned earlier, CCI is currently pursuing the development of better energy and production data in collaboration with CCA, NRCan, STC, and CIEEDAC.

To help address the lack of a physical production indicator, we suggest the construction industry could disaggregate its activities into a few primary categories related to NAICS divisions. Physical data are already available on residential and non-residential building construction. The remaining portions of the industry could be allocated to one or more physical measures using the following process.

To monitor energy intensity changes per physical unit of output, the physical units must be relatively comparable in space (same product from two different plants) and time (i.e., the product is roughly the same 10 years from now). In industries where products are extremely diverse, this poses a problem. Two approaches can be taken to help define physical production measures: simplify/generalize the product definition and/or disaggregate the sector.

The following concepts may be helpful when considering ways to simplify or generalize the definition of the product one wishes to use.

1. Some products or services, though economically significant (such as running electrical wiring, installing plumbing or exterior finishing), may consume little energy in their completion and, in the overall scheme of energy-related analysis, are insignificant. We don't recommend using the installation of these products as a base unit.

2. Process uniformity may be one approach to aggregating products. Tonnes of concrete poured may be a better output measure than numbers of buildings completed. The guiding characteristic will be the uniformity of energy use in the process, not the product generated.
3. The market share of the product or sub-products could be used to factor out structural differences in the output. For example, to estimate the energy intensity of building construction, one could use the square meters of floor space produced modified by the market share of each building type.

Disaggregation of an industry to the three- or four-digit NAICS category can facilitate the use of physical measures of energy intensity. An industry need not be analyzed using only one output measure. If an industrial branch generates many different products, it may be possible to find physical units for some of them and not for others. The energy intensity indicator could be the sum of a set of indicators, some based on physical units and others on economic ones. Changes could be reported on a product-by-product basis or reported in an aggregate sense (e.g., "We noted a 3% improvement in energy intensity from the previous year.").

Finally, if decisions can be made about the most appropriate data to collect, the actual task of data collection should reside with Statistics Canada. This is recommended not only because this is STC's primary task but it also ensures that the data collection process for both the energy and production side are consistent with each other.

6 Conclusion

Energy use and greenhouse gas emissions from the construction industry have increased in recent years, due in part to the reallocation of refined petroleum products from the commercial sector (distributors of RPPs) to other various sectors including construction. Compared to 1990 levels, energy use has increased by over 37% while CO_2 emissions have risen by over 42%. These increases have occurred concurrent with an increase in economic output (GDP) of 61% above 1990. In terms of energy intensity, these changes translate into a decline of 14.5%. Due to a relatively stable carbon-based fuel mix over the study period, changes in CO_2 intensity mirrored changes in energy intensity and declined 11.5% below 1990.

On a provincial/regional level, a few trends are evident. Ontario and Québec consistently account for about half of the energy used nationally in this industry. Fuel shares among provinces/regions differ, depending somewhat on availability. Construction in Ontario and Québec rely proportionally more on natural gas and light fuel oil. Construction in Atlantic Canada uses proportionally large amounts of light and heavy fuel oil. Saskatchewan and Manitoba are the most energy and emission intense of the provinces/regions, and the Territories are the least intense.

However, as highlighted in Section 2, these data and the intensity indicators built from them are not perfect. First, the energy use data do not include the industry's use of

electricity, and there is uncertainty in the allocation of energy used by the industry. Second, due to a lack of aggregate physical measures of output in this industry, intensity indicators are based only on a measure of economic output, GDP. Several factors unrelated to energy use affect economic measures, and therefore may lead to misleading intensity indicators. Third, structural changes in the industry – the relative growth or reduction of components of the construction industry that have atypical energy/emission intensities – may be responsible for changes in industrial intensity, and thus don't represent real changes in production efficiencies. Techniques exist to separate out this factor were the appropriate data available; however, lack of data prevented these techniques from being applied for this analysis.

Several data issues are identified in this report. STC's *Electricity Supply and Disposition Quarterly* survey does not separately list the consumption of electricity in the construction industry, hampering energy assessments of this industry. Energy use data are not disaggregated sufficiently to properly estimate changes in energy and CO_2 intensity in the various sub-sectors of the industry, further hampering our understanding of energy and emission trends in this diverse industry. Lastly, given a lack of a coherent physical output measure, all energy and emission intensity measures are based on an economic output measure and are thus vulnerable to confounding factors.

