



INDUSTRIAL CONSUMPTION OF ENERGY SURVEY

Statistical Report of Energy Use in the Canadian Manufacturing Sector, 1997–2017

Statistics Canada annually conducts the Industrial Consumption of Energy (ICE) survey (co-sponsored by the Office of Energy Efficiency (OEE) of Natural Resources Canada (NRCan) and Environment and Climate Change Canada. The survey collects energy use data from establishments in Canada's Manufacturing sector. The survey is an essential tool for monitoring the evolution of energy consumption by manufacturing industries and helps to fulfill part of the OEE's mandate to strengthen and expand Canada's commitment to energy efficiency.

This statistical report examines energy use patterns for the Canadian Manufacturing sector using the results of the 2017 ICE survey. The estimates are based on the North American Industry Classification System (NAICS) and include all 21 subsectors of the Manufacturing sector (NAICS 31 to 33).

Manufacturing continued to reduce energy intensity in 2017

After a brief pause during the 2008–2009 recession, manufacturing energy intensity has **continued to decline**. In 2017, it was about **11 percent below the pre-recession peak of 2004**. Longer term, energy intensity declined 24 percent from 1997 to 2017.¹ These figures represent an absolute drop in the sector's energy use of about **360 petajoules (PJ)**, which is roughly equivalent to the amount of energy consumed by cars in Ontario, Quebec and the Atlantic provinces in 2017.²

¹ GDP figures, reported in constant 2012 prices, are available only starting in 1997.

² Natural Resources Canada, Comprehensive Energy Use Database, 1990–2017, Transportation Sector, Canada, Table 31.

Over the 1997–2017 period, activity in the Manufacturing sector³ shifted. The shift was from Paper Manufacturing, the subsector with the **highest rate of energy use per unit of gross domestic product (GDP)**, toward **less energy-intensive industries** (such as Chemical and Food Manufacturing). This change, combined with efficiency improvements in other energy-intensive subsectors, resulted in an **overall reduction in energy intensity of the Manufacturing sector** from **14.5 megajoules per dollar of GDP (MJ/\$GDP) in 1997 to 10.9 MJ/\$GDP in 2017**.

The trend in improved energy intensity is evident over both the long- and short-term. The sector continued its recovery from the global economic downturn in 2009 as GDP increased steadily in the following years. Figure 1 indicates that **output of the Manufacturing sector has outpaced energy use**, resulting in continued **improvement in energy intensity**. An important contributor to this improvement is the [Canadian Industry Partnership for Energy Conservation \(CIPEC\)](#), which supports a network of almost 2,400 facilities and more than 50 trade associations. They work together to **cut costs, improve energy efficiency and reduce industrial GHG emissions**. To encourage and support industry's energy efficiency efforts, NRCan offers Canadian industry **tools and services** through CIPEC. These include benchmarking reports, best practice guides and cost-shared assistance.

³ Although there are 21 subsectors in the Manufacturing sector, 7 subsectors accounted for almost 92 percent of all energy consumption in the sector in 2017.

In 2017, the Manufacturing sector generated **\$198.6 billion in GDP** (constant 2012 dollars) and consumed **2,171.7 PJ** of energy. This amount is roughly equal to twice the energy consumed for freight transportation in Canada in 2017.

Cascades Inc. – An industry leader in energy efficiency after two decades of commitment

Cascades Inc. makes products out of recycled fibres and, consequently, has had an environmental attitude from its earliest days.



Energy costs represent a large portion of Cascades' total costs, so energy efficiency

was a natural focal point. To address energy costs, in the 1990s, the forward-looking company established a division of 15 employees who specialize in energy management.

The energy efficiency team's objectives have included large projects, such as implementing a company-wide energy management system, defining overall energy-reduction targets, and establishing specific energy efficiency action plans with Cascades' many production facilities. For example, Cascades undertook a program to replace propane forklifts with electric ones – ideal for Cascades facilities located in Quebec, which use carbon-neutral hydroelectricity.

