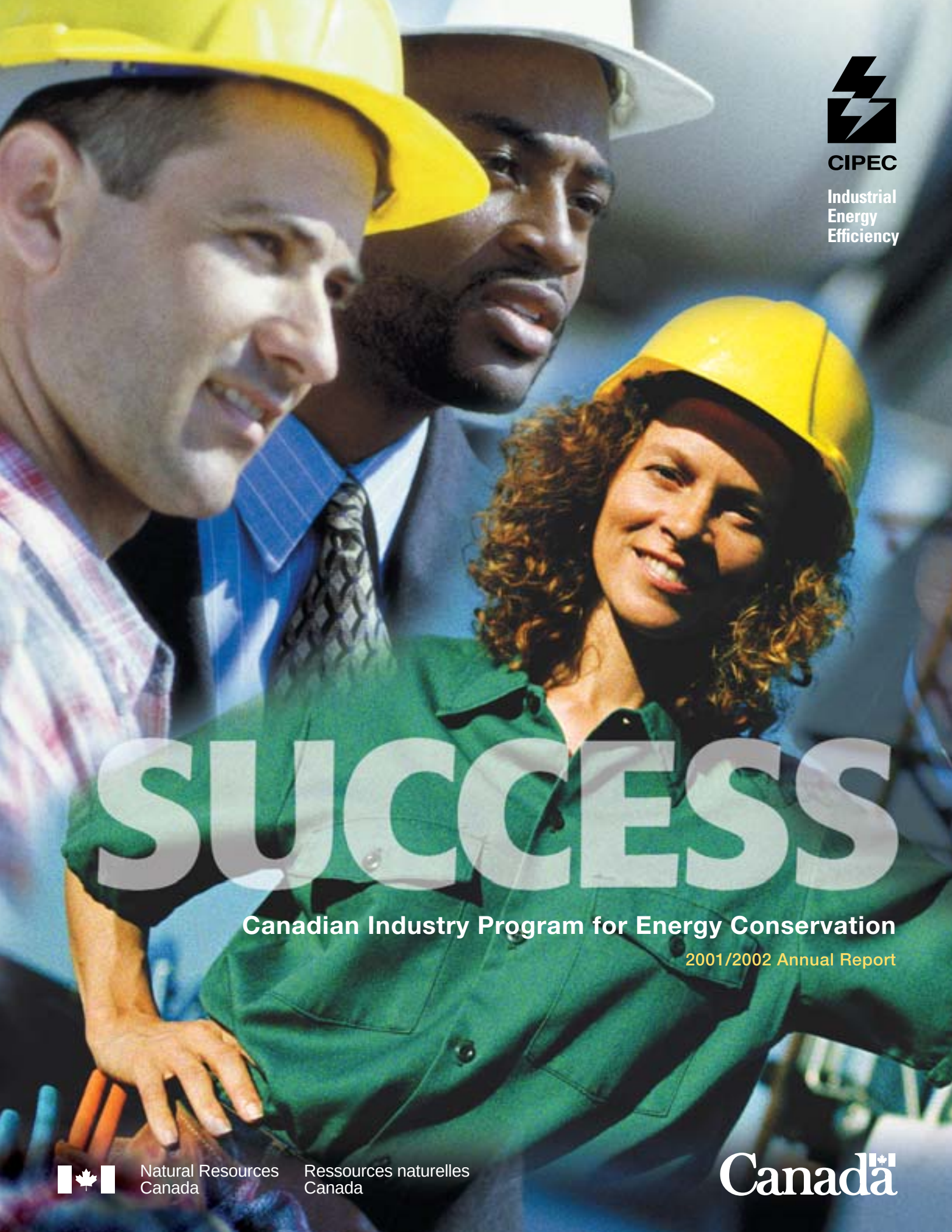

CIPEC

Industrial Energy Efficiency

SUCCESS

Canadian Industry Program for Energy Conservation

2001/2002 Annual Report

Natural Resources Canada | Ressources naturelles Canada

Canada

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2001/2002 ANNUAL REPORT

Success Stories

Sector Reports

OUR MISSION

To promote effective voluntary action that reduces industrial energy use per unit of production, thereby improving economic performance while participating in meeting Canada's climate change objectives.

The following companies exhibit the vision and perspective that symbolize CIPEC's mission.

BHP Billiton Diamonds Inc.'s recently formed "Operating Excellence" team at its Ekati Diamond Mine™ in the Northwest Territories has invigorated the company's energy efficiency efforts. Because all fuel used at the mine must be trucked in, minimizing energy consumption is vital to the mine's economic viability.

Operating Excellence

at Northwest Territories diamond mine

Although the mine is energy efficient by design and the company has an eight-year record of investing in energy savings, Operating Excellence has taken earlier efforts to a new level by instilling a relentless commitment to seizing every available opportunity to reduce waste.

The Operating Excellence team, formed in April 2002, is made up of a small group of passionate volunteers from a number of departments. Their goal is to save 500 000 litres of fuel per year – about 6 percent of the mine's annual consumption. Seeking to build an energy-saving culture within the company, the team introduced a suggestion program that garnered overwhelming response. Reinforced by an energy awareness program that includes prizes and recognition, the mine began installing motion-sensor lighting and educating staff to turn out lights in unoccupied areas. Thanks to the suggestions it received as well as its own ideas, within three weeks of its launch, the Operating Excellence team cut fuel usage by an impressive 88 000 litres per year.

Operating Excellence continues to look at all corners of the mine's operations for additional energy savings. For example, the team is investigating the possibility of replacing diesel fuel with used oil in its waste incinerators, potentially saving as much as 475 000 litres of fuel per year. With a great deal of energy needed to pump potable water at the mine, the team is also looking at cutting electricity consumption by improving the efficiency of water-handling equipment, including devices as small as toilets and sinks.

Photo courtesy of BHP Billiton Diamonds Inc.

With its annual eight-week window of opportunity to haul 90 million litres of fuel oil northward on a winter road that is open only from late January to late March, BHP Billiton Diamonds Inc. is concerned more with fuel savings than dollar savings.

Like most of The Clorox Company of Canada, Ltd.'s manufacturing operations, the Glad Division plant in Orangeville, Ontario, has been actively seeking ways to improve its energy efficiency.

Community action

preserves an efficient transportation option

In recent years, the plant has installed high-efficiency lighting systems and motion-sensor-activated lights, wrapped its extruder manifolds with insulating blankets and retrofitted its switch gears with capacitors – all in aid of conserving energy. However, it is the company's participation in the preservation and operation of a railway line that has attracted the most attention.

Spearheading a consortium of six local companies, Clorox played a vital role in acquiring the mothballed 55-kilometre Canadian Pacific Railway line between Orangeville and Streetsville, Ontario, and creating a company to operate it. The consortium, called the Orangeville-Brampton Rail Access Group (OBRAG), convinced provincial, county and local governments to purchase the line and took on responsibility for maintenance, capital improvement and administration. OBRAG hired Cando Contracting Ltd., a specialist in running short-haul railways, to operate the rolling stock.

Beginning operations in November 2000, the rail line now provides a vital link between local manufacturers and their supply chains, carrying about 500 freight-car loads of raw materials to Orangeville each year. Although the driving force behind the preservation of the rail line was an economic one, OBRAG estimates that its trains save a significant amount of fossil fuel consumption by replacing about 1400 annual truck trips from the Greater Toronto Area over local roads. Supplanting these stop-and-go truck trips with a non-stop train route is definitely a step in the right direction for air quality and reduced GHG emissions.

The "Pride of Orangeville" hauls raw materials twice weekly to seven manufacturers in Ontario.

Five are in Orangeville, including the Glad Division plant, and two are in Brampton.

The environmental principles under which General Motors of Canada Limited (GMCL) operates demonstrate the company's resolve to "reach further than compliance with the law to encompass the integration of sound environmental practices into our business decisions."

Persistence

pays off in energy savings for General Motors of Canada Limited

The company's persistence in fulfilling this mandate has led to impressive results in many areas, including GHG emissions reductions. Over the last decade, a far-reaching program of initiatives launched by GMCL has reduced its company-wide GHG emissions by 37 percent since 1990, in the process reducing its energy use by 479 million kWh. Energy efficiency efforts undertaken by the company at its vehicle assembly plants have reduced energy consumption per vehicle produced from 3.43 MWh in 1990 to 2.44 MWh in 2000, a decrease of 30 percent. Over the same period, GMCL realized a similar per-vehicle reduction in GHGs, from 0.652 tonnes of carbon dioxide equivalent (CO_2e) in 1990 to 0.458 tonnes in 2000.

GMCL has achieved these results through a rationalization of production and by investing in energy-efficient equipment and manufacturing processes. The company also actively informs employees and suppliers and motivates them to commit to energy efficiency in their operations. In addition, GMCL participates in such organizations as the Coalition for Environmentally Responsible Economies (CERES), which brings together environmental, investor and advocacy groups to focus on creating sustainable and socially responsible practices. GMCL is working toward an aggressive new environmental target – a 25 percent reduction in energy usage with a baseline year of 1995 by the year 2005. This would result in a projected CO_2 reduction of about 45 percent compared with a 1990 baseline.

A non-production load improvement project at General Motors of Canada Limited's site in Oshawa, Ontario, has resulted in annual energy savings of more than 2.5 million kWh.

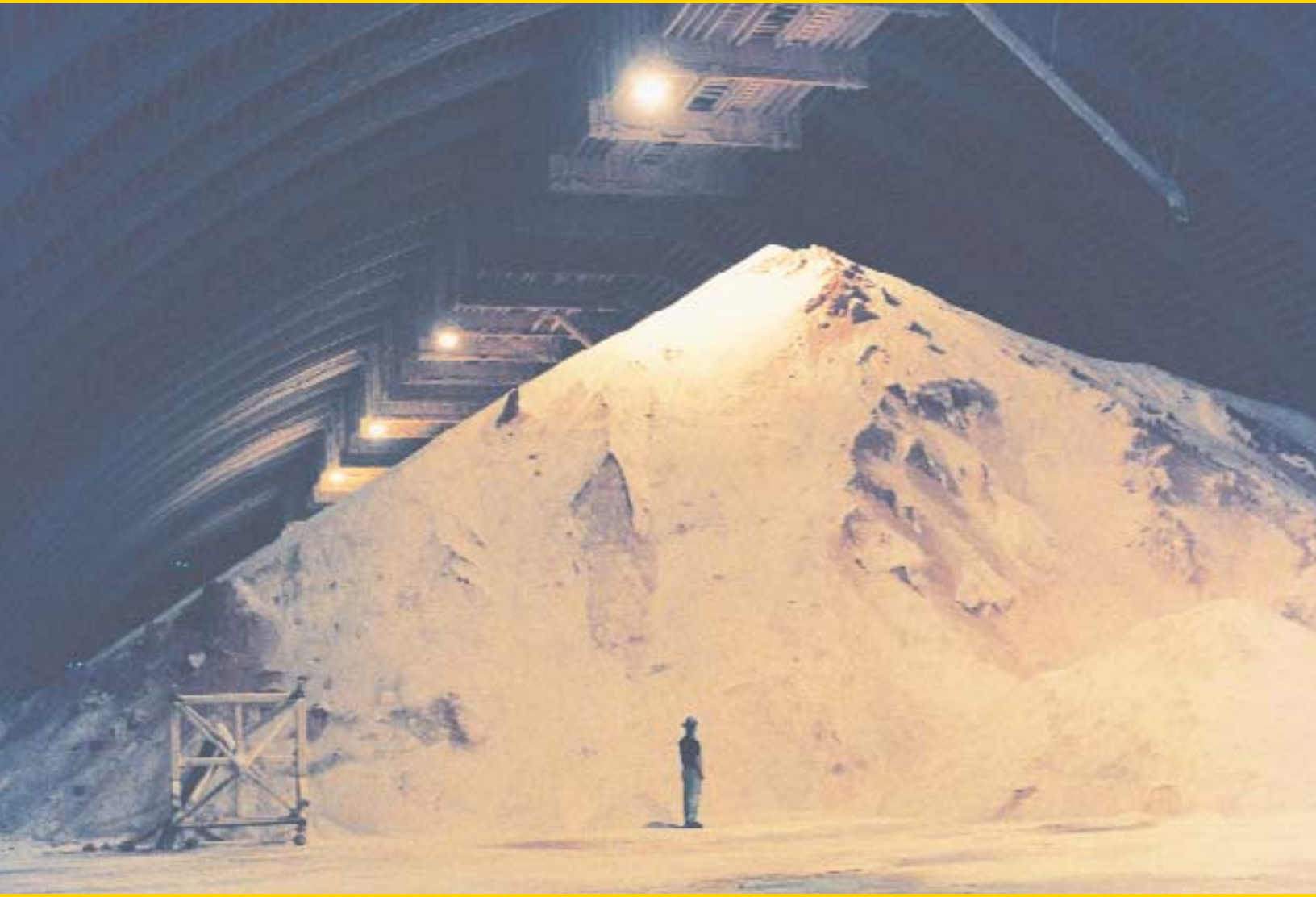
Fuelled by natural gas, the fluosolids dryer at IMC Potash Colonsay operates around the clock, 330 days a year. Drying fluosolids is an energy intensive activity, and any improvements in the process are likely to pay significant dividends in reduced energy costs at this potash mill in Colonsay, Saskatchewan.

Innovation

enables potash producer to cut process fuel consumption

The company established a project team to evaluate energy consumption in the dryer, identify the most promising possibilities for process improvement and implement these solutions. The team found that gaining better control of airflow in the dryer's windbox (thereby holding temperatures at optimum levels) offered major opportunities for a reduction in energy consumption. However, lacking adequate airflow data that would enable it to identify optimum variables for the complex equipment, the team was forced to improvise using "design of experiment" techniques. Getting it right was critical, as any mistakes would show up as a deterioration in product quality.

Using a variety of systems, technologies, practices and programs, the project team developed a solution that works for various production levels. The mill's digital control system was modified with an algorithm that mimics the response of a control operator to process changes, instantly adjusting airflow to maintain optimum drying temperatures. The project's results speak for themselves – by improving dryer fuel efficiency by 11 percent, the mill has reduced annual natural gas consumption at the Colonsay site by 1.4 million m^3 and cut electricity use by reducing the workload on windbox fans. The company estimates that the $10,000 project will save the mill $490,000 per year, results that can be tripled by duplicating the solution at two other company mills.



By reducing the natural gas consumption of its fluosolids dryer, IMC Potash Colonsay has greatly improved the mill's granular productivity while reducing its unit cost of production.

As part of a worldwide family of quality-oriented companies, Michelin North America (Canada) Inc. is committed to a simple energy management goal: to manufacture more product with less energy.

Sharing best practices

across North America drives results for Michelin

Making this happen has led the company to work closely with Michelin operations in the United States, establish and share best practices, and develop an ongoing energy training program for employees in its three tire plants in Nova Scotia. It has also provided the impetus to upgrade technology and implement practices for operations and maintenance that are more energy efficient.

Michelin has appointed an energy champion at each plant who works to ensure that energy efficiency considerations are integrated into the decision-making process and incorporated into the plant's working culture. Within its plants, power monitoring systems identify areas of prime electricity usage – the first step in developing ways to improve electrical efficiency. Ongoing audits of steam and compressed-air handling systems enable plants to identify areas that need improvement and to implement maintenance procedures that ensure that steam and air leaks are located and repaired immediately.

Investments in new technology are also yielding results. The company installed variable speed drives on four major handling units in one of its plants (an investment that paid for itself in less than one year through energy savings) and upgraded lighting to more efficient T-8 fluorescent technology. Thanks to concerted efforts to upgrade energy efficiency, Michelin's energy intensity trends have shown a strong improvement. Depending on the product line, the company's Canadian plants have reduced the energy consumed per kilogram of production by between 10 and 25 percent since 1992.

Michelin North America (Canada) Inc. has improved the energy efficiency of its systems for refrigeration, compressed air, motor drives and HVAC at its three facilities in Nova Scotia.

When Nestlé Canada Inc. asked its factories to commit to a 5 percent reduction in energy use for the year 2000, Midwest Food Products Inc.'s plant in Carberry, Manitoba, responded.

Exceeding targets

drives energy efficiency at Nestlé subsidiary

The producer of frozen and dehydrated potato products took a hard look at its processes and identified a number of areas where energy usage performance could be improved. For example, the plant decided to upgrade its electrical system and retrofit its line dryers to improve energy efficiency. Midwest Food Products also installed more efficient automatic pressure-venting equipment on its steam system as part of a program to minimize vented steam, thereby reducing energy waste.

The results of these and the plant's other energy initiatives are impressive. These initiatives represent a reduction in energy costs of more than $900,000 in 1999 and $400,000 in 2000 for the Carberry plant. As a result of its aggressive actions to reduce wasted energy, between 1997 and 2000 Midwest Food Products slashed CO_2 emissions that result from the consumption of fuels in its processing plant by about 10 000 tonnes per year, making a significant contribution to Canada's GHG-reduction initiatives.

Nestlé Canada Inc. is also concerned about the environmental impacts of its factories, and in 2000 the head office undertook a company-wide water-usage reduction program with an identified target of a 5 percent reduction per year. Midwest Food Products has exceeded this target by reducing its water usage by 15 percent in one year.

The factories of Nestlé Canada Inc., which include Midwest Food Products Inc., support economically sound industry initiatives that are designed to voluntarily assist the Government of Canada in meeting its goal of reducing greenhouse gas emissions.

Finding simple, low-cost opportunities to capture waste energy is leading to significant GHG reductions for petroleum and natural gas producer Nexen Inc.

Imagination

yields big GHG reductions for oil producer Nexen Inc.

Over the past five years, Nexen has employed this strategy to achieve significant energy waste reductions in its heavy oil operations.

As part of its road map to GHG reduction, Nexen installed portable vent gas compressors and gathering systems at various locations throughout its operations to capture previously vented natural gas, thereby conserving 5.8 million standard cubic feet per day (mmscfpd) of methane and reducing GHG emissions by the equivalent of more than 700 kilotonnes of CO_2 per year. At its facility in Luseland, Saskatchewan, the company now uses captured gas to fuel production equipment, saving the equivalent of 1 mmscfpd in energy consumption and reducing emissions by 150 000 tonnes of CO_2e per year.

With its road map to reduced GHGs also pointing the way to an improved bottom line, Nexen is studying other profitable opportunities to save waste energy. The company is exploring the capture and compression of casing gas for injection into its gas wells, providing an energy reserve for future use as vent rates decline and energy demand increases. Nexen is also looking at the use of casing gas collected in the field for processing and sale to generate power for use in the oil field or to fuel its nearby processing facilities. Whichever road it follows, the company is certain that the imagination and dedication of its operations staff can overcome any detours or roadblocks along the way.

Nexen Inc.'s facility in Luseland, Saskatchewan, and its other heavy-oil operating areas have shown impressive results through methane vent reductions. Nexen is challenging other producers to find similar benefits in other oil and gas operations.

Ontario Power Generation Inc. (OPG) is serious about improving energy efficiency and reducing GHG emissions. In recent years, the company has incorporated these twin objectives into its management systems, launched a series of major energy-saving activities and joined with other organizations to further a proactive environmental agenda.

Partnerships work!

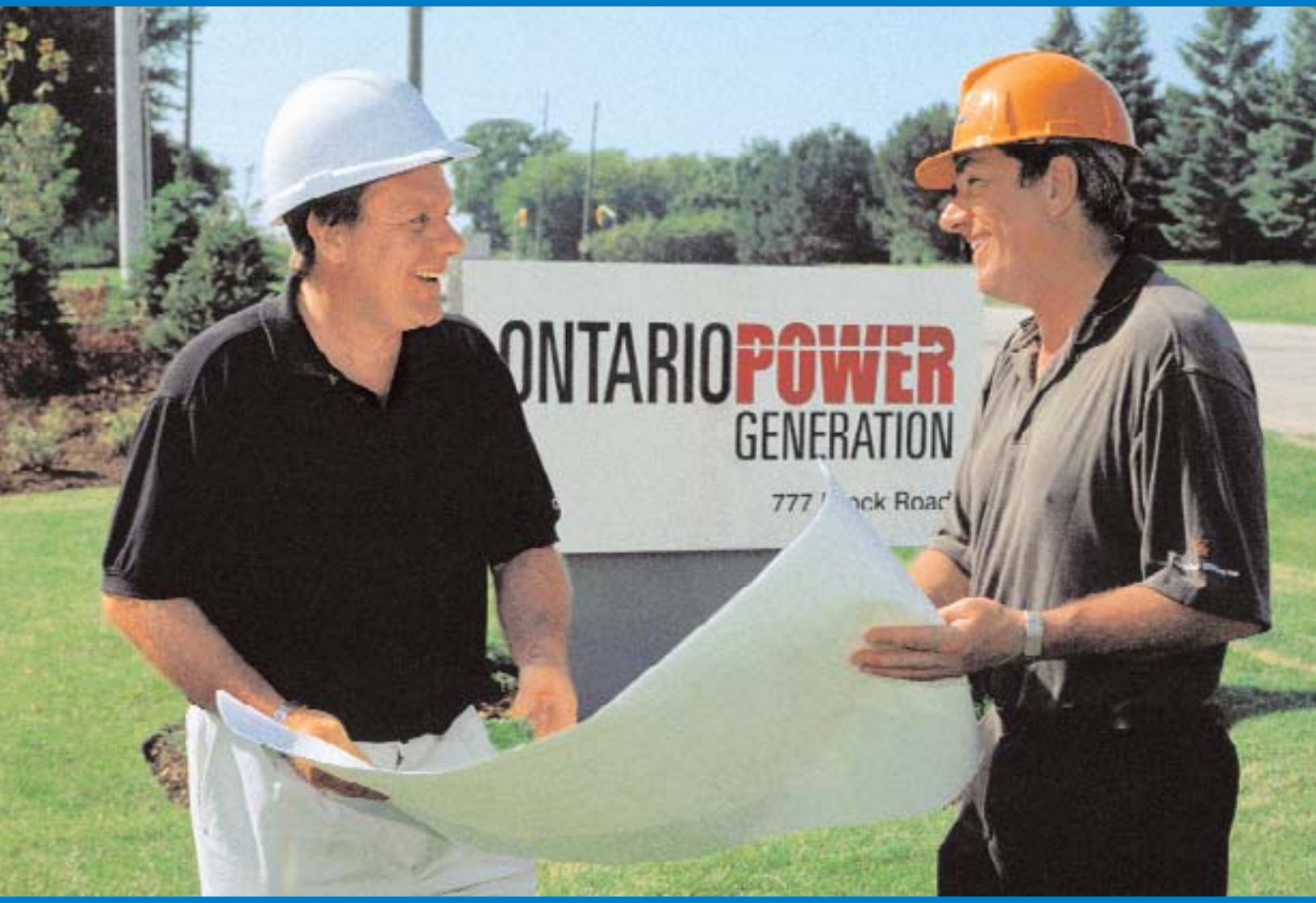
Ontario Power Generation program recognized as North American leader

OPG's actions are part of a comprehensive initiative called "Energy Efficiency @ Work," an award-winning program that combines employee education, cooperative action, energy-related investment and the search for alternative "green" sources of electrical energy.

The Energy Efficiency @ Work program has yielded dramatic results. Since 1994, the company has undertaken more than 300 thermal/conversion efficiency and electrical efficiency projects, leading to energy savings of 2000 GWh per year, annual cost savings of $90 million and yearly GHG emissions reductions of 2.7 million tonnes. The company's energy savings under the program are equivalent to the energy consumed by a city of 80 000 people every year.

Networking and sharing information and advice helped to make the Energy Efficiency @ Work program a success. The program is a result of many contributions and special partnerships that OPG developed with the Canadian Energy Efficiency Alliance, Natural Resources Canada's Office of Energy Efficiency and support from the Alliance to Save Energy and Consortium for Energy Efficiency. Together, these organizations have demonstrated that energy efficiency makes sense and can be accelerated through partnerships.

Committed to cooperative action on climate change, OPG's Energy Efficiency @ Work program was the first Canadian endeavour to win the prestigious Climate Protection Award presented by the U.S. Environmental Protection Agency. These achievements amply demonstrate OPG's commitment to maintaining its triple bottom line of economic performance coupled with environmental stewardship and social equity.



Ontario Power Generation Inc., in partnership with Enbridge Gas Distribution Inc., EnerSys Analytics Inc., Internorth Construction Ltd. and NRCan's Commercial Building Incentive Program, achieved a 30 percent energy improvement over Canada's *Model National Energy Code for Buildings* for OPG's 777 Brock Road Building in Pickering, Ontario. More information is available at the Web site at http://www.energy-efficiency.com.

An energy audit at Schneider Foods' plant in Kitchener, Ontario, has uncovered major opportunities for energy and cost savings.

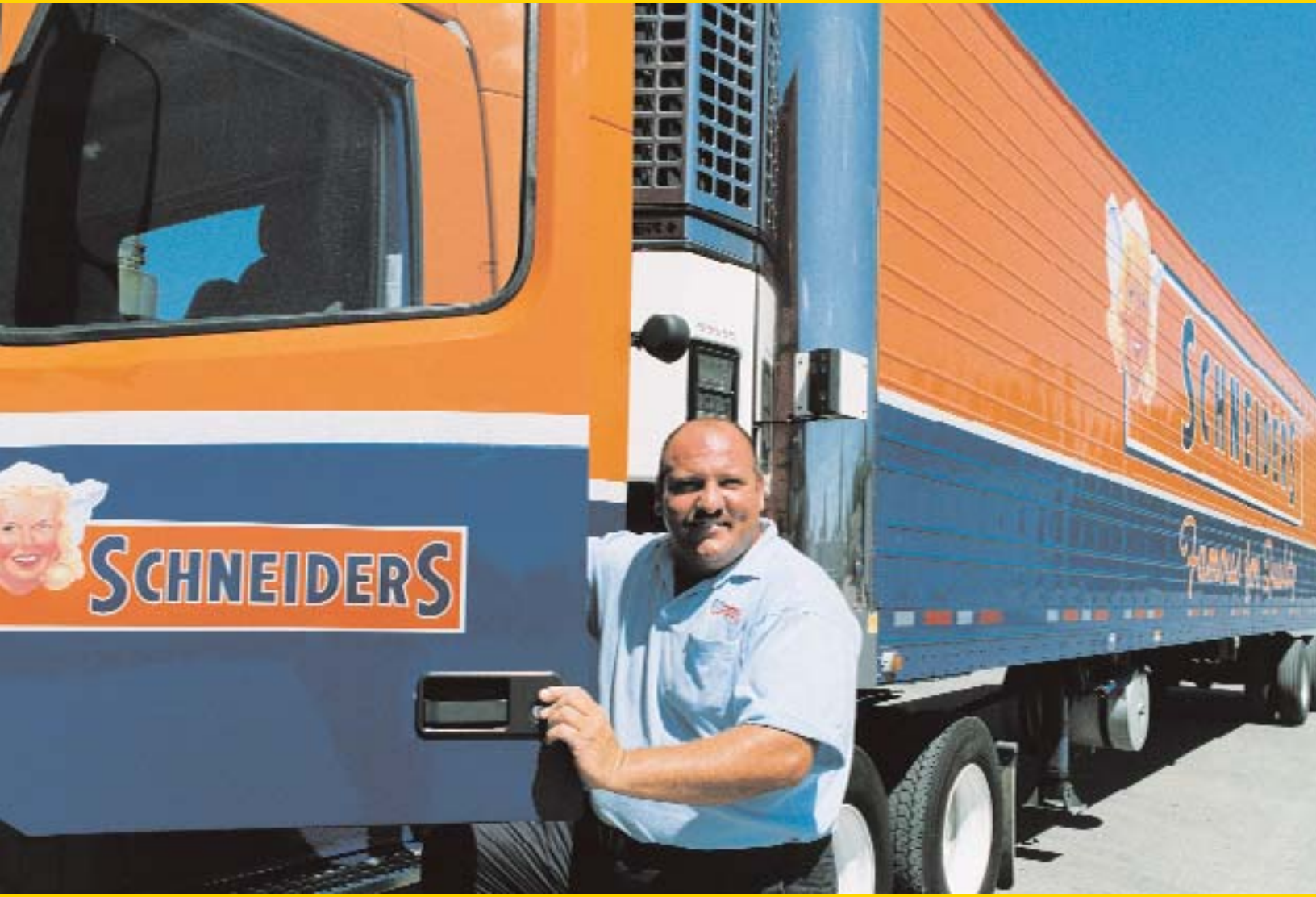
Incentives

drive productive energy audits at Schneider Foods

The audit, conducted with the help of the Government of Canada's Industrial Energy Audit Incentive, focussed on the company's steam and refrigeration systems and on opportunities for energy cogeneration. By taking a thorough look at Schneider Foods' facility, equipment and operating systems, the audit uncovered hundreds of thousands of dollars in potential savings – savings that are also possible at other Schneider plants.

For example, modifications to the boiler plant feeding the plant's steam systems could save $145,000 in yearly natural gas expenditures, and reductions in the main plant's ventilation rate can save another $125,000. Together, these measures would reduce the plant's natural gas consumption by about 20 percent, with a payback on investment of less than one year. Improvements to refrigeration and ventilation systems could reduce electricity use by 15 percent and produce savings of $465,000 per year. Several of the measures recommended by the audit, such as reductions in steam pressures and in the ammonia cooling process, can be implemented at no cost, thereby producing instant savings with no impact on temperatures or product quality.

The audit identified cogeneration as one of the most promising energy-saving opportunities for Schneider Foods. The plant's electrical and steam usage profile is ideal for on-site power generation, and an investment of $6 million to install a natural-gas-powered generating system should net the company about $1.5 million in annual energy savings.



Schneider Foods recognized several opportunities to modify current operating methods and system settings at its power plant that will reduce energy consumption without affecting production.

Compared with most plants in the Stelco family, the Stelfil Ltée facility in Lachine, Quebec, is small. But small manufacturing plants that focus on energy efficiency can have a big impact.

Conversion

from propane to natural gas yields environmental benefits for Stelfil Ltée

Since 1991, by diligently looking at equipment, maintenance and operating practices for ways to improve efficiency, Stelfil achieved a 30 percent reduction in energy consumption.

The plant left no stone unturned. For example, the steel wire producer recognized an opportunity to reduce its GHG emissions by converting its heavily used fleet of lift trucks to natural gas. Stelfil installed two 3600-psi natural gas compressors and refitted its 24 lift trucks to handle the new fuel. The results have been outstanding – not only was the annual consumption of 240 000 litres of propane replaced by 145 000 m^3 of less expensive natural gas, but the cleaner-burning fuel saved an additional 225 000 m^3 of natural gas each year by reducing ventilation requirements. In total, Stelfil's lift truck program reduced the plant's GHG emissions by 489 tonnes of CO_2.