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Appendix A: Coefficients

Table 1: Energy Coefficients, GJ/Physical Unit

Fuel	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Butane	m3	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44	28.44
Coal	tonne	29.30	29.30	29.30	26.07	26.13	25.53	25.84	26.79	26.79	26.17	26.66	27.02	26.98	26.59
Coal, Canadian Bituminous	tonne	30.36	30.36	26.00	26.07	26.13	25.53	25.84	26.79	26.79	26.17	26.66	27.02	26.98	26.59
Coal, Canadian Lignite	tonne	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Coal, Foreign Anthracite	tonne	27.70	27.70	27.70	27.70	27.70	27.70	27.70	27.70	27.70	27.70	27.70	27.70	27.70	27.70
Coal, Foreign Bituminous	tonne	29.00	29.78	29.82	29.82	29.82	29.82	29.82	29.82	29.82	29.82	29.82	29.82	29.82	29.82
Coal, Coke	tonne	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83
Coke on Cat Crackers	tonne	37.09	37.09	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65
Coke Oven Gas	000 m3	18.61	18.61	19.14	19.14	19.14	19.14	19.14	19.14	19.14	19.14	19.14	19.14	19.14	19.14
Diesel	m3	38.68	38.68	38.68	38.30	38.30	38.30	38.30	38.30	38.30	38.30	38.30	38.30	38.30	38.30
Electricity	MWh	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Gasoline	m3	34.66	34.66	34.66	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Heavy Fuel Oil	m3	41.73	41.73	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50
Kerosene	m3	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.53	38.52
Light Fuel Oil	m3	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.53	38.52
LPG	m3	26.85	26.85	26.85	26.80	26.46	26.65	26.81	26.82	26.92	26.84	26.44	26.45	26.42	26.42
Middle Distillates	m3	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.53	38.52
Natural Gas	000 m3	37.78	38.06	37.99	38.26	38.26	38.11	38.41	38.43	38.52	38.56	38.74	38.85	39.00	39.24
Petroleum Coke	tonne	37.09	37.09	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65	38.65
Propane	m3	25.53	25.53	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31
Spent Pulping Liquor	tonne	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
Steam	GJ	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Still Gas	m3 HFO equiv	41.73	41.73	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50
Wood	tonne	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00

Source: STC RESD. Canadian Bituminous coal is a weighted average of coal by province as provided by STC to CIEEDAC

Table 2: CO_2 Coefficients, tCO_2/Physical Unit

Fuel	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Ammonia	tonne	1.66	2.01	1.43	1.34	1.29	1.20	1.09	0.99	1.05	1.09	1.17	1.23	1.20	1.20
Butane	m3	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Coal	tonne	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41
Coal, Canadian Bituminous	tonne	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21
Coal, Canadian Lignite	tonne	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47
Coal, Foreign Anthracite	tonne	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57	2.57
Coal, Foreign Bituminous	tonne	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63
Coal, Coke	tonne	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17
Coke on Cat Crackers	tonne	3.14	3.16	3.09	3.18	3.18	3.19	3.18	3.18	3.19	3.18	3.18	3.19	3.18	3.19
Coke Oven Gas	000 m3	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Diesel	m3	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.69	2.69
Gasoline	m3	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32
Heavy Fuel Oil	m3	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16
Kerosene	m3	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Light Fuel Oil	m3	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
LPG	m3	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
Middle Distillates	m3	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
Natural Gas	000 m3	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
Petroleum Coke	tonne	3.14	3.16	3.09	3.18	3.18	3.19	3.18	3.18	3.19	3.18	3.18	3.19	3.18	3.19
Propane	m3	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
Spent Pulping Liquor	tonne	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Still Gas	m3 HFO equiv	1.74	1.80	1.68	1.72	1.75	1.76	1.70	1.72	1.84	1.83	1.73	1.75	1.75	1.77
Wood	tonne	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84

Note: Biomass (wood and spent pulping liquor) is considered to be CO_2 neutral

Source: Environment and Climate Change Canada; (ECCC 2016). Anode value calculated in Common Reporting Format Tables of the Inventory

Table 3: CH_4 Coefficients, $kgCH_4$/Physical Unit

Fuel	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Butane	m3	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coal	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Coal, Canadian Bituminous	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Coal, Canadian Lignite	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Coal, Foreign Anthracite	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Coal, Foreign Bituminous	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Coal, Coke	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Coke on Cat Crackers	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Coke Oven Gas	000 m3	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Diesel	m3	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Gasoline	m3	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Heavy Fuel Oil	m3	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Kerosene	m3	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Light Fuel Oil	m3	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
LPG	m3	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Middle Distillates	m3	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Natural Gas	000 m3	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Petroleum Coke	tonne	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Propane	m3	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Spent Pulping Liquor	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Still Gas	m3 HFO equiv	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Wood	tonne	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09

Source: Environment and Climate Change Canada (ECCC 2016)

Table 4: N_2O Coefficients, kgN_2O/Physical Unit

Fuel	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Butane	m3	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Coal	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coal, Canadian Bituminous	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coal, Canadian Lignite	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coal, Foreign Anthracite	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coal, Foreign Bituminous	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coal, Coke	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coke on Cat Crackers	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coke Oven Gas	000 m3	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Diesel	m3	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Gasoline	m3	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Heavy Fuel Oil	m3	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Kerosene	m3	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Light Fuel Oil	m3	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
LPG	m3	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Middle Distillates	m3	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Natural Gas	000 m3	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Petroleum Coke	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Propane	m3	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Spent Pulping Liquor	tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Still Gas	m3 HFO equiv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood	tonne	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06