Just since 2013, over 130 projects have taken place at Cascades. The total energy savings have been over 1 million GJ, which is equivalent to the average yearly energy consumption of 9,503 Canadian households. Cascades is now positioned as an extraordinarily efficient company in the pulp and paper industry. It uses only 9.9 GJ/tonne to manufacture its products, which is 63 percent less energy than the Canadian industry average, which uses 26.7 GJ/tonne.

Figure 1. Indexed growth of energy use, GDP and energy intensity for the Manufacturing sector, 2009–2017

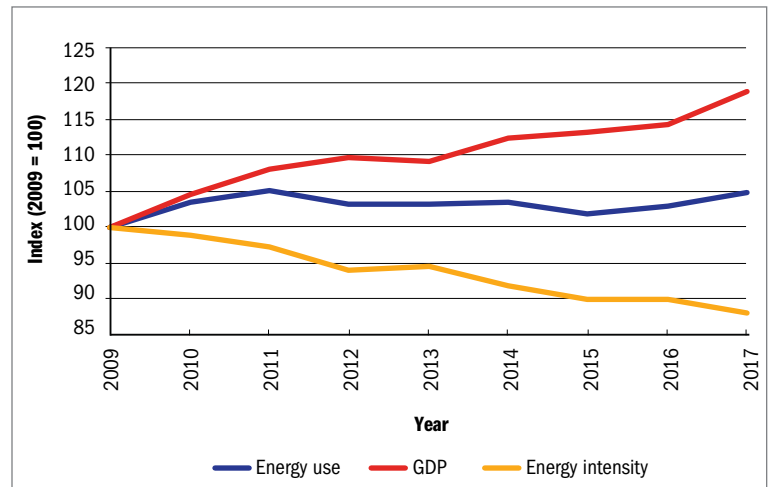


Table 1 demonstrates that **five of the seven** most energy-consuming subsectors **reported a decline in energy use** in 2017 compared to 1997, with the most significant decline being in **Paper Manufacturing** (-33.6 percent). Several **factors** can influence the amount of energy used by a particular industry, such as its level of **economic activity**, its **structure**, and **how efficiently it uses energy**. Adopting more efficient energy-related processes or technologies helps an industry reduce its demand for energy. Examples are **waste energy recovery** and **re-use and cogeneration** in the Paper Manufacturing subsector.

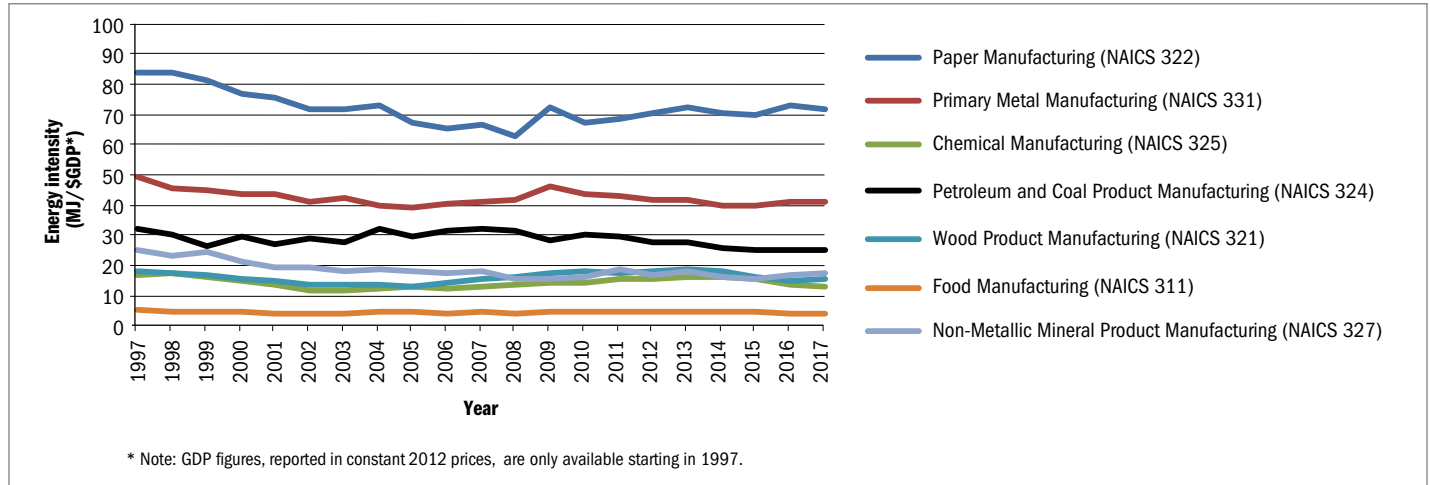
Table 1. Comparison of energy use, GDP and energy intensity of the Manufacturing sector and selected subsectors, 1997–2017