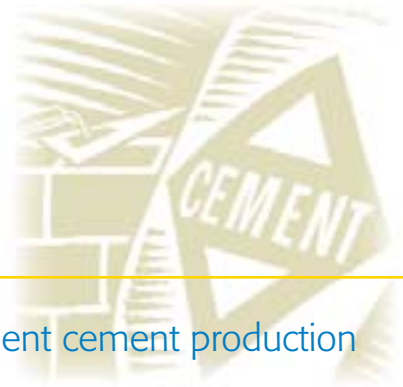
And there were other benefits. Employee safety improved because using natural gas substantially reduced carbon monoxide emissions within the plant, the danger of explosion was minimized and back injuries resulting from cylinder replacements were eliminated. Moreover, lift truck engine maintenance costs were cut, refuelling time was halved and energy costs were slashed by more than $100,000 per year.

Stelfil Ltée's employee awareness programs and its continued search for new technologies will allow it to further reduce its energy consumption in the coming years.

St. Lawrence Cement Inc. reduces the energy component of its cement products by substituting supplementary cementitious materials (SCMs) for Portland cement and recovering energy from selected waste materials.

Substitution

with waste materials a key to energy-efficient cement production



The company is a joint owner – with St. Marys Cement – of Great Lakes Slag, which granulates blast furnace slag, a by-product of steel making. St. Lawrence Cement grinds the granulated slag at its plant in Mississauga, Ontario, to produce GranCem®, an SCM that can reduce the use of energy-intensive Portland cement in the production of concrete. Ready mix companies blend GranCem® with Portland cement to make concrete for the construction of foundations and highways. The appropriate use of GranCem® indeed brings improved performance in mechanical properties and durability to concrete.

GranCem®, which is used in a mixture with cement in a ratio of 1 to 3 or 1 to 4, consumes about 25 percent of the energy needed to manufacture the Portland cement that it replaces. By investing in GranCem® production, St. Lawrence Cement is able to accommodate much of its market growth without corresponding increases in energy consumption.

St. Lawrence Cement is also using waste materials to substitute part of the energy component in cement. The company has installed a $6 million granular fuel system at its facility in Joliette, Quebec, that will allow the plant to burn waste material such as sawdust, tire fluff, rubber chips and dried sewage sludge in two of its four kilns. The new system will enable the company to offset the burning of about 42 000 tonnes of coal and coke fuel per year by co-processing waste material that would otherwise have been landfilled or disposed of in a less beneficial manner.

Cement manufacturing is highly energy intensive. St. Lawrence Cement has concentrated significant efforts on improving energy efficiency in recent decades.

Thanks in part to its active involvement in workshops conducted by Natural Resources Canada's Office of Energy Efficiency under the CIPEC banner, Versacold Group has made outstanding progress toward improved energy efficiency.

Participation

in "Dollars to $ense" workshops pays off for Versacold Group

Across the company, Versacold facilities reduced energy costs in 2001 despite rapid increases in natural gas prices, the inclusion of an additional site in the company's calculations and a doubling of electricity prices in Alberta due to deregulation. Compared with its energy use in 2000, the company decreased its use of electricity by 1.2 million kWh (1 percent) and its use of natural gas by 12 800 GJ (7 percent).

Innovation and cooperation are among the tools Versacold uses locally to further its company-wide energy efficiency goals. For example, at its facility in Lethbridge, Alberta, the company is recovering waste heat from the industrial refrigeration plant and using it to preheat process feed water for Maple Leaf Potatoes, which shares the same building. In 2001, the heat recovery program's first full year of operation, Versacold transferred an average of 1.42 million Btu per hour of waste heat from its cooling facilities to the potato plant's feed water. Over the course of the year, the facility reduced natural gas consumption by 11 percent, saving more than $87,000 in expenditures for natural gas. When electricity savings are added, the $105,000 project paid for itself in less than a year.

Versacold Group rewards the outstanding efforts of its energy managers with its own annual energy efficiency awards. These are presented to each of the company's Pacific, Alberta and Eastern regions. A national award is also given. Two of these awards were presented at Versacold's energy managers' conference in Vancouver, British Columbia, in 2002.

PARTNERSHIP IN A

NEW ERA

This report represents a watershed for the Canadian Industry Program for Energy Conservation (CIPEC). For the first time, it reflects the completion of our expansion beyond our original mining and manufacturing mandate to encompass the energy management efforts of substantially all Canadian industry.

CIPEC, a remarkable partnership between Canadian business and the Government of Canada, is now the true standard-bearer for industrial energy efficiency action across the country.

The transition to this expanded role was completed with the addition of three new sectors to the CIPEC family. In last year's Annual Report, the energy supply sector, represented by electricity generation and upstream oil and gas, reported for the first time. This year, the construction sector joins the fold.

With industry more unified under the CIPEC umbrella, the organization now brings together sectoral associations that encompass well over 95 percent of all industrial energy use in Canada. Broader, stronger and more active than ever in our efforts to promote effective energy management, the program continues to set new standards for organizations of its type throughout the world.

CONTINUOUS IMPROVEMENT: A SNAPSHOT

MINING, MANUFACTURING AND CONSTRUCTION

- These sectors achieved an energy intensity improvement of 1.8 percent per year between 1990 and 2001, well above the 1 percent-per-annum improvement commitment made in 1994.
- Energy-related greenhouse gas (GHG) emissions in 2001 were 8.4 percent lower than emissions in 1990.
- According to Natural Resources Canada (NRCan) statistics, these sectors used 22.5 percent less energy to produce a dollar of output in 2001 than they did in 1990.

ENERGY SUPPLY

- Upstream oil and gas companies have implemented 307 projects that have resulted in GHG reductions of 13 million tonnes.
- Electric utilities reported 706.3 GWh of alternative energy production in 2001, up from 0.4 GWh in 1990.

CANADIAN INDUSTRY: THE BIG PICTURE

- The average annual energy intensity improvement from 1990 to 2001 was 0.5 percent.
- The total energy saved by CIPEC industries during 2001 is equivalent to 93 percent of consumer energy demand in the Atlantic provinces.
- Energy savings related to effective energy management practices totalled more than $2.8 billion in 2001.
- CIPEC sectors used 5.6 percent less energy to produce a dollar of output in 2001 than they did in 1990.
- Two new trade associations signed letters of cooperation with CIPEC, bringing total participation to 45 associations. Collectively, these groups represent more than 5000 companies – more than 95 percent of industrial energy demand.
- There are now 25 CIPEC task forces, covering almost every aspect of industrial energy demand in Canada.
- By the end of 2002, 374 companies were registered as Industrial Energy Innovators, an increase of 60 companies over the previous year. The eagerness of Canadian companies to sign up for this program is a sure sign that they are more aware than ever that sound energy management is key to business success and to their ability to take advantage of new programs.

CIPEC continues to grow because companies recognize two facts about energy efficiency: it's good for business and it benefits the environment. Today, with volatile and generally rising energy prices and international climate change initiatives that are prompting businesses to look closely at how they use energy, CIPEC and the resources it offers have never been more relevant. By providing tools to improve energy efficiency, CIPEC is helping participants cut costs and increase profits. Combined on a national scale, these actions are playing a significant role in reducing Canada's energy consumption and GHG emissions – essential progress toward meeting our international climate change commitments.

SUSTAINING CIPEC'S MOMENTUM

When Canada signed the Kyoto Protocol, its national climate change mandate advanced to a new level. The challenge now facing CIPEC is to match the accelerated pace of change required of business with the innovative support programs and powerful energy management tools needed to foster success.

With the vast majority of Canadian industry now covered by CIPEC, our goal is to help industry – sector by sector and company by company – to sustain and intensify the march toward effective energy management. CIPEC's mission remains fundamentally the same: to promote, encourage and foster energy efficiency improvements and GHG emissions reduction throughout Canada's industrial sectors.

CIPEC believes that the tools and resources that it makes available to participating sectors will take on greater importance as companies seek out every opportunity to improve economic performance and lower GHG emissions. CIPEC's customized workshops can help companies audit their energy consumption, identify waste, establish energy management systems and implement actions that improve efficiency.

As the pace toward GHG emissions reductions quickens, CIPEC will respond by continuing to play a key role as a conduit for vital information on government programs and funding opportunities and to develop programs and services that respond to the evolving needs of Canadian industry.

A NEW ENERGY NETWORK

One of CIPEC's most significant recent initiatives is its Energy Managers Network. The goal of this group is to develop a learning network for industrial energy practitioners who seek to share the knowledge, information, tools and skills required to improve the competitiveness of their organizations and support climate change goals.

The CIPEC Energy Managers Network is based on the belief that achieving improvement in industrial energy efficiency requires ever-broadening participation from industry. The Network is supported by a Web site that provides access to a comprehensive energy management tool kit, training resources, workshops and the CIPEC Energy Managers Network Discussion Board.

AN IMPORTANT RESOURCE

In 2002, NRCan conducted a study to determine the effectiveness of the CIPEC program. The results affirmed the importance of CIPEC to improving energy efficiency and reducing GHG emissions in Canada. According to the study, there was a significant difference between the amount of energy consumed by CIPEC participants and by non-participants. The results demonstrated that

- the growth of energy consumption by participants was less than half of that for non-participants
- three times more participants reported reductions in energy use than non-participants
- 15 percent fewer participants reported an increase in energy use than non-participants

The study also revealed that individual CIPEC programs are well received, with 100 percent of participants using at least one program element. Results show that

- 60 percent of participants read our regular newsletter *Heads Up CIPEC*
- 45 percent use the CIPEC Web site
- 42 percent participate in CIPEC workshops

Of participants attending a CIPEC "Dollars to $ense" workshop, more than half implement energy efficiency elements such as conducting energy inventories, developing motor-loading profiles and establishing an energy management team.

THE ROAD AHEAD

In the coming year, CIPEC's goal is to broaden its mandate and augment its services to help industry comply with increasingly demanding standards of emissions performance. The stakes are high for Canada and for the industries that power our economy. CIPEC is ready to play a vital role in building and sustaining the momentum toward positive change.

On behalf of the CIPEC family of industries, I would like to express our gratitude to NRCan for its continued and growing support of CIPEC's unique public and private sector partnership. The task ahead is demanding, but with government and industry working together, I am confident that Canada will continue to make strong progress toward its climate change goals.

Douglas E. Speers

President and CEO, EMCO Limited

Chair, CIPEC Executive Board

New CIPEC Chair

Douglas E. Speers has been named Chair of CIPEC's Executive Board. He replaces W. Warren Holmes, Senior Vice-President, Canadian Mining Operations, Falconbridge Ltd., who served as Chair from 2000 to 2002. A professional engineer with extensive experience in the petroleum industry, Mr. Speers is President and CEO of EMCO Limited, a leading Canadian building products company. Under his leadership, EMCO has moved to the forefront in the pursuit of energy efficiency. His commitment to CIPEC's goals and his track record of service in other voluntary roles in manufacturing, construction and education make Mr. Speers an ideal choice to guide the new CIPEC.

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HOW CIPEC WORKS

CIPEC is an umbrella organization overseeing a partnership between government and private industry aimed at improving Canada's industrial energy efficiency. CIPEC comprises sectoral task forces, each of which represents companies engaged in similar industrial activities that participate through their trade associations. The Task Force Council, with representatives from each CIPEC sector, provides a common forum for sectors to share ideas and recommend ways to address common needs. Overall direction is provided by an Executive Board, which is made up of private sector leaders who are committed to industrial energy efficiency.

In the CIPEC partnership, change emerges from consensus and joint action built through open and honest communication. CIPEC continues to be the focal point for industry's response to Canada's climate change efforts. Our role is to promote the evolution of energy efficiency and to identify and reward those who lead the way.

We carry out this mandate in part through a strong communications and awareness program anchored in our twice-monthly *Heads Up CIPEC* newsletter and in regular features in selected trade magazines. In July 2002, *Heads Up CIPEC* was redesigned as an on-line newsletter. This technological transformation has helped to increase traffic on the CIPEC Web site from 32 000 hits per month to more than a quarter of a million.

CIPEC also raises awareness of the goals and benefits of improved energy use in other ways. The Task Force Council and individual sectors are constantly at work to broaden participation, encourage the sharing of information and bolster awareness of the role and achievements of CIPEC industries.

CIPEC volunteers include successful business leaders and others recognized on the national stage. The profile of these leaders and their strong belief in CIPEC's principles give us a strong edge in attracting new industry participants and in continuing the successful partnership between industry and government.

THE EVOLUTION OF CIPEC DATA

For the first time, CIPEC sectors in this report are organized in accordance with the North American Industry Classification System (NAICS). NAICS replaces the Standard Industrial Classification (SIC) system used in previous years. The switch was made to bring Canada's classification system in line with Mexico and the United States and its partners in the North American Free Trade Agreement and involved sub-sector realignment. In addition, the GDP dollar values reported here have been updated to reflect a 1997 base year. Previous reports were based on a 1986 base year.

Accurate measurement and meaningful data are fundamental to measuring energy efficiency improvements. The data used in this report are collected by Statistics Canada and interpreted by the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC) at Simon Fraser University in Burnaby, British Columbia. From Statistics Canada data, CIEEDAC produces energy intensity indicators for each sector based on production and GDP.

The cooperative CIEEDAC system is internationally recognized for its methodologies, data integrity and cooperation with CIPEC. Primary funding for CIEEDAC comes from NRCan, with additional contributions from industry associations that participate in CIPEC and from the province of Quebec.

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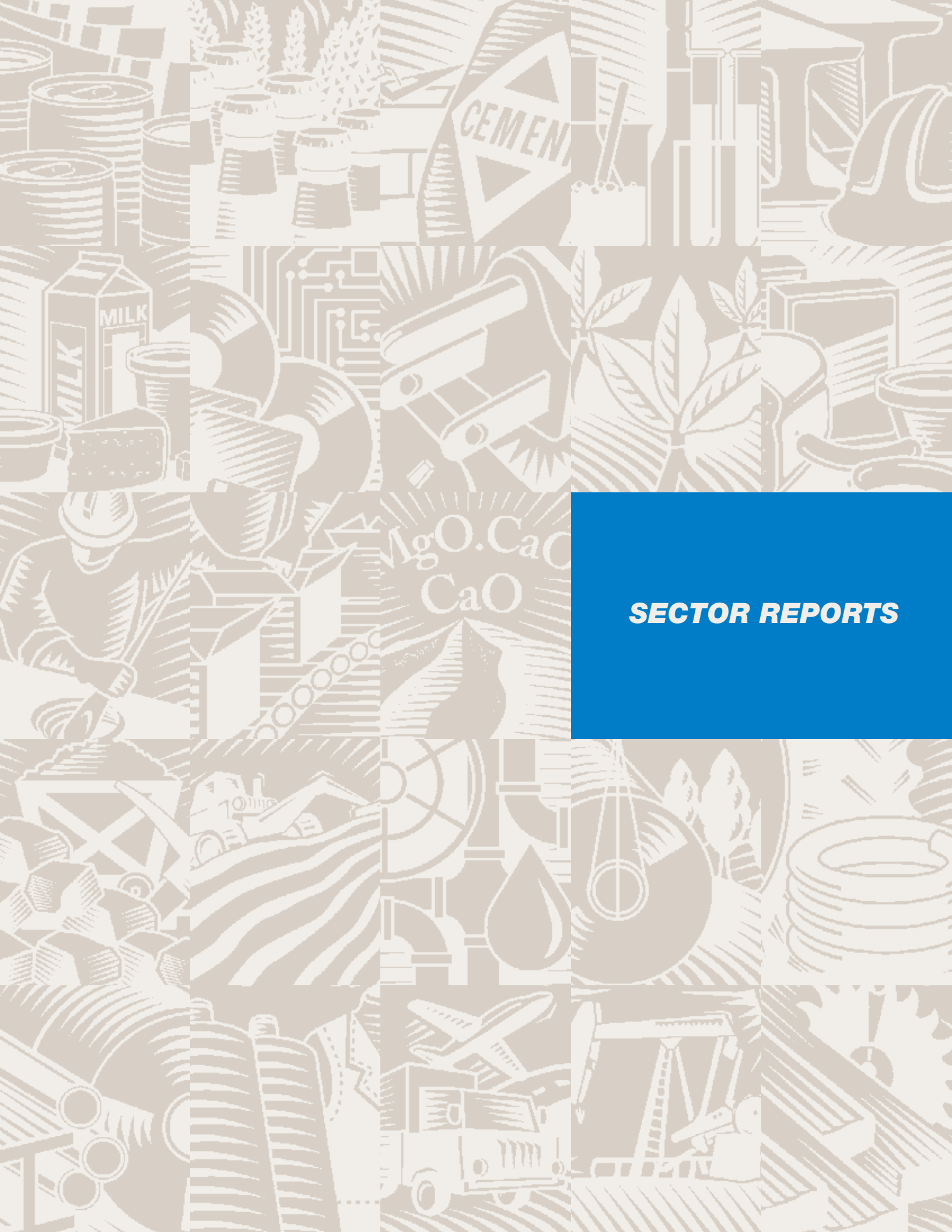


SECTOR REPORTS

Aluminum

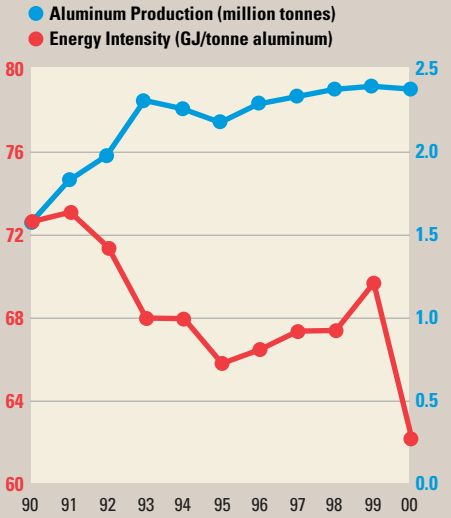
Profile *In 2002, Canada's aluminum sector ranked third in the world in annual primary aluminum production. The combined output of the industry's 10 aluminum plants in the province of Quebec and one in British Columbia is a major contributor to Canada's national and local economies. Although production increases have forced the industry's total energy usage slightly upward, measurements of energy efficiency continue to demonstrate much-improved performance compared with 1990 benchmark levels.*

Performance Highlights

- In January 2002, the industry signed a framework agreement on GHG emissions with the province of Quebec.
- Alcan Inc. will reduce total annual emissions at its facilities in the province of Quebec by 285 000 tonnes of CO_2e by the end of 2003 compared with a baseline year of 1999.
- Alcoa Inc. will cut annual emissions by 200 000 tonnes of CO_2e between the beginning of 2001 and the end of 2004.
- Aluminerie Alouette Inc. will cut its emissions by 12.3 percent on average over the 1996–2004 period.
- The industry reports that on average it has reduced its CO_2e intensity per tonne of aluminum produced from 5.59 tonnes of CO_2e per tonne of aluminum in 1990 to 3.94 in 2000.

Aluminum Sector – NAICS 331313

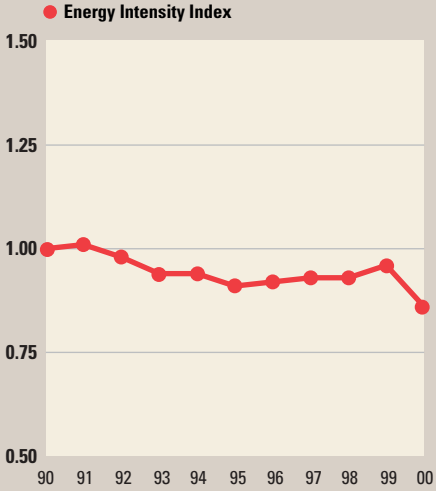
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2000.* January 17, 2002. Simon Fraser University.

Aluminum Sector – NAICS 331313

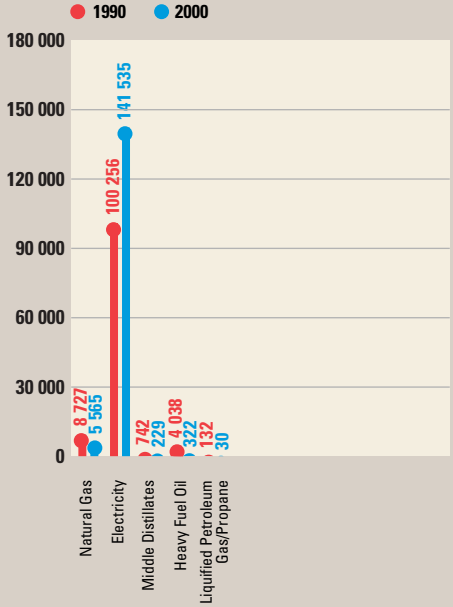
Energy Intensity Index (1990–2000) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2000.* January 17, 2002. Simon Fraser University.

Aluminum Sector – NAICS 331313

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2000.* January 17, 2002. Simon Fraser University.

ACTIONS

An industrial sector that supports the objectives of the Kyoto Protocol, the Canadian aluminum industry has undertaken numerous actions to reduce GHG emissions and improve energy efficiency.

A framework agreement on voluntary reductions of GHG emissions between the province of Quebec and the aluminum industry was signed in January 2002. The agreement calls for GHG reductions of approximately 200 000 tonnes of CO_2e for the sector between 2002 and 2007. Energy intensity improvements and attention to product life-cycle issues are also built into the agreement.

Following the signing, aluminum producers began negotiations to conclude detailed individual agreements. In June 2002, Alcoa Inc. committed to voluntary reductions of GHG emissions for its smelters in Baie-Comeau, Bécancour and Deschambault and for its rod plant in Bécancour. Under its agreement with the Quebec provincial government, Alcoa will cut its annual emissions by 200 000 tonnes of CO_2e between the beginning of 2001 and the end of 2004, with further reductions planned before the agreement expires at the end of 2007.

In October 2002, Alcan Inc. agreed to voluntarily reduce GHG emissions from its six smelters in the province of Quebec, its aluminum plant in Vaudreuil, and its port facilities, power generation plants and railway operations. Under the agreement, Alcan will reduce total annual emissions from these facilities by 285 000 tonnes of CO_2e by the end of 2003 compared with a baseline year of 1999.

Aluminerie Alouette Inc. signed an agreement with the Quebec provincial government in February 2003. This agreement calls for the company to reduce its GHG emissions by an average of 12.3 percent for the period 1996–2004 – a total reduction of 69 000 tonnes of CO_2e.

These voluntary agreements demonstrate that aluminum producers recognize the opportunity to build on the industry's track record of emissions reductions, which began in 1990.

Canada's aluminum producers have also included energy efficiency issues in their corporate communications programs. For example, Alcan published a comprehensive report entitled *Alcan's Journey Towards Sustainability*, which discusses key business issues, including the environment and energy management.

In its 2001 publication *Life Magazine*, Alcoa dedicates a full section to energy, including a discussion of energy efficiency programs within the company and energy development projects. The publication presents a course of action, which the company believes will lead to a better quality of life.

Aluminerie Alouette's report *De concert avec le milieu*, a booklet on taking environmental considerations into account, explains how the use of new cathode block material and the development of improved cast iron contributes to the overall energy efficiency of its smelters. The company has also modified its administrative building's heating system and programmed its thermostats, saving about 50 000 litres of heating oil per month in the winter heating season.

ACHIEVEMENTS

Primary aluminum production increased by 73 percent between 1990 and 2002, with the industry's GHG emissions remaining stable. Over the same period, the sector reduced its GHG emissions per unit of production by more than 36 percent of CO_2e per tonne produced. Since 1990, the aluminum sector has reduced its emissions of tetrafluoroethane (CF_4) and hexafluoroethane (C_2F_6) by approximately 52 percent.

According to industry forecasts, the production of primary aluminum in Canada should increase by 1.4 million tonnes by 2010, leading to process emissions increases of 3 million tonnes of CO_2e. On average, the industry reduced its CO_2e intensity from 5.59 tonnes of CO_2e per tonne of aluminum in 1990 to 3.94 in 2000. The industry expects that by 2010, overall intensity will be reduced further to 3.07 or even lower.

CHALLENGES

The industry will continue to make ongoing energy efficiency gains by implementing enhanced manufacturing processes and advanced energy management practices. However, the construction of new, state-of-the-art smelters, which currently have a carbon intensity of less than 2 tonnes of CO_2e per tonne of production, and the retrofit of some other smelters will have the most dramatic impact on the sector's overall energy efficiency and GHG emissions. Modern facilities currently account for 72 percent of total aluminum production.

However, building new facilities requires sizable capital investments and the availability of large quantities of electricity at favourable prices. The combination of low aluminum prices and high energy costs that are typical of today's marketplace will make it difficult for the industry to generate the funds needed to finance these investments. Developing workable economic models for the continued development of new facilities remains a significant challenge for the industry.

Brewery

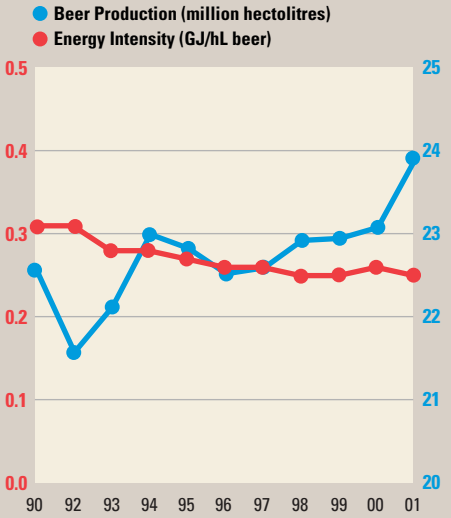
Profile *Brewing in Canada is a diverse and modern industry that is actively pursuing ambitious energy efficiency targets. The industry is made up of two national brewing companies, several regional brewers and numerous microbreweries. Together, these establishments, which employ more than 14 000 workers in 83 breweries across Canada, produced about 24 million hectolitres of beer in 2001.*

Performance Highlights

- Enhanced maintenance, monitoring and control procedures are enabling brewers to identify and implement energy-saving measures.
- Compared with production in 1990, the industry has reduced its energy consumption by more than 19 percent per hectolitre of beer produced.
- The industry remains committed to an annual energy reduction of 1 percent over the next two years and, beginning in 2004, 1.5 percent annually through 2006.

Brewery Sector – NAICS 312120

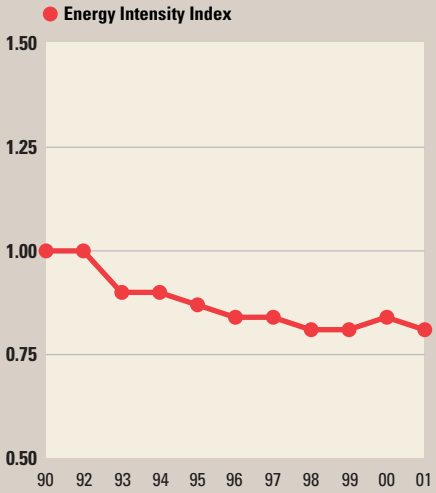
Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Brewery Sector – NAICS 312120

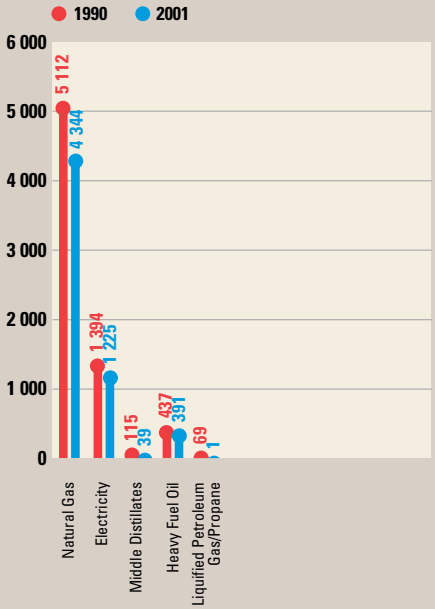
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Brewery Sector – NAICS 312120

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

Canada's brewers continue to pursue energy efficiency by improving their beer-making processes, plant infrastructure and packaging activities. Capital investment in new bottle-washing and pasteurization equipment will help the sector improve energy efficiency and reduce GHG emissions. Continuously advancing monitoring, control and maintenance procedures are enabling brewers to identify and implement opportunities for improvement. These measures include advances in production process systems, waste-trimming enhancements to post-run shutdown procedures and upgrades to heating, ventilating, lighting and air-conditioning systems. Companies are working to entrench accountability for energy and utility management throughout their organizations, creating an environment that supports efforts to implement and sustain energy efficiency projects and practices.

For example, energy planning, monitoring and targeting, departmental accountability and employee participation are being combined in a comprehensive effort to improve energy efficiency. Brewers are using energy audits and staff accountability to focus employee attention on conservation and on opportunities to reduce energy waste. Extensive benchmarking helps to identify and implement a best-practices approach. Capital projects are assessed to ensure that they are designed for – and incorporate – energy efficiency strategies.

On the distribution and sales side of the sector, The Beer Store installed special computers in trucks in its fleet in London, Ontario, which reduced idling, saved fuel and extended the trucks' working life. Thanks to this pilot project, the fleet reduced its idling time by 3000 hours, or 51 percent, saving more than 32 000 litres of fuel and reducing emissions by more than 114 tonnes. The project's success earned The Beer Store a Fleet Excellence Award from the national Repair Our Air – Fleet Challenge.

ACHIEVEMENTS

The Canadian brewing industry has made significant progress in increasing energy efficiency. Compared with 1990, the industry now uses over 19 percent less energy to produce a hectolitre of beer. In 2001, the industry consumed 6003 TJ of energy, 72 percent of which was natural gas, 7 percent fuel oil and 20 percent electricity. The brewing industry is committed to an energy-reduction target of 1 percent per year over the next two years and, beginning in 2004, 1.5 percent annually through 2006.

CHALLENGES

Canadian brewers continue to identify ways to reduce expenditures while maintaining quality and innovation. In the face of increased international competition and the growth of other non-beer beverage categories, the industry combines innovative marketing strategies with prudent cost-management programs. Canada's brewers also have successfully pursued international markets and made Canada one of the top beer exporters in the world. Several companies have negotiated agreements to produce products in Canada that would otherwise be imported. Brands available in the Canadian market range from traditional ales and lagers to new beverages that feature varying strengths of alcohol, distinctive flavours and unique textures. Clearly, the industry is well positioned to meet its competition head-on.

Because energy is a substantial cost component in the brewing process, finding ways to improve energy efficiency will continue to be a priority for Canada's brewers.