Source: Environment and Climate Change Canada (ECCC 2016)

Appendix B: NAICS Codes, Canadian Construction Industry

NAICS Code	Description
23	**Construction**
236	**Construction of Buildings**
2361	Residential Building Construction
23611	Residential Building Construction
2362	Non-Residential Building Construction
23621	Industrial Building Construction
23622	Commercial and Institutional Building Construction
237	**Heavy and Civil Engineering Construction**
2371	Utility System Construction
23711	Water and Sewer Line and Related Structures Construction
23712	Oil and Gas Pipeline and Related Structures Construction
23713	Power and Communication Line and Related Structures Construction
2372	Land Subdivision
23721	Land Subdivisions
2373	Highway, Street, and Bridge Construction
23731	Highway, Street, and Bridge Construction
2379	Other Heavy and Civil Engineering Construction
23799	Other Heavy and Civil Engineering Construction
238	**Specialty Trade Contractors**
2381	Foundation, Structure, and Building Exterior Contractors
23811	Poured Concrete Foundation and Structure Contractors
23812	Structural Steel and Precast Concrete Contractors
23813	Framing Contractors
23814	Masonry Contractors
23815	Glass and Glazing Contractors
23816	Roofing Contractors
23817	Siding Contractors
23819	Other Foundation, Structure, and Building Exterior Contractors
2382	Building Equipment Contractors
23821	Electrical Contractors
23822	Plumbing, Heating, and Air Conditioning Contractors
23829	Other Building Equipment Contractors
238291	Elevator and Escalator Installation Contractors
238299	All Other Building Equipment Contractors
2383	Building Finishing Contractors
23831	Drywall and Insulation Contractors
23832	Painting and Wall Covering Contractors
23833	Flooring Contractors
23834	Tile and Terrazzo Contractors
23835	Finish Carpentry Contractors
23839	Other Building Finishing Contractors
2389	Other Specialty Contractors
23891	Site Preparation Contractors

Appendix C: Construction Sector Data Tables

1. Production Data

Construction Sector Production, Constant 2007 Million Dollars

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Gross Output														
GDP	72,696	59,346	73,707	94,414	98,021	102,098	104,738	98,211	105,559	109,208	117,567	120,026	121,668	117,121

Source: STC (CANSIM Table 379-0031), Gross Output data discontinued.

2. Energy Use Data

Total National Construction Industry Energy Use by Fuel (TJ)

Fuel Type	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Natural Gas	19,524	12,432	14,041	18,905	18,759	19,114	18,675	14,457	18,405	16,844	17,292	17,501	17,576	17,555
Liquid NGL	7,138	3,868	2,627	2,658	2,771	3,099	3,296	2,977	3,376	3,889	4,632	3,705	3,413	3,326
Total RPP	40,233	33,167	36,469	52,296	53,554	55,827	56,373	54,209	59,822	68,244	70,453	67,761	64,431	71,092
Gasoline		*1,023*	*1,818*	*2,848*	*3,034*	*3,368*	*3,473*	*5,551*	*8,315*	*10,132*	*10,417*	*9,688*	*8,938*	*9,831*
Kerosene	347	92	48	74	64	60	38	49	60	260	335	299	385	344
Diesel	33,861	28,682	31,574	44,587	46,318	48,655	49,250	44,037	45,877	52,846	55,276	55,233	52,321	57,971
Light Fuel Oil	4,664	3,403	2,605	3,226	3,054	3,275	3,009	2,549	3,260	2,600	2,084	1,671	1,959	2,033
Heavy Fuel Oil	1,359	631	424	1,561	1,084	469	603	2,023	2,309	2,406	2,341	870	827	913
Aviation Gasoline									1					
Aviation Turbo Fuel														
Total	**66,895**	**49,467**	**53,137**	**73,859**	**75,084**	**78,040**	**78,344**	**71,643**	**81,603**	**88,977**	**92,377**	**88,967**	**85,420**	**91,973**

Source: STC RESD

Notes: These data may not match directly the data in the tables found in Appendix D because there are coefficient differences between ICE and the RESD. Gasoline data are confidential in RESD and have been estimated.

3. Annual Energy Use by Province (All data from STC RESD)*

1990 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	4,768	12,571	21,149	2,867	3,613	11,637	9,770	520	**66,894**
NG		5,012	6,640	912	297	2,406	4,257		**19,524**
NG liquids	384	1,662	2,446	194	500	1,187	677	89	**7,138**
Total RPPs	4,386	5,896	12,062	1,759	2,817	8,044	4,836	431	**40,233**
Gasoline									
Kerosene	23	159	50	13	17	60	15	13	**347**
Diesel	2,468	4,445	10,810	1,680	2,473	7,449	4,161	376	**33,861**
LFO	1,412	802	1,202	53	97	406	652	41	**4,664**
HFO	481	491	1	13	232	132	8	-	**1,359**