Sector and subsectors	Change in energy consumption (%)	Change in GDP* (%)	Change in energy intensity (%)
Total Manufacturing	-14.3	13.3	-24.3
Paper	-33.6	-22.5	-14.4
Primary Metal	-4.6	13.5	-16.0
Chemical	-9.5	18.1	-23.3
Petroleum and Coal Product	-0.4	29.5	-23.1
Wood Product	13.1	32.5	-14.6
Food	15.4	49.4	-22.7
Non-Metallic Mineral Product	-6.9	35.1	-31.1

Note: GDP figures, reported in constant 2012 prices, are available only starting in 1997.

Figure 2 shows that the **seven subsectors experienced a decrease in energy intensity** from 1997 to 2017. **Significant decreases** occurred for **Non-Metallic Mineral Product Manufacturing** (-31.1 percent), **Chemical Manufacturing** (-23.3 percent), **Petroleum and Coal Product Manufacturing** (-23.1 percent) and **Food Manufacturing** (-22.7 percent).

Figure 2. Energy intensity of the seven selected subsectors, 1997-2017

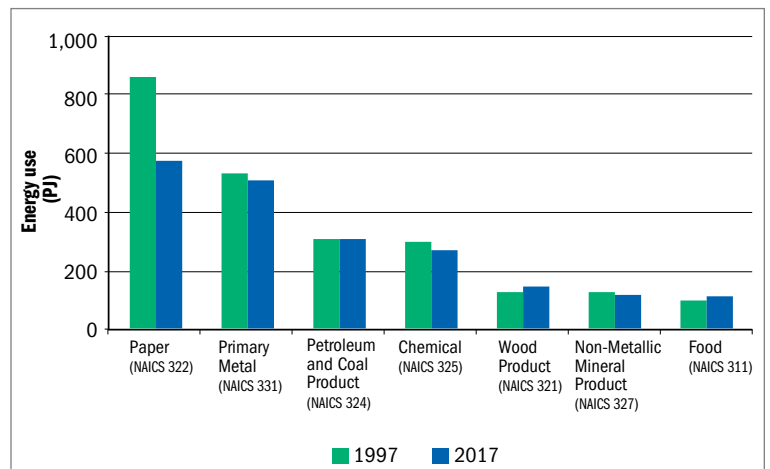


Energy consumption has varied by subsector

Some of the biggest changes in energy consumption levels occurred in subsectors that had large fluctuations in outputs, including:

- Energy consumption in Paper Manufacturing decreased **33.6 percent** from 1997 to 2017 (GDP fell **22.5 percent**).
- Food Manufacturing consumed **15.4 percent** more energy in 2017 compared to 1997 (GDP increased **49.4 percent**).

Figure 3. Energy consumption of the seven selected Manufacturing subsectors, 1997 and 2017



Weston Foods becomes the first bakery to be ENERGY STAR for Industry certified

Weston Foods' commitment to managing their use of energy more efficiently has earned them ENERGY STAR for Industry certification. Weston is one of the first two Canadian companies and the first bakery manufacturer to do so. Twelve Weston bakeries in Canada are now ENERGY STAR certified, which recognizes them as top energy performers in their sector. In fact, Weston's ENERGY STAR certified facilities have routinely exceeded the company's goal of a 2-percent annual reduction in water and energy use.