Cement

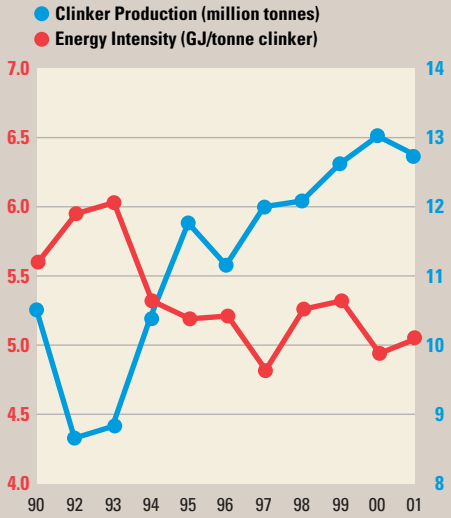
Profile *The cement industry is the cornerstone of Canada's domestic construction industries and a significant exporter that contributes substantially to the country's balance of payments. According to Statistics Canada figures, the industry's eight companies, which operate 16 processing facilities, produced 12.7 million tonnes of clinker and 12.8 million tonnes of cement in 2001.*

Performance Highlights

- Ciment Québec Inc. saved electricity by modifying the way it transports raw material from the roller mill to the kiln.
- Lafarge Canada Inc. continues to invest in energy efficiency in plants across Canada.
- The use of the cement replacement GranCem® is enabling St. Lawrence Cement Inc. to accommodate much of its market growth without increasing energy consumption.
- Lehigh Inland Cement Limited has implemented a program to replace aging equipment with more energy-efficient alternatives and has been working to improve the energy efficiency of its compressed-air systems and process fans.
- The cement sector's use of waste fuel declined slightly to 3038 terajoules, which is 6.1 percent of the total energy (excluding electricity) used by the sector in 2001.
- The sector anticipates a 2 percent decrease in GHG intensity per unit of production by 2010.

Cement Sector – NAICS 327310

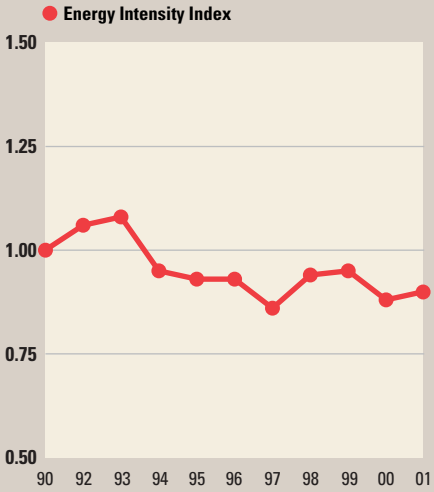
Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Cement Sector – NAICS 327310

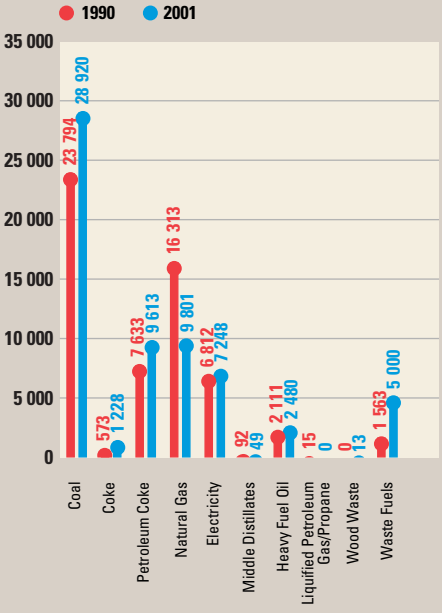
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Cement Sector – NAICS 327310

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

Cement manufacturers continue to take action to improve energy efficiency. For example, Ciment Québec Inc. of Saint-Basile, Quebec, has modified the way it transports raw material from the roller mill to the kiln. Before the modification, material was moved by two compressed-air pumps, drawing 575 kW of electricity. The new system employs an electric elevator that uses only 75 kW to operate and achieves the same objective.

A new kiln at Lafarge Canada Inc.'s plant in Richmond, British Columbia, reached its energy intensity targets in 2001, using 3058 MJ per tonne of clinker. Before the new kiln was installed, fuel consumed by its two wet process kilns was 6307 MJ per tonne of clinker. At its plant in Exshaw, Alberta, Lafarge made major investments to equip the facility to burn coal, including the installation of a coal mill system to supply ground coal to both of the facility's kilns. The company also installed new dust collectors to further reduce emissions. At Lafarge's plant in Kamloops, British Columbia, chain-system upgrades, the implementation of combustion-control expert systems, cooler-optimization exercises and an easier-to-burn raw mix enabled the facility to reduce its fuel consumption to 4249 MJ from 4533 MJ per tonne of clinker.

St. Lawrence Cement Inc. and St. Marys Cement are joint owners of Great Lakes Slag, a venture in Sault Ste. Marie, Ontario, that processes granulated steel mill blast furnace slag for use as a partial replacement for cement. St. Lawrence Cement grinds the granulated slag at its plant in Mississauga, Ontario, to produce GranCem®, a supplementary cementitious material that can reduce the proportion of Portland cement used in the production of concrete. GranCem®, which may be blended in a mixture with cement in a ratio of 1 to 3 or 1 to 4, reduces the embodied energy of the final concrete product by about 20 percent of the contained energy of the final concrete. Used properly, GranCem® also improves the mechanical properties and durability of concrete. GranCem® production enables St. Lawrence Cement to accommodate much of its market growth without corresponding increases in energy consumption.

St. Lawrence Cement is also using waste materials to provide part of the energy component in cement. The company has installed a $6 million granular fuel system at its facility in Joliette, Quebec, which will allow the plant to burn waste material such as sawdust, tire fluff, rubber chips and dried sewage sludge in two of its four kilns. The new system will enable the company to offset the burning of about 42 000 tonnes of coal and coke fuel per year by co-processing material that would otherwise be incinerated or sent to landfill.

Lehigh Inland Cement Limited's facility in Edmonton, Alberta, has established a corporate energy management plan and implemented a program to replace aging equipment with alternatives that are more energy efficient. In recent years, the company has focused on upgrading its motor drive systems and production process equipment. In 2002, Inland installed power-monitoring equipment to monitor and reduce electricity consumption in all process areas of its plant.

Lehigh Inland has been working to improve the energy efficiency of its compressed-air systems and process fans. The company continues to upgrade fans with replacements that are more modern and energy efficient and has launched efforts to improve plant productivity.

The Cement Sector Task Force's recently established energy committee is now working to help sector companies share information and develop joint actions on issues such as power deregulation, energy trends, increased use of waste fuel, CO_2 emissions and demand.

ACHIEVEMENTS

Canada's cement sector has reduced its fuel consumption by 30 percent per tonne between 1970 and 1990, principally by implementing major process improvements, according to the Cement Association of Canada (CAC). Kiln efficiency improved by 11 percent between 1990 and 2000, and direct emissions of CO_2 per tonne of cementitious product were 8 percent lower over the same period. The CAC projects a further 2 percent decrease in GHG intensity per unit of production by 2010.

Since 1990, the cement sector has managed to reduce its overall energy intensity by 11.1 percent while demand for its products increased 19.3 percent. The expanded use of power monitoring, targeting and other systems and technologies will combine with ongoing plant modernizations to produce further energy efficiency improvements within the sector.

The cement industry continues to work closely with governments and other industries to promote "concrete" solutions to environmental issues and sustainable, durable infrastructure. For example, the intelligent use of cement-based products in the transportation, residential housing and agriculture sectors can improve energy efficiency and reduce GHG emissions in these sectors, thereby supporting Canada's Kyoto goals.

CHALLENGES

With energy making up a substantial portion of the cost of producing cement, energy consumption is a significant competitive issue within the cement industry. Although the importance of energy has traditionally led many companies to treat energy cost-reduction information as confidential, there is a growing consensus that the benefits of sector-wide cooperation outweigh the competitive risks. The CAC believes that this shift in attitude will lead to broader information sharing and cooperation among sector companies.

There is concern in Canada's cement sector, especially among major exporters, that the current slowdown in the U.S. economy, especially in construction, will have an increasingly adverse impact on energy efficiency. Energy intensive cement production processes are most efficient when operating as close as possible to full capacity, and weakness in demand can trigger corresponding declines in cement plant throughput.

Long-standing discussions among waste producers and waste users have not yet yielded an appropriate methodology to establish emissions-related credits for waste material use in the production of cement. Moreover, the potential implementation of economic instruments such as a carbon tax could seriously impair Canada's cement exports.

Chemical

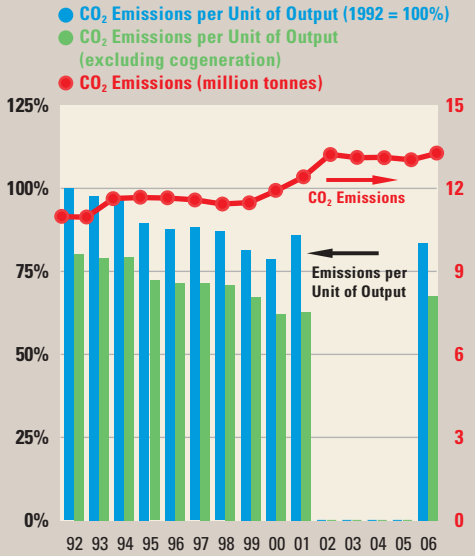
Profile *The chemical sector encompasses a diverse industry that produces organic and inorganic chemicals, plastics and synthetic resins. The chemical industry is the third largest in Canada in terms of value of shipments. Companies in this sector operate 775 facilities Canada-wide, directly employing more than 24 000 people, with an annual payroll of $1.3 billion. The Canadian Chemical Producers' Association (CCPA) is the trade association that represents manufacturers in this sector. Its member companies produce more than 90 percent of industrial chemicals manufactured in Canada.*

Performance Highlights

- NOVA Chemicals Corporation's cogeneration power plant in Joffre, Alberta, has enabled the company to reduce net emissions by 20 percent in 2001.
- Petresa Canada decreased its CO_2e emissions per unit of production by 2.6 percent in 2001.
- In building a new monoethylene glycol plant, Shell Chemicals Canada Ltd. incorporated a number of features aimed at minimizing or eliminating GHG emissions.
- Between 1996 and 2001, Methanex Corporation reduced its CO_2 emissions per tonne of production from 0.76 tonne to 0.67 tonne.
- Dow Chemical Canada Inc. is pioneering the use of wheat straw as a wood replacement in the manufacture of composite panel building materials.
- CCPA member companies' total GHG emissions in 2001, expressed as CO_2 equivalent, decreased 40 percent from 1992 levels.

Chemical Sector – NAICS 325100, 325210

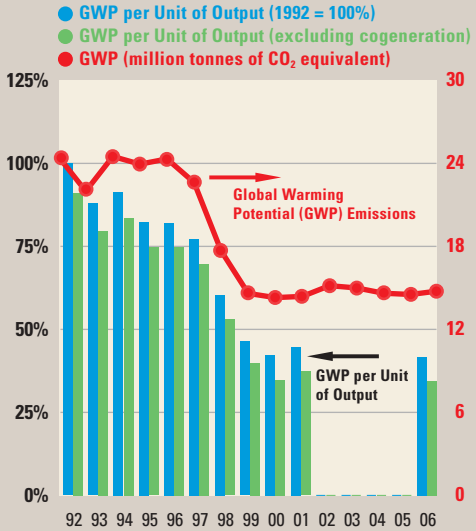
Carbon Dioxide Emissions vs. Product Output



Data source: CCPA Member Operations, February 2003

Chemical Sector – NAICS 325100, 325210

Global Warming Potential vs. Product Output



Data source: CCPA Member Operations, February 2003

ACTIONS

The CCPA's Responsible Care® initiative, which guides chemical companies in their environmental activities, incorporates detailed principles for reducing emissions. In keeping with Responsible Care® guidelines, CCPA member companies continued to pursue actions to promote energy efficiency in 2001. For example, NOVA Chemicals Corporation's electricity/steam cogeneration power plant at the company's manufacturing facility in Joffre, Alberta, continues to help move toward lower total GHG emissions. Compared with conventional electricity sources, the cogeneration facility produces about half of the emissions per unit of output and has enabled the company to reduce net emissions by 20 percent in 2001 compared with 2000. The company projects that by 2004 its net emissions will be significantly below 1990 levels. NOVA Chemicals' goal is to reduce its net emissions intensity from its Canadian chemical facilities by 25 percent below 1999 levels by 2005.

Petresa Canada, based in Bécancour, Quebec, has made considerable effort to reduce its GHG emissions. The ISO 14001 registered company regularly monitors and audits its GHG emissions and continuously seeks ways to improve its performance. In 2001, Petresa decreased its CO_2e emissions per unit of production by 2.6 percent. Since its plant began operations in 1995, the company has reduced its emissions intensity by 20 percent.

In building its new monoethylene glycol plant at its facility in Scotford, Alberta, Shell Chemicals Canada Ltd. incorporated a number of features aimed at minimizing or eliminating GHG emissions. The company integrated heating systems at its facilities, partnered with Air Liquide Canada Inc. to recover and sell waste CO_2, and established a cogeneration facility to produce electricity and heat. In its first part-year of operation in 2000, the plant reduced its total emissions ratio to 0.94 tonne of CO_2e per tonne of product. When the last phases of plant integration were completed in 2001, the total emissions ratio had dropped to 0.72 tonne. Emissions projections through 2007 predict further reductions in the coming years.

At Methanex Corporation, operational excellence is a key component in emissions-reduction efforts. By instituting stringent preventive and predictive maintenance programs, the company has significantly reduced the frequency of energy-wasting plant shutdowns, raising reliability to an impressive 98.36 percent in 2001. Methanex has also developed procedures to direct process gases into fuel systems during shutdown periods, thereby significantly reducing gas flaring and venting. Between 1996 and 2001, Methanex reduced its CO_2 emissions per tonne of production from 0.76 tonne to 0.67 tonne.

Dow Chemical Canada Inc. takes a broad view of emissions reduction. Besides establishing new cogeneration facilities at its plants in Fort Saskatchewan, Alberta, and Sarnia, Ontario, Dow is pioneering the use of wheat straw as a wood replacement in the manufacture of composite panel building materials. This helps to preserve forests and eliminate the needless burning of agricultural waste. Dow also sells hydrogen, a by-product previously burned as a fuel, to a customer whose process requires hydrogen. Dow will replace the energy lost by the sale with natural gas (raising its own GHG emissions), but the customer will no longer need to manufacture hydrogen – a trade-off that produces a net benefit to the environment.

ACHIEVEMENTS

In 2001 the chemical sector's energy consumption totalled 189 649 TJ. According to data released in the CCPA's latest Responsible Care® report, from 1992 to 2001, member companies' CO_2 emissions levels increased by 13 percent, and CO_2 emissions per unit of output decreased 14 percent. However, product output increased by 31 percent over the same period. Total GHG emissions in 2001, expressed as CO_2 equivalents, decreased by 40 percent from 1992 levels.

In 2001, member companies' emissions of methane declined by 14.9 percent compared with 2000, continuing a seven-year reduction trend. Similarly, emissions of N_2O continued to decline by 11.4 percent – a total decrease of 91.7 percent since 1992. Measured in terms of global warming potential, emissions in 2001 were 1 percent higher than in 2000 but 40 percent lower than in 1992.

The CCPA estimates that total CO_2 emissions per unit of output will decrease by an additional 3 percent by 2006, 16 percent less than in 1992. Including cogeneration, members expect a 21 percent increase in total emissions of CO_2 by 2006 compared with 1992. By 2006, GHG emissions, expressed in terms of global warming potential per unit of output, are projected to decrease by 58 percent compared with 1992, or by 65 percent when excluding cogeneration emissions.

CHALLENGES

CCPA members are guided by technological, economic and legislative considerations as they pursue improved environmental performance and enhanced global competitiveness. Members face an ongoing challenge to reduce GHG emissions while accommodating ongoing growth in their operations and their output. Canada's participation in the Kyoto Protocol has made this challenge more complex.

It is no surprise that as production levels increase, the energy requirements of CCPA members have also increased. However, despite the pressures of growth, many member companies have been able to reduce their CO_2 emissions per unit of product. As integral players in an international market, Canadian facilities must continually invest capital to remain competitive with other regions. These investments frequently affect energy efficiency and GHG emissions.

The chemical industry's continuing growth makes it likely that, although CO_2 emissions per unit of output will continue to improve, total CO_2 emissions will grow. The dramatic improvements already made through application of cogeneration and N_2O abatement technologies will be difficult to replicate.

Construction

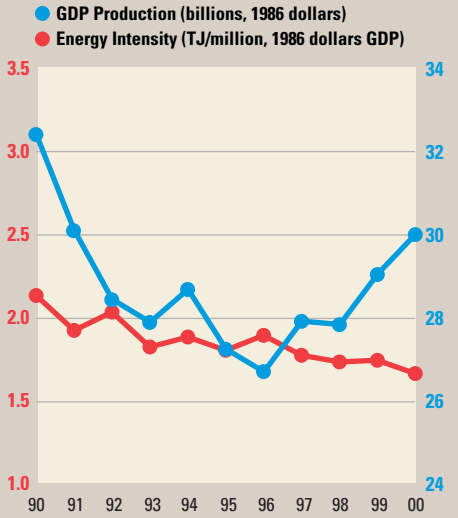
Profile *The construction sector is Canada's largest industry, comprising a diverse array of companies whose work touches every economic sector and region of the country. The construction industry employs a work force of more than 900 000 and generates $134 billion in annual economic activity – about 12 percent of Canada's GDP.*

Performance Highlights

- The Canadian Construction Association (CCA) joined CIPEC in December 2001.
- The construction industry has been a leader among industrial sectors in adopting and implementing environmentally sound business practices.
- CCA has actively participated in the Government of Canada's consultations concerning the ratification of the Kyoto Protocol.
- Following GDP growth of 3.5 percent in 2001 and 3.9 percent in 2002, the industry forecasts growth of 1.9 percent in 2003.
- Economic considerations play a major role in the industry's ability to invest in energy efficiency.

Construction – NAICS 230000[1]

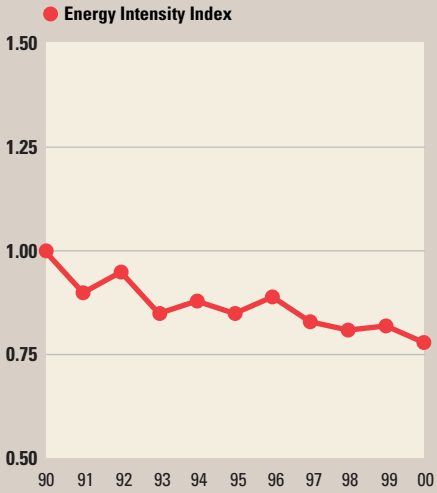
Energy Intensity (excluding electricity) and Economic Output (1990–2000)



Data source: Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2000.* Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *A Review of Energy Consumption and Related Data: Canadian Construction Industry 1990–2000*, Fall 2002.

Construction – NAICS 230000[1]

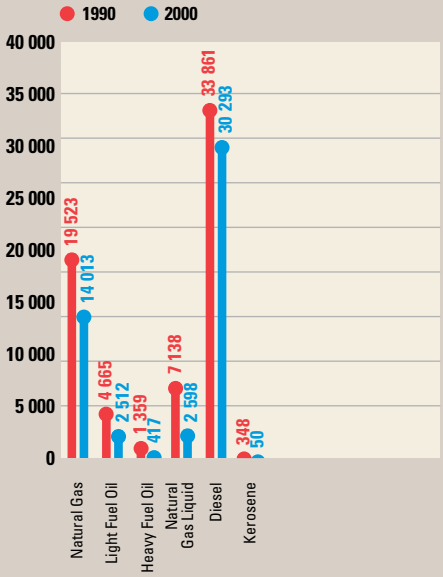
Energy Intensity Index (excluding electricity) (1990–2000) Base Year 1990 = 1.00



Data source: Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2000.* Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *A Review of Energy Consumption and Related Data: Canadian Construction Industry 1990–2000*, Fall 2002.

Construction – NAICS 230000[1]

Energy Sources in Terajoules per Year (TJ/yr.) (excluding electricity)



Data source: Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1990–2000.* Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *A Review of Energy Consumption and Related Data: Canadian Construction Industry 1990–2000*, Fall 2002.

[1] NAICS 236 includes buildings; NAICS 237 includes heavy and civil engineering construction; and NAICS 238 includes specialty trade contractors.

ACTIONS

The construction sector is a new participant in CIPEC, welcomed into the voluntary initiative in December 2001, when the Canadian Construction Association (CCA) joined the program. CCA is the national voice of the construction industry, with a membership of more than 20 000 enterprises. Members work at everything from design and management to road building and general contracting.

The construction industry has been a leader among industrial sectors in adopting and implementing environmentally sound business practices. Sector companies are well aware of the damage that human-induced climate change could cause our planet, our country and our economy.

CCA endorses the concept of sustainable development and recognizes the need to balance environmental and economic considerations in the decision-making process when planning new developments. CCA accepts the need for a fair, equitable and expedient environmental assessment and review process that is developed with the help of industry input. As a result, CCA has actively participated in the Government of Canada's consultations concerning the ratification of the Kyoto Protocol. CCA believes that Canada's response to climate change should adhere to certain basic principles:

- Measures to achieve GHG-reduction objectives must be voluntary rather than mandatory.
- The approach taken must be balanced, not unduly favouring one region or industrial sector over another.
- Measures must ensure that Canada's economy remains competitive in the global marketplace, particularly with regard to the United States.
- The climate change program should recognize that infrastructure improvements play a major role in improving Canada's environmental performance and should include incentives for building renovations/retrofits and for improving essential physical infrastructure such as roads, highways and sewage treatment.
- Measures should take into consideration the current and past efforts of specific industries. For example, the construction industry has made significant reductions in GHG emissions over the past decade.

ACHIEVEMENTS

Energy consumption in the sector is directly related to levels of construction activity. Following GDP growth of 3.5 percent in 2001 and 3.9 percent in 2002, the industry forecasts growth of 1.9 percent in 2003, 2.6 percent in 2004 and only 1.3 percent in 2005. A strong residential construction market caused higher overall growth in 2002. However, anticipated higher interest rates and a lessening of demand will reduce residential construction growth, resulting in slower overall sector growth through 2005.

Non-residential construction is expected to record growth in the 1.4 percent range in 2003, with a variance among industry sub-sectors. The GDP of non-residential building structures will increase by 3.8 percent (led by a 10.9 percent increase in industrial buildings), and GDP growth for roads and highways will be flat with growth of only 0.4 percent. Some sectors, such as oil, gas and utility structures, will record negative GDP growth in 2003; construction GDP in other sectors, such as mining and communications, will reflect robust growth. After strong construction intentions in 2001 and 2002, government construction intentions will drop to growth of 0.6 percent in 2003.

CHALLENGES

The construction sector is committed to improving its energy efficiency. Sector companies continue to upgrade their vehicle fleets and motorized machinery with modern vehicles that are more fuel efficient. They are also continually on the lookout for more energy-efficient materials and practices – elements that can lower costs and reduce GHG emissions. However, economic considerations play a major role in the industry's ability to invest in energy efficiency. Motorized vehicles, machinery and heavy equipment are expensive, requiring companies to make major capital commitments. Given the competitiveness and unpredictability of the construction industry, the desire to upgrade must compete with the need to maximize the return on existing machinery. Balancing these needs often impedes substantial advances in energy efficiency.

Similarly, the sector's diversity makes it difficult to develop energy efficiency programs that are meaningful and practical. What works in constructing roads may not apply to building factories and bridges or to designing and engineering new projects. However, CCA is committed to encouraging its members to become Industrial Energy Innovators and to take advantage of opportunities to improve their energy efficiency. CCA believes that over time its participation in CIPEC will help to accelerate improvements in the environmental performance of Canada's construction industry.

Dairy

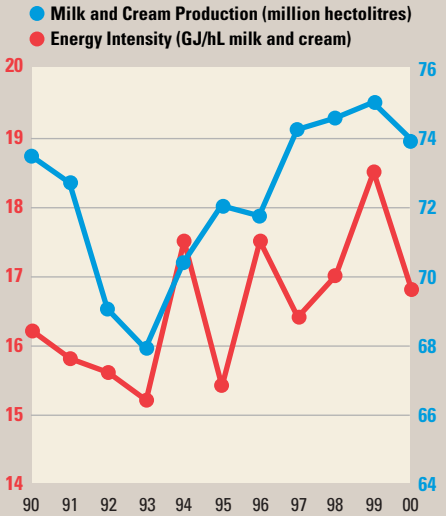
Profile *Canada's dairy product manufacturing sector spans Canada from coast to coast. Operating more than 270 facilities and employing 20 500 people, Canada's dairies processed more than 73 million hectolitres of raw milk and shipped an estimated $5.9 billion worth of milk products in 2000.*

Performance Highlights

- Saputo Inc. has undertaken a series of small projects aimed at reducing energy consumption.
- Parmalat Dairy & Bakery Inc. has developed a corporate energy strategy that aims to lower energy intensity 10 percent by 2006 compared with 2001 levels.
- A major expansion to William Nielson Ltd.'s dairy plant in Ottawa, Ontario, incorporates a range of energy efficiency design features.
- Nestlé Canada Inc. has installed an Electroflow™ system at its dairy plant in Sherbrooke, Quebec.
- An Electroflow™ system at the Atwood Cheese Company Limited reduced electricity consumption by 5 percent in the system's first six months of operation.
- Gay Lea Foods Co-operative Limited uses a system that captures wastewater for cooling.
- In 2001, the sector's total energy consumption was 12 434 TJ, up from 11 952 TJ in 1990.
- The sector's energy intensity is increasing because of consumer demand for products that require more energy to produce.

Dairy Sector – NAICS 311500

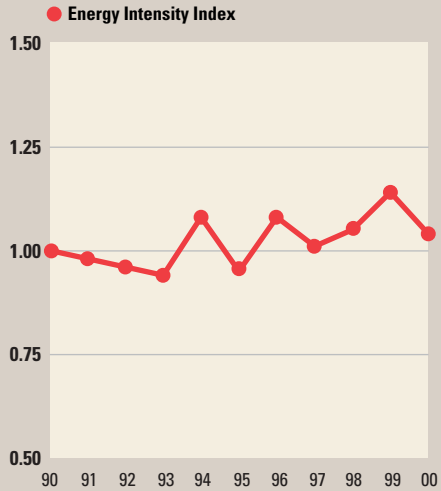
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000.* January 17, 2002. Simon Fraser University.

Dairy Sector – NAICS 311500

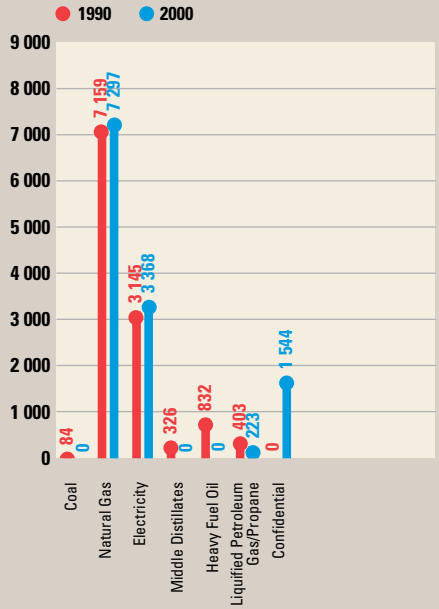
Energy Intensity Index (1990–2000) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000.* January 17, 2002. Simon Fraser University.

Dairy Sector – NAICS 311500

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2000.* January 17, 2002. Simon Fraser University.

ACTIONS

Energy is a key component in milk processing. Typically, dairies employ electrical, thermal and water-based energy systems in their facilities for processes such as pasteurization, churning, washing, packaging, cooling, freezing and drying. Sector companies recognize the importance of energy efficiency in controlling costs and continue to initiate programs to better manage their energy consumption. Dairies have implemented energy-saving programs to encourage recovery and re-use of hot water, recycle tanker wash water, upgrade lighting systems and motors, and minimize air and water leakage. The following are examples of recent energy efficiency efforts by individual companies.

Saputo Inc.'s Milk Division in Edmonton, Alberta, has undertaken a series of small projects aimed at reducing energy consumption. For example, the plant acted to reduce steam generation and took measures to maximize the use of permeate for heating and cooling, thereby offsetting reliance on ammonia refrigerants and boiler-generated steam.

Parmalat Dairy & Bakery Inc. has developed a corporate energy strategy that focuses on capital and continuous improvement opportunities, with the goal of reducing energy intensity by 10 percent below 2001 levels by 2006. Parmalat's energy and environmental teams are working together more closely to establish energy and emissions baselines. Parmalat is also developing a standard energy tracking and forecasting system.

A major expansion to William Nielson Ltd.'s dairy plant in Ottawa, Ontario, includes energy efficiency components such as skylights and metal halide lights. The company is also exploring the possibility of installing SOLARWALL® metal wall cladding and high-efficiency boilers with economizers and adjustable arms. Elsewhere in the plant, Nielson downsized its steam production system to bring capacity in line with demand, enabling the company to replace an older boiler with a more energy-efficient alternative. The company is also converting to high-efficiency motors and has switched its fleet of propane-powered machines to natural gas.

Nestlé Canada Inc. has installed an Electroflow™ system at its dairy plant in Sherbrooke, Quebec. The system, which balances electricity loads at periods of peak demand and downtime, has dramatically reduced the plant's electricity consumption. Nestlé has also implemented a performance contracting program at the plant to manage its refrigeration and airflow programs.

The Atwood Cheese Company Limited has also installed an Electroflow™ system at its dairy plant in Atwood, Ontario. In the system's first six months of operation, it generated more than 5 percent savings in electricity costs. Atwood has also increased motor efficiency at the plant and modified its processes to reduce spikes in power consumption.

Gay Lea Foods Co-operative Limited uses a system that reduces water consumption through an enclosed circulation loop, captures energy from re-circulating water for cooling and reclaims cheese fines, which previously were discharged into the sewage system. The system uses an ammonia membrane (welded plate) heat exchanger that keeps process water in an enclosed system. This decreases water consumption by 80 percent, reduces the surcharge for biological oxygen demand (BOD) by 50 percent and decreases electricity consumption by 50 percent. The system also reclaims lost cheese solids from the water, increasing process yield by 0.6 percent.

ACHIEVEMENTS

Energy efficiency efforts have enabled dairy sector companies to lower their costs and improve their operating efficiency. Energy data for the year 2001 are not yet available. In 2000, the sector's total energy consumption was 12 434 TJ, up slightly from the 1990 level of 11 952 TJ. The amount of milk and cream produced in 2000 increased from 1990 levels. Since 1996, consumer demand for more energy intensive products has offset the sector's progress in improving energy efficiency. Despite this upward pressure on energy consumption, the energy consumed per hectolitre of output decreased in 2000 to 16.8 GJ from 18.5 GJ in 1999.

CHALLENGES

Following the disbanding of the National Dairy Council of Canada in 2001, the sector has re-established an active Dairy Sector Task Force and is now recruiting provincial dairy associations. Begun in 2002, this work is now showing results and should expand the CIPEC presence within the sector in the years to come. A recent study has shown that sector companies that are not CIPEC participants have increased their energy consumption at double the rate of those that do participate in CIPEC. This makes it essential for the task force to broaden its reach within the sector.

For many dairy product manufacturers, unstable energy prices and the scarcity of capital make developing a sound business case for investments in energy efficiency a significant challenge. Moreover, the rationalization and competitive pressures that have emerged in recent years continue to drive the industry to downsize facilities in the face of static sales.

Today's marketplace demands that dairies provide innovative, high-quality and value-added products at the best possible prices. Unfortunately, creating these value-added products often conflicts with efforts to improve energy efficiency. Manufacturers have already made the most of the low-cost and no-cost energy efficiency improvements available to them. Their greatest challenge in the foreseeable future is to make the more costly, payback-delayed improvements that will further advance energy efficiency.