1991 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,857	11,411	17,931	2,495	3,468	9,431	8,775	534	**57,903**
NG		4,626	5,749	578	400	1,687	3,738		**16,778**
NG liquids	399	1,688	2,892	199	489	1,248	654	95	**7,664**
Total RPPs	3,459	5,097	9,289	1,719	2,577	6,495	4,383	440	**33,461**
Gasoline									
Kerosene	18	176	30	12	10	37	11	11	**305**
Diesel	2,097	4,208	8,402	1,654	2,481	5,919	3,827	405	**28,995**
LFO	1,048	496	857	39	79	490	545	25	**3,576**
HFO	295	215	-	14	9	50	-	-	**584**

1992 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,771	10,877	17,388	2,406	3,643	9,869	9,279	369	**57,599**
NG		3,889	6,078	733	927	2,594	4,687		**18,905**
NG liquids	386	1,756	3,324	207	424	1,369	957	102	**8,524**
Total RPPs	3,385	5,231	7,987	1,467	2,293	5,906	3,636	265	**30,169**
Gasoline									
Kerosene	13	144	8	9	17	21	7	16	**235**
Diesel	2,051	4,278	7,250	1,436	2,179	5,481	3,304	229	**26,206**
LFO	858	504	705	22	66	378	324	23	**2,879**
HFO	463	308	22	-	30	25	-	-	**848**

*Note: Spreadsheet versions and alternative forms of these tables (e.g., all years for each province in one table) are available from CIEEDAC by request

1993 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,175	8,416	13,943	1,896	3,718	9,236	9,871	461	**50,714**
NG		3,493	4,865	687	960	2,536	5,189		**17,730**
NG liquids	80	496	687	46	304	695	914	69	**3,289**
Total RPPs	3,095	4,426	8,391	1,163	2,455	6,006	3,768	392	**29,696**
Gasoline									
Kerosene	19	78	6	4	19	3	12	22	**162**
Diesel	1,913	3,279	7,684	1,151	2,386	5,421	3,426	340	**25,599**
LFO	902	863	684	7	41	551	331	31	**3,408**
HFO	264	207	17	-	9	29	-	-	**526**

1994 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,255	7,931	15,769	2,205	4,078	10,692	9,590	503	**54,021**
NG		3,454	5,278	668	956	2,363	4,776		**17,496**
NG liquids	25	258	1,746	117	158	609	242	22	**3,178**
Total RPPs	3,230	4,219	8,746	1,420	2,964	7,719	4,571	481	**33,347**
Gasoline									
Kerosene	48	64	2	1	10	3	11	10	**149**
Diesel	1,912	2,998	7,978	1,405	2,844	6,997	4,128	420	**28,682**
LFO	874	924	765	14	64	712	434	52	**3,837**
HFO	394	234	-	-	44	7	-	-	**679**

1995 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,227	6,245	15,093	2,350	4,431	9,976	8,142	3	**49,467**
NG	-	1,968	3,908	483	1,153	1,804	3,117		**12,432**
NG liquids	51	225	2,231	151	153	825	230	3	**3,868**
Total RPPs	3,176	4,053	8,954	1,716	3,125	7,348	4,795	-	**33,167**
Gasoline*	839	42	149	159	301	271	94	-	**1,023**
Kerosene	25	49	3	2	1	3	9	-	**92**
Diesel	1,846	2,962	8,210	1,549	2,737	6,412	4,303	-	**28,018**
LFO	839	868	592	6	58	651	389	-	**3,403**
HFO	460	132	-	-	28	11	-	..	**631**

*Gasoline data are confidential in RESD and have been estimated

1996 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	2,982	6,048	16,259	2,048	5,053	10,630	8,112	1	**51,131**
NG	-	1,966	4,762	480	1,309	2,056	3,281		**13,855**
NG liquids	71	161	2,463	112	145	666	159	1	**3,779**
Total RPPs	2,910	3,920	9,033	1,455	3,599	7,907	4,672	-	**33,497**
Gasoline*	722	44	166	180	343	301	103	-	**1,147**
Kerosene	9	46	-	-	3	4	11	-	**73**
Diesel	1,757	2,782	8,166	1,263	3,106	6,646	4,172	-	**27,891**
LFO	722	946	701	12	119	920	386	-	**3,804**
HFO	416	102	-	-	28	36	-	..	**582**

*Gasoline data are confidential in RESD and have been estimated

1997 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,077	6,663	14,335	2,386	5,108	12,495	6,572	2	**50,639**
NG	-	2,663	6,113	661	617	2,014	1,784		**13,851**
NG liquids	87	197	2,141	174	176	748	155	2	**3,679**
Total RPPs	2,991	3,804	6,081	1,551	4,315	9,734	4,633	-	**33,109**
Gasoline*	738	49	187	201	378	340	115	-	**1,275**
Kerosene	10	53	-	-	3	4	17	-	**87**
Diesel	1,713	2,657	5,092	1,332	3,734	8,501	4,136	-	**27,166**
LFO	738	1,026	802	18	162	865	365	-	**3,978**
HFO	522	19	-	-	38	24	-	..	**603**