Process and equipment improvements at Weston to help reduce energy use are ongoing. For example, upgrades to the variable frequency drives on the air compressor system in the Sudbury facility have reduced energy consumption by 50 percent. Moving forward on energy efficiency, Weston wants to align with the ENERGY STAR for Industry certification brand to promote its environmental commitments as a premier bakery in North America.



Fuel mix has evolved

The fuel mix used by the Manufacturing sector has changed since the 2008–2009 recession. **Natural gas** was **31.6 percent** of energy use in 2017, up from **27.2 percent** in 2009, while **electricity use** has remained constant during that period (29 percent share). The price of natural gas fell from 33.5¢ per cubic metre (¢/m³) in 2008 to 13.0¢/m³ in 2017, while industrial electricity prices, on a national basis, were more stable.

Significant **reductions** were evident in the consumption of many energy sources from 1997 to 2017, in particular **propane, middle distillates and coke oven gas**, whereas the use of **steam increased** substantially.

Table 2. Manufacturing sector's energy use by energy source, 1997 and 2017

Energy source	1997 energy (PJ)	2017 energy (PJ)	Growth, 1997-2017 (%)
Natural gas	824.9	686.0	-16.8
Electricity	640.2	622.0	-2.9
Coal	43.4	41.9	-3.4
Coke	97.6	82.2	-15.7
Coke oven gas	30.9	19.7	-36.1
Petroleum coke and coke from catalytic cracking catalyst	62.4	X	N/A
Heavy fuel oil	137.7	X	N/A
Middle distillates	21.8	13.5	-38.1
Propane	14.2	7.3	-48.9
Refinery fuel gas	145.6	X	N/A
Butane	..	X	N/A
Spent pulping liquor	302.9	238.9	-21.1
Steam	30.0	41.6	38.7
Wood	181.5	178.5	-1.6
Total	2,533.0	2,171.7	-14.3

Note: Because of rounding, the numbers in the table may not add up.

.. stands for not available for a specific reference period

X Suppressed to meet the confidentiality requirements of the *Statistics Act*.

N/A stands for not applicable

3M's long history of strengthening energy efficiency

3M has carefully managed their energy use for decades and developed a strong culture of continuous improvement in energy efficiency. In 2008, the company appointed a dedicated, full-time **energy manager**, enabling the company to pursue a common approach to energy efficiency and significantly improve its performance.

This culture led to the **implementation of the ISO 50001 Energy Management standard**. As 3M explained, "No other program can bring as much success and payback as a properly implemented ISO 50001-certified energy management system. The framework it provides ensures our energy-saving measures will lead to **bottom-line results** as well as influence an **evolving culture of sustainability and energy stewardship**." Its facilities have shown an energy performance **improvement of 25 percent**, resulting in **annual savings of about \$150,000** for each manufacturing plant.



For a full breakdown of energy use, GDP and energy intensity for the Manufacturing sector and selected subsectors, see the OEE website at oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/ice/2017/tables.cfm.

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HVAC reconfiguration means energy savings for CAE Inc.

Making a significant investment in energy efficiency made big sense for Montreal-based CAE Inc. The company, based in Montreal, has 3,200 employees working at its 97,000 m² corporate headquarters and flight simulator factory. Built in 1954, the plant has undergone many expansions, including the addition of heating, ventilation, and air conditioning (HVAC) equipment to meet increasing demand. In 2013, it invested heavily in a retrofit of its HVAC system, including reconfiguration of all rooftop HVAC units as well as the addition of a heat recovery network. Since securing capital for a project not related to core business can be difficult, a solid business case was developed that detailed the **tangible benefits of investing in energy-saving technology**.

The new system has lived up to its promise. Annual electricity and natural gas consumption **have fallen by 31 percent and 38 percent**, respectively. Overall **energy intensity has dropped by 0.49 GJ/m²**. CAE now pays nearly **\$1 million less per year in energy and maintenance costs** – demonstrating that an investment in energy efficiency can yield substantial paybacks.

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