Electrical and Electronics

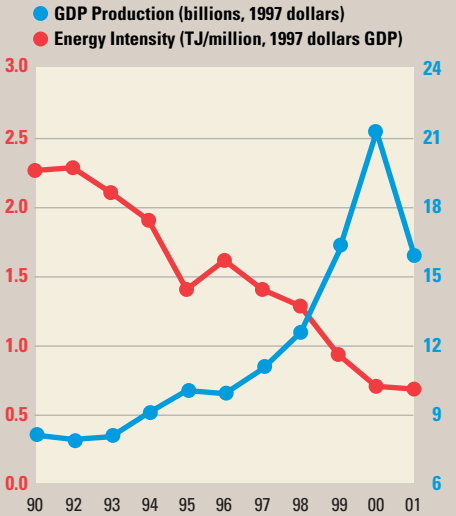
Profile *The electrical and electronics sector includes a diverse array of companies that produce electrical appliances, lighting, consumer electronics, communications and electronic equipment, cabling, office equipment, industrial equipment and other electrical products. These companies operate more than 1400 facilities and employ more than 100 000 workers across Canada. The industry is a major exporter and a vital, growing contributor to the national economy.*

Performance Highlights

- The electrical and electronics sector is Canada's least energy intensive industry.
- Litton Systems Canada Ltd. retrofitted its 45-year-old facility in Toronto, Ontario, with the latest in energy-efficient lighting systems.
- In 2001 IBM Canada Ltd. achieved exceptional energy conservation results, reducing overall energy consumption by 2.4 percent, despite an 11 percent increase in occupied area.
- Between 1990 and the end of 2001, the sector's energy consumption remained relatively constant despite substantial growth in production.
- The sector has decreased its energy intensity by nearly 70 percent from 1990 through 2001.
- The industry anticipates a significant decrease in energy consumption in the coming years.
- Many sector products decrease CO_2 emissions by increasing the energy efficiency of other industries.

Electrical and Electronics Sector – NAICS 334, 335[1]

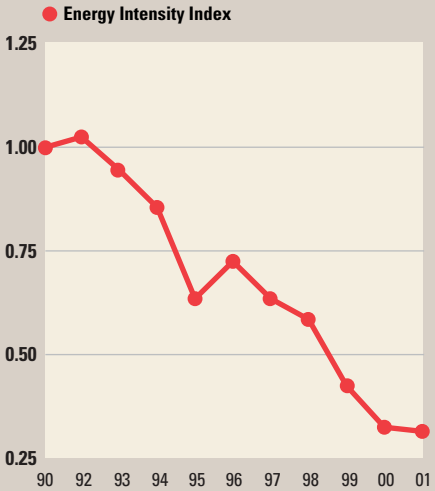
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Electrical and Electronics Sector – NAICS 334, 335[1]

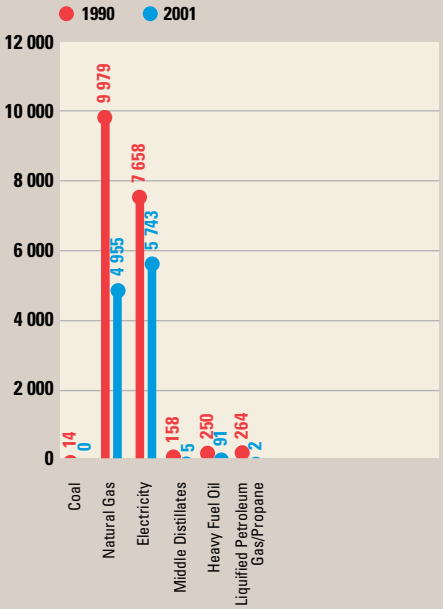
Energy Intensity Index (1990–2001)
Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Electrical and Electronics Sector – NAICS 334, 335[1]

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

[1] Computers, Electronic Products, Electrical Equipment

ACTIONS

Across the electrical and electronics sector, companies are strong proponents of environmental sustainability and energy efficiency. Although the industry is one of Canada's least energy intensive, many companies have incorporated energy efficiency programs into their efforts to control costs.

For example, Litton Systems Canada Ltd. retrofitted its 45-year-old facility in Toronto, Ontario, with the latest in energy-efficient lighting systems. The comprehensive program included undertaking a building-wide analysis of lighting requirements, carefully selecting the correct lighting system for each functional area and installing a computerized lighting control system. The retrofit is saving Litton approximately 113 000 kWh of electricity per month, or about $100,000 per year.

In September 2001, IBM Canada Ltd. celebrated the opening of its Toronto Software Lab in Markham, Ontario. Housing more than 2300 software developers, engineers and support staff, the property is the third largest research facility in Canada. Energy efficiency, environmental management and wildlife habitat protection were a mandatory part of the facility's overall design strategy. Energy conservation was built into the lighting and climate systems, and heating and cooling is provided by the local municipality's first cogeneration plant. These energy initiatives earned the lab a $320,000 incentive through the Commercial Building Incentive Program, which is administered by NRCan's Office of Energy Efficiency.

Company-wide, IBM Canada's continuous review of its business has enabled it to consolidate operations into fewer and larger locations, thus decreasing costs and saving energy and other resources. Mobility initiatives give employees the tools needed to work from home, reducing space requirements, energy consumption and transportation fuel. Currently, 26 percent of the company's staff, or 4700 employees, do not have dedicated office space. It is estimated that, with the reduction in travelling to and from work, these employees save 48 tonnes of pollutants and GHG emissions (including CO_2) per year.

In 2001 IBM Canada achieved exceptional energy conservation results, reducing overall energy consumption by 2.4 percent, despite an 11 percent increase in occupied area and cutting energy consumption density (MWh/sq. ft. per year) by 12.85 percent. Energy efficiency measures conserved 26 076 MWh, leading to 2657 tonnes of CO_2 emissions avoidance. The cumulative CO_2 emissions reduction from the base year 1990 was 34 863 tonnes by the end of 2001.

ACHIEVEMENTS

Natural gas and electricity satisfy virtually all of the electrical and electronics industry's energy requirements. In 2001 the industry consumed 10 798 TJ of energy, representing 0.4 percent of the energy consumed by the mining and manufacturing sector as a whole and less than 1 percent of total energy-related manufacturing CO_2 emissions. On average, energy expenditures represent less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies and 16 percent for labour.

Between 1990 and the end of 2001, the sector's energy consumption remained relatively constant despite substantial growth in production. These factors have combined to decrease energy intensity by nearly 70 percent. Acquisitions, mergers and internal rationalization are enabling the industry to realize increased efficiencies of scale, which are expected to lead to a significant decrease in energy consumption in the coming years.

Sector companies contribute to Canada's overall energy efficiency and GHG-reduction programs in other ways. Many sector products, from oil-refinery control systems to high-efficiency motors and lighting, are used by companies in other sectors to decrease their energy consumption.

CHALLENGES

The energy management challenges faced by the electrical and electronics sector are largely the result of global economic factors and the subsequent decrease in the availability of investment capital for energy conservation projects. Around the world, prices are restrained by excess global manufacturing capacity, soft demand, weak job markets, low interest rates and productivity gains. A weak corporate profit picture inevitably leads to tighter capital investment controls, especially for spending on machinery and equipment. An end to the contraction trend in the sector may be close, but a full recovery is likely several months away.

Nevertheless, the electrical and electronics sector continues to lead other manufacturing sectors in decreasing its energy use and intensity. This positive trend is a result of productivity gains and greater efficiencies within manufacturing operations. In addition, the industry continues to focus its efforts on establishing new standards and increasing the energy efficiency of its products.

Electricity Generation

Profile *The electricity generation sector produces the electrical energy that powers industry, business and homes across Canada. Using water, fossil fuel, nuclear energy and alternative energy sources, the sector produced 539 TWh in 2000, meeting Canada's domestic energy needs while earning more than $1 billion in export revenues.*

Performance Highlights

- TransAlta Utilities Corporation has established a $100 million Sustainable Development Research and Investment Fund.
- BC Hydro Corporation plans to build a 20-MW green energy demonstration project for Vancouver Island.
- ATCO Electric has launched a new energy management service for its customers.
- New radiant heaters installed by Canadian Niagara Power Company Limited have led to an energy input reduction of 15 percent.
- Manitoba Hydro launched the Power Smart Eco-Efficiency Solutions Program to help industrial customers improve their energy efficiency and environmental performance.
- An 11-MW wind power generation project in Saskatchewan now provides half of the electricity used in Government of Canada facilities in that province.
- For the third consecutive year, TransAlta was listed on the Dow Jones Sustainability World Index.

The sector is currently working with NRCan's Office of Energy Efficiency to develop indices and figures.

ACTIONS

The industry continues to support the Canadian Electricity Association's (CEA's) Environmental Commitment and Responsibility (ECR) Program. The ECR Program was established in 1997 to report on environmental performance on a national, industry-wide basis. Participation in the ECR Program became a requirement of corporate utility CEA membership in 1998.

Individual electricity producers are taking significant steps toward energy efficiency and reducing the industry's impact on the environment. For example, Alberta's TransAlta Utilities Corporation has established a $100 million Sustainable Development Research and Investment Fund for investments in renewable energy, carbon-offset projects and the research and development of clean coal technology.

In June 2001, BC Hydro Corporation announced that it plans to build a 20-MW green energy demonstration project for Vancouver Island. The project will produce 10 MW of electricity from wind, 6 to 8 MW through micro-hydro and 3 to 4 MW from ocean waves.

ATCO Electric, in partnership with ATCO Gas, has launched a new energy management service. ATCO EnergySense is an innovative energy management hot-line and on-site evaluation service for residential, farm and commercial customers. Company advisors answer telephone inquiries, make on-site visits and arrange for cost-effective home energy management audits (through a partnership with NRCan's Office of Energy Efficiency). Customers can also visit the interactive ATCO EnergySense House, an on-line energy audit tool.

An energy audit by Ontario's Canadian Niagara Power Company Limited in 2000 identified opportunities for improving efficiency in the company's lighting and heating systems. The company replaced unit heaters in the service area garage with gas-fired tube heaters. The new heaters emit radiant heat, decreasing the amount of heated air lost when doors are opened and increasing heating effectiveness and occupant comfort. Installation of the new heaters has led to an energy input reduction of 15 percent.

In 2001, Manitoba Hydro launched the Power Smart Eco-Efficiency Solutions Program in partnership with NRCan, Environment Canada, National Research Council Canada and Manitoba Conservation. The pilot program will identify and help industrial customers to implement measures in order to improve their energy efficiency and environmental performance.

In April 2001, the province of Saskatchewan entered into an agreement with the Government of Canada, Enbridge Inc. and Suncor Energy Inc. to develop the $20 million Sunbridge Wind Power Project, located five kilometres southeast of Gull Lake, Saskatchewan. The 11-MW project, completed in 2002, provides half of the energy used by facilities owned and operated by the Government of Canada in Saskatchewan. A second Saskatchewan wind power project was scheduled for completion in 2002, thanks to financial commitments from the provincial government and SaskPower. The 5.3-MW project will enable SaskPower to offer EcoLogo-certified green power, which will meet or exceed all government and industry safety and performance standards for renewable energy.

For the third consecutive year, the Alberta energy company TransAlta was listed on the Dow Jones Sustainability World Index. Companies are selected for the index based on a rigorous assessment that includes evaluation of social and environmental factors and economic performance. TransAlta was one of only four North American power generation companies to be included in this index of the world's most sustainable companies. TransAlta has invested more than $23 million in renewable energy and distributed generation over the last two years. TransAlta is the first company in Calgary to have the electricity needs of its corporate headquarters met through wind generation.

ACHIEVEMENTS

The Canadian Electricity Association's *2001 ECR Annual Report*, published as part of the CEA's ECR Program, was distributed in October 2002. The report's theme is energy efficiency and focuses on demand and supply side energy management. The report is available on-line at www.canelect.ca/english/managing_issues_environment_ecr_library.html.

The sector's Electricity Metering Accuracy Program is helping to expand the use of electronic electricity meters. Electronic meters provide customers with real-time information on energy use and prevailing rates, enabling them to better manage their energy costs and usage patterns. For electric utilities, the meters will improve customer satisfaction, reduce operating costs, lower capital investment requirements in generation and infrastructure, and improve environmental performance.

CEA is currently undertaking a survey of energy efficiency programs in the electricity sector. The survey includes all programs aimed at reducing customer electricity demand and companies' efforts to reduce their own energy use. Initial results indicate that although the Canadian electricity industry continues to make sizable investments in energy efficiency programs, the scale and rationale for consumer energy management programs have changed due to the evolving nature of the industry.

CHALLENGES

Although the electricity generation sector is committed to taking action on energy efficiency, short-term gains are difficult to achieve. Improvements are achieved largely by replacing older, less efficient capital stock with new technology, a process that involves considerable planning and long turnover cycles. Although such programs deliver substantial, lasting effects, gains do not come quickly.

All efforts to increase energy efficiency must be balanced with the need to provide customers with reliable, affordable sources of energy. The demand for electricity is growing due to economic and population growth and structural factors such as changing production processes and consumer preferences. Rising demand will tax the imagination and resources of the electricity generation sector to find creative new ways to improve energy efficiency.

Fertilizer

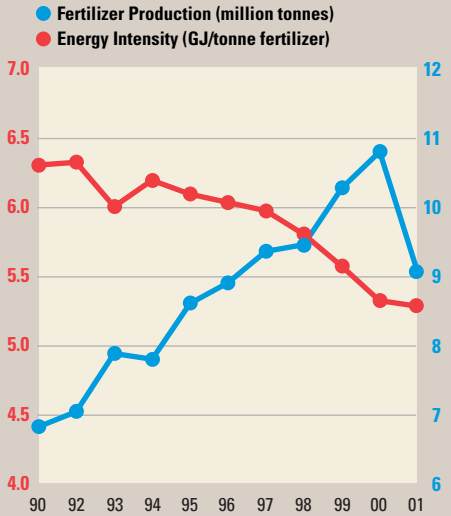
Profile *Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers, manufacturing 12 percent of the world's total fertilizer materials. Companies in this sector operate more than 30 production facilities and are among the world's most energy-efficient producers.*

Performance Highlights

- The Canadian industry is among the most energy efficient compared with its global competitors.
- In 2001, the Canadian Fertilizer Institute and NRCan initiated a benchmarking study of the fertilizer sector.
- Potash Corporation of Saskatchewan Inc.'s (PCS's) Cory Division will cut its energy consumption by using waste steam from an adjacent cogeneration project beginning in 2003.
- PCS is converting operations at its mine in Sussex, New Brunswick, from reliance on oil as a fuel source to natural gas.
- Agrium Inc. commissioned a cogeneration project at its Carseland Nitrogen Operations near Calgary, Alberta, in 2002.
- CF Industries Inc. made a number of energy efficiency improvements at its ammonia and urea production facilities in Medicine Hat, Alberta.
- The sector's fuel energy efficiency in the production of nitrogenous fertilizers has improved by about 16 percent over an 11-year period.
- Nitrogen fertilizer production in Canada increased from 6.8 million tonnes in 1990 to 9.0 million tonnes in 2001.

Fertilizer Sector – NAICS 325313 (nitrogenous)

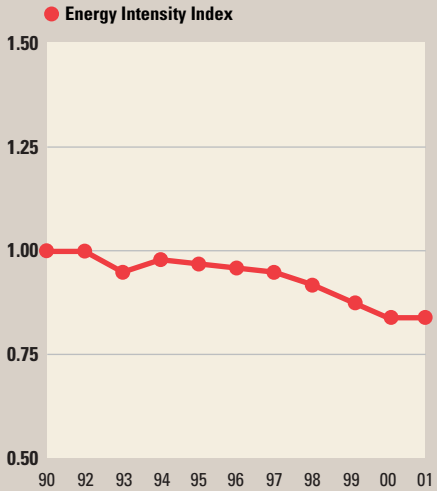
Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Fertilizer Institute (CFI), January 2003.

Fertilizer Sector – NAICS 325313 (nitrogenous)

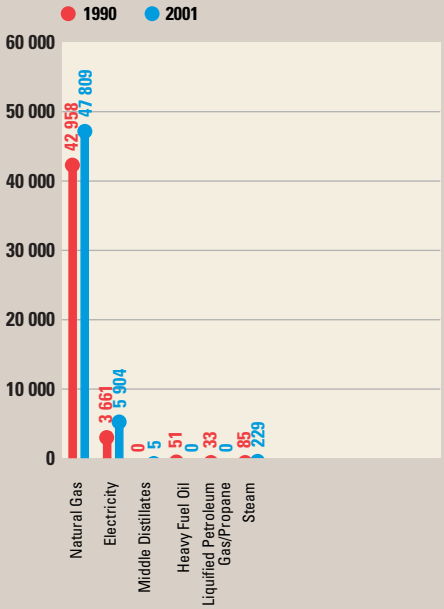
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Fertilizer Institute (CFI), January 2003.

Fertilizer Sector – NAICS 325313 (nitrogenous)

Energy Sources in Terajoules per Year (TJ/yr.)



Data source:
(1) Natural Gas: 1990–2001, CFI, January 2003.
(2) Other Fuels: 1990–2001. Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001*, December 20, 2002. Simon Fraser University.

ACTIONS

Under a contribution agreement with NRCan, the Canadian Fertilizer Institute (CFI) began the second phase of a benchmarking study of potash production in 2002. Final data collection and analysis is planned for early 2003. Benchmarking information will enable potash fertilizer producers to assess their energy efficiency performance against best-in-class operations and to identify areas where further improvements can be made. CFI plans to launch a similar benchmarking study of nitrogenous fertilizer production within the next year. To prepare for this initiative, CFI has already completed a study of CO_2 emissions from ammonia plants around the world and is now reviewing the results.

The year 2002 was the third and final year of CFI-funded research on the use of best management practices to minimize GHG emissions. Conducted in cooperation with the Natural Sciences and Engineering Research Council of Canada, the University of Manitoba and Agriculture and Agri-Food Canada, this research reflects CFI's commitment to stewardship throughout the life cycle of fertilizer products. The final report on this research will be available in the first half of 2003.

Also in 2001, CFI concluded a comprehensive study of carbon sequestration in agricultural soils under various regimes of fertilizer use and agricultural practices. A formal report was issued early in 2002.

Individual companies were also active contributors to the sector's energy efficiency efforts, including divisions of the Potash Corporation of Saskatchewan Inc. (PCS). At its Cory Division mine in Saskatchewan, PCS plans to draw waste steam from an adjacent power plant being constructed by Saskpower International Inc. and ATCO Ltd. PCS will use the steam in its crystallization process to produce potash. The cogeneration project will enable the Cory mine to mothball and eventually decommission an existing steam generation boiler plant, thereby significantly reducing CO_2 emissions. Steam from the project should be available to the Cory mine in the first half of 2003.

At the Sussex potash mine in New Brunswick, PCS is converting operations from reliance on oil as a fuel source to natural gas. Slated for completion in the first half of 2003, the conversion will result in a substantial reduction in the facility's CO_2 emissions.

A cogeneration project at Agrium Inc.'s Carseland Nitrogen Operations near Calgary, Alberta, was commissioned in early 2002. The facility, developed in a joint venture with TransCanada PipeLines Limited, is reducing the need for coal-generated electricity by using gas turbines to produce about 80 MW of electrical power for export into Alberta's power grid. The project will reduce GHG emissions by more than 300 000 tonnes of CO_2e annually.

CF Industries Inc. has made a number of energy efficiency improvements at the company's ammonia and urea production facilities in Medicine Hat, Alberta. Advances include establishing more efficient ammonia converter intervals and instituting de-bottlenecking and energy-use improvements, particularly in the low-pressure recovery and recycling area of CF's urea plant.

ACHIEVEMENTS

According to results of the Fertilizer Sector Task Force data-quality project, the sector's production of nitrogenous fertilizers increased from 6.8 million tonnes in 1990 to 9.0 million tonnes in 2001. The task force reports that the natural gas consumed as fuel in this production was 47 809 TJ in 2001 versus 42 958 TJ in 1990. This represents an improvement in fuel energy efficiency of approximately 16 percent over the 11-year period.

Based on CIEEDAC data, since 1990, potash production has increased some 18 percent, for a total of 8.2 kilotonnes in 2001. Although data reported to CFI by its members indicate greater production values, overall, energy indicators show an improvement in energy intensity that averages more than 1 percent per year since 1990.

CHALLENGES

The Canadian fertilizer industry is among the worldwide industry's lowest GHG emitters per unit of output. However, fertilizer manufacturing requires significant amounts of natural gas, both as a feedstock and as an energy source. As a result, the manufacturing and use of fertilizer produces GHG emissions, primarily CO_2. Conversely, the fertilizer industry plays an important role in carbon sequestration, helping to fix CO_2 in agricultural soils. The industry's products help to create agricultural sinks, which substantially offset the environmental impact of GHGs released during the manufacturing process. The industry believes that agricultural sinks could be a key component of a national short-term approach to reducing net national CO_2 emissions.

As a major energy consumer, Canada's fertilizer industry is concerned about the impact of Canada's Kyoto commitments. Despite the Canadian industry's international energy efficiency leadership, the introduction of climate change policy scenarios could put the industry at considerable risk. Keeping pace with growth in the worldwide demand for food will drive growth in fertilizer production and, consequently, the industry's energy consumption. Current and projected energy efficiencies cannot offset the impact of this growth, despite the industry's best efforts.

CFI believes that although gains in manufacturing energy efficiency will come in small increments, major reductions in the GHG impact of fertilizers can come from improvements in their use. The fertilizer industry supports research and other efforts that serve to improve the efficiency of fertilizer use and to foster best-practices approaches within Canada's agricultural community. The industry believes that the right mix of policies, practices and economic incentives could have a substantial impact on the global effort to reduce GHG emissions. Conversely, focusing solely on the energy used by Canada's fertilizer industry could inadvertently increase global GHG emissions and exacerbate the world's food shortages.

Food and Beverage

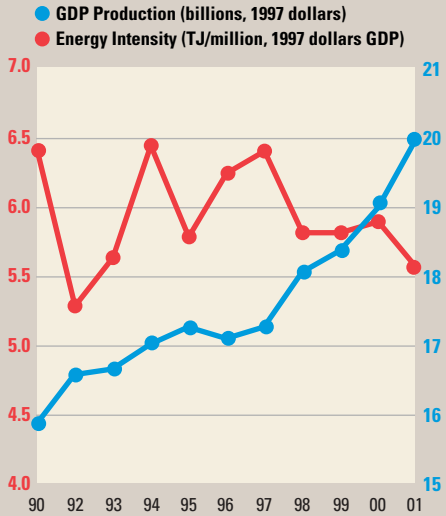
Profile *Canada's food and beverage sector includes manufacturers that produce a diverse range of products, including meat, dairy, poultry, fish/seafood, fruit and vegetables, bakery products, oils and sugars, coffee, snack foods, beer, soft drinks and confections.*

Performance Highlights

- Effem Inc., of Bolton, Ontario, has used NRCan's Industrial Energy Audit Incentive to identify a number of energy efficiency opportunities.
- Maple Leaf Foods Inc. and its family of companies signed on as Industrial Energy Innovators, adding 97 manufacturing plants to the program.
- Nestlé Canada Inc. conducted steam trap audits at three of its factories.
- Sakai Spice (Canada) Corporation has installed new power factor correction equipment.
- Sun Valley Foods, a division of Cargill Limited, installed a new roof that has a higher R-value at its facility in London, Ontario.
- At its facility in High River, Alberta, Cargill Foods, a division of Cargill Limited, installed an automated monitoring and control system on its cold-water pumps, reducing the number of pumps needed to maintain system pressure.
- Schneider Foods recently completed an energy audit of its facility in Kitchener, Ontario, that identified hundreds of thousands of dollars in potential savings.
- From 1990 to 2001, food processors improved their collective energy intensity by 13.3 percent.
- For the years 2000 to 2005, the sector anticipates an average reduction in energy use of 2.2 percent per year.

Food Sector – NAICS 311000;
Beverage Sector – NAICS 312100[1]

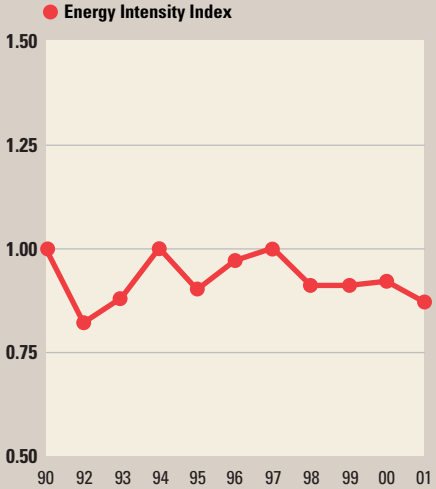
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.
Note: Includes data for brewery and dairy sectors.

Food Sector – NAICS 311000;
Beverage Sector – NAICS 312100[1]

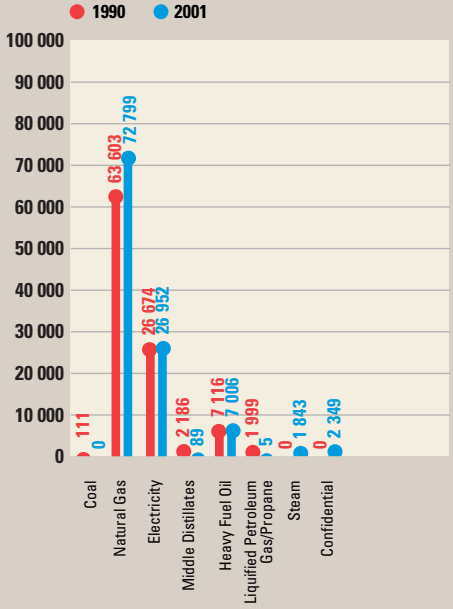
Energy Intensity Index (1990–2001)
Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.
Note: Includes data for brewery and dairy sectors.

Food Sector – NAICS 311000;
Beverage Sector – NAICS 312100[1]

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.
Note: Includes data for brewery and dairy sectors.

[1] NAICS 311000: Food manufacturing includes dairy data. NAICS 312100: Beverage includes soft drinks, ice, breweries, wine and distilleries.

ACTIONS

The CIPEC Food and Beverage Sector Task Force meets three to four times a year, prior to CIPEC Task Force Council meetings. Task Force meetings in 2002 were hosted by Food and Consumer Products Manufacturers of Canada – a CIPEC partner since 1999 – and by Nestlé Canada Inc. at its manufacturing facility in Toronto, Ontario. Other sector partners include the Canadian Meat Council, the Baking Association of Canada, the Canadian Council of Grocery Distributors and the sector's newest partner, the Fisheries Council of Canada, which joined in 2001.

Individual food and beverage sector companies continue to take action to improve energy efficiency and minimize GHG emissions. A new Industrial Energy Innovator, Effem Inc. of Bolton, Ontario, has used NRCan's Energy Audit Incentive to identify a number of energy efficiency opportunities. The company will achieve energy savings through improvements to its compressed-air, vortex cooling and vacuum systems and through the use of skylights and improved lighting-control systems and practices.

Canada Bread Company Limited in Etobicoke, Ontario, a subsidiary of Maple Leaf Foods Inc., installed a Miniveil air-curtain system on a conveyor that opens to the facility's refrigerated palletizing room. The air curtain will reduce heat transfer at the opening and help keep the room at its required constant temperature of between 15°C and 21°C. In 2002, Maple Leaf Foods signed on as an Industrial Energy Innovator corporately, thereby making its 92 plants across Canada eligible to take advantage of the program's benefits. For example, Maple Leaf Consumer Foods held a customized "Dollars to $ense" energy management workshop and energy awareness day in Winnipeg for its Manitoba plants. The company's Canada Bread plants in Ontario participated in a daylong energy symposium in Hamilton. More customized workshops are planned for locations across Canada in 2003.

Nestlé Canada Inc. conducted steam trap audits at three of its factories, leading to efficiency improvements to its steam systems. The company has also continued its program of lighting upgrades and installed a wastewater treatment system.

Sakai Spice (Canada) Corporation's mustard processing plant in Lethbridge, Alberta, has made a number of energy efficiency improvements. The company has installed new power factor correction equipment, implemented an energy monitoring system and made improvements to its systems for refrigeration, compressed air, lighting and heating, ventilation and air conditioning. Sakai plans to launch new lighting initiatives and to make improvements to its plant's building envelope.

Sun Valley Foods, a division of Cargill Limited, completed a number of energy efficiency projects in 2001. The company replaced the roof of its facility in London, Ontario, with one that has a higher R-value, completed an audit and repair program on its compressed-air system and replaced light switches with lighting sensors in offices and locker rooms. In 2002, Sun Valley also conducted studies on power quality, power factor and refrigeration plant efficiency.

Cargill Foods, a division of Cargill Limited, in High River, Alberta, installed an automated monitoring and control system on its cold-water pumps, enabling the company to reduce the number of pumps needed to maintain system pressure from four to two. Off-line pumps are held in reserve to handle peak demand.

Schneider Foods recently completed an energy audit of its facility in Kitchener, Ontario. The audit found that modifications to the steam plant and reductions in the ventilation rate in the main plant will enable Schneider to reduce natural gas costs at the boiler plant by about $270,000 per year. These measures have an estimated payback time of less than one year and can reduce natural gas consumption by about 20 percent. Modifications to the refrigeration and ventilation systems could result in electricity and operating savings of approximately $465,000 per year. The modifications can reduce electricity use by 15 percent and would pay for themselves in about three years.

ACHIEVEMENTS

Canada's food processing industry continued to increase its gross output in 2001, but its energy use decreased slightly. The sector's total energy consumption declined to 111 043 TJ in 2001, compared with 111 736 TJ in 2000, a decrease of 0.6 percent. Over the past 11 years, the sector's total energy consumption increased by 9.2 percent, from 101 689 TJ in 1990 to 111 043 TJ in 2001, due largely to a significant increase in natural gas consumption. (These totals include energy use and output data from the dairy and brewery sectors, which are highlighted separately in this report.)

The sector's use of heavy fuel oil decreased by 16 percent over the past year. This reduction may be attributed to the leveling off or reduction in natural gas prices that occurred over the year. Although energy consumption within the sector has risen, the food industry has made long-term progress toward better energy efficiency. From 1990 to 2001, food processors improved their collective energy intensity by 13.3 percent.

CHALLENGES

Based on input from its member companies, the food and beverage sector has established aggressive targets for energy efficiency. For the years 2000 to 2005, the sector anticipates an average reduction in energy use of 2.2 percent per year. From 2006 to 2010, the sector's goal is an average reduction of 1.7 percent per year, for a total of 19.5 percent over the next 10 years.

Reaching these goals will not be easy. Many sector companies are concerned about the impact of Canada's commitment to the Kyoto Protocol and whether they will be able to meet the agreement's emissions requirements. Among their concerns are that the major changes in energy usage patterns needed to curb emissions will compromise product quality and may jeopardize their ability to meet legislated food safety regulations.