*Gasoline data are confidential in RESD and have been estimated

1998 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,074	6,461	15,526	3,338	5,025	10,203	5,957	6	**49,590**
NG	-	2,553	5,951	1,203	490	1,495	1,416		**13,108**
NG liquids	41	133	1,794	383	490	959	209	6	**4,015**
Total RPPs	3,033	3,775	7,780	1,751	4,045	7,749	4,332	-	**32,467**
Gasoline*	755	56	204	221	419	377	131	-	**1,418**
Kerosene	8	8	-	-	3	1	6	-	**26**
Diesel	1,804	3,010	6,947	1,510	3,468	7,328	3,966	-	**28,032**
LFO	755	694	629	20	122	17	229	-	**2,466**
HFO	460	7	-	-	33	26	-	..	**525**

*Gasoline data are confidential in RESD and have been estimated

1999 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,305	6,608	16,727	3,383	5,234	11,215	5,631	143	**52,246**
NG	-	2,686	7,171	1,370	499	1,770	1,214		**14,709**
NG liquids	66	135	1,157	95	950	1,252	161	10	**3,826**
Total RPPs	3,238	3,787	8,399	1,918	3,785	8,193	4,256	133	**33,711**
Gasoline*	737	62	229	246	468	419	142	5	**1,580**
Kerosene	3	14	-	-	4	5	2	24	**53**
Diesel	2,108	3,062	7,506	1,647	3,250	7,734	3,905	86	**29,298**
LFO	737	645	664	25	40	5	207	18	**2,341**
HFO	383	4	-	-	23	30	-	..	**439**

*Gasoline data are confidential in RESD and have been estimated

2000 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,443	6,383	18,244	3,043	4,808	11,071	6,007	138	**53,137**
NG	-	2,385	6,931	1,131	590	1,895	1,109		**14,041**
NG liquids	49	164	690	28	313	1,244	126	14	**2,627**
Total RPPs	3,394	3,834	10,623	1,883	3,905	7,933	4,772	124	**36,469**
Gasoline*	773	70	263	280	538	482	163	5	**1,818**
Kerosene	6	12	-	1	4	5	4	16	**48**
Diesel	2,222	2,893	9,634	1,547	3,348	7,412	4,431	87	**31,574**
LFO	773	852	726	55	-	9	174	16	**2,605**
HFO	377	7	-	-	15	25	-	..	**424**

*Gasoline data are confidential in RESD and have been estimated

2001 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,698	6,546	17,911	3,211	4,399	11,065	5,668	177	**52,675**
NG	-	2,408	6,214	1,122	570	1,613	1,003		**12,931**
NG liquids	31	182	647	33	161	1,404	129	28	**2,614**
Total RPPs	3,667	3,956	11,050	2,055	3,668	8,047	4,536	149	**37,130**
Gasoline*	821	80	302	322	616	547	186	6	**2,079**
Kerosene	3	19	2	1	5	5	4	4	**42**
Diesel	2,390	2,988	10,124	1,684	3,020	7,462	4,159	127	**31,954**
LFO	821	864	622	48	-	3	187	12	**2,557**
HFO	436	5	-	-	27	30	-	..	**498**

*Gasoline data are confidential in RESD and have been estimated

2002 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,767	7,998	22,425	3,642	4,948	11,151	6,607	149	**60,685**
NG	-	3,542	9,024	1,250	606	1,894	1,136		**17,453**
NG liquids	25	201	590	48	89	1,212	92	9	**2,265**
Total RPPs	3,741	4,255	12,811	2,344	4,253	8,045	5,379	140	**40,967**
Gasoline*	1,110	94	351	378	711	640	221	7	**2,417**
Kerosene	3	5	2	1	6	10	3	5	**35**
Diesel	2,094	3,143	11,888	1,915	3,494	7,367	4,981	98	**34,982**
LFO	1,110	1,005	570	50	1	5	174	30	**2,945**
HFO	517	8	-	-	41	23	-	..	**588**

*Gasoline data are confidential in RESD and have been estimated

2003 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,866	9,795	23,555	3,979	5,648	10,775	7,580	266	**65,465**
NG	-	4,191	9,222	1,458	680	1,772	1,379		**18,702**
NG liquids	25	167	672	48	53	1,116	78	10	**2,171**
Total RPPs	3,841	5,437	13,661	2,473	4,915	7,887	6,123	256	**44,592**
Gasoline*	1,083	106	393	417	791	713	246	8	**2,692**
Kerosene	3	16	3	13	7	9	4	21	**76**
Diesel	2,276	4,047	12,436	2,002	4,117	7,130	5,744	200	**37,953**
LFO	1,083	984	829	41	-	4	129	27	**3,098**
HFO	458	284	-	-	-	31	-	..	**773**