Sector members in Ontario are also concerned about immediate and medium-term electricity supply issues. Electrical cost uncertainties could lead these companies to re-examine cogeneration systems, which may result in increases in natural gas or heavy fuel oil consumption.

Foundry

Profile *Metal castings are the first step in the value-added manufacturing chain and are used in the manufacture of most durable goods. Markets and industries served by foundries include the automotive sector, construction, agriculture, forestry, mining, pulp and paper, heavy industrial machinery and equipment, aircraft and aerospace, plumbing, soil pipe, municipal, roads, defence, railways, petroleum and petrochemical, electrical distribution and a myriad of specialty markets. There are approximately 200 foundries in Canada, employing 15 000 people and generating annual sales of more than $2 billion. About 80 percent of the foundry sector's production is exported.*

Performance Highlights

- Canada's 200 foundries employ 15 000 people and generate annual sales of more than $2 billion.
- A "Dollars to $ense" workshop at Ancast Industries Ltd. has led to annual energy savings of $60,000 to $70,000.
- Bibby-Ste-Croix, in Sainte-Croix, Quebec, has established an energy efficiency committee to oversee the foundry's energy improvement strategy.
- ESCO Limited partnered with BC Hydro Corporation and NRCan in a cost-sharing initiative under BC Hydro's Power Smart program.
- NRCan's Office of Energy Efficiency and the Canadian Foundry Association launched a pilot foundry audit program with four foundries.
- Crowe Foundry Limited identified potential energy usage reductions of 22 percent and cost savings of 18 percent.
- Grenville Castings Limited identified opportunities to reduce energy consumption and energy costs by 5 percent.

The sector is currently working with NRCan's Office of Energy Efficiency to develop indices and figures.

ACTIONS

Individual foundries continued to take action to advance their energy efficiency programs on their own and in partnership with the Canadian Foundry Association and NRCan's Office of Energy Efficiency. For example, a "Dollars to $ense" workshop at Ancast Industries Ltd. of Winnipeg, Manitoba, has led to annual energy savings of $60,000 to $70,000 and stimulated further energy efficiency initiatives at the Winnipeg foundry. Ancast Industries expects to save $80,000 per year by implementing a three-phase, $200,000 project to recover heat from its three coreless induction furnace cooling systems. The company is currently compiling a list of all its potential energy-saving projects, including replacing inefficient lighting, cutting compressed-air requirements, reducing motor horsepower requirements and shutting down unneeded equipment during peak production periods.

Bibby-Ste-Croix, in Sainte-Croix, Quebec, established an energy efficiency committee to oversee the foundry's energy improvement strategy. The foundry also set up a new, energy-efficient melting department, improving the efficiency of furnace usage from 75 to 95 percent. The company installed a power supply control system that automates operations in all modes, from melt to hold, sinter and cold start. This system will save about 10 percent in electricity consumption. The foundry also installed automatic controls for its charging system.

ESCO Limited of Port Coquitlam, British Columbia, partnered with BC Hydro Corporation and NRCan in a cost-sharing initiative under BC Hydro's Power Smart program. The foundry identified energy efficiency opportunities in the operation and design of its cleaning room dust collector systems, welding booths and connecting ducts. Upgrading these systems will significantly reduce the horsepower required to run them, saving about 852 650 kWh per year. The foundry is also improving its compressed-air system by eliminating air leaks, shutting down compressors during non-production periods, adding a high-flow valve and reducing operating pressure by 7 percent. These measures are expected to save ESCO 560 750 kWh per year. In total, the cost-sharing initiative will enable the company to achieve a payback period of slightly more than one year.

NRCan's Office of Energy Efficiency and the Canadian Foundry Association launched a pilot foundry audit program with four foundries participating: ESCO Limited, Wabi Iron & Steel Corp., Crowe Foundry Limited and Grenville Castings Limited.

Under the audit program, Crowe Foundry Limited of Cambridge, Ontario, identified potential energy use reductions of 22 percent and cost savings of 18 percent through process heat recovery; improvements to heating, ventilation and compressed-air systems; and by establishing an energy monitoring and targeting program.

At its plants in Smiths Falls, Perth and Merrickville, Ontario, Grenville Castings Limited identified opportunities to reduce energy consumption and energy costs by 5 percent by implementing low-cost energy activities. These included changes in compressed-air end-use practices, improving process combustion system efficiencies and changes in equipment schedules.

ACHIEVEMENTS

Motivated by environmental and bottom-line concerns, Canada's foundries continue to implement energy efficiency improvements and reduce GHG emissions. Many companies no longer use GHG-generating fuels such as coal, oil or coke in their operations and have eliminated the use of steam produced by coal-generated electricity.

Escalating oil, natural gas and electricity costs are leading a growing number of companies to adopt active programs throughout the industry, including installing equipment that is more efficient, implementing improved methods and establishing fuel-switching and waste-energy capture programs. These actions are bolstering the sector's efforts to improve its energy efficiency.

CHALLENGES

Canada's foundries continue to search for and adopt energy-efficient equipment and methods. More than ever, foundries are closely monitoring energy consumption and implementing programs to improve energy efficiency. Efforts are complicated by the sector's growing business complexity – many sector companies now go far beyond raw castings and design parts, build tooling, cast prototypes and make, machine and assemble castings and sub-assemblies. By necessity, the industry's expanded role has led to increased upward pressures on energy consumption.

Many foundries, especially in Ontario, are concerned by electricity prices and electrical distribution charges. Although changes in the energy market affect all facilities to some extent, foundries that rely more heavily on electricity are hurt more than those that rely on other fuels. The Canadian Foundry Association is concerned that higher energy costs will endanger the position of Canadian foundries in the highly competitive international marketplace.

General Manufacturing

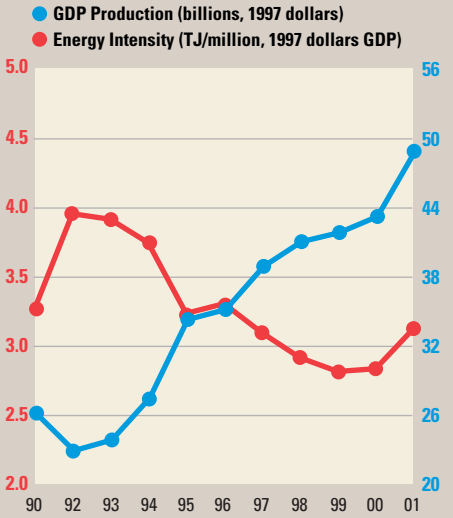
Profile *The general manufacturing sector comprises a variety of industries, including leather, clothing, furniture, printing activities, construction materials, floor coverings, insulation, glass and glass products, adhesives, plastics and pharmaceuticals. The sector encompasses approximately 2000 small, medium and large companies that, combined, consumed 152 679 TJ of energy in 2001.*

Performance Highlights

- Simmons Canada Inc. reports a company-wide decrease in natural gas use in 2001 of 121 869 cubic metres, or 13.8 percent.
- North American Felt installed a heat exchanger in its incinerator chimney, enabling the company to use the previously wasted heat to generate steam.
- Interface Flooring Systems (Canada) Ltd. saved about $400,000 over a six- to eight-month period through energy conservation measures.
- Sintra Inc. installed automatic temperature control systems at its offices in Québec, Sherbrooke and Joliette.
- EMCO Limited has completed the installation of two new high-efficiency boilers at its plant in La Salle, Quebec, reducing the plant's natural gas consumption by 7.5 percent.
- Husky Injection Molding Systems Ltd.'s GHG emissions in 2001 were 15 percent below 1990 levels, despite the company tripling in size over the same period.

General Manufacturing[1]

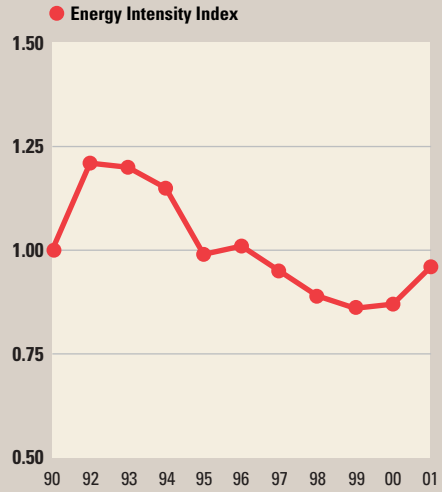
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

General Manufacturing[1]

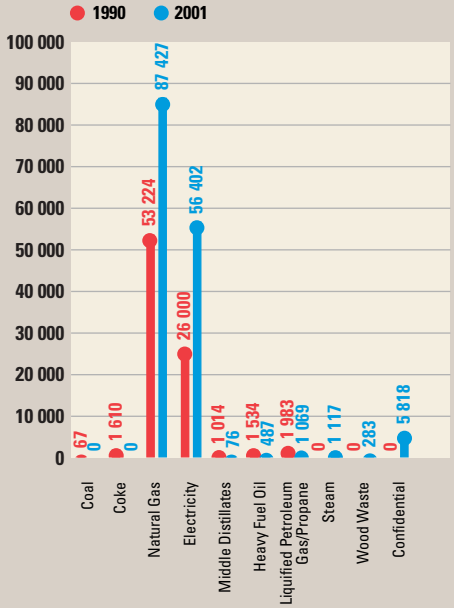
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

General Manufacturing[1]

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

[1] NAICS 315 Clothing and Manufacturing
NAICS 316 Leather and Allied Products
NAICS 323 Printing and Related Support Activities
NAICS 3254 Pharmaceutical and Medicine
NAICS 3255 Paint Coating and Adhesive Manufacturing
NAICS 3256 Soap, Cleaning Compound and Toilet Preparation
NAICS 3259 Other Chemical Products Manufacturing
NAICS 3261 Plastic Products Manufacturing
NAICS 327210 Glass and Glass Products Manufacturing
NAICS 332 Fabricated Metal Products
NAICS 333 Machinery
NAICS 337 Furniture and Related Products
NAICS 339 Miscellaneous Manufacturing

ACTIONS

Across the country, individual sector members, represented by the Eastern, Central and Western General Manufacturing Sector Task Forces, are making important contributions to energy efficiency. For example, Simmons Canada Inc., based in Mississauga, Ontario, has made significant gains in energy efficiency by consolidating its production in the prairie provinces, implementing new procedures for using gas heaters and air make-up units, and by upgrading its lighting systems. Simmons reports a company-wide decrease in its natural gas use in 2001 of 121 869 cubic metres, or 13.8 percent, while its electricity consumption increased by only 0.1 percent. Simmons has targeted an additional improvement of 2 percent in 2002.

The energy efficiency team at Owens Corning Canada Inc.'s Scarborough plant in Toronto, Ontario, continues to find ways to keep its operations running with less energy. The plant eliminated compressed-air use in key areas and lowered pressure in its compressed-air system from 115 psi to 106 psi while producing the same output. The team also made modifications to the plant's oven/incinerator process. Combined, these actions have produced energy savings of $45,000 per month. At its plant in Edmonton, Alberta, Owens Corning is converting its lift trucks from propane to natural gas, saving the company an estimated $20,000 per year in energy costs.

At its plant in Joliette, Quebec, North American Felt installed a heat exchanger in its incinerator chimney, enabling the company to use the previously wasted heat to generate steam. The company also installed insulation on the incinerator piping system, preserving fume heat and reducing natural gas consumption.

Interface Flooring Systems (Canada) Ltd. will save about $400,000 over a six- to eight-month period through energy conservation measures. The total conversion of Interface's electricity supplies to green sources in the coming years will net annual savings of about $400,000.

The paving company Sintra Inc. installed automatic temperature-control systems at its regional offices in Québec, Sherbrooke and Joliette that reduce heating and air-conditioning demand (and thus energy consumption) when the buildings are unoccupied. A similar system will be installed at its headquarters in Montréal in 2003.

EMCO Limited has completed the installation of two new high-efficiency boilers at its plant in La Salle, Quebec, reducing the plant's natural gas consumption by 7.5 percent. System optimization of its boilers is expected to improve its boiler room energy consumption by an additional 2 percent in 2003. At EMCO's plant in Pont-Rouge, Quebec, the company has reduced energy consumption by converting its main dryer from steam to natural gas. At its plant in Edmonton, Alberta, EMCO modified various gas-fired burners and reviewed the electrical specifications for all its equipment to ensure that correctly sized motors were in place. The company also eliminated non-essential equipment. Edmonton achieved its greatest gains by enclosing its paper mill effluent output, thereby reducing the energy required to heat incoming process water.

Husky Injection Molding Systems Ltd. of Bolton, Ontario, continues to be a leader in environmental management practices. In 2001, the company's GHG emissions were 15 percent below 1990 levels, despite the company tripling in size over the same period. The company has achieved these results by including energy efficiency in all of its business decisions – using the latest construction technology to improve the energy efficiency of its facilities, purchasing the most fuel-efficient vehicles, using video conferencing instead of air travel and taking a host of other actions. Husky expects to completely eliminate its net CO_2e emissions and become GHG neutral by 2010.

ACHIEVEMENTS

The three General Manufacturing Sector Task Forces, which each meet three to four times a year, continue to make progress in meeting the commitments outlined in their current action plan. The task forces are currently revising the sector's action plan for the period 2003–2006. The task forces have established and are maintaining ongoing collaborative efforts with manufacturing, technology and energy organizations that are interested in furthering industrial energy conservation and efficiency. Moreover, the growing regional task forces in western and eastern Canada continue to extend CIPEC's reach to manufacturers nationwide. Across the country, the sector is encouraging the involvement of other associations and firms and stimulating the reporting of energy efficiency progress by the sector's Industrial Energy Innovators.

CHALLENGES

The General Manufacturing Sector Task Forces cover an extremely broad range of industries that comprise companies of all sizes. This diversity makes it a challenge to develop comprehensive, accurate, sector-wide energy data.

Moreover, the implementation of energy efficiency programs is an uphill battle for many sector companies. Where energy is a large component of overall costs, many manufacturers, especially smaller ones, lack the knowledge and financial resources to identify and act on energy-saving opportunities. For companies that are less energy intensive, the relatively small role that energy plays in overall costs makes it difficult to justify major capital expenditures. For companies of all sizes, finding the staff and capital resources to dedicate to energy projects is a significant impediment. Furthermore, as many companies restructure to lower costs and reduce staffing, the competition for resources has pushed energy efficiency improvement programs to the back burner.

These challenges are exacerbated by wide fluctuations in energy prices, which make it difficult to build a classical business case for investments in energy efficiency.

Lime

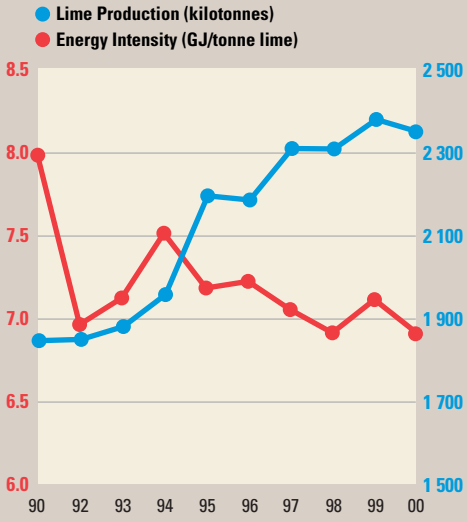
Profile *Canada's merchant lime sector supplies essential raw materials for steel production, mining, pulp and paper manufacturing, water treatment, environmental management and other basic industries. Operating 15 facilities and employing more than 700 people, the sector's four companies and their affiliates had a combined lime-calcining capacity of approximately 3 million tonnes in 2001.*

Performance Highlights

- In 2001, the lime sector had a combined lime-calcining annual capacity of approximately 3 million tonnes.
- The sector co-sponsored a customized energy workshop for Canadian lime producers in June 2002.
- Chemical Lime Company of Canada Inc. held a customized energy workshop in western Canada in January 2003.
- Graymont (QC) Inc. commissioned an energy-efficient short rotary kiln at its facility in Bedford, Quebec.
- While the sector's total energy consumption increased by 1491 TJ between 1990 and 2000, the sector's energy intensity index decreased by 13.5 percent.
- Companies representing nearly 99 percent of the lime-production capacity in Canada's merchant lime sector are now Industrial Energy Innovators.

Lime Sector – NAICS 327410

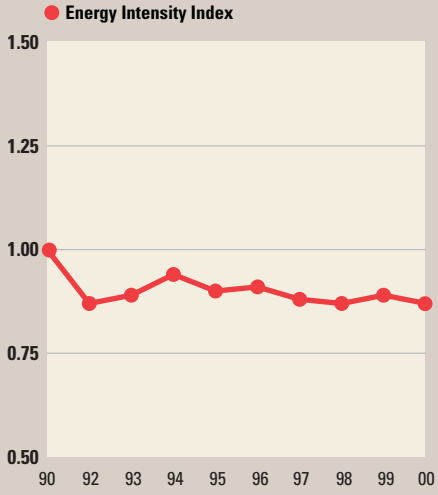
Energy Intensity and Physical Output (1990–2000)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* March 11, 2003. Simon Fraser University.

Lime Sector – NAICS 327410

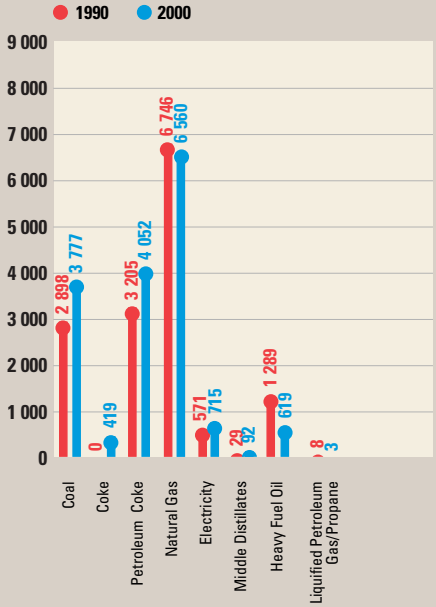
Energy Intensity Index (1990–2000) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* March 11, 2003. Simon Fraser University.

Lime Sector – NAICS 327410

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* March 11, 2003. Simon Fraser University.

ACTIONS

In June 2002, the Canadian Lime Institute, in conjunction with NRCan's Office of Energy Efficiency, co-sponsored a customized energy workshop for Canadian lime producers. Carmeuse Lime (Beachville) Ltd. hosted the workshop at its facility in Ingersoll, Ontario. All but one member company of the Canadian Lime Institute was represented at the event, which drew 22 participants that ranged from energy managers, mechanics and operators to accounting personnel, senior executives, plant managers, superintendents and supervisors. Chemical Lime Company of Canada Inc. held a similar customized energy workshop in January 2003. The event, held at the Chemical Lime Company's plant in Langley, British Columbia, attracted 29 participants.

Individual lime manufacturers continue to make significant energy efficiency improvements. For example, Graymont (QC) Inc. commissioned an energy-efficient short rotary kiln at its facility in Bedford, Quebec. The kiln, which includes a process preheater, is rated at 550 tonnes of production per day.

ACHIEVEMENTS

Companies in the merchant lime sector represented by the Canadian Lime Institute continue to work actively to improve the energy efficiency of their operations. Within the sector, Industrial Energy Innovators account for close to 99 percent of Canada's lime-production capacity.

Accurate energy consumption and efficiency data for 2001 were not available as of this writing. However, in 2000, it took 16 237 TJ of energy to produce 2351 kilotonnes of lime. This compares with 16 937 TJ and 2381 kilotonnes in 1999, and 14 746 TJ and 1848 kilotonnes in 1990. Energy consumption per tonne of lime decreased from 7.11 GJ per tonne in 1999 to 6.91 GJ in 2000, a 3 percent improvement. While total energy consumption increased by 1491 TJ between 1990 and 2000, the sector's energy intensity index decreased by 13.5 percent. The sector is committed to continuing improvement in its energy intensity at a target rate of 0.3 to 0.5 percent per year.

Only about 40 percent of the GHGs emitted by the lime sector relate to the consumption of energy to prepare limestone for calcination and to convert it into finished products. The remaining 60 percent emerges from the calcination or decomposition of limestone. The sector's GHG emissions are offset to some extent by the re-absorption of CO_2 by lime during its life cycle. The National Lime Association estimates that more than 25 percent of the lime produced in Canada and the United States re-absorbs CO_2 either in process or naturally.

CHALLENGES

In an industry that depends heavily on combustion fuels, rising fuel prices make energy efficiency a top priority. Although ongoing refinements continue to be made to existing calcining equipment, substantial capital investments in new, more efficient kiln installations are needed to realize major gains. Although these investments are important to the industry's competitiveness and energy efficiency, a recent weakened demand for the industry's product has increased the challenge facing lime producers to find the needed capital.

Producers are also challenged to balance energy efficiency with quality. The production of lime occurs at high temperatures, using large quantities of combustion fuel. Natural gas is the sector's principal fuel source, with petroleum, coke and coal making up most of the balance. Fuel switching and high-efficiency large-kiln technology may reduce energy requirements, but they can also interfere with product quality, a significant concern for some of the sector's largest customers.

Mining

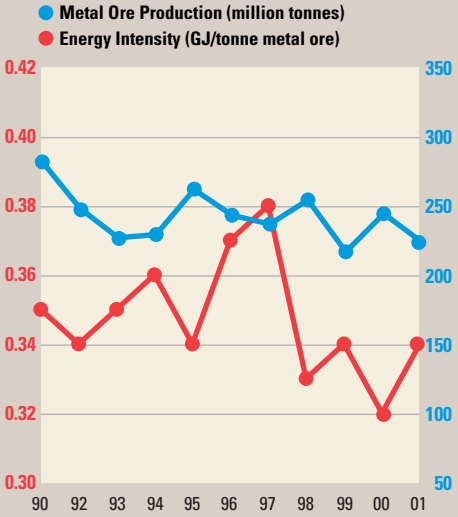
Profile *Canada's minerals and metals industry produces 60 different mineral commodities. At the end of 2001, there were 71 metal mines and 26 non-ferrous metal smelters and refineries (excluding aluminum) located across the country. The mining and minerals processing industry directly employs 375 000 people and contributed $35 billion to Canada's GDP in 2001 – 3.75 percent of the national total. Canada is one of the world's largest mineral exporters, with 80 percent of its production – valued at $47.4 billion – destined for foreign markets. This represents 13.8 percent of total domestic exports, or $1 for every $8 earned in Canada through exporting. Despite an overall decline in mineral prices in recent years, mineral and metal exports increased by 63 percent between 1993 and 2001.*

Performance Highlights

- Canada is one of the world's largest mineral exporters, with 80 percent of its production – valued at $47.4 billion – destined for foreign markets.
- In 2001, the Mining Association of Canada (MAC) received a VCR Inc. Association Leadership Award of Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) for its voluntary progress in reducing energy consumption and GHG emissions across Canada's mining and metals industry.
- MAC has completed energy benchmarking studies on underground bulk and open-pit mining operations.
- MAC's Task Force on Energy hosted its second energy efficiency conference in November 2002.
- Falconbridge Limited's Canadian divisions implemented energy conservation projects that reduced energy consumption by 13.8 GWh in 2001.
- Inco Limited implemented 88 projects under its Energy Breakthrough program, resulting in savings of 1331 TJ and emissions reductions of more than 61 kilotonnes of CO_2e.
- MAC members have agreed to extend the sector's annual energy intensity reduction target of 1 percent to 2005.

Metal Ore Mining Sector – NAICS 212200

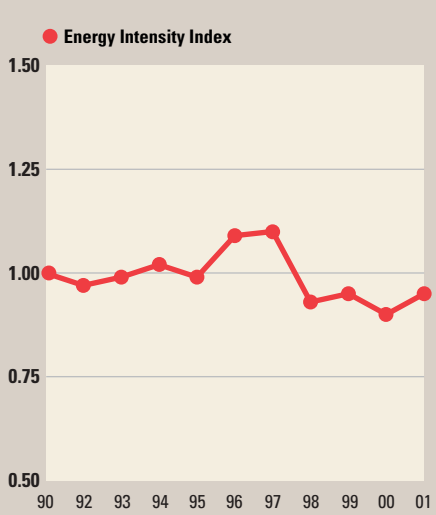
Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Metal Ore Mining Sector – NAICS 212200

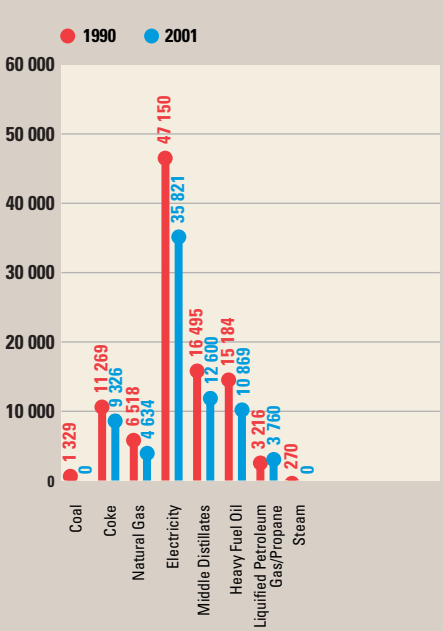
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Metal Ore Mining Sector – NAICS 212200

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

Through the Mining Association of Canada (MAC), members of the mining industry are firmly committed to improving energy efficiency and participating in a solution to climate change. As part of their commitment to GHG reduction, 16 of MAC's 26 members (62 percent of total membership), representing most of energy consumption in the metal mining sector, are participating in Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.). MAC continues to encourage member and non-member companies to report progress annually. In 2001, MAC achieved VCR Inc.'s Gold Level Champion reporting status and was awarded VCR Inc.'s Association Leadership Award for voluntary progress for its success in helping to reduce energy consumption and GHG emissions across Canada's mining and metals industry.

To encourage greater member participation, MAC voluntarily reports the GHG emissions of its members in its annual *Environmental Progress Report*. In 2001, the second year of this report, nine member companies provided data for public reporting on their energy consumption and on their direct and indirect GHG emissions.

To help companies develop and implement effective energy efficiency programs across the Canadian mining industry, MAC's Task Force on Energy hosted its second annual Energy Efficiency Conference in Calgary, Alberta, in November 2002. The session, which was designed for managers involved in energy efficiency, production, financial analysis, environmental issues and long-term cost-efficiency planning, included a workshop that helped attendees identify business opportunities available through improved energy efficiency.

To measure and compare energy performance within the industry, MAC, with the assistance of NRCan's Office of Energy Efficiency, has performed energy benchmarking studies on underground bulk and open-pit mining operations. A third benchmarking study that will focus on non-ferrous smelting and refining is being planned. These studies have provided valuable information for measuring an organization's energy performance and have helped identify where improvements and better practices can be adopted.

Within the industry, individual companies are seizing opportunities to improve energy efficiency. For example, at its smelter in Sudbury, Ontario, Falconbridge Limited is installing furnace-peak, paste-heater and automation controls. At its Sudbury mine, the company is turning down its principal mine ventilation system and reducing shaft air temperatures. At its Raglan operation, in northern Quebec, Falconbridge is rationalizing remote generators and concentrator compressed-air systems and is optimizing underground heating. At its Kidd Creek facilities in Timmins, Ontario, the company is introducing process improvements to reduce natural gas use and is making improvements to its zinc plant cell-house and to its systems for compressed air, mine ventilation and electrical metering. In 2001, Falconbridge's Canadian divisions implemented energy conservation projects that reduced energy consumption by 13.8 GWh. By maintaining its focus on energy efficiency, the company's Canadian divisions have improved their energy intensity by 9.31 percent and reduced their carbon intensity by 6.36 percent since 1990.

Inco Limited's Energy Breakthrough (EB) program has become the focal point of the company's energy efficiency and climate change mitigation efforts. During the program's first full year of operation in 2001, Inco expanded it to include additional operations, including the company's copper and nickel refineries. Over 12 months, Inco implemented 88 EB projects, resulting in audited energy savings of 1331 TJ and emissions reductions of more than 61 kilotonnes of CO_2e. In Inco's Ontario operations alone, EB projects produced energy savings of $13.5 million, well above the company's $12 million target. Inco's EB program is supported by the company's PowerPlay awareness campaign that links individual action, energy efficiency and climate change mitigation. PowerPlay encourages employees to identify energy-saving projects that can be integrated into the EB tracking system. During the program's pilot phase, employees offered 650 suggestions. The top 60 projects were implemented, resulting in annual energy savings of just under $10 million.

ACHIEVEMENTS

In 2001, total energy used in metal mining was 77 012 TJ compared with 79 054 TJ in 2000. Over the period 1990–2001, energy consumption in metal mining decreased by 24 percent, while energy intensity, or energy consumed per unit of metal concentrate, improved by 3 percent. For the period 1990–2000, metal mining decreased its total GHG emissions by 19.2 percent and improved overall GHG intensity by 18.5 percent.

MAC member companies have agreed that the target of 1 percent annual reduction in energy consumption per unit of output, originally intended to run from 1995 to 2000, will be extended to 2005.

CHALLENGES

MAC believes that when considering the mining industry's role in meeting Canada's Kyoto commitments, it is vital that the Government of Canada develop an implementation plan that fully respects the trade and competitiveness implications of ratification for all Canadians. What is needed is a clear-eyed assessment of Canada's ability to meet the Kyoto target and the consequences of doing so. As has been the case in the past, MAC will fully support the development of this implementation plan, but the process must not halt immediate action in limiting the GHG emissions that contribute to climate change. MAC members want to be part of the solution and accept that prudent precautionary measures are necessary for a healthy environment and a healthy economy.

MAC supports the development of balanced climate change policies that achieve the following:

- efficiently improve environment quality and deliver sustainable and predictable environmental, social and economic policies over the long term
- encourage and support early action by industry to reduce GHG emissions
- build on voluntary measures by industry
- maximize flexibility to minimize costs
- examine emissions embodied in trade
- encourage investment in better energy-efficient processes and the cost-effective replacement of capital stock
- recognize and encourage the growth of domestic industry
- support a productive and competitive economy
- maximize investment certainty for business

Energy costs for Canada's mining sector represent a significant component of the total cost of operations, and mining companies have made energy efficiency a top priority. Companies have employed new technology and results-based energy audits to boost energy efficiency, reduce emissions and improve competitiveness. Although the limits of technology and the net cost of further reducing GHG emissions are significant barriers, many financially attractive opportunities still exist for improving energy efficiency and reducing costs.