*Gasoline data are confidential in RESD and have been estimated

2004 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	4,442	10,902	25,579	4,266	5,566	11,441	8,224	206	**70,624**
NG	-	4,872	9,215	1,541	776	1,778	1,735		**19,916**
NG liquids	25	191	725	43	53	1,120	71	12	**2,240**
Total RPPs	4,417	5,839	15,639	2,682	4,737	8,542	6,418	194	**48,468**
Gasoline*	1,181	113	420	441	836	757	263	8	**2,860**
Kerosene	5	20	5	3	10	8	4	23	**78**
Diesel	2,700	4,524	14,421	2,180	3,891	7,746	5,985	138	**41,585**
LFO	1,181	1,082	793	58	-	5	166	25	**3,309**
HFO	510	100	-	-	-	26	-	..	**636**

*Gasoline data are confidential in RESD and have been estimated

2005 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	4,109	8,919	27,428	4,619	6,224	13,652	8,698	210	**73,859**
NG	-	4,243	8,341	1,645	708	2,139	1,829		**18,905**
NG liquids	35	326	1,108	35	43	992	99	18	**2,658**
Total RPPs	4,073	4,349	17,978	2,939	5,473	10,521	6,770	192	**52,296**
Gasoline*	958	112	416	441	837	751	263	7	**2,848**
Kerosene	6	18	5	5	11	8	3	18	**74**
Diesel	2,853	3,083	15,429	2,469	4,563	9,740	6,299	150	**44,587**
LFO	958	777	1,182	24	62	1	205	17	**3,226**
HFO	235	359	946	-	-	21	-	..	**1,561**

*Gasoline data are confidential in RESD and have been estimated

2006 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	4,161	11,076	26,643	4,340	5,822	14,607	8,237	199	**75,084**
NG	-	3,987	7,774	1,745	765	2,567	1,921		**18,759**
NG liquids	35	256	1,288	38	43	1,020	73	18	**2,771**
Total RPPs	4,125	6,833	17,580	2,557	5,014	11,020	6,243	181	**53,554**
Gasoline*	857	119	441	469	885	799	292	3	**3,034**
Kerosene	4	11	4	4	19	4	4	15	**64**
Diesel	3,096	5,345	15,708	2,050	4,071	10,196	5,701	151	**46,318**
LFO	857	924	942	34	39	-	246	12	**3,054**
HFO	145	434	485	..	..	21	..	-	**1,084**

*Gasoline data are confidential in RESD and have been estimated

2007 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	4,544	11,806	25,310	5,281	7,141	14,202	9,574	181	**78,039**
NG	-	4,050	7,227	1,993	1,238	2,537	2,069		**19,114**
NG liquids	38	309	1,453	46	43	1,081	106	23	**3,099**
Total RPPs	4,506	7,447	16,630	3,243	5,860	10,584	7,399	158	**55,827**
Gasoline*	1,045	64	357	626	1,045	756	463	8	**3,368**
Kerosene	4	19	4	4	15	-	4	11	**60**
Diesel	3,291	6,009	15,329	2,601	4,784	9,794	6,720	127	**48,655**
LFO	1,045	1,035	936	12	16	8	212	12	**3,275**
HFO	119	320	4	..	..	26	..	-	**469**

*Gasoline data are confidential in RESD and have been estimated

2008 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	4,046	11,081	26,736	5,340	7,404	13,956	9,595	187	**78,345**
NG	-	4,006	7,982	1,928	1,410	1,533	1,817		**18,675**
NG liquids	40	253	1,574	53	48	1,174	129	25	**3,296**
Total RPPs	4,006	6,821	17,181	3,358	5,946	11,249	7,649	162	**56,373**
Gasoline*	1,143	73	386	570	1,144	792	452	7	**3,473**
Kerosene	4	23	4	-	4	-	-	4	**38**
Diesel	2,719	5,369	15,951	2,775	4,771	10,423	7,099	143	**49,250**
LFO	1,143	877	836	13	27	8	98	8	**3,009**
HFO	94	479	4	-	-	26	-	-	**603**

*Gasoline data are confidential in RESD and have been estimated

2009 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	3,768	15,871	23,514	3,964	6,968	10,842	6,461	255	**71,643**
NG	-	4,927	5,357	1,453	799	1,068	853		**14,457**
NG liquids	38	233	1,420	46	53	1,076	101	10	**2,977**
Total RPPs	3,730	10,712	16,737	2,466	6,116	8,698	5,507	245	**54,209**
Gasoline*	733	340	1,379	626	1,410	1,127	596	22	**5,551**
Kerosene	-	30	4	-	8	-	-	8	**49**
Diesel	2,850	8,549	13,796	1,815	4,604	7,514	4,703	207	**44,037**
LFO	733	764	869	16	39	31	89	8	**2,549**
HFO	98	1,029	689	9	55	26	119	-	**2,023**

*Gasoline data are confidential in RESD and have been estimated

2010 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	6,279	17,499	24,864	4,895	7,646	12,635	7,536	246	**81,600**
NG	-	5,843	6,444	2,057	1,225	1,429	1,406		**18,405**
NG liquids	39	287	1,512	31	47	1,339	107	14	**3,376**
Total RPPs	6,240	11,369	16,908	2,807	6,374	9,867	6,023	232	**59,822**
Gasoline*	974	491	2,093	813	1,571	2,193	933	67	**8,315**
Kerosene	-	28	3	..	6	-	13	11	**60**
Diesel	4,571	9,239	12,804	1,954	4,676	7,484	4,998	151	**45,877**
LFO	974	941	1,164	6	53	48	72	3	**3,260**
HFO	544	670	844	34	68	142	7	-	**2,309**
Aviation Gasoline								-	**1**

*Gasoline data are confidential in RESD and have been estimated

2011 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	6,138	18,322	25,660	5,284	7,936	15,689	9,378	569	**88,976**
NG	-	4,838	4,155	2,209	864	2,940	1,838		**16,844**
NG liquids	30	298	1,805	31	46	1,562	99	18	**3,889**
Total RPPs	6,108	13,186	19,700	3,044	7,026	11,187	7,441	551	**68,244**
Gasoline*	729	588	3,038	647	1,560	3,277	883	6	**10,132**
Kerosene	15	60	177	..	-	..	-	8	**260**
Diesel	5,052	11,356	15,232	2,367	5,308	7,675	5,331	525	**52,846**
LFO	729	489	1,253	-	47	19	50	12	**2,600**
HFO	179	693	-	30	111	216	1,177	-	**2,406**
Aviation Gasoline								-	**-**

*Gasoline data are confidential in RESD and have been estimated

2012 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	5,241	18,703	26,991	7,256	7,664	16,218	10,052	251	**92,377**
NG	-	5,499	4,199	2,086	591	3,065	1,844		**17,292**
NG liquids	30	329	2,103	35	62	1,975	91	15	**4,632**
Total RPPs	5,211	12,875	20,689	5,135	7,011	11,178	8,117	237	**70,453**
Gasoline*	487	802	2,533	1,023	1,425	3,466	1,025	9	**10,417**
Kerosene	-	65	242	..	15	-	1	12	**335**
Diesel	4,451	10,984	16,721	4,060	5,518	7,508	5,828	209	**55,276**
LFO	487	343	1,189	22	-	21	14	7	**2,084**
HFO	140	681	4	30	53	183	1,249	-	**2,341**
Aviation Gasoline								-	**-**

*Gasoline data are confidential in RESD and have been estimated

2013 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	4,436	17,515	25,953	7,107	8,922	15,799	9,051	184	**88,967**
NG	11	5,689	3,905	2,394	595	3,696	1,207		**17,501**
NG liquids	23	347	1,474	39	47	1,683	82	14	**3,705**
Total RPPs	4,402	11,479	20,574	4,674	8,280	10,420	7,762	170	**67,761**
Gasoline*	411	845	2,306	1,029	1,671	2,762	967	9	**9,688**
Kerosene	..	52	210	..	1	22	2	12	**299**
Diesel	3,921	9,703	17,141	3,614	6,540	7,392	6,775	148	**55,233**
LFO	411	331	917	4	3	73	10	1	**1,671**
HFO	51	548	-	27	65	171	8	-	**870**
Aviation Gasoline								-	**-**

*Gasoline data are confidential in RESD and have been estimated

2014 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	5,522	15,976	23,447	7,260	8,650	15,995	8,410	159	**85,420**
NG	12	5,820	3,862	2,175	682	3,818	1,208		**17,576**
NG liquids	16	341	1,331	32	58	1,553	90	12	**3,413**
Total RPPs	5,494	9,815	18,254	5,053	7,910	10,624	7,112	154	**64,431**
Gasoline*	513	634	1,904	996	1,584	2,571	933	8	**8,938**
Kerosene	..	56	312	..	1	3	11	2	**385**
Diesel	4,894	8,227	14,782	4,024	6,248	7,858	6,148	133	**52,321**
LFO	513	316	1,256	3	15	18	12	11	**1,959**
HFO	17	582	-	30	62	174	8	-	**827**
Aviation Gasoline								-	

*Gasoline data are confidential in RESD and have been estimated

2015 Construction Industry Energy Use, Provincial Breakdown (TJ)

Fuel	Atlantic	Québec	Ontario	Manitoba	Saskatchewan	Alberta	Brit. Columbia	Territories	Canada
Total Energy	6,923	16,084	27,058	6,598	10,413	16,537	8,202	158	**91,973**
NG	12	5,605	3,724	2,090	795	4,034	1,294		**17,555**
NG liquids	20	348	1,307	27	60	1,484	74	11	**3,326**
Total RPPs	6,891	10,131	22,027	4,481	9,558	11,019	6,834	154	**71,092**
Gasoline*	644	616	2,400	1,120	1,929	2,560	887	8	**9,831**
Kerosene	-	43	289	-	1	3	9	2	**344**
Diesel	6,138	8,551	18,369	3,335	7,549	8,269	5,905	136	**57,971**
LFO	644	320	969	-	4	7	12	8	**2,033**
HFO	18	601	-	26	75	180	21	..	**913**
Aviation Gasoline								..	