Oil Sands

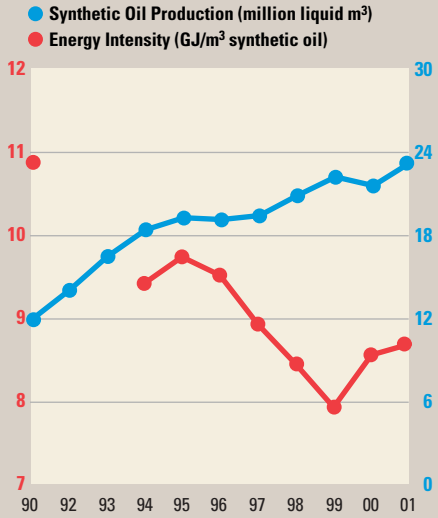
Profile *Canada's oil sands sector includes two plants in northern Alberta and one heavy oil upgrader in Saskatchewan. Together, these facilities produce more than 400 000 barrels of crude oil per day for markets in Canada and the United States. The sector is a major employer and a significant contributor to Canada's GDP.*

Performance Highlights

- The oil sands sector is committed to ongoing improvements in energy efficiency through a combination of operational excellence and technological innovation.
- Initiatives launched by Suncor Energy Inc.'s oil sands operations have reduced its GHG emissions in 2001 by 2 million tonnes of CO_2e compared with 1990.
- Syncrude Canada Ltd. continues to pursue "Syncrude 21," its 11-year strategic capital investment program begun in 1997.
- The Athabasca Oil Sands Project is committed to reducing its GHG emissions by 50 percent by 2010.
- Using a life-cycle value assessment process, Petro-Canada was able to reduce projected GHG emissions from its new MacKay River oil sands project by approximately 15 percent.
- In 2001, energy consumed per unit of production was 8.68 GJ/m^3, a total improvement of 20 percent since 1990.

Oil Sands Sector – NAICS 211114

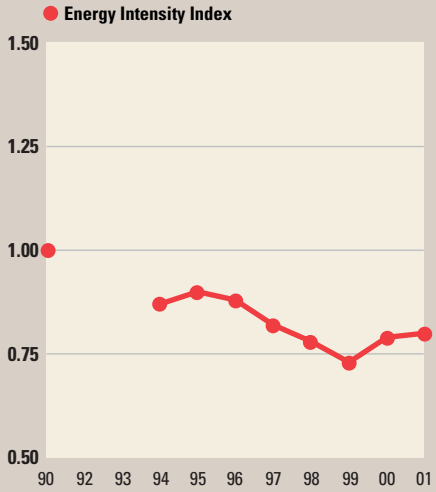
Energy Intensity (1990, 1994–2001) and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Oil Sands Sector – NAICS 211114

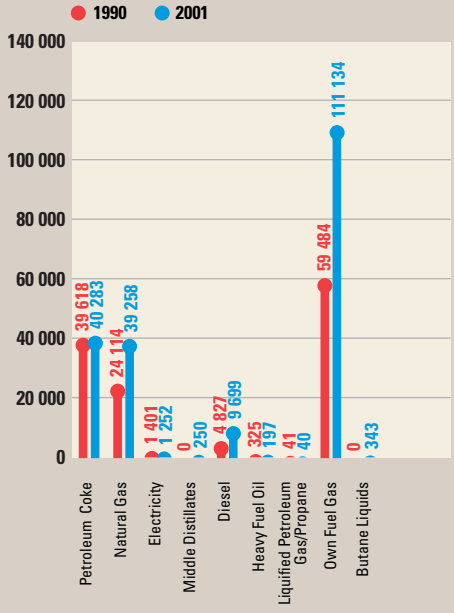
Energy Intensity Index (1990, 1994–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Oil Sands Sector – NAICS 211114

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

Ongoing technological innovation and a commitment to operational excellence continue to help the oil sands sector make substantial improvements in energy efficiency. Plants are improving the reliability of their operations and introducing programs to recover waste heat and boost yields through more efficient processing. Other gains are coming from the introduction of new technologies in the mining and extraction stages.

In 2001, Suncor Energy Inc. – Oil Sands began construction of the Firebag Oil Sands Project north of Fort McMurray, Alberta. Firebag is designed to use steam-assisted gravity-drainage (SAGD) technology to reach deep bitumen deposits with less impact to the air, water and land than traditional mining methods. Suncor has improved its extraction process by implementing a new steam turbine generator that uses waste heat from the oil sands upgrader in the extraction process while generating electrical power. In addition, TransAlta Energy Corporation began operating a new cogeneration facility on the Suncor plant site in the summer of 2001. Initiatives launched by the company's oil sands operations have reduced its 2001 GHG emissions by 2 million tonnes of CO_2e compared with 1990. Suncor estimates that planned internal operating initiatives, including new technologies, new products, energy efficiency projects and energy chargebacks, should lower its GHG emissions by more than 6 million tonnes of CO_2e by 2005.

Syncrude Canada Ltd. continues to pursue "Syncrude 21," its 11-year strategic capital investment program begun in 1997. The four-stage project is upgrading oil sands operations and improving energy efficiency. Syncrude 21 and predecessor activities have had a significant impact on the company's energy efficiency and, subsequently, on GHG emissions. Although the company plans to increase annual crude production by 95 million barrels between 1988 and 2012, Syncrude has targeted a one-third total improvement in energy use and CO_2 emissions per barrel over that period. This represents a 25 percent reduction compared with 1990. The company will achieve these improvements by shifting to less energy intensive mining and extraction methods, upgrading its technology and implementing process improvements.

The Athabasca Oil Sands Project (AOSP) met its commitment in March 2001 to estimate GHG emissions resulting from the construction phase of the project. A full report on these emissions is scheduled for completion in early 2003. As an offset to its GHG emissions, the AOSP joint-venture partners engaged the Tree Canada Foundation to plant 160 000 trees. The project is committed to a best-practices approach to environmental management, and AOSP is committed to reducing its GHG emissions by 50 percent by 2010 through a combination of energy efficiency measures, purchased and partner-generated offsets and clean development mechanism projects in conjunction with international partners.

Petro-Canada began construction of an in-situ oil sands development at MacKay River, near Fort McMurray, Alberta, in late 2000. Before launching the oil sands venture, Petro-Canada instituted a life-cycle value assessment analysis process. Using this process, Petro-Canada was able to incorporate improvements in its design process that reduced projected GHG emissions by approximately 15 percent. The project will use SAGD technology to produce 30 000 barrels of oil per day. This technology will enable Petro-Canada to produce from previously inaccessible resources and do so with significantly less surface impact than traditional oil sands mining. To minimize GHG emissions at the site, the project will use a cogeneration power plant to produce steam and electricity for its operations and provide surplus electricity to the power grid. The cogeneration project will reduce GHG emissions from the oil sands plant by 50 percent.

ACHIEVEMENTS

In 2001, the oil sands sector continued to make steady progress toward energy efficiency. Energy consumed per unit of production rose slightly to 8.68 GJ/m^3, compared with 8.55 GJ/m^3 in 2000. Although total annual production rose 95 percent since 1990, energy use rose only 56 percent. In 2001, the sector's energy consumption totalled 202 455 TJ, and its energy intensity has improved a total of 20 percent since 1990. This compares favourably with the sector's target of a 1 percent minimum average improvement in energy efficiency per unit of production per year.

CHALLENGES

The oil sands industry's challenges continue to be both technological and financial. To further improve energy efficiency, sector companies must continue to combine investment in innovative technologies with operational excellence. They must continue to develop and implement better, less energy intensive extraction methods and modify material-handling systems to efficiently accommodate ever-increasing production. Due to the massive scale required for oil sands production, these activities tax the industry's financial capabilities and human resources. The long lead times and substantial investments required to introduce enhancements continue to force difficult choices on the industry and limit the sector's progress toward greater energy efficiency.

Petroleum Products

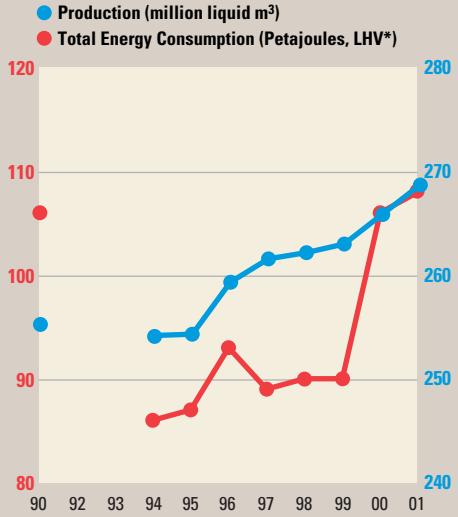
Profile *Canada's petroleum products sector markets gasoline, diesel, heating oil, jet fuels, lubricating oil, grease, food-grade white oils, asphalts and aromatic hydrocarbons through a network of more than 15 000 wholesale and retail outlets nationwide. Operating 21 oil refineries across the country, the industry provides direct employment for 100 000 Canadians and generates an estimated 100 000 indirect jobs.*

Performance Highlights

- The industry operates 21 oil refineries across the country and provides 200 000 direct and indirect jobs.
- The Canadian Petroleum Products Institute and NRCan's Office of Energy Efficiency initiated a successful anti-idling pilot project in Mississauga, Ontario.
- Imperial Oil Limited plans to install a $120 million, 90-megawatt natural-gas-fired cogeneration facility at its refinery in Sarnia, Ontario.
- In 2001, Petro-Canada refineries cut more than 36.6 kilotonnes from their annual GHG emissions and saved more than 667 000 GJ of energy.
- Suncor Energy Inc. reduced its marketing and refining GHG emissions in 2001 by 6.3 percent compared with 2000.
- Shell Canada Products Limited improved its energy efficiency by more than 2 percent in 2001.
- In 2001, the sector's energy intensity index stood at 94.2 – 16.6 percent better than in 1990.

Petroleum Products – NAICS 324110

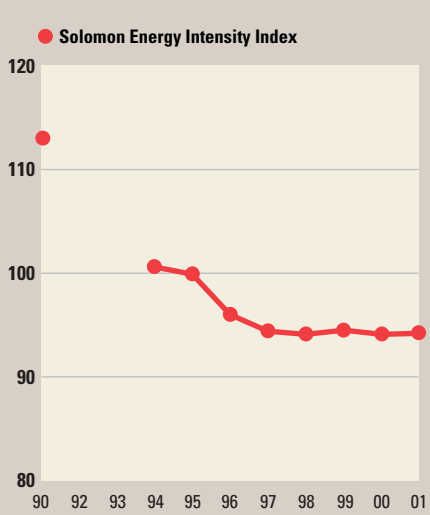
Production and Energy Consumption (1990, 1994–2001)



Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2001.* Prepared for the Canadian Petroleum Products Institute and the Canadian Industry Program for Energy Conservation by John Nyboer. Canadian Industrial Energy and End-Use Data Analysis Centre, December 2002, Simon Fraser University.

Petroleum Products – NAICS 324110

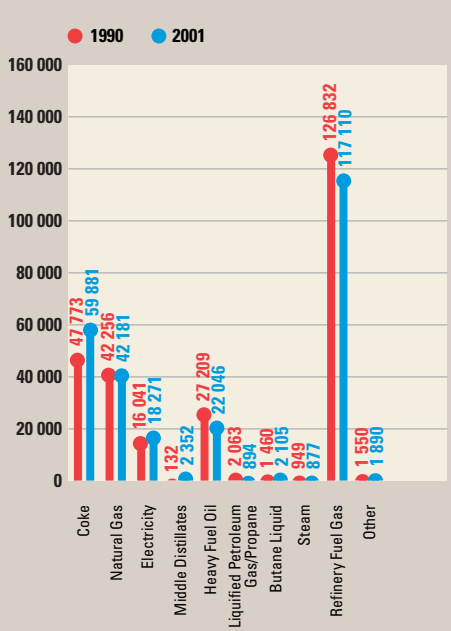
Solomon Energy Intensity Index (1990, 1994–2001) Base Year (1990) = 113



Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2001.* Prepared for the Canadian Petroleum Products Institute and the Canadian Industry Program for Energy Conservation by John Nyboer. Canadian Industrial Energy and End-Use Data Analysis Centre, December 2002, Simon Fraser University.

Petroleum Products – NAICS 324110

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: *Review of Energy Consumption in Canadian Oil Refineries and Upgraders: 1990 to 2001.* Prepared for the Canadian Petroleum Products Institute and the Canadian Industry Program for Energy Conservation by John Nyboer. Canadian Industrial Energy and End-Use Data Analysis Centre, December 2002, Simon Fraser University.

* LHV (lower heating value) does not include the latent heat of the water vapour (steam) generated as a result of combustion.

ACTIONS

A pilot project jointly initiated and funded by the Canadian Petroleum Products Institute (CPPI) and NRCan's Office of Energy Efficiency helped to raise public awareness of how small, day-to-day choices can have a significant environmental impact. An anti-idling campaign, conducted in fall 2001 in Mississauga, Ontario, involved more than 50 service stations from five gasoline retail chains. Designed to encourage motorists to reduce unnecessary vehicle idling, the highly successful pilot generated a wealth of data to help shape similar programs in the future.

Individually, Canadian refiners continue to invest in capital projects and make improvements to their operations to reduce the refining sector's energy intensity index by 1 percent per year through to 2005. For example, Imperial Oil Limited plans to install a $120 million, 90-megawatt natural-gas-fired cogeneration facility at its refinery in Sarnia, Ontario, that will produce about 75 percent of the site's electricity requirements. Although this will slightly add to the company's total emissions, it will offset the use of power from more carbon-intensive sources and reduce overall GHG emissions by as much as 500 kilotonnes per year. Imperial Oil reports that GHG emissions from its downstream operations were 2.7 percent lower in 2001 than in the previous year because of a lower carbon fuel mix, less flaring and slightly lower production.

In 2001, process improvements at its refineries in Montréal, Quebec, and Mississauga, Ontario, enabled Petro-Canada to cut more than 36.6 kilotonnes from its annual GHG emissions and save more than 667 000 GJ of energy. Projects planned for and underway at its four refineries will produce additional reductions of 2.5 million GJ of energy and 130.7 kilotonnes of GHG emissions by 2005. Since 1990, Petro-Canada's company-wide actions have reduced annual GHG emissions by more than 1.2 million tonnes.

The comprehensive Energy Management System at Suncor Energy Inc. is contributing to energy efficiency and reduced GHG emissions. The company has installed a box cooler control at its refinery in Sarnia to reduce steam consumption. Work is now complete on minimizing inefficient operating conditions by increasing the response rate to process variables from 14 times per week to every two hours. The overall energy improvement from 1990 to 2001 has averaged 0.6 percent per year, as measured by the energy formula from the Solomon Energy Intensity Index. Overall, Suncor's 2001 marketing and refining GHG emissions were 6.3 percent below 2000 levels. The company will purchase steam and electricity from the Sarnia Regional Cogeneration Plant, thereby reducing emissions by an annual 174.6 kilotonnes of CO_2e.

Following a trend established in the early 1990s, Shell Canada Products Limited improved its energy efficiency by more than 2 percent in 2001. At its refinery in Scotford, Alberta, Shell is considering projects that will reduce net GHG emissions by 135 kilotonnes, with a further 165-kilotonne reduction possible by purchasing cogenerated power. At its refineries in Sarnia and Montréal, the company is investing $150 million to install gasoline hydrotreaters, which will reduce sulphur levels in gasoline to meet upcoming Government of Canada standards of 30 parts per million. Modifications to the hydrotreater design will enable Shell to reduce anticipated fuel consumption and reduce GHG emissions from the new equipment by 20 percent. Shell's planned energy improvement capital investments, totalling $50 million between 2001 and 2005, are expected to reduce GHG emissions by 300 kilotonnes.

ACHIEVEMENTS

Since the 1990 base year, the sector's total energy consumption has increased slightly by 0.5 percent to 267 638 TJ; production over the same period increased by 14 percent. In 2001, the sector's energy intensity index stood at 94.2, basically the same as in 2000 and 16.6 percent better than in 1990. The sector utilizes the Solomon Energy Intensity Index because it is an international standard that dates back to 1990, is well documented and has been the basis for CPPI member commitments.

In 2001, production of petroleum products increased by 2.7 percent while energy consumption increased by 0.5 percent, or 1459 TJ, compared with 2000.

CHALLENGES

The sector will be challenged in the next several years to continue to reduce energy consumption. Meeting lower sulphur-content standards for gasoline and diesel fuel will require the industry to invest an estimated $1.8 billion in capital improvements. These improvements in fuel quality, combined with new engine systems in vehicles, will lead to an estimated 90 percent reduction in tailpipe emissions of key smog-forming gases (NO_x, SO_x and volatile organic compounds). Paradoxically, the production of low-sulphur fuel will require methods and processes that are more energy intensive, thereby making it more difficult and expensive for refineries to reduce their own CO_2 emissions.

Although the industry has made sizable capital investments and re-engineered its practices to reduce energy intensity, continued development of innovative energy efficiency projects will be needed in order for the industry to maintain its continuous improvement trend.

Pulp and Paper

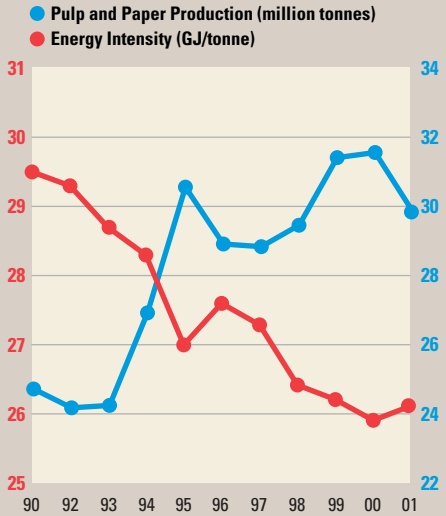
Profile *Pulp and paper, a key component of the forest products industry, is a major contributor to Canada's economy. Besides market pulp, the sector includes the newsprint, specialty papers, paperboard, building board and other paper sub-sectors.*

Performance Highlights

- Canada's pulp and paper facilities have reduced their GHG emissions by 26 percent since 1990 through energy improvements, fuel switching and energy conservation projects, even though production increased by 21 percent.
- Fifty-seven percent of the pulp and paper industry's energy needs now come from renewable biomass energy.
- Tembec Paper Group – Pine Falls Operations has completed a number of GHG-reduction initiatives at its newsprint mill in Manitoba.
- Stora Enso North America's Port Hawkesbury Mill expects to record a 37.2 percent reduction in total direct fossil-fuel-source GHG emissions by 2005.
- Alberta-Pacific Forest Industries Inc.'s direct and indirect GHG emissions in 2001 were 50 percent below 1994 benchmark levels.
- Energy-reduction and fossil-fuel-substitution activities at Domtar Inc. have led to substantial gains in energy efficiency.

Pulp and Paper Sector – NAICS 322100

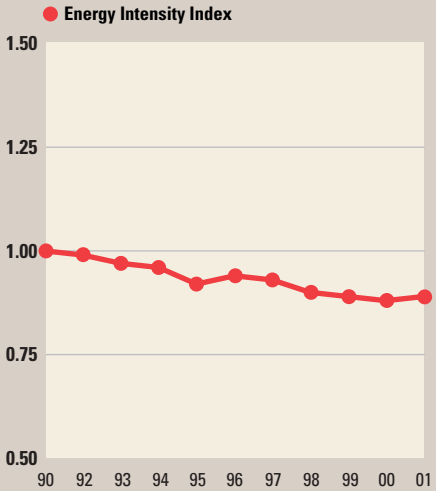
Energy Intensity and Physical Output (1990–2001)



Data source: *Energy Monitoring Report, 1990–2001*, Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association).

Pulp and Paper Sector – NAICS 322100

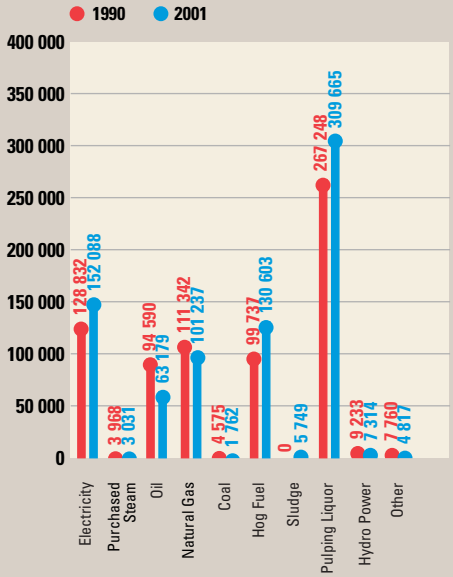
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: *Energy Monitoring Report, 1990–2001*, Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association).

Pulp and Paper Sector – NAICS 322100

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: *Energy Monitoring Report, 1990–2001*, Forest Products Association of Canada (formerly the Canadian Pulp and Paper Association).

ACTIONS

Pulp and paper companies continue to improve energy intensity and implement programs to reduce the use of fossil fuels. For example, Tembec Paper Group – Pine Falls Operations has completed a number of initiatives to reduce GHG emissions at its Manitoba newsprint mill complex. Since 1998, the company has used solids (sludge) from its wastewater treatment system as biomass fuel for its boilers, thereby reducing its reliance on coal. In March 2001, the company commissioned a new, $124 million thermo-mechanical pulp mill that incorporates a sophisticated heat recovery unit. Excess heat generated by the new mill is harnessed to produce steam, enabling Tembec to further reduce its coal consumption. As a result of these and other actions, the company's GHG emissions for fiscal year 2001 were 17 percent below 1990 levels. Tembec is now working toward launching a proposed joint venture sawmill in partnership with 11 First Nations community businesses to provide additional biomass fuel (bark) as part of its coal-replacement efforts at its newsprint mill.

Stora Enso North America – Port Hawkesbury Mill of Nova Scotia expects to see a 37.2 percent reduction in its total direct fossil-fuel-source GHG emissions and a 63.4 percent reduction in specific emissions per tonne of production over 1990 levels by 2005. These improvements will come from displacing heavy oil with natural gas and from energy-saving projects. Gas was first delivered to the mill in July 2001 and is being used to replace heavy oil as boiler fuel. The mill's specific emissions for 2001 were 23.5 percent below 1990 levels and were running 52.0 percent below 1990 levels in the first 10 months of 2002.

Alberta-Pacific Forest Industries Inc. (Al-Pac) of Boyle, Alberta, is Canada's newest and North America's largest single-line kraft pulp mill. The mill was designed to be almost self-sufficient in terms of energy through its use of wood-waste and black-liquor energy sources to produce process steam and electricity. Today the mill generates 84 percent of its own energy requirements. Al-Pac's direct and indirect GHG emissions in 2001 amounted to 0.23 tonne of CO_2e per air-dried tonne of pulp production, a decrease of 50 percent since 1994, the mill's first year of production. Al-Pac's absolute mill GHG emissions have dropped from 215 343 tonnes of CO_2e in 1994 to 137 593 tonnes in 2001, a decrease of 36.1 percent despite increased pulp production. The sale of Al-Pac–generated surplus power to the Alberta Interconnected Electric System and a company-created forest sequestration sink should position Al-Pac as a net carbon sink rather than a net emitter. The company's surplus power sales will offset GHG emissions by 25 766 tonnes of CO_2e per year in the Alberta power grid, and the forest sequestration project will make Al–Pac a net carbon sink of 561 029 tonnes of CO_2e per year by 2024.

Energy-reduction and fossil-fuel-substitution activities at Domtar Inc. have led to substantial gains in energy efficiency. In 2000, although production at Domtar's pulp and paper operations increased by 32.4 percent compared with 1990, total GHG emissions from fossil fuels per tonne of product decreased by 23.4 percent. The company expects to further reduce GHG emissions by promoting continuous improvement activities, installing equipment that is more energy efficient, maximizing the use of resources such as waste, improving efficiency and increasing the use of biomass fuels.

The industry has also taken action on energy efficiency through its associations and institutes. For example, the Forest Engineering Research Institute of Canada (FERIC), in collaboration with NRCan's Office of Energy Efficiency, launched its SmartDriver program for forestry trucks in 2001. The program provides advice on safe, fuel-efficient driving techniques and guidance on selecting vehicle components to reduce fuel consumption. FERIC's "star trucks" initiative, developed in partnership with Tembec Inc., made further advances in 2001 by providing an increased payload capacity and reduced idling time. These activities enable fleets to reduce hauling costs and GHG emissions by more than 10 percent.

ACHIEVEMENTS

Over the past decade, the pulp and paper industry has made steady progress toward improving its energy efficiency. For the period 1990–2001, the pulp and paper industry improved its energy consumption per tonne of output by 11.4 percent. The sector decreased its total energy consumption per tonne of pulp and paper from 29.5 GJ in 1990 to 26.1 GJ in 2001. Over the same period, the consumption of fossil fuel and electricity (excluding biomass) decreased from 14.7 GJ per tonne to 11.2 GJ per tonne.

The industry's ongoing focus on biomass energy sources has enabled pulp and paper companies to reduce their use of less environmentally friendly fossil-fuel sources, despite growing production. Fifty-seven percent of the industry's energy needs are now met by turning wastes into renewable fuels. Over the same period, the industry's use of heavy fuel oil has been reduced by 33.2 percent. Thanks to this trend, it took 11.4 percent less energy to produce a tonne of pulp and paper in 2001 than it did in 1990. Expressed in terms of GHG emissions, the sector emitted 38 percent fewer GHGs to produce a tonne of pulp and paper in 2001 than it did in 1990.

CHALLENGES

The rapid climb of fossil-fuel prices is providing significant impetus to pulp and paper companies to improve their fuel efficiency and use more biomass fuel sources. The switch to biomass will help the sector achieve additional reductions in energy intensity. At the same time, international disputes, production curtailments and other factors have resulted in a reduction in total biomass availability. Although this decline exists in most areas of Canada, there is still a significant amount produced annually and that is available for energy use.

Rubber

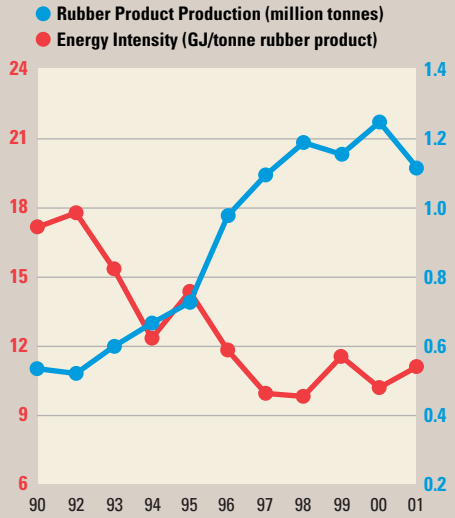
Profile *The rubber products sector comprises establishments that are engaged in manufacturing tires and tubes, automotive parts, rubber hoses and belting, mechanical rubber goods and a wide variety of other products such as rubber and plastic weatherstripping, pressure-sensitive tape, rubber gloves, rubber mats, rubber household products and tire-retreading materials. To meet demand for its products, the rubber products industry employs just over 26 000 people in some 240 facilities nationwide, providing a total payroll of more than $700 million annually.*

Performance Highlights

- The Rubber Association of Canada (RAC) sponsored an energy efficiency workshop customized for the rubber industry on November 20, 2002.
- The tire industry is continuing its efforts to promote the use of energy-saving wide-base tires within the trucking industry.
- The RAC has signed an agreement with NRCan to further develop its education campaign on tires, "Be Tire Smart – Play Your Part."
- Goodyear Canada Inc. is using SOLARWALL® technology at its plant in Napanee, Ontario.
- NRI Industries Inc. has completed the installation of a second continuous curing press at its plant in Toronto, Ontario.

Rubber Sector – NAICS 326200

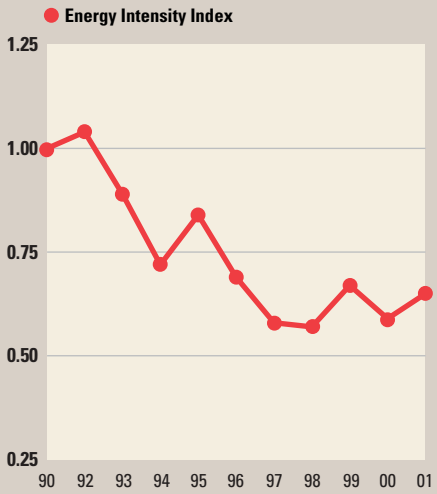
Energy Intensity and Physical Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Rubber Sector – NAICS 326200

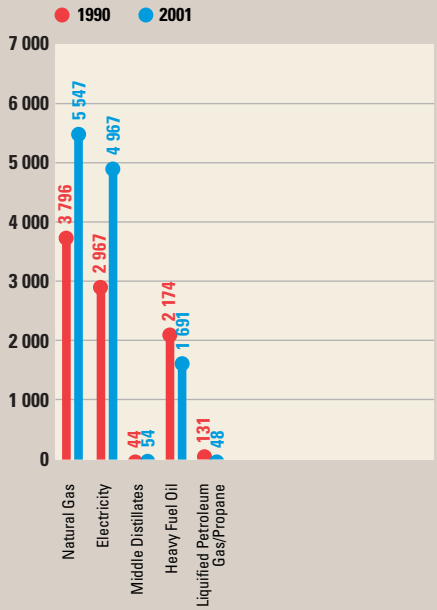
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Rubber Sector – NAICS 326200

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

The rubber industry continues to take the initiative in improving its energy efficiency. For example, on November 20, 2002, the Rubber Association of Canada (RAC) sponsored an energy efficiency workshop that was customized for the rubber industry and conducted in partnership with NRCan's Office of Energy Efficiency. The workshop looked at how energy is used and lost in rubber products facilities and how to incorporate energy savings within management objectives. The workshop was well received and has created a demand for follow-up workshops among sector companies.

The tire industry is continuing its efforts to promote the use of energy-saving wide-base tires within the trucking industry. With wide-base tires, fewer tires are needed, thereby reducing energy-wasting sidewall friction and improving fuel economy by approximately 5 percent. This provides economic benefits to trucking fleets as well as relief for the environment.

The RAC has signed an agreement with NRCan to further develop its education campaign on tires, "Be Tire Smart – Play Your Part." The first phase of the expanded program includes gathering information through a national survey of tire inflation. The survey will obtain information on 1800 motorists in six locations across Canada to determine their current knowledge, attitudes and practices regarding their vehicle tire maintenance. In addition, technical data such as vehicle identification number, tire size, tire pressure and tread depth will be collected for each vehicle.

Individual RAC member firms have also taken action to improve energy efficiency. For example, Goodyear Canada Inc. is using SOLARWALL® technology to advance ISO 14000 continuous improvement objectives at its facility in Napanee, Ontario. Completed in late 2002, the $76,500 project is expected to result in annual natural gas savings of more than 600 GJ, with an associated GHG reduction of more than 30 tonnes per year. The system saves additional energy by recapturing heat lost through the building's walls and by reducing air stratification and exhaust heat loss. Goodyear expects that the installation will reduce natural gas costs to heat the area it supplies by about 80 percent.

NRI Industries Inc. of Toronto, Ontario, has taken numerous steps to improve energy efficiency. The company uses motion sensors in each office to turn off lights when the space is not in use, uses high-efficiency equipment such as steam boilers and motors, and has installed improved building and machinery insulation. Recently installed high-efficiency boilers are expected to reduce natural gas use at the company's plant in Mississauga, Ontario, by 43.4 percent and at its Toronto plant by 27.2 percent. NRI has completed the installation of a second continuous curing press at the Toronto plant and is converting several inefficient batch operations to more efficient continuous processes. The company is also capturing heat from its boilers for use as building heat.

ACHIEVEMENTS

Based on sample data collected by the RAC for 2001, total production of the rubber products sector was 1 111 950 tonnes, with a value of approximately $6.76 billion, up from 531 961 tonnes and $3.31 billion in 1990. Most of the Canadian industry's total shipments were exports, with more than 95 percent of these going to the United States. In absolute terms, energy consumption for the rubber products industry increased between 1990 and 2000, rising from 9115 TJ in 1990 to 12 309 TJ in 2001. However, the sector's gross output increased at a higher rate, leading to a significant decline in energy intensity over the same period.

CHALLENGES

The rubber industry faces a number of issues that affect the sector's efforts to improve energy efficiency, among them the Kyoto Protocol, rising energy costs and increasing foreign competition. Canada's signing of the Kyoto Protocol has created a great deal of uncertainty for rubber manufacturers. There is no specific policy program yet identified, and the industry has deep concerns that unless there is significant industry consultation in its creation, upcoming policies may be unworkable. In addition, rising energy prices, accelerated by international uncertainties, are putting serious pressures on manufacturers. Although higher prices provide a strong incentive to invest in energy efficiency in the longer term, weak international markets and intensifying foreign competition will make it difficult to find the capital to make these investments.

Domestic rubber manufacturers are concerned about the rising influx of low-cost offshore product from emerging industrial countries such as China. An industry trade journal recently reported that the U.S. Department of Transportation received requests for paperwork to import tires from dozens of Chinese tire plants alone. Canadian manufacturers will be forced to compete with imports from these low-labour-cost producers and may find it impossible to allocate additional resources to energy efficiency.

Steel

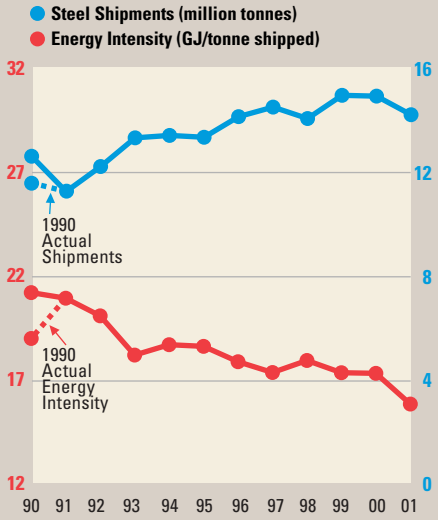
Profile *Canada's steel sector is one of the country's largest industries, generating annual sales of more than $11 billion, including more than $3 billion in exports. The companies that make up the steel sector supply flat-rolled (sheet and plate), long (re-bar and structural steel) and specialty and alloy (stainless and tool steels) products for major markets in the automotive, appliance, oil and gas, machinery, construction and packaging industries. The Canadian steel sector comprises 16 plants that directly employ 34 500 workers in five provinces.*

Performance Highlights

- Algoma Steel Inc. reduced its GHG emissions by 7.9 percent through adjustments to its fuel mix and improved facility efficiency.
- Recent energy-saving measures taken by Gerdau AmeriSteel Corporation's facility in Cambridge, Ontario, are saving the company more than 1.2 million kWh of electricity annually, or $55,000 per year.
- Ongoing energy efficiency efforts at Dofasco Inc. have improved its energy consumption by 17.6 percent since 1990.
- Stelco Inc. companies have achieved an aggregate 20 percent reduction in specific energy consumption and CO_2 intensity.
- The steel sector's energy intensity performance improved significantly, from 17.29 GJ per tonne in 2000 to 15.81 in 2001.

Steel Sector – NAICS 331100

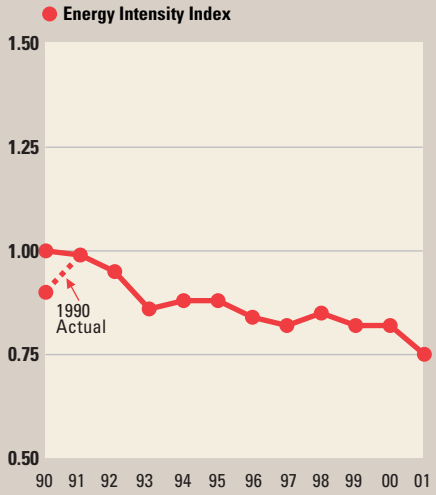
Energy Intensity and Physical Output (1990–2001)



Data source: Energy: Statistics Canada. *Quarterly Report on Energy Supply and Demand (QRESD).* December 2002. Data source: Shipments: Statistics Canada. *Catalogue 41-001, Primary Iron and Steel.*

Steel Sector – NAICS 331100

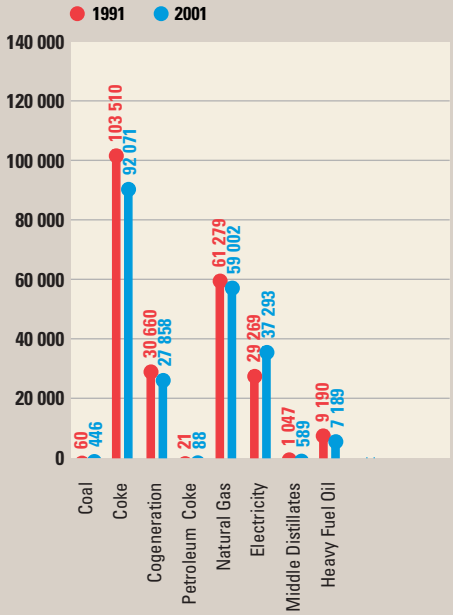
Energy Intensity Index (1990–2001) Base Year 1990 (adjusted) = 1.00



Data source: Energy: Statistics Canada. *Quarterly Report on Energy Supply and Demand (QRESD).* December 2002. Data source: Shipments: Statistics Canada. *Catalogue 41-001, Primary Iron and Steel.*

Steel Sector – NAICS 331100

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Energy: Statistics Canada. *Quarterly Report on Energy Supply and Demand (QRESD).* December 2002.

ACTIONS

Canadian steelmakers continued to invest in programs that improve energy efficiency as part of efforts to upgrade productivity and quality while reducing costs.

Algoma Steel Inc. completed a project for one of its plate heat treat furnaces at its mill in Sault Ste. Marie, Ontario, that reduced natural gas consumption by 0.8 million BTU per tonne of steel processed. The project lowered costs and improved product quality while reducing emissions by nearly 20 000 tonnes of CO_2 per year. Algoma is implementing a networked energy (power) monitoring system to track the company's entire power consumption grid and to help plan future power reductions. From 2000 to 2001, Algoma reduced its GHG emissions by 7.9 percent through adjustments to its fuel mix and improved facility efficiency.

Gerdau AmeriSteel Corporation's facility in Cambridge, Ontario, established energy conservation teams at its melt shop and rolling mill to identify and implement energy-reduction measures. Recent energy initiatives include installing a timer to automatically shut down the bag house during off-use periods, adjusting the fume exhaust system of the ladle baking station to limit operation to periods when it is required, and automatically shutting down pumps when the mill is down. These measures are saving the company more than 1.2 million kWh of electricity annually, or $55,000 per year.

Dofasco Inc. undertook a pilot audit of energy and utilities savings at its Tin Products Business Unit. A cross-function team at the company's facilities in Hamilton, Ontario, identified energy and utilities savings opportunities of about 10 percent per year. The pilot audit will be extended to two other business units in 2002. The company's Steelmaking Business Unit improved its ladle metallurgy control, power profile and burner tuning on the electric arc furnace vessel, leading to energy savings of 33 500 GJ per year. The Utilities Business Unit reduced pilot fuel consumption in its boilers, freeing up fuel to displace purchased fuel used elsewhere in the plant. Combined activities in 2001 resulted in a 0.32 percent improvement in the total plant energy rate and produced annualized energy savings of 204 000 GJ. Dofasco's specific energy consumption has improved 17.6 percent from 1990 to 2001.

Throughout 2001, the Stelco Inc. group of companies, comprising two divisions and seven wholly owned subsidiaries, achieved an aggregate 20 percent improvement in specific energy consumption (GJ per tonne shipped) and CO_2 intensity (tonne of CO_2 produced per tonne of product shipped) compared with the 1990 base year. Annual CO_2 emissions from direct and indirect sources totalled 7.3 million tonnes – a reduction of 12 percent, or 1 million tonnes, from the 1990 base year.

- Stelco subsidiary Lake Erie Steel Company, in Nanticoke, Ontario, upgraded controls and installed high-performance discharge doors on its two original furnaces, thereby reducing heat loss and energy requirements for its hot strip mill reheating furnaces. The company also converted the primary cooler pump in its coke ovens from electric to steam drive, using steam produced with blast furnace gas to reduce electric power consumption. Lake Erie Steel has improved its overall energy efficiency by 32 percent relative to the 1990 base year.
- At AltaSteel Ltd., a Stelco division, in Edmonton, Alberta, a computerized preventive maintenance program continues to improve energy efficiency by minimizing operating delays. The company replaced an electro-mechanical tilting system for its melting furnace with a hydraulic system, thereby enhancing product process control and improving quality and yield.
- Stelco Inc.'s Hilton Works in Hamilton, Ontario, continued to make energy efficiency improvements in 2001, despite market-driven production cutbacks and the idling of one of its two blast furnaces. Hilton lowered specific energy consumption by almost 1 percent relative to its 1989 base year, reducing annual CO_2 emissions by more than 33 000 tonnes. These gains were the result of actions such as re-evaluating heating requirements at its hot strip mill to reduce steam use, coke-oven battery optimization, furnace stockline control and tuyère improvements to reduce furnace fuel rates, and air-fuel ratio improvements in its rod mill reheat furnace.
- Stelco McMaster Ltée improved the bar mill reheat furnace at its facility in Contrecoeur, Quebec, reducing specific energy consumption by 4.1 percent between 1999 and 2002. Improvements to the eccentric bottom tapping furnace oxy-burners and ladle preheating reduced natural gas consumption by 26 percent. A new, 16-stand in-line bar mill enabled the company to save 11.6 percent in electrical energy per tonne of steel produced. In 2001, specific energy consumption at Stelco McMaster improved 10 percent over its 1989 base year.

ACHIEVEMENTS

The Canadian steel industry produced 16.7 million tonnes of steel and shipped 15.7 million tonnes in 2001. The sector's energy intensity performance improved significantly, from 17.29 GJ per tonne in 2000 to 15.81 in 2001. Since 1990, the sector has improved its aggregated energy performance by more than 25 percent. This represents an average annual improvement of 2.27 percent, surpassing the industry's commitment to an average improvement of 1 percent per year for the period.

CHALLENGES

Through voluntary efforts, the steel sector has reduced GHGs to well below the Kyoto Protocol target, but because the Government of Canada does not provide credit for early action, the industry faces higher costs. In addition, imports of low-priced steel continue to be a major threat to the profitability and stability of the Canadian steel sector. For Canadian steelmakers to be competitive, government must put in place effective measures to counter unfairly traded imports, address global steel over-capacity, and deal with trade-distorting practices by foreign governments.

Canada's tax system remains uncompetitive with the United States, our major trading partner. Moreover, research into the development of new energy efficiency technologies by Canadian steel producers, when conducted outside of Canada or through international collaboration and partnerships, does not fully benefit from the Government of Canada's Scientific Research and Experimental Development Program. Such international efforts are common in industries that are as capital intensive and internationally based as the steel industry.

Textiles

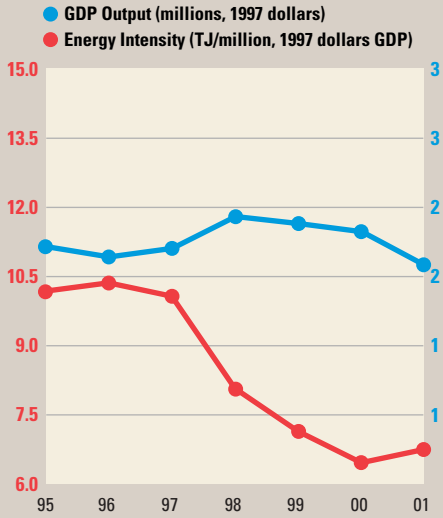
Profile *Canada's textile industry produces the fibres, yarns, fabrics and textile articles purchased by users and customers as diverse as automotive manufacturing, clothing, construction, environmental protection, road building and retail. The industry exports just under half of its production.*

Performance Highlights

- In 2001, the industry's GDP output was 6 percent lower than in 1995, while its energy consumption decreased by 38 percent.
- Agmont Inc. is studying opportunities to reduce its use of natural gas by installing a solar water heating system.
- Lincoln Fabrics Ltd. conducted an energy audit to identify energy efficiency opportunities.
- Beaulieu Canada Company introduced a program to systematically gather and analyse energy data at its plants.
- Doubletex Inc. instituted a number of energy efficiency projects throughout its operations.
- DuPont Canada Inc.'s performance contracting program is helping to make significant reductions in the company's energy consumption.

Textiles Sector – NAICS 313, 314*[1]

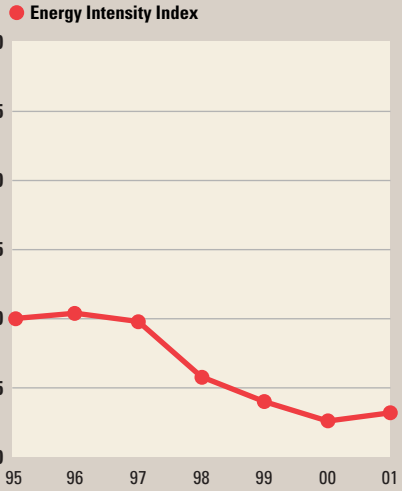
Energy Intensity and Economic Output (1995–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Textiles Sector – NAICS 313, 314*[1]

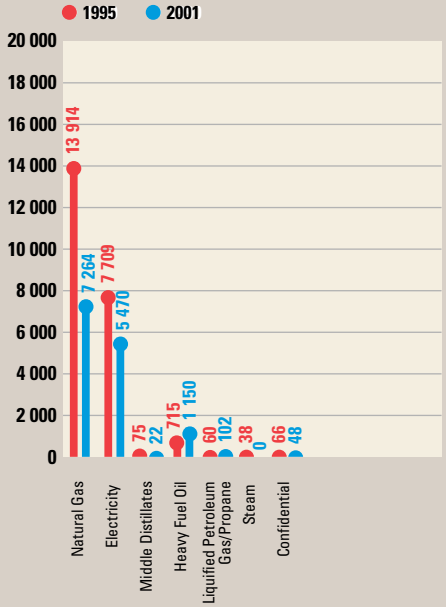
Energy Intensity Index (1995–2001) Base Year 1995 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Textiles Sector – NAICS 313, 314*[1]

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

[1] Sum of all NAICS 313 Textile Mills and NAICS 314 Textiles Products Mills

ACTIONS

Throughout the textiles sector, companies are benefiting from more efficient uses of energy. J.L. de Ball Canada Inc. of Granby, Quebec, has introduced programs to recover and re-use heat from washing machine water, improve tenter frame energy performance by installing new controls to modulate exhaust fans and temperature, and conduct energy surveys at all locations in its plant to identify energy conservation opportunities.

Consoltex Inc., with headquarters in Saint-Laurent, Quebec, and four manufacturing plants in Quebec and Ontario, remains committed to active efforts to improve energy efficiency. The company is carrying on with its steam trap improvement program, refitting its lighting systems with metal halide fixtures and pursuing opportunities to recycle process water. Consoltex is making strong progress toward a targeted 10 percent reduction in energy use per unit of production through to 2005.

Agmont Inc. of Montréal, Quebec, is conducting lighting retrofit and employee energy awareness programs and is studying opportunities to reduce its use of natural gas by installing a solar water heating system.

Lincoln Fabrics Ltd. of St. Catharines, Ontario, conducted an energy audit to identify energy efficiency opportunities. The company also upgraded its looms and implemented a program to detect and repair air leaks in order to improve the performance of its compressed-air system.

Beaulieu Canada Company of Acton Vale, Quebec, introduced a program to systematically gather and analyse energy data at its plants in Ontario and Quebec. The company is also planning to conduct energy audits.

Doubletex Inc., with plants in Montréal, Quebec, and Toronto, Ontario, installed a water-effluent heat recovery system, improved piping insulation, introduced a heat recovery program for its washing lines and launched an upgraded steam trap maintenance program. Doubletex is also studying opportunities to reduce energy consumption by using solar water heating.

DuPont Canada Inc. continues to implement its performance contracting program. The company's facility in Maitland, Ontario, started the company's first project under this program in October 2001. The project is now saving about 45 000 pounds per hour of steam, or more than 10 percent of the total steam used at the site. Three other projects, worth a total of more than $8 million, are under construction at the company's plant in Kingston, Ontario.

Through NRCan's Office of Energy Efficiency, the Canadian Textiles Institute and CIPEC have jointly agreed to conduct a benchmarking study in the wet-processing segment of the textile industry. Wet processing is one of the industry's more energy intensive activities, and most companies employ similar technology. Moreover, advances driven by energy efficiency might also help to address textile mill effluent environmental issues.

The Textiles Sector Energy Task Force sponsored a "Spot the Energy Savings Opportunities" workshop that was customized for textiles companies and held in Montréal in spring 2002. The event was attended and enthusiastically received by nine companies and by representatives of the Indian Industrial Programme for Energy Conservation, who were on a study tour of CIPEC.

ACHIEVEMENTS

Based on NAICS* data for Groups 313 and 314, the textile industry improved its energy intensity by 34 percent between 1995 and 2001. The sector's actual energy use dropped by 38 percent during the same period, with a slight decrease in the industry's GDP. Although these numbers are encouraging, they appear to be overly optimistic based on the knowledge and experience of the sector. More work will be required in the coming year to better understand these aggregated and extrapolated data.

The Textiles Sector Energy Task Force remains committed to an energy intensity reduction target of 1 percent per year for the period 2000–2010. To meet this goal, the textile industry will build on its significant success in improving energy efficiency since 1995 and will continue its ongoing consultations with governments and other stakeholders to meet Canada's Kyoto goals.

CHALLENGES

Increased efforts are required to sensitize companies in the textile industry to the long-term implications of Canada's Kyoto commitments and to encourage active participation in Canada's National Implementation Strategy on Climate Change. The task force believes that one of its key challenges is to gain the active participation of more of the industry's major producers as Industrial Energy Innovators, and the group is continuing to work toward this end. In addition, companies must be encouraged to adopt a benchmarking and best-practices approach to energy management.

The Textiles Sector Energy Task Force and the Canadian Textiles Institute have devoted significant time and resources to addressing these challenges. These organizations plan to continue and intensify their efforts.

* Under the new North American Industry Classification System (NAICS), textile producers are classified under Artificial and Synthetic Fibres/Filaments Manufacturing (NAICS 32522), Textile Mills (NAICS 313) and Textiles Products Mills (NAICS 314). NAICS Subgroup 32522 includes producers of synthetic fibres and filaments. NAICS Group 313 comprises establishments that are primarily engaged in manufacturing, finishing or processing yarn or fabrics. NAICS Group 314 includes establishments primarily engaged in manufacturing textile products (except clothing) such as carpets, household textiles, etc. Changes to the classification of industries by Statistics Canada from the Standard Industrial Classification (SIC) to NAICS means that energy data for the synthetic fibre industry are no longer available separately. The statistics contained in this profile cover only NAICS Groups 313 and 314 as described above.

Transportation Equipment Manufacturing

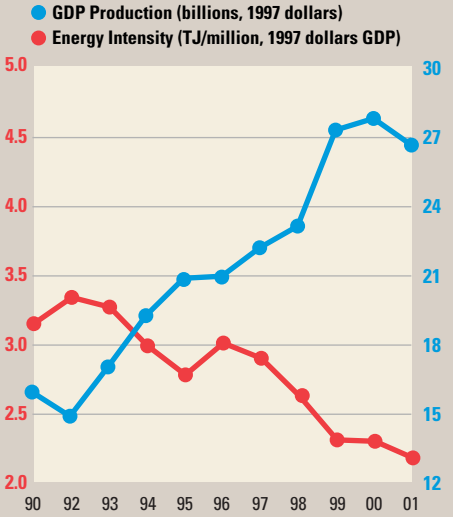
Profile *The Canadian transportation equipment manufacturing sector includes companies that manufacture aircraft, aircraft parts, automobiles, motor vehicle parts, trucks, buses, trailers, military vehicles, railroad rolling stock, ships and pleasure boats. The sector is a major part of the Canadian economy, accounting for nearly 3 percent of Canada's GDP and more than 16 percent of Canada's total manufacturing GDP in 2001. Including dealers, parts and distribution networks, the sector employs more than a half a million people across Canada.*

Performance Highlights

- Despite an upturn in the Canadian economy at the end of 2001, the value of the total output of the transportation manufacturing sector for the year still decreased by 4.2 percent.
- Between 1990 and 2001, the sector recorded an overall improvement in energy intensity of 30.9 percent.
- Honda of Canada Mfg., Toyota Motor Manufacturing Canada Inc. and The Woodbridge Group joined the Transportation Sector Equipment Manufacturing Task Force in 2001, bringing additional automotive industry representation to the table.
- General Motors of Canada Limited reduced its total energy consumption by 41 percent from 1990 to 2001 through rationalization of production and energy conservation projects.
- The Woodbridge Group introduced an energy-reduction management system in 2002, resulting in the identification of potential energy savings.
- In 2001, Honda reduced the electricity requirements of a compressed-air system that resulted in a CO_2e emissions reduction of approximately 56 tonnes per year.
- Ford Motor Company of Canada, Limited implemented a heat recovery system at its casting plant in Windsor, Ontario, resulting in a potential energy reduction of 225 000 mmBTU per year.

Transportation Equipment Manufacturing Sector – NAICS 336000

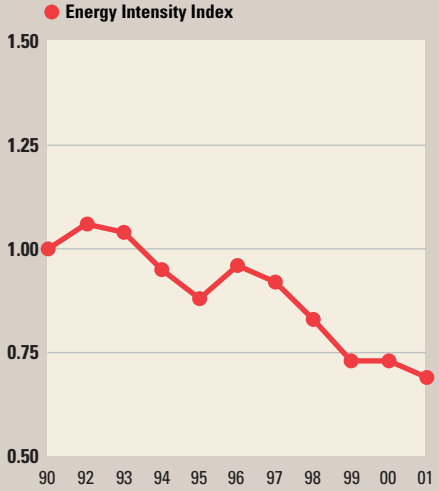
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Transportation Equipment Manufacturing Sector – NAICS 336000

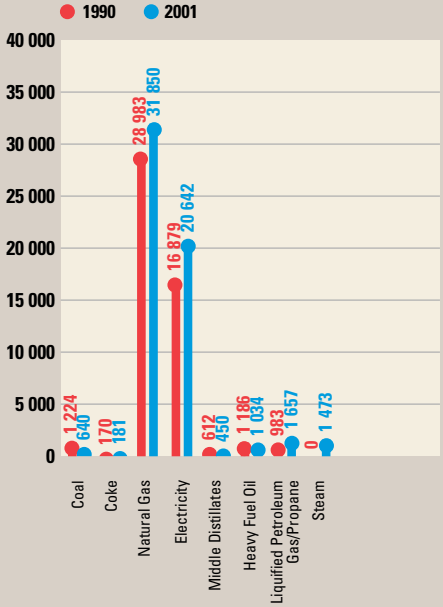
Energy Intensity Index (1990–2001)
Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

Transportation Equipment Manufacturing Sector – NAICS 336000

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC). *Development of Energy Intensity Indicators for Canadian Industry: 1990–2001.* December 20, 2002. Simon Fraser University.

ACTIONS

The CIPEC Transportation Equipment Manufacturing Sector Task Force continues to pursue the activities outlined in its 2001–2003 action plan. Individual sector members have made significant advances in energy efficiency.

In 2002, The Woodbridge Group introduced an energy-reduction management system and delivered a customized "Dollars to $ense" energy training program across 57 locations worldwide. Eight training sessions alone enabled the company to identify $600,000 in energy savings opportunities. The Woodbridge Group has established a company-wide energy-reduction goal of 10 percent for 2003.

In 2001, Honda of Canada Mfg. reduced the electricity requirements of the compressed-air system in its Civic manufacturing plant by supplementing 1000-hp compressors with smaller, 500-hp units. Honda estimates that this project has led to a reduction in CO_2e emissions of approximately 56 tonnes per year. Honda has also taken steps to eliminate leaks in its compressed-air system and to reduce compressed-air demand by switching some assembly tools to electric power.

Ford Motor Company of Canada, Limited continues to seek opportunities to improve the energy efficiency of its manufacturing facilities. The company has installed a heat recovery system on the cupola melting process at its casting plant in Windsor, Ontario, enabling the plant to recover waste energy and redistribute it to areas of the plant where it is needed. The company expects this project to reduce energy usage by 225 000 mmBTU per year.

Toyota Motor Manufacturing Canada Inc. saw total energy-reduction results in excess of 168 665 mmBTU per year. Although capital input was minimal, most reductions resulted from delaying booth and oven starts, changing downdrafts in paint-shop ovens and booths, reducing plant temperature set-points and eliminating processes where quality improvement activities had made them redundant.

The Transportation Equipment Manufacturing Sector Task Force continued its tradition of promoting energy efficiency at its sixth annual One Day Energy Conference, held at General Motors of Canada Limited Headquarters in Oshawa, Ontario. Another annual energy conference is scheduled for the first quarter of 2003.

ACHIEVEMENTS

Despite a dramatic year-end economic upturn (assisted in large part by a no-interest purchase financing program in the automotive sector), the value of the total output of the transportation equipment manufacturing sector for 2001 still decreased by 4.2 percent. Energy usage for the year decreased by 9.0 percent over 2000, more than double the decrease in output. Consequently, the sector's energy intensity decreased by 5.2 percent. In 2001, the sector consumed 57 930 TJ, up 15.8 percent from 1990. Over the same period, gross output increased by 93.2 percent, leading to an overall improvement in energy intensity of 30.9 percent.

Energy use by fuel type has remained fairly constant since 1990, with natural gas (55 percent) and electricity (36 percent) making up the bulk of the energy used. Liquid petroleum gases, middle distillates (No. 2 fuel oil) and heavy fuel oil use increased by 12 percent in 2001 compared with 2000, due largely to the rapid escalation of natural gas prices. The use of these fuels, which was previously in a long period of decline, will undoubtedly continue to increase until natural gas prices return to historical levels.

CHALLENGES

The predicted downturn in the United States' economy, especially in the automotive sector, will have a detrimental effect on the transportation equipment manufacturing sector's energy intensity. Economically motivated plant downtime will lead to the under-utilization of facilities, thereby raising energy intensity numbers despite an overall decrease in energy consumption. Although the transportation equipment manufacturing sector is committed to continuously improving quality, environmental performance and energy efficiency, investment-payback requirements of less than two years and internal competition for funds are challenging energy managers who are seeking to make major gains. Moreover, energy efficiency improvements arising from the implementation of new technology are likely to be offset by trends that are driving energy use higher. These trends include the increased use of cooling to improve working conditions, more demanding pollution control and a shift to more energy intensive products and processes.

Sector companies are already efficient energy users, and there are relatively few cost-effective opportunities for dramatic gains, even under the pressure of higher energy costs. Unless there are major advances in technology, energy efficiency improvements are likely to come in small increments.

Upstream Oil and Gas

Profile *The upstream oil and gas sector includes the companies that find and develop Canada's vast hydrocarbon reserves. This dynamic exploration and production industry is represented by the Canadian Association of Petroleum Producers (CAPP) and the Small Explorers and Producers Association of Canada (SEPAC). The member companies of these associations account for more than 99 percent of the crude oil and natural gas produced in Canada and are an important part of a $60 billion-a-year national industry that affects the livelihoods of more than half a million Canadians.*

Performance Highlights

- Increasing numbers of upstream oil and natural gas companies are voluntarily embracing the industry's principles of stewardship. As of January 2003, all producing members of CAPP must commit to its Stewardship initiative.
- Between 1996 and 2001, the industry reduced gas flaring in Alberta by 53 percent.
- A credit of 2500 tonnes of CO_2 has been granted to Calpine Canada Resources Company for recovering and recycling oil from oil-field waste.
- GHG-reduction projects implemented in 2001 and 2002 have enabled ConocoPhillips Canada to reduce emissions by approximately 223 kilotonnes of CO_2e emissions per year.
- Petro-Canada uses an environmentally sensitive drilling rig in the Mackenzie Delta that saves fuel and reduces emissions of NO_x and CO_2.

The sector is currently working with NRCan's Office of Energy Efficiency to develop indices and figures.

ACTIONS

The upstream oil and gas sector is a strong proponent of environmental performance and energy conservation. Guides to best industry practices, thoughtful input into proposed legislative changes, and sponsorship of research and development that enhances industry's efficiency and reduces its effects are just a few of the ways that CAPP and SEPAC promote energy efficiency and environmental protection across the country. The industry has come a long way during the past decade and is committed to continued and further progress.

In 1999 CAPP established its Stewardship initiative, a voluntary program to encourage members to continually improve their environmental, health and safety performance and to report their progress to stakeholders. The Stewardship initiative provides quantitative benchmarks that allow firms to gauge areas of excellence and identify operations that need improvement. As of January 2003, all of CAPP's producing member companies must commit to the Stewardship initiative.

CAPP and SEPAC are developing a guide to help companies with calculations and methodologies for company-operated facilities on a gross-production basis and to empower facility operators to implement efficiency programs. The CAPP-SEPAC guide will also eliminate double-counting of emissions. CAPP member companies have agreed to use production energy intensity (PEI) and production carbon intensity (PCI) as standardized GHG performance indicators.

Following are examples of individual petroleum producers that have made significant strides toward improved energy efficiency and reduced GHG emissions.

Even while recording strong growth and increased production, EnCana Corporation has made significant progress in reducing absolute GHG emissions and emissions intensity. EnCana's absolute GHG emissions for 2001 were more than 2 megatonnes lower than its emissions in 2000.

From 2000 to 2001, Calpine Canada Resources Company actively worked to identify and implement actions to improve its energy efficiency, heat recovery and capture of vented or flared gas. Calpine's overall gross production volumes increased 10 percent over that period, while corresponding CO_2e emissions remained constant. In a joint project recognized by CleanAir Canada Inc. for creating emissions credits, Newalta Corporation granted Calpine a credit of 2500 tonnes of CO_2 for recovering and recycling oil from oil-field waste.

GHG-reduction projects implemented in 2001 and 2002 have enabled ConocoPhillips Canada to reduce emissions by approximately 223 kilotonnes of CO_2e emissions per year. Further actions planned for 2003 and 2004 will lower annual GHG emissions by an additional 56 kilotonnes of CO_2e, an 8.6 percent reduction compared with 2001.

Petro-Canada uses an environmentally sensitive drilling rig to explore for natural gas in the Mackenzie Delta. The rig is designed to redistribute all of the waste heat it generates while operating, saving fuel and reducing emissions of NO_x and CO_2.

ACHIEVEMENTS

As noted, as of January 1, 2003, all CAPP producer members must commit to the Association's Stewardship initiative. CAPP is developing practical tools that include presentations, workshops and implementation manuals to help its member companies meet their commitments.

In 1997 the Alberta Energy and Utilities Board and the Clean Air Strategic Alliance, along with various stakeholders, began a review of gas flaring in Alberta. By voluntarily pursuing the project team's recommendations, the industry achieved a 53 percent reduction in flaring by the end of 2001 (as compared with 1996), surpassing the project's targets. The industry has now turned its attention to the related issue of venting.

The upstream oil and gas sector is committed to research and development. For example, eight of the world's largest energy companies are participating jointly in the international CO_2 Capture Project to reduce the overall cost of the capture, transport and storage of CO_2.

CHALLENGES

Rising energy demands and higher prices have led to a rapid increase in exploration and development. Greater activity in the field translates into more energy consumption, making a reduction in overall energy use within the sector unlikely in the short term. However, sector companies have made substantial progress in reducing their energy intensity and, consequently, their carbon intensity.

Upstream oil and gas operations emit GHGs through the combustion of natural gas, propane and diesel; the process venting and fugitive emissions of methane; and the process venting of CO_2. The industry is also concerned about indirect emissions related to its purchase of electricity generated by fossil-fuel combustion. The sector is addressing each of these challenges through research and innovation and by sharing its successes throughout the industry.

Wood Products

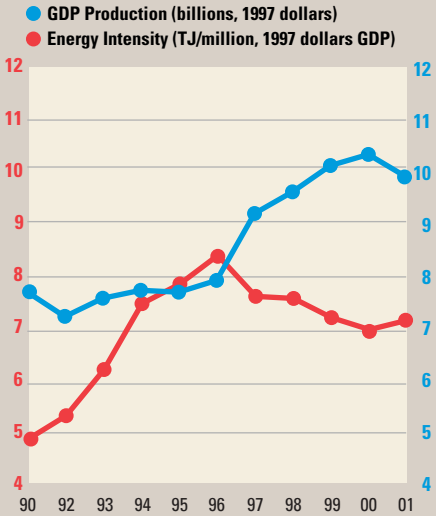
Profile *The wood products sector includes three industry groups: establishments engaged in sawing logs into lumber and similar products; companies that make products that improve the natural characteristics of wood by manufacturing veneers, plywood, reconstituted wood panel products and engineered wood assemblies; and establishments that make a diverse range of wood products, such as millwork. At the end of 2001, the industry consisted of nearly 3000 establishments across Canada that employed just under 20 000 workers.*

Performance Highlights

- Weldwood of Canada Limited's HI-ATHA sawmill does not generate any fossil-fuel GHG emissions during normal operations.
- Energy efficiency improvements at Riverside Forest Products Limited, Armstrong Division have resulted in an average GHG emissions reduction of 0.264 tonne of CO_2e per year per 1000 MSF (thousand square feet) of plywood produced.
- Tembec Industries Inc. has established its Impact Zero® program to minimize the effect of manufacturing activities on the environment.
- Erie Flooring and Wood Products has made significant improvements to its energy efficiency.
- Forintek Canada Corp.'s industry-wide energy benchmarking project is well underway.
- Wood products companies continue to develop cost-effective biomass energy systems to reduce the use of costly natural gas and electricity.

Wood Products Manufacturing Sector – NAICS 321000[1]

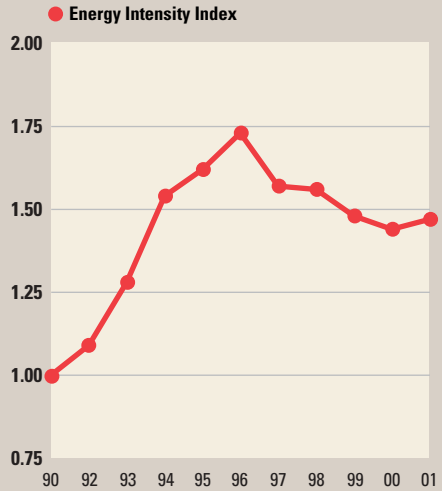
Energy Intensity and Economic Output (1990–2001)



Data source: Canadian Industrial Energy End-Use Data and Centre (CIEEDAC). *Development of Energy Intensity Indicators Analysis for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Wood Products Manufacturing Sector – NAICS 321000[1]

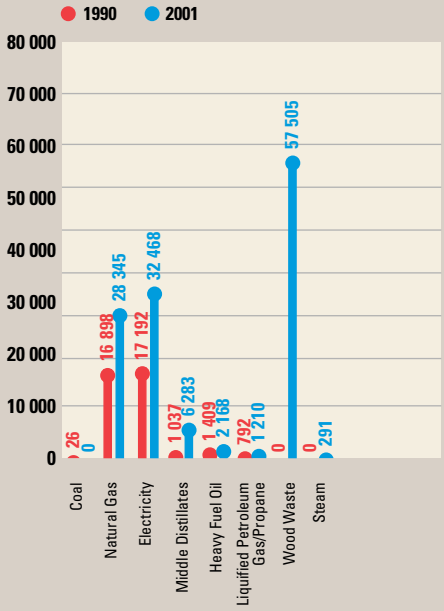
Energy Intensity Index (1990–2001) Base Year 1990 = 1.00



Data source: Canadian Industrial Energy End-Use Data and Centre (CIEEDAC). *Development of Energy Intensity Indicators Analysis for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

Wood Products Manufacturing Sector – NAICS 321000

Energy Sources in Terajoules per Year (TJ/yr.)



Data source: Canadian Industrial Energy End-Use Data and Centre (CIEEDAC). *Development of Energy Intensity Indicators Analysis for Canadian Industry 1990–2001.* December 20, 2002. Simon Fraser University.

[1] Wood waste data not available prior to 1995. Wood waste is excluded from total.

ACTIONS

Forest product companies are actively building energy efficiency through improved operating methods and ongoing capital investment. For example, Weldwood of Canada Limited's HI-ATHA sawmill in Hinton, Alberta, does not generate any fossil-fuel GHG emissions during normal operations. Wood-waste fuel provides nearly all mill heating, including kiln drying. The mill's electricity is generated using biomass fuel at the adjacent Hinton pulp mill operation. The mill has reduced its propane consumption – used for winter heating – from an average of 225 000 litres to 50 000 litres by capturing surplus heat generated by wood waste from its lumber-drying kilns.

Between 1990 and 2000, Domtar Inc.'s GHG emissions from fossil fuels rose only 3.5 percent while production increased by 24.6 percent. This is a direct result of energy-reduction and continuous improvement activities throughout the company, better working practices that maximize the use of resources, improved efficiency, the elimination of waste and the replacement of fossil fuels by renewable biomass fuels.

Over the last three years, Riverside Forest Products Limited, Armstrong Division in Armstrong, British Columbia, has made improvements to its process furnaces, dryers and kilns and to systems for its motor drives, the boiler plant, water, lighting, heating, ventilation and air conditioning. The company has also advanced its use of cogenerated steam and electricity. These improvements have resulted in an annual average 0.61 percent reduction in GHG emissions, or 0.264 tonne of CO_2e per year per 1000 MSF (thousand square feet) of plywood produced. The company will continue to improve its operating, process and equipment efficiency and to reduce fossil-fuel consumption by drawing more energy from biomass sources.

Tembec Industries Inc. is committed to integrating sustainable development into its operations and to continually improving its environmental performance. To attain these objectives, Tembec has established the Impact Zero® program for its manufacturing facilities. The main goal of Impact Zero® is to minimize the effect of manufacturing activities on the environment. The program includes the development of environmental objectives, targets and action plans and the implementation and maintenance of an environmental management system in accordance with ISO 14001.

In its first year since becoming a CIPEC Industrial Energy Innovator, Erie Flooring and Wood Products of West Lorne, Ontario, has made significant improvements to its energy efficiency. By improving its boiler plant and systems for process heating, motor drives and lighting and climate control, the company has reduced its energy consumption by 10 percent per year. The company plans to continue to upgrade its older equipment with alternatives that are more energy efficient, install additional variable frequency motors and evaluate the potential for cogeneration.

Forintek Canada Corp.'s energy benchmarking project is well underway. The project, which has received funding from NRCan's Office of Energy Efficiency, is designed to support the CIPEC Wood Products Sector Task Force's efforts to promote energy efficiency in the solid wood industry. Forintek is examining industry performance in Canada and is developing benchmarking data to establish energy efficiency targets, action plans, policies and best practices within the sector's companies. To help refine its energy auditing procedures, Forintek has performed pre-audits on two mills and will begin auditing other facilities when company questionnaires are received. Forintek is also collecting general statistics on energy consumption in Canada and competing countries and is developing recommendations about the technologies in use in Canadian mills.

ACHIEVEMENTS

The wood products sector consumed 70 769 TJ of fossil fuels and electricity in 2001. Although rising production in the sector has driven energy consumption upward, actions taken by companies to improve energy efficiency have led to substantial gains in energy intensity.

Recent rises in energy prices will provide a powerful incentive for wood products manufacturers to implement low-cost energy efficiency measures. Companies will likely continue to develop cost-effective biomass energy systems based on wood waste, displacing the use of costly natural gas and electricity.

CHALLENGES

Companies in the wood products sector have continued to make investments and introduce measures that improve energy efficiency. However, ongoing adverse economic factors continue to make it exceedingly difficult for most forest products companies to invest in energy efficiency. Economic realities are also forcing companies to pursue new markets and to manufacture higher-value products that require more energy to produce.

Seeking to maintain production efficiency at sustainable levels, Canadian wood products companies have closed facilities and allocated production to fewer mills. Although the closure of facilities will reduce the sector's total energy consumption over the short term, the lack of investment in energy efficiency makes it unlikely that the industry will be able to make significant improvements in energy intensity.

Industrial Energy Innovators

Through NRCan's Office of Energy Efficiency (OEE), the Industrial Energy Innovators program focuses on transforming the sector-level commitments made by task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level.

As of April 1, 2002, 374 manufacturing and mining companies – representing approximately 85 percent of industrial energy use in Canada – have signed on as Industrial Energy Innovators. The majority of these companies are participants in Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.), a non-profit partnership between industry and government across Canada. VCR Inc. provides the means for promoting, assessing and recognizing the effectiveness of the voluntary approach in addressing climate change. In addition, 65 Industrial Energy Innovators and five trade associations have earned VCR Inc.'s Gold, Silver or Bronze Level Champion Reporter status.

CIPEC has strengthened the participation of Industrial Energy Innovators in VCR Inc. through a number of activities. These include programs to increase awareness of the economic benefits of improved energy use, tools to remove barriers that hinder energy management improvement projects within companies, and ideas to promote effective energy management systems within individual companies. CIPEC believes that parallel efforts among like-minded organizations are needed to maximize Canada's industrial energy efficiency.

For information on becoming an Industrial Energy Innovator, contact the OEE by e-mail at cipec.peeic@nrcan.gc.ca or visit the Web site at oee.nrcan.gc.ca/cipec.

Industrial Energy Innovators by Sector

Aluminum
Alcan Inc.
Alcoa – Aluminerie de Baie Comeau
Alcoa – Aluminerie de Bécancour Inc.
Alcoa – Aluminerie Lauralco, Inc.
Aluminerie Alouette Inc.

Brewery
Big Rock Brewery Ltd.
Labatt Breweries of Canada
Molson Breweries – Edmonton Brewery
Molson Canada – Ontario
Moosehead Breweries Ltd.
Sleeman Brewing and Malting Co. Ltd.

Cement
ESSROC Canada Inc.
Gordon Shaw Concrete Products Ltd.
Lafarge Canada Inc.
Lehigh Inland Cement Limited
St. Lawrence Cement Inc.
Tilbury Cement Ltd.

Chemical
Chinook Group Limited – Sombra Plant
Degussa-Hüls Canada Inc.
DuPont Canada Inc.
MDS Nordion Inc.
Nacan Products Limited
NOVA Chemicals Corporation
OxyVinyls Canada Inc.
Rohm and Haas Canada Inc.

Construction
Lockerbie & Hole Industrial Inc.

Dairy
Agrinor Inc.
Agropur
Armstrong Cheese Company Ltd. – Alberta
Foothills Creamery Ltd.
Hewitt's Dairy Limited
Laiterie Chagnon Ltée
Lone Pine Cheese Ltd.
Le Mouton Blanc
Parmalat Dairy & Bakery Inc.
Pine River Cheese & Butter Co-operative
Roman Cheese Products Ltd.
Salerno Dairy Products Ltd.

Electrical/Electronics
ASCOlectric Ltd.
Broan-NuTone Canada
Camco Inc.
Century Circuits Inc.
Crest Circuit Inc.
Honeywell Limited
IBM Canada Ltd.
Milplex Circuit (Canada) Inc.
Nortel (Northern Telecom Limited)
Osram Sylvania Ltd.
PC World – Division of Circuit World Corporation
Vansco Electronics Ltd.

Electricity Generation
Ontario Power Generation Inc.

Fertilizer
IMC Potash Belle Plaine
IMC Potash Colonsay
IMC Potash Esterhazy
Potash Corp. of Saskatchewan Inc.
– Allan Division
– Cory Division
– Lanigan Division
– New Brunswick Division
– Patience Lake Division
– Rocanville Division

Food and Beverage
Alberta Processing Co., A Division of West Coast Reduction Ltd.
Andrés Wines Ltd.
API Grain Processors
Beta Brands Limited
Better Beef Ltd.
Black Velvet Distilling Co.
Borden Foods Canada
Burnbrae Farms Ltd. – Mississauga
Canada West Foods J.V. Inc.
Canamera Foods
Canbra Foods Ltd.
Canyon Creek Soup Company Ltd.
Cargill Animal Nutrition – Camrose Plant
Cargill Animal Nutrition – Lethbridge Plant
Cargill Foods – High River Plant
Carson Foods
Casco Inc.
Champion Petfoods
Coca-Cola Bottling Ltd.
Cuddy Food Products
Don Chapman Farms Ltd./ Lakeview Vegetables Inc.
Effem Inc.
Family Muffins & Desserts Inc.
Furlani's Food Corporation
Garden Province Meats Inc.
Greenview Aquafarm Ltd.
H.J. Heinz Company of Canada Ltd.
Heritage Frozen Foods Ltd.
Hershey Canada Inc.
Hubberts Industries
Hub Meat Packers Ltd. – Sunrise Brand
J.R. Ouimet Inc.
Kraft Canada Inc.
Legal Alfalfa Products Ltd.
Lilydale Cooperative Ltd.
Maple Leaf Foods Inc.
Maple Lodge Farms Ltd.
Marsan Foods Limited
McCain Foods (Canada) – Alberta, A Division of McCain Foods Limited
Mitchell's Gourmet Foods Inc.
Nestlé Canada Inc.
Northern Alberta Processing Co., A Division of West Coast Reduction Ltd.
Oakrun Farm Bakery Ltd.
Les Oeufs Bec-O Inc.
Olymel, L.P.
Pepsi-Cola Canada Beverages
Prairie Mushrooms (1992) Ltd.
Principality Foods Ltd.
Reinhart Foods Limited
Quality Fast Foods
Sakai Spice (Canada) Corporation
Schneider Foods
Sunny Crunch Foods Limited
Sunrise Bakery Ltd.
Sun-Rype Products Ltd.
Sun Valley Foods Canada
Townline Foods/Processing Ltd.
Transfeeder Inc.
Trochu Meat Processors
Trophy Foods Inc.
Unifeed Premix
Versacold Corporation
Westcan Malting Ltd.
Westglen Milling Ltd.
Weston Foods Inc.

Foundry
Ancast Industries Ltd.
Bibby-Ste-Croix
Century Pacific Foundry Ltd.
Crowe Foundry Limited
Deloro Stellite Inc.
ESCO Limited – Port Coquitlam Operations
ESCO Limited – Port Hope Operations
Eureka Foundry Corporation (A Subsidiary of ACI Canada Inc.)
Gamma Foundries Limited
Grenville Castings Limited
Ramsden Industries Limited
Stackpole Limited
Vehcom Manufacturing (A Division of Comtech Mfg. Ltd.)
Wabi Iron & Steel Corporation

Industrial Energy Innovators by Sector

General Manufacturing

3M Canada Inc.
ABCO Property Management Inc.
Acadian Platers Co. Ltd.
Armstrong World Industries Canada Ltd.
Bentofix Technologies Inc.
Canadian Uniform Limited
Champion Feed Services Ltd.
Climatizer Insulation Inc.
Corus s.e.c.
Coyle & Greer Awards Canada Ltd.
Crown Cork & Seal Canada Inc.
Descor Industries Inc.
Dipaolo CNC Retrofit Ltd.
Emco Limited – Building Products
Envirogard Products Ltd.
Escalator Handrail Company Inc.
Euclid-Hitachi Heavy Equipment Ltd.
Federated Co-operatives Limited
Ferraz Shawmut Canada Inc.
Fibrex Insulations, Inc.
Garland Commercial Ranges Limited
Greif Containers Inc.
IKO Industries Ltd.
Imaflex Inc.
Imperial Home Decor Group Canada Inc.
Imperial Tobacco Canada Limited
Interface Flooring Systems (Canada) Ltd.
International Paper Industries Ltd.
J.A. Wilson Display Ltd.
Jones Packaging Inc.
Kindred Industries
Kodak Canada Inc.
LePage (Division of Henkel Canada Limited)
Maksteel Service Centre
(Division of Makagon Industries Ltd.)
Metro Label Company Ltd.
Metroland Printing, Publishing & Distributing Ltd.
Montupet Ltd.
North American Decal
Norwest Precision Limited
Orica Canada Inc.
Owens Corning Canada Inc. – Candiac Plant
Owens Corning Canada Inc. – Toronto Plant
Polytainers Inc.
PowerComm Inc.
Procter & Gamble Inc.
PRO-ECO Limited
Russel Metals Inc. (Alberta)
S.C. Johnson and Son, Limited
Saint-Gobain Ceramic Materials
Sandvik Tamrock Canada Inc.
Sandvik Tamrock Loaders Inc.
Scapa Tapes North America
Simmons Canada Inc.
Soprema Inc. (Drummondville Plant)
Stowe Woodward Co. (British Columbia)
(Division of Cascades Inc.)
Superior Radiant Products Ltd.
Teknion Furniture Systems Inc.
Unifiller Systems, Inc.
VA TECH Ferranti-Packard Transformers Ltd.
VicWest Steel
Wabash Alloys Ontario
Waiward Steel Fabricators Ltd.
Wyeth-Ayerst Canada Inc.
ZENON Environmental Inc.

Lime

Carmeuse Lime (Beachville) Limited
Chemical Lime Company of Canada Inc.
Dundas Lime Limited
Graymont (NB) Inc.
Graymont (QC) Inc.
Graymont Western Canada Inc.
Northern Lime Limited

Mining

Aur Resources Inc.
Barrick Gold Corporation
BHP Billiton Diamonds Inc.
Boliden Limited
Canadian Electrolytic Zinc Limited
Echo Bay Mines Ltd. – Lupin Operation
Falconbridge Limited
Fonderie Horne – Métallurgie Noranda inc.
Hillsborough Resources Limited
Hudson Bay Mining & Smelting Co., Ltd.
Inco Limited
Iron Ore Company of Canada
Mines et exploration Noranda inc. –
Division Matagami
Mines Wabush (Managed by
Compagnie Minière Cliffs inc.)
Newmont Canada Limited, Golden Giant Mine
Noranda Inc. – Brunswick Mining Division
Noranda Inc. – Brunswick Smelter
Noranda Metallurgy Inc.
(Canadian Copper Refinery)
Placer Dome Canada Limited
Quebec Cartier Mining Company
Syncrude Canada Ltd.
Teck Cominco Limited

Petroleum Products

Bitumar Inc.
Canadian Tire Petroleum
Chevron Canada Limited – Burnaby Refinery
Husky Energy Inc.
Imperial Oil Limited
Irving Oil Limited
Parkland Refining Ltd.
Pengrowth Corporation
Petro-Canada
Safety-Kleen Corp.
Shell Canada Products Limited
Suncor Energy Inc. – Sunoco Group
Ultramar Ltd. (Saint-Romuald Refinery)

Plastics

The Clorox Company of Canada, Ltd.
Downeast Plastics Ltd.
Husky Injection Molding Systems Ltd.
Matrix Packaging Inc.
Par-Pak Ltd.
Silgan Plastics Canada Inc.

Pulp and Paper

Abitibi-Consolidated Inc.
Bowater Canadian Forest Products Inc.
Cariboo Pulp and Paper Company Limited
Cascades Inc.
Domtar Inc.
Emballages Smurfit-Stone Canada inc. –
La Tuque Plant
Eurocan Pulp & Paper Company Limited
F.F. Soucy Inc.
Interlake Paper Limited
Kruger Inc.
Lake Utopia Paper
Marathon Pulp Inc.
Maritime Paper Products Limited
New Skeena Forest Products Inc.
Norampac Inc. (Division of Cascades Inc.)
NorskeCanada
Paperboard Industries International Inc.
(Division of Cascades Inc.)
Papiers Stadacona
Perkins Papers Inc. (Division of Cascades Inc.)
Rolland Inc. (Division of Cascades Inc.)
St. Marys Paper Ltd.
Stora Enso North America, Port Hawkesbury Mill
Tembec Paper Group – Spruce Falls Operations
Tolko Manitoba Kraft Papers
UPM-Kymmene Miramichi, Inc.
Weldwood of Canada Limited
West Fraser Timber Co. Ltd.

Rubber

Goodyear Canada Inc.
Hamilton Kent
Michelin North America (Canada) Inc.
NRI Industries Inc.

Steel

Algoma Steel Inc.
AltaSteel Ltd.
Atlas Specialty Steels
(A Division of Slater Stainless Corp.)
CHT Steel Company Inc.
Dofasco Inc.
Gerdau Ameristeel Corporation
Hilton Works (A Division of Stelco Inc.)
Ivaco Inc. (Ivaco Rolling Mills)
Lake Erie Steel Company
(A Division of Stelco Inc.)
Laurel Steel (Division of Harris Steel Limited)
Namasco Limited
QIT – Fer et Titane inc.
Slater Steel Inc. – Hamilton Specialty Bar Division
Stelco Inc.
Stelco-McMaster Ltée
Stelfil Ltée
Stelpipe Ltd.
Stelwire Ltd.

Textiles

Agmont Inc.
Albarrie Canada Limited
Barrday Inc.
Beaulieu Canada Company
Bennett Fleet (Quebec) Inc.
Britex Group (The)
C.S. Brooks Canada Inc. (Magog)
Cambridge Towel Corporation (The)
Cavalier Textiles
Coats Bell
Collingwood Fabrics Inc.
Collins & Aikman Canada Inc.
Consoltex Inc.
CookshireTex inc.
Denim Swift
Doubletex Inc.
Fabrene Inc.
J.L. de Ball Canada Inc.
LaGran Canada Inc.
Lincoln Fabrics Ltd.
Manoir Inc.
Monterey Textiles (1996) Inc.
Nova Scotia Textiles, Limited
PGI-DIFCO Performance Fabrics Inc.
Spinrite Inc.
St. Lawrence Corporation
Stedfast Inc.
Velcro Canada Inc.
VOA Colfab Inc.

Transportation Equipment Manufacturing

ABC Group Inc.
Accuride Canada Inc.
Air Canada Technical Services
Boeing Toronto Limited
Bombardier Aerospace
Bombardier Inc. – Valcourt Plant
Cami Automotive Inc.
Canadian General-Tower Limited
Canadian Pacific Railway Company
DaimlerChrysler Canada Inc.
Dresden Industrial, A Division of
KSR International Co.
Dura Automotive Systems (Canada), Ltd.
Dynaplas Ltd.
Ford Motor Company of Canada, Limited
General Motors of Canada Limited
Honda of Canada Mfg.
Iafrate Machine Works Ltd.
International Truck and Engine
Corporation Canada
Oetiker Limited
Orenda Aerospace Corporation
Orion Bus Industries Inc.
Oxford Automotive, Inc. –
Suspension Division, Chatham
Polywheels Manufacturing Ltd.
Pratt & Whitney Canada Inc.
Presstran Industries
Prévost Car Inc.
Production Paint Stripping Ltd.
R. Reininger & Son Limited
Rockwell Automation Canada Inc.
Russel Metals Inc.
Sterling Trucks, A Division of Freightliner Limited
Toyota Motor Manufacturing Canada Inc.
TRW Automotive
Volvo Cars of Canada Ltd.
Woodbridge Group (The)

Upstream Oil and Gas

BP Canada Energy Company
ConocoPhillips Canada (North) Limited –
Empress Plant
Enbridge Pipelines Inc.
Newalta Corporation
Nexen Canada Ltd.
Paramount Resources Ltd.
Taurus Exploration Ltd.
Trans World Oil & Gas Ltd.

Wood Products

Canfor Corporation
Erie Flooring and Wood Products
Madawaska Doors Inc.
Marcel Lauzon Inc.
Nexfor Inc.
Riverside Forest Products Limited,
Armstrong Division
Tembec Industries Inc.
Weyerhaeuser Canada Ltd.

Association Members

Aerospace Industries Association of Canada

Alberta Food Processors Association

Aluminium Association of Canada

Automotive Parts Manufacturers' Association

Baking Association of Canada

Canadian Association of Manmade Vitreous Fibre Manufacturers

Canadian Association of Petroleum Producers

Canadian Chamber of Commerce

Canadian Chemical Producers' Association

Canadian Construction Association

Canadian Council of Grocery Distributors

Canadian Electricity Association

Canadian Fertilizer Institute

Canadian Foundry Association

Canadian Gas Association

Canadian Lime Institute

Canadian Manufacturers & Exporters (CME)

– CME Alberta Division

– CME British Columbia Division

– CME Manitoba Division

– CME New Brunswick Division

– CME Newfoundland Division

– CME Nova Scotia Division

– CME Ontario Division

– CME Prince Edward Island Division

Canadian Meat Council

Canadian Petroleum Products Institute

Canadian Plastics Industry Association

Canadian Steel Environmental Committee (Canadian Steel Producers Association)

Canadian Textiles Institute

Canadian Vehicle Manufacturers' Association

Cement Association of Canada

Council of Forest Industries

Electro-Federation Canada

Fisheries Council of Canada

Food and Consumer Products Manufacturers of Canada

Forest Products Association of Canada

Forintek Canada Corporation

Mining Association of Canada

Ontario Agri Business Association

Ontario Food Producers' Association

Packaging Association of Canada

Québec Forest Industries Association

Rubber Association of Canada

Small Explorers and Producers Association of Canada

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Glossary of Terms

Annual Census of Mines
NRCan survey that collects information on NAICS 2122 (Metal Mining) and NAICS 2123 (Non-Metal Mineral Mining and Quarrying). Full name is Annual Census of Mines, Quarries and Sand Pits.

Annual Survey of Manufacturers (ASM)
Statistics Canada survey. Provides information on the consumption of purchased fuels and electricity (CPFE) for approximately 230 sub-sectors at four-digit NAICS code levels.

Base Year
A reference year. For the Framework Convention on Climate Change, 1990 is the base year.

Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.)
VCR Inc. is a key element of Canada's National Action Program on Climate Change. It encourages the private and public sectors to take voluntary steps to limit or reduce GHG emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce GHGs from their operations. This is followed by an action plan and subsequent progress reports. The Industrial Programs Division of NRCan's Office of Energy Efficiency provides a means for manufacturing, mining, construction and energy supply companies to enrol in VCR Inc.

Carbon Dioxide (CO_2)
A compound of carbon and oxygen that in its normal gaseous state is clear and colourless. CO_2 is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions that do not involve combustion.

Carbon Dioxide Equivalent (CO_2e)
A metric measure used to compare the emissions of the different GHGs based upon their global warming potential. Global warming potentials are used to convert GHGs to CO_2e.

Economic Energy Intensity
Energy consumption per unit of economic output.

Embodied Energy
The energy consumed to transform all upstream raw materials into the final product; in a life-cycle approach, it would be the "cradle to grave" energy burden.

Energy Intensity
Energy consumption per unit of output.

Energy Intensity Indicator
A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Performance Measures
Any of a variety of metrics that would indicate an aspect of energy performance.

Framework Convention on Climate Change
United Nations convention to address climate change signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing GHG emissions at 1990 levels by the year 2000.

Greenhouse Gas (GHG)
A GHG absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main GHGs are carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs) and nitrous oxides (N_2O). By far the most abundant GHG is CO_2, accounting for 70 percent of the greenhouse effect.

Gross Domestic Product (GDP)
The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1997 dollars unless otherwise noted.

Higher Heating Value
The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15˚C when combustion starts, and the products of combustion being cooled to 15˚C before the heat release is measured (also called gross calorific value or gross heating value).

Industrial Consumption of Energy (ICE) Survey
Statistics Canada survey on energy use. Covers purchased and non-purchased energy for approximately 24 industrial sub-sectors.

Lower Heating Value
The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen, the higher and lower heating values are the same (also called the lower calorific value or the net heating value).

Natural Resources Canada (NRCan)
The predominant natural resource department of the Government of Canada, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources and to develop an understanding of Canada's land mass.

Nitrogen Dioxide (NO_2)
One of a group of gases called nitrogen oxides, which are composed of nitrogen and oxygen. Like sulphur dioxide, nitrogen oxides can react with other chemicals in the atmosphere in the presence of sunlight to form acidic pollutants, including nitric acid.

Nitrogen Oxides (NO_x)
The sum of nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen oxides react with volatile organic compounds in the presence of sunlight to form ground-level ozone.

North American Industry Classification System (NAICS)
A classification system that categorizes establishments into groups with similar economic activities. The structure of NAICS, adopted by Statistics Canada in 1997 to replace the 1980 Standard Industrial Classification (SIC) system, has been developed by the statistical agencies of Canada, Mexico and the United States.

Physical Energy Intensity
Energy consumption per unit of physical output.

Quarterly Report on Energy Supply and Demand (QRESD)
Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are gathered principally by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products.

Specific Energy (Consumption)
Energy consumption per physical unit of output (also called physical energy intensity).

Standard Industrial Classification (SIC)
A classification system that categorizes establishments into groups with similar economic activities.

Statistics Canada
Statistics Canada is the country's national statistical agency, with programs organized into three broad subject areas: demographic and social, socio-economic and economic. Under the *Statistics Act*, Statistics Canada is required to collect, compile, analyse, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Sulphur Oxides (SO_x)
A product of combustion of fuels that contain sulphur. SO_x is a major component of acid rain.

Tier I
Informal designation by CIPEC of industries that are major energy-consuming industries. The seven designated Tier I industries are pulp and paper, petroleum refining, cement, mining, steel, chemicals and aluminum. The Tier I industries account for approximately 80 percent of total Canadian industrial energy consumption.

Tier II
Informal designation by CIPEC of industries that are minor energy-consuming industries (relative to Tier I industries) but contribute substantially to Canadian industrial GDP. Tier II industries account for 60 percent of Canadian industrial GDP.

For more information or to receive additional copies of this publication, write to

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Leading Canadians to Energy Efficiency at Home, at Work and on the Road

The Office of Energy Efficiency of Natural Resources Canada strengthens and expands Canada's commitment to energy efficiency in order to help address the challenges of climate change.

Canada