*Gasoline data are confidential in RESD and have been estimated

4. Physical Fuel Consumption

Total National Construction Industry Physical Fuel Consumption

Fuel Type	Units	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Natural Gas	G litres	516.70	326.60	369	494	490	499	486	376	478	437	446	451	451	447
NG Liquid	M litres	279.60	151.50	103	105	109	122	130	118	133	154	183	146	135	131
Total RPPs	**000 m³**	**1,037.70**	**859.40**	**948**	**1,368**	**1,402**	**1,464**	**1,478**	**1,423**	**1,575**	**1,800**	**1,859**	**1,790**	**1,702**	**1,878**
Gasoline	*000 m³*		*29*	*52*	*81*	*87*	*96*	*99*	*159*	*238*	*289*	*298*	*277*	*255*	*281*
Kerosene	000 m³	9.20	2.4	1.3	2.0	1.7	1.6	1.0	1.3	1.6	6.9	8.9	7.9	10.2	9.1
Diesel	000 m³	875.50	724	816	1165	1210	1271	1286	1150	1198	1380	1443	1442	1366	1514
Light Fuel Oil	000 m³	120.50	88.0	67	83	79	84	78	66	84	67	54	43	51	52
Heavy Fuel Oil	000 m³	32.50	15.1	10.2	36.7	25.5	11.0	14.2	47.6	54.3	56.6	55.1	20.5	19.5	21.5
Aviation Gas	000 m³		0.0	0.0	x	x	x	0.0	x	0.0	0.0	0.0	0.0	0.0	0.0

Source: STC RESD[12]

Note: Gasoline data are confidential in RESD and have been estimated

5. Emissions Data

Construction Sector CO_2 Emissions by Fuel Type (tonnes)

Fuel Type	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Natural Gas	977,080	617,601	697,590	934,343	927,157	943,231	919,404	711,394	903,520	825,989	844,142	851,896	852,274	846,033
NG Liquid	423,594	229,523	155,742	159,102	165,866	185,439	197,351	178,197	201,900	232,727	277,261	221,773	204,295	199,087
Total RPPs	2,812,954	2,291,465	2,499,752	3,670,950	3,755,810	3,911,676	3,950,161	3,794,436	4,179,082	4,762,856	4,916,031	4,723,894	4,492,868	4,957,465
Gasoline	-	*46,766*	*83,109*	*188,456*	*200,764*	*222,865*	*229,813*	*367,318*	*550,282*	*670,449*	*689,308*	*641,069*	*591,490*	*650,547*
Kerosene	23,552	6,144	3,328	5,120	4,352	4,096	2,560	3,328	4,096	17,664	22,784	20,224	26,112	23,296
Diesel	2,355,095	1,948,636	2,195,847	3,132,774	3,253,555	3,417,645	3,459,340	3,092,693	3,222,082	3,711,662	3,882,208	3,879,249	3,674,809	4,071,584
LFO	331,737	242,264	185,277	228,774	216,661	232,353	213,633	180,872	231,252	184,451	147,836	118,654	139,027	144,257
HFO	102,570	47,656	32,191	115,825	80,478	34,716	44,815	150,226	171,371	178,630	173,896	64,698	61,430	67,781
Total	**4,213,627**	**3,138,588**	**3,353,084**	**4,764,395**	**4,848,833**	**5,040,346**	**5,066,917**	**4,684,027**	**5,284,502**	**5,821,571**	**6,037,435**	**5,797,563**	**5,549,436**	**6,002,585**

Source: Calculated from STC RESD data using ECCC conversion coefficients (ECCC, 2016)

Note: Gasoline data are confidential in RESD and have been estimated

[12] Provincial physical fuel data available upon request.

Appendix D: Data Tables for Construction, all sectors (NAICS 230)

1) **NAICS Energy Use Report**: Energy use, industry production, intensity indicators and index are provided for the construction industry, all sectors. Conversion coefficients from energy in physical units to terajoules (TJ) come from Statistics Canada Cat No: 57-003 XPB. See Appendix A for details.
2) **NAICS Carbon Dioxide Report**: CO_2 emissions, industry production, intensity indicators and index are provided for the construction industry, all sectors. Conversion coefficients from energy in physical units to CO_2 come from ECCC 2017. See Appendix A for details.
3) **NAICS Methane Report**: CH_4 emissions, industry production, intensity indicators and index are provided for the construction industry, all sectors. Conversion coefficients from energy in physical units to CH_4 come from ECCC 2017. See Appendix A for details.
4) **NAICS Nitrous Oxide Report**: N_2O emissions, industry production, intensity indicators and index are provided for the construction industry, all sectors. Conversion coefficients from energy in physical units to N_2O come from ECCC 2017. See Appendix A for details.
5) **NAICS Total GHG Report**: Sum of all GHG emissions, industry production, intensity indicators and index are provided for the construction industry, all sectors. Conversion coefficients from energy in physical units to carbon dioxide equivalents (CO_2e) come from ECCC 2017. See Appendix A for